



Colombo West International
Terminal (Private) Limited

Environmental and Social Impact Assessment (ESIA) and Environment & Social Management Plan (ESMP) for West Container Terminal – 1: Colombo, Sri Lanka

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Environmental and Social Impact Assessment (ESIA) and Environment & Social Management Plan (ESMP) for West Container Terminal – 1: Colombo, Sri Lanka

Final Report

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EXECUTIVE SUMMARY

Introduction

In Sri Lanka, the amount of cargo handled in seaports has been rapidly increasing as its economy has grown steadily in recent years. Colombo Port, which is the largest port in the country, has functioned as a leading transshipment hub port in the South Asia region, and approximately 80% of the 2018 container throughput was transshipment freight to neighbouring countries such as India. The annual container throughput at the Colombo Port doubled in the last ten years from 3.5million TEUs in 2009 to 7 million TEUs in 2018 and is forecast to reach nearly 9 million TEUs by 2030 and approximately 16 million TEUs by 2050.

With such increase in the cargo demand, The West Container Terminal (WCT)-1 is aiming to construct the container terminal with a capacity of 3.2 million TEUs at the western part of the Colombo Port. The total requirement of sand volume is estimated to be 15 million m³ which will be sourced from SLPA sand borrow area at Kerawalapitiya, located 9km away from Kepungoda and 7.2km from Basiyawatta towards offshore and 20km away from Colombo Port and about 8.5km from Negombo Lagoon mouth.

The proposed project must conduct EIA as it falls under the “Prescribed Project” category under Sri Lanka’s National Environmental Act (NEA) of 2000. As per requirement of NEA 2000, the proposed WCT-1 has conducted the EIA study and CCCRMD issued permit of 8th February, 2006 and periodically renewed by the project proponent- SLPA.

Purpose and Objective of Study

ERM understands that SLPA is planning to develop the WCT-1 by constructing container terminal at the western part of Colombo Port. In this context, the project requires evaluating the environmental and social impacts and risk associated with the project and to implement mitigation measures to avoid adverse impacts. The project need to assess as per applicable reference framework.

This ESIA report discusses the environmental, social and ecological baseline around the Colombo Port and assess the potential adverse and beneficial impacts that the project could have along with suitable mitigation measures and an Environmental and Social Management Plan (ESMP) for the project.

Project Proponent

The West Container Terminal Phase-1 Project's proponent is Colombo West International Terminal (Pvt) Ltd (CWIT). Adani Ports and SEZ Ltd., the largest port operator in India, John Keells Holdings, the largest company in Sri Lanka, and the Sri Lanka Ports Authority make up the partnership known as CWIT (SLPA).

Resource Requirement

Water

Approximately 250 kilo liters per day (KLD) water will be required for construction activities which will be sourced from SLPA. And during the operation phase approximately 35 KLD of water will be utilized which will be sourced from SLPA and also water supply tank will be used to meet the demand.

Manpower

It is estimated that approximately 950 persons will be required during the peak construction stage of the proposed project. During the operation stage work force requirement will be approximately 500-600 person.

Environmental and Social Baseline

To determine whether there are sensitivities/sensitive receptors in this area, a 5km radial zone around the proposed project site has been investigated. The zone of influence (ZOI) is defined by a generally flat area that is predominately made up of built-up areas, the ocean and port facilities. The baseline study was conducted through primary monitoring and surveys and also through collection of relevant secondary information from variable sources.

Physical Environment

Air Quality: Ambient air quality was monitored at three locations within the ZOI during the months of July, October, November, and December. The average concentration of PM₁₀ and PM_{2.5} in all three locations was within the prescribed value of the ambient air quality standard as per CEA, except for AQ-3, near the port main gate. And all remaining parameters, such as SO₂, NO₂, and CO, measured at the monitoring locations were within the ambient air quality standard of the CEA. The higher particulate values in the AQ-3 monitoring location could be attributed to vehicular emissions and the generation of re-entrained dust from vehicles plying the roads.

Noise Quality: Ambient noise monitoring was conducted at three monitoring locations during the study period. The daytime equivalent noise levels at these locations varied from 39.13 dB(A) to 62.62 dB(A), which are in compliance with the CEA standard for industrial and commercial areas of 75 dB(A) as well as the IFC guidelines for industrial and commercial areas of 70 dB(A). The night-time equivalent noise levels at these locations varied from 30.82 dB(A) to 60.32 dB(A), which are in compliance with CEA standard for industrial and commercial areas of 60 dB(A) as well as the IFC guidelines for industrial and commercial areas of 70 dB(A). The higher noise level recorded in NQ-3, could be attributed to traffic movement and existing ports operational activities near the monitoring location.

Sediment Quality: Screening level marine sediment quality was monitored from two locations within the basin area and two locations in the sand borrow area. Additional sediment quality was monitored at 11 locations within the basin area and at 15 locations in the sand borrow area. All the heavy metals like arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc were well below the intervention value specified in the Dutch Standards. The polychlorinated biphenyls (PCBs) and polycyclic aromatic hydrocarbons (PAHs) were not detected in monitored locations.

Marine Water Quality: Marine water quality was analysed from four locations: two from basin areas and two from sand borrow area. In Sri Lanka, there are currently no standards for marine water quality; as a result, surface water quality guidelines created by the European Union (EU) have been adopted. The monitoring parameters like pH, DO, BOD, COD, TSS, ammoniacal nitrogen, and heavy metals (Ar, Cd, Zn, Pb, Hg, Cr, Cu, etc.) are well within the standards for the EU with regard to fisheries and aquatic life..

Biological Environment

Habitat: Ecological Appropriate Area of Analysis (EAAA) has been considered to assess the ecology and biodiversity of the area, Modified habitats within the EAAA include the marine part of Colombo Port area; sand borrow areas designated by SLPA for borrow of sands for multiple projects and offshore disposal area. The marine areas outside the Colombo port, vessel movement routes and designated sand borrow areas including the rocky reefs within the EAAA can be considered as natural habitats. On the terrestrial side Negumbo lagoon and Muturawawella Wetland can be considered as Natural Habitat.

Flora: around 123 plant species were reported from the EAAA, which included 77 natives and 46 exotics. None of the plant species found here are endemic to Sri Lanka.

Fauna: A total of 270 species of the seven taxonomic groups – the vertebrates (fish, amphibians, reptiles, birds and mammals) and the two selected invertebrate groups (butterflies and dragonflies)

are likely to occur here. Of these 234 are native / resident species whereas 17 species were exotic/introduced species and 20 were endemic.

A total of 27 species of reptiles which include a crocodile, turtles, agamid lizards, geckos, skinks, monitor lizards and snakes. Among these are four endemics, viz. Sri Lankan Keelback (*Xenochrophis asperimus*), Schokari's bronzeback (*Dendrelaphis schokari*), Flowery wolf snake (*Lycodon osmanhilli*) and Dumerul's kukri snake (*Oligodon sublineatus*).

As many as 105 bird species belonging to 48 families were recorded. This includes four endemics Sri Lanka Green-pigeon (*Treron pompadora*), Sri Lanka Crimson Fronted Barbet (*Psilopogon rubricapillus*), Sri Lanka Swallow (*Cecropis hyperythra*), and Lesser Sri Lanka Flameback (*Dinopium psarodes*). A total of 14 migrant species have been recorded in the vicinity during the migratory season and may therefore occur here.

17 species of mammals belonging to 10 families would potentially use the village woodland/plantation and marsh habitats. These include shrews, bats, two wildcats [Rusty spotted Cat and fishing cat], mongoose, otter, civets, porcupine, bandicoots and rats, squirrels and the hare.

Among the invertebrates are 57 species of butterflies representing six families. This also included the two endemics *Appias galena* (Sri Lankan Lesser Albatross) and *Potanthus satra* (Sri Lankan Dart/Tropic dart).

A total of 19 coral species belonging to 13 coral families were recorded in the IEE study. Earlier surveys and consultation with local fishermen has established presence of twenty three freshwater and brackish water species from the waterbodies, canals and marshes surrounding the proposed project site. Among the recorded fish species, one is globally Critically Endangered species Desilvai's Blind Eel (*Monopterus desilvai*). *Monopterus desilvai* is also a range restricted species and assessed as Critically Endangered by the National Red List of Sri Lanka (2012).

None of the species assessed under Criteria 1, 2 and 3 of IFC PS6 was found to be Critical Habitat Trigger for the project site or the EAAA. Based on the assessment, Criterion 4 and 5 will not be triggered.

Socio-Economic Environment

There are twenty Grama Niladhari Divisions (GND) under three Divisional Secretary's Divisions (DSD), i.e. Colombo, Negombo, Wattala located within the ZOI. The total population of these three DSDs is 2848819. Colombo is the most populated DS with population of 2479518. Total population in ZOI related GND is 120193. Catholic is majority religion in ZOI GNDs with 63.3 percent followers.

Secondary data shows that education level in these coastal GNDs is found to be significantly low compared to national level. Only 1 percent to 5 percent people has their university level education.

Drinking water mostly sourced through pipeline water within the ZOI. But in Colombo 95.26 percent water demand is meeting through tube well.

Fisheries communities in Colombo and Negombo will have direct or indirect impact due to their proximity to the project location. The fishermen residing in this regions are one of the major stakeholders. The total fishing population in the affected area is about 36654 from 8692 households. Despite of above statistics, the actual affected fishing community would include those who used certain fishing techniques. Only the OFRP boats will have some disturbances during the dredging activities and transport of dredge material to the basin area as they are operating within a 20 km area from the shore. and the dredging site is located within their operational area. The fishermen involved in fishing activities in large scale used to cross the area for deep-sea fishing, hence will not have significant impact.

Considering the disturbances for the fishing activities during the dredging period and possible accidents, following proposals are recommended to implement to improve the livelihood of the fisheries community;

As fisheries are anticipated to be impacted by dredging activities, it is advised to implement a suitable management plan which limits dredging to smaller areas at a time by informing the dredger location through digital media to relevant parties to minimize restrictions on fishing.

- To protect the fishermen, CWIT has prepared a strategy for an insurance programme. All registered fishermen who fall under the project's dredging area will be covered by the insurance programme for the duration of the project's operation.
- A formal system will be established with consultation with DFAR's to address any harm that dredging activities may cause to fishing boats and other associated equipment. The Project Proponent/Project Developer will provide compensation for losses brought on by dredging activities based on the assessment and approval of this committee.
- To improve the knowledge of the local fishing community, government authorities, regular awareness program to be held in order develop knowledge on the project activities.

Stakeholder Consultation

A range of stakeholders were consulted in order to gather their views, opinions and concerns about the proposed project including fishermen communities, women households at different GNs and it also include administrative officers such as Grama Niladhari officers, stakeholders associated with fishing activities etc.

The main findings and observations from the stakeholder consultation has been summarised below:

- **Stakeholders associated with fishing activities:** While talking to them many important information was obtained such as different type of fishing activities and different types of boats associated with these, market price of different kind of fishes, high and low season for fishing activities etc. Fishermen expressed their concern over sand mining activities as these activities has negative impact on overall fish population and it also has an impact on coastal sand erosion.
- **GN Officer, Doowe boat owners:** They gave their opinion about the benefits of this project such as short and long term employment, improvement to Colombo port etc. They also expressed their view on the negative impact from sand dredging activities and they proposed some mitigation measures to reduce those negative impacts. Also discussion on some beneficiary approaches such as possibilities to provide high quality fish nets to fishermen in project affected area etc. has also been done.
- **Fish landing point, Doowa GND, Negombo:** The office of fish landing point reported that there has been change in fish unloading in the last 5 years due to sand mining activities, drazing at sea for port city project. The fishermen from Chilaw, Wennappuwa, Mulative, Nayaru and also from southern province come at this fish landing point for unloading and selling fishes
- **Women group:** During the discussion it was understood that women are not associated with the fishing activities, they mostly staying at home for household works. But some women are associated with tailoring work, daily wage work, housekeeping work, pickle making and animal husbandry.

Summary of Key Potential Impacts

The environmental and social impacts that may be associated with Project activities are considered across the following stages a) Stage 1: Site Establishment, (b) Stage 2: Operation of terminal, summary of potential impact sources along with mitigation measures are presented in the table below:

Table 0.1 Potential Impacts and Mitigation Measures

S. No.	Project Activity	Aspect	Potential Impact	Mitigation Measures
Stage 1: Construction of Terminal				
1	Dredging at reclamation area for unsuitable soil	Costal morphology -	Costal morphology -	<ul style="list-style-type: none"> Trailer suction hopper dredgers (TSHD) will used for dredging activity;
2	Dredging of sand from sand extraction area			<ul style="list-style-type: none"> Trailer suction hopper dredgers (TSHD) will used for dredging activity; Sand extraction is limited to a maximum of 3m at a location to avoid creation of scattered deep holes in the area; Sand extraction should be limited to the prescribed area only; Use suction method to extract the sand;
3	Dredging of sand at borrow area and discharge in the reclamation area	Surface water quality	Increased sediment load in the receiving surface water body and potential to result in increase of suspended solid, decreased DO and increased BOD	<ul style="list-style-type: none"> Trailer suction hopper dredgers (TSHD) will used for dredging activity; Unsuitable soil from reclamation area will be disposed in the SLPA designated disposal site;
4	Dredging and disposal of soft (unusable sediment) at land reclamation area			<ul style="list-style-type: none"> Minimise the suspended sediments release through use of modern sand extraction method; The sand extraction can be limited to short-term as much as possible to avoid spawning or migration seasons and other biological critical time period; Maintain proper extraction methods and technology to prevent or minimise and potential damage and contractor should strictly adhere to sand dredging guidelines and strictly follow mitigation measures put forward to minimise sedimentation; Use of silt curtains wherever possible, i.e., along the boundaries of the dredge pocket and the reclamation area within the port basin and/or maintain turbidity level of the site to the standard level with other appropriate methods;

S. No.	Project Activity	Aspect	Potential Impact	Mitigation Measures
5	Discharge of untreated sewage from construction site			<ul style="list-style-type: none"> ■ verflow shall be avoided during dredger sailing including sailing from the sand borrow area to the reclamation area. ■ Offshore: All sewage generated will be treated and disinfected on-board and disposed offshore beyond 3 nautical miles (nm) complying with the MARPOL requirements. ■ Onshore: Provision of STP to treat wastewater from construction sites / labour camp proposed to be located within the Port Premises
6	Discharge of untreated bilge and ballast water		Impacts to surface water body due to mixing of hydro-carbon and chemicals; potential impact on water quality and aquatic ecology	<ul style="list-style-type: none"> ■ The bilge water will be handled by the shipping agent or terminal operator
7	Fugitive dust emissions from handling of construction materials like sand, cement and aggregate	Ambient air quality	Fugitive emission of dust and potential to degrade the ambient air quality.	<ul style="list-style-type: none"> ■ Construction materials would be stored in designated storage area; ■ The vehicular speed limit of 20 km/hr will be maintained within the project site;
8	Piling operation; Operation of TSHD	Under water noise and vibration	Potential increase of underwater noise and impact on aquatic fauna	<ul style="list-style-type: none"> ■ A Construction Stage Cetacean Mitigation Plan will be prepared and implemented to reduce the potential impact upon marine mammals; ■ Generate low intensity impulsive noise prior to start of pile driving activities and ensure that any visible marine fauna moves away from the underwater noise source; ■ Periodic monitoring of underwater noise during pile driving activity; ■ Using High frequency - low energy piling technology.

S. No.	Project Activity	Aspect	Potential Impact	Mitigation Measures
9	Dredging at sand borrow area and reclamation at basin area	Marine ecology	Potential impact on benthic habitat and fauna, primary productivity, spawning habitat of marine organism, bioaccumulation of toxic materials, and marine mammals	<ul style="list-style-type: none"> ■ Avoid rainy season and least impact on small-scale fishing operations; ■ Proactive and informed management of the dredging programme as it is executed can often significantly reduce the risk of or minimize the negative impacts. Through modelling and monitoring during execution, impacts may be predicted before being realized, and the dredging programme may be optimized to achieve the environmental objectives. A combination of monitoring, both of the dredge plume and at receptor sites, and dredge plume modelling to guide the dredging works need to be conducted before the beginning of dredging operations; ■ Potential impacts on sensitive receptors would also be minimized by conducting dredging works in phases in order to minimize the long term smothering. ■ The loading should be made precautionary by reducing the pumping flow during the final stages of the loading process or by reducing the total loading time ■ Extraction should be completed within a shorter period of time ■ Use of silt curtains wherever possible, i.e., along the boundaries of the dredge pocket and the reclamation area within the port basin and/or maintain turbidity level of the site to the standard level with other appropriate methods. ■ Overflow shall be avoided during dredger sailing including sailing from the sand borrow area to the reclamation area ■ Monitoring should be conducted in the sensitive receptors such as developing corals for turbidity and possible impacts, rather than the site of the plume or hopper; ■ It is recommend that, as a minimum standard, the World Bank guidelines are adhered to, in terms of the acceptable limit of suspended sediment concentration allowed. This equates to 2,000

S. No.	Project Activity	Aspect	Potential Impact	Mitigation Measures
				<p>mg/l. (World Bank Technical Paper 140) and is derived in order to prevent covering valuable benthic species (e.g. shellfish) which are particularly sensitive to increased suspended sediment concentration.</p> <ul style="list-style-type: none"> ■ A Construction Stage Cetacean Mitigation Plan will be prepared and implemented to reduce the potential impact upon marine mammals;
10.	Transport of rocks & boulders and construction material	Increase of road traffic in site access road	Increase of road traffic and community health and safety	<ul style="list-style-type: none"> ■ A traffic management plan will be prepared and implemented to reduce the potential impact on traffic and transport; ■ Traffic movement will be restricted during religious festival, school hours, market times in proximity to religious, schools and markets along the site access road; ■ Road conditions will be monitored and any damage of road or structures shall be remedied immediately to reduce the potential for significant impacts to the local communities.
11.	Dredging operations	Fishing activity	<p>Reduction of fish catch due to dredging operation;</p> <p>Damage of fishing gear due to movement of dredger</p>	<ul style="list-style-type: none"> ■ A proper warning signal system must be established to inform locations of the vessels operation; ■ The project developer should make all the possible attempts at minimizing the disturbances to the fishermen carrying out fishing activities in the area demarcated for sand mining. ■ Regular awareness programmes will be conducted for fishing community, government officials etc. in the area in order to enhance their knowledge on the project activities.
12.	Construction activity and labour residential facility	Occupational health & safety	Accidents and injuries associated with the operation of heavy machinery and other construction activities;	<ul style="list-style-type: none"> ■ Occupational health and safety management plan has been prepared for the project, same will be implement by the contractor and sub-contractor;

S. No.	Project Activity	Aspect	Potential Impact	Mitigation Measures
			Health impacts associated with environmental conditions and changes in environmental quality	
13.	Transport of rock, boulder & construction material and construction activity	Community health & safety	- Change of environment quality due to emission and discharge from the project; Construction traffic movement	<ul style="list-style-type: none"> ■ Implement the pollution control measures- like air and noise emission control measures; waste water treatment measures; ■ Road and traffic control measures; as proposed under road & traffic section; ■ Accessible grievance mechanism for all community groups to report concerns associated with potential Project health impacts

Stage 2: Oof Terminal

14.	Discharge of operational waste water and surface runoff	Surface water quality	Surface water body impacts due to increase of organic load potential impact on water quality and aquatic ecology	<ul style="list-style-type: none"> ■ Treatment of operational waste water through ETP; ■ Sewage will be treated through STP;
15.	Maintenance of dredging			<ul style="list-style-type: none"> ■ Maintenance dredging will be conducted as per plan in coordination SLPA
16.	Sourcing of workforce for construction activity Opportunity for local enterprises	Socio-economic opportunities	Positive impact - job and economic opportunity	<ul style="list-style-type: none"> ■ Some skilled and semi-skilled workers will be sourced by the contractors. ■ CWIT will encourage contractors to hire appropriate positions from the local community ■ Community Grievance Management Process for addressing any valid complaints from the community within the. ZOI
13	Operation of back up DG sets and ships	Ambient air quality	Emission of gases will have the potential to degrade the ambient air quality of the nearby community.	<ul style="list-style-type: none"> ■ Periodic ambient air quality monitoring as per Environmental Monitoring Plan;

S. No.	Project Activity	Aspect	Potential Impact	Mitigation Measures
				<ul style="list-style-type: none"> Explore minimizing the usage of diesel-based generators and avoid any idling; Explore usage of cleaner fuels – such as natural gas for large engines and equipment;
17.	Operation of machineries & equipment and vehicles	Noise quality	There will be an increase in ambient noise levels with potential impacts on site workers	<ul style="list-style-type: none"> All DG sets would be provided with acoustic enclosures; Appropriate PPEs (e.g. ear plugs) will be used by workers while working near high noise generating equipment. Period maintenance of equipment need to be carried out
18.	Operation of terminal and movement of ships	Marine ecology	<ul style="list-style-type: none"> - Potential impact on marine ecology due to discharge of untreated waste water and runoff water; - Potential impact to marine mammals due vessel movement. 	<ul style="list-style-type: none"> Implement the surface water quality management plan (Refer to SI. No. 14) An Operational Stage Cetacean Mitigation Plan will be prepared and implemented to reduce the potential impact upon marine mammals;. Implement the underwater noise management plan (Refer to SI. No. 8)

Conclusion

The conclusions of this ESIA Report have given information on the type and scope of any potential environmental and social impacts associated with the project under consideration and have identified mitigation strategies to lessen or eliminate those impacts while maintaining compliance with

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Acronyms and Abbreviations

Name	Description
ADB	Asian Development Bank
ANZECC	Australian and New Zealand Environment and Conservation Council
AOI	Area of Influence
AOO	Area of Occupancy
APSEZ	Adani Ports and Special Economic Zone
BOD	Biochemical Oxygen Demand
BOT	Build, Operate and Transfer
CBD	Convention on Biological Diversity
CC&CRM	Coast Conservation and Coastal Recourse Management Department
CCA	Cost Conservation Act
CCCRMD	Coast Conservation and Coastal Resources Management Department
CCD	Coast Conservation Department
CEA	Central Environmental Authority
CICT	Colombo International Container Terminal
CITES	Convention on International Trade in Endangered Species of Wild Fauna & Flora
CO	Carbon Monoxide
COD	Chemical Oxygen Demand
CPEP	Colombo Port Expansion Project
CWIT	Colombo West International Terminal (Private) Limited
CZMP	Coastal Zone Management Plan
DG	Diesel Generator
DO	Dissolved Oxygen
DSD	Divisional Secretary's Division
EAAA	Ecological Appropriate Area of Analysis
EBA	Endemic Bird Area
EC	Electrical Conductivity
ECT	East Container Terminal
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
ELCS	Environmental Laboratory and Consultancy Services
EOO	Extent of Occurrence
ERM	Environmental Resource Management
ESF	Environmental and Social Framework
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
FI	Fisheries Inspector
GIIP	Good International Industrial Practice
GND	Grama Niladhari Divisions

GRM	Grievance Redressal Mechanism
GRM	Grievance Redressal Mechanism
GSHAP	Global Seismic Hazard Assessment Program
GSMB	Geological Survey and Mines Bureau
IBA	Important Bird Area
IBAT	Integrated Biodiversity Assessment Tool
IDAY	Inboard Single Day Boat
IEE	Initial Environmental Examination
ITI	Industrial Technology Institute
IUCN	International Union for Conservation of Nature
JV	Joint Venture
LNG	Liquefied Natural Gas
LOI	Letter of Intent
MEPA	Marine Environment Protection Authority
MSW	Municipal Solid Waste
MTRB	Motorized Traditional Boats
MVA	Megavolt Amperes
NE	North East
NEA	National Environmental Act
NO2	Nitrogen Dioxide
NTRB	Non-motorized traditional crafts
OHS	Occupational Health and Safety
OSCP	Oil Spill Contingency Plan
PCU	Passenger Car Unit
PIC	Convention on Prior Informed Consent
PM	Particulate Matter
POB	Port Operation Building
POP	Persistent Organic Pollutants
PPE	Personal Protective Equipment
PUCSL	Public Utility Commission of Sri Lanka
PUCSL	Public Utility Commission of Sri Lanka
RCC	Reinforcement Concrete
RDA	Road Development Authority
RYP	Red Yellow Podzile
SAGT	South Asia Gateway Terminal
SCT	South Container Terminal
SEL	Sound Exposure Level
SLPA	The Sri Lanka Ports Authority
SMS	Safety Management System
SO2	Sulphur Dioxide

SPL	Sound Pressure Level
STP	Sewage Treatment Plant
SW	South West
TDS	Total Dissolved Solid
TSHD	Trailer suction hopper dredgers
TSS	Total Suspended Solid
UDA	Urban Development Authority
UNCCD	United Nations Convention to Combat Desertification
WCT	West Container Terminal
ZOI	Zone of Influence

1 INTRODUCTION

1.1 Project Background

Colombo Port is a rapidly growing maritime hub of the South Asia Region. The Sri Lanka Ports Authority (SLPA) executed the Colombo Port Expansion Project (CPEP) to build a deep-water harbour basin (Colombo South Harbour) with three container terminals on its three sides (south, east, and west) each with designed capacity of 2.4 million TEUs per year. The project was aimed at consolidating Colombo Port's position as a trans-shipment hub for the South Asia region by providing sufficient container handling capacity and sufficient depth for new-generation vessels.

Accordingly, the Environment Impact Assessment (EIA) was conducted by SLPA on the directive of Project Approving Agency i.e., Coast Conservation and Coastal Resources Management Department (CCCRMD) in April 2005 for capturing the stage wise development of southern, eastern and western container. Following due consultation with Government Agencies and stakeholders, CCCRMD issued a Permit on 8th February 2006 which has been periodically renewed by SLPA, as the Project Proponent.

The initial phase of CPEP commenced in 2009. The South Container Terminal (SCT) concession was awarded on a Build Operate and Transfer (BOT) basis to China Merchants Port Holdings Company Limited in collaboration with SLPA. The terminal is now known as Colombo International Container Terminal (CICT). Then, in 2016, SLPA built Phase 1 of the East Container Terminal (ECT) comprising of a 600m quay and ~20 ha yard area. Since then, the remaining development activities encountered several delays. After an unsuccessful attempt to develop the remainder of ECT on a BOT basis, it was then decided to develop and operate the facility by SLPA themselves.

Consequently, the Cabinet of Ministers approved the proposal made by Ministry of Ports and Shipping to develop WCT-1 under the CPEP, on a BOT basis for a period of 35 years as a Public-Private-Partnership with Adani Ports and Special Economic Zone (APSEZ) Limited and its local representative John Keells Holdings PLC and SLPA. On 15th March 2021, a Letter of Intent (LOI) was issued by the Ministry of Ports and Shipping and thereunder SLPA, acting for and behalf of GOSL to the APSEZ Consortium pursuant to the approval granted by the Cabinet of Ministers at the meeting held on 8th March 2021.

The proposed WCT-1 is to be constructed by reclaiming the near shore area using sea sand. The total requirement of sand volume is estimated to be 15 million m³. The required sand will be sourced from SLPA sand borrow area at Kerawalapitiya, located 9 km away from Kepungoda and 7.2 km from Basiyawatta towards offshore and 20 km away from Colombo Port and about 8.5 km from Negombo Lagoon mouth. The Initial Environment Examination (IEE) was prepared for Sand Extraction area in 2022 granted approval by the Central Environmental Authority (CEA).

As part of fulfilling the conditions precedent of the BOT Agreement, CWIT was required to submit an Environmental Management Plan (EMP) based on the EIA for the approval of the CCCRMD prior to commencement of construction and operation and implement the required mitigation measures in a satisfactory manner. The EMP prepared by CWIT and SLPA was approved by the CCCRMD on 3rd September 2021. Finally, on 30th September 2021, BOT Agreement was signed between CWIT and SLPA. The development and operation of WCT-1 will be undertaken by CWIT under Section 17 of the Board of Investment of Sri Lanka and approved under the Strategic Projects Development Act.

Environmental Resources Management (ERM) has been engaged by the Colombo West International Terminal (Private) Limited to conduct the ESIA and ESMP study for the proposed WCT-1 in accordance with applicable framework and support lenders lending decision and follow up approach and strategies.

1.2 Overview of the Project

The West Container Terminal development and operation is part of the Colombo Port Expansion Project (CPEP) which Sri Lanka Ports Authority (SLPA) embarked in April 2008 with the assistance of Asian Development Bank (ADB). Colombo West International Terminal (Private) Limited (CWIT), the Project Proponent, expects to commence construction of the terminal in early CY2022 with phase 1 of the terminal, comprising of a quay length of 600 metres, slated to be operational within a period of approximately 24 months. The remainder of the terminal is expected to be completed within a further period of approximately 24 months. The total project cost is envisaged to be approximately USD 650 million. CWIT has signed BOT agreement with SLPA for complete terminal development in 60 months. The identified site for berthing the WCT-1 is falling within the premises of the Colombo Port which administratively is located within the Colombo Divisional Secretary's Division (DSD), refer **Figure 1-1**.

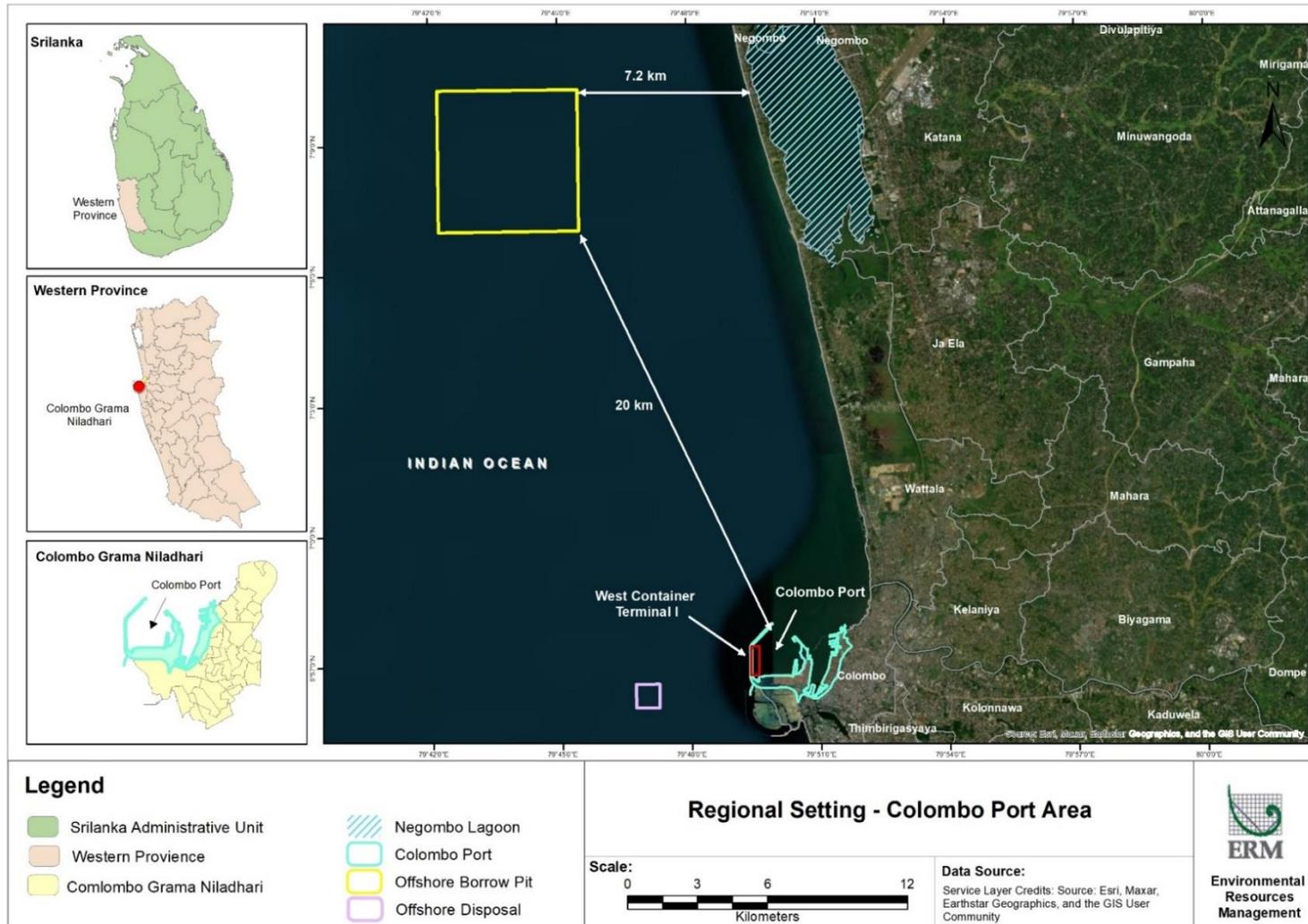
1.3 Project Objective

The overall objective of the WCT-1 Project is to construct the container terminal with a capacity of 3.2 million TEUs at the western part of the Colombo Port using sea sand as extracted from SLPA offshore sand borrow area. The development of this terminal will reinforce Colombo Port's position as the primary hub in the region as well transform the port's position in terms of global shipping connectivity, which is currently 12th globally. Colombo West International Terminal (Pvt) Ltd (CWIT) will undertake the construction of proposed terminal as a part of CPEP in order to meet the stringent requirement of the Port.

1.4 Project Proponent

Colombo West International Terminal (Pvt) Ltd (hereafter CWIT) is the proponent for the West Container Terminal Phase-1 Project. CWIT is a consortium comprising of India's largest port operator, Adani Ports and SEZ Ltd; Sri Lanka's leading enterprise, John Keells Holdings PLC; and the Sri Lanka Ports Authority (SLPA). The consortium is set to develop Colombo West International Terminal (CWIT) on a Build, Operate and Transfer (BOT) basis for a period of 35 years.

Figure 1-1 Regional Setting Map of WCT-1 Project



1.5 Purpose of the Study

Colombo West International Terminal (Private) Limited (hereafter CWIT) intends to secure project financing from international multilateral development banks and commercial lenders for the development of WCT-1 Project. Considering this, CWIT engaged ERM to develop an Environmental and Social Impact Report (ESIA) Report in accordance with international E&S standards as applicable.

This ESIA report is prepared based on the typical methodology adopted for an environment and social impact assessment process recognised through international E&S standards. The purpose of this ESIA study is to:

- Identify and assess the potential environmental and social impacts that the Project may have on the environment and communities within its area of influence,
- Avoid, or where avoidance is not possible, minimise, mitigate, or compensate for adverse impacts on the environment and communities,
- Ensure that affected communities are appropriately engaged on issues that could potentially affect them; and
- Promote improved social and environmental performance through the effective use of management systems.

While this ESIA aims to identify both positive and adverse impacts associated with the development of the Project, however, it is inherently more focused on describing and mitigating potential adverse impacts.

1.6 Objectives and Scope of Works

1.6.1 Objectives

Colombo West International Terminal (Private) Limited intends to secure project financing from international multilateral development banks and commercial lenders for the development of WCT-1 Project. Considering this, CWIT engaged ERM to develop an Environmental and Social Impact Report (ESIA) Report in accordance with international E&S standards as applicable.

1.6.2 Scope of Works

The scope of work for the proposed study is as follows:

- Screening of the Project according to the applicable reference framework;
- Scoping for the Study;
- Development of an integrated project description of the Project components including its sub-components, which are under the purview of the Project Proponent (PP);
- Development of a regulatory, policy and administrative framework relevant to the Project;
- Baseline information collection and baseline reporting. CWIT is responsible for primary data (air, noise & vibration, marine water, sediment quality, road traffic, bio-monitoring and socio-economic data collection including consultation with local communities and other stakeholders).
- Assessment of the potential environmental impacts of the Project in the ZOI;
- Assessment of potential social, economic and environmental impacts on the local community in the Project area and any other stakeholders, who have been identified during the social consultation process; and,

- Formulation of an Environment Management Plan (EMP) and specific mitigation plans for the identified potential impacts.

1.7 Applicable Reference Framework

The E&S studies will be undertaken based on following reference frameworks:

- Local country regulations (Sri Lanka) - Applicable national, state and local environmental and social laws, regulations, policies, procedures and guidelines;
- International Best Practice Standards and Guidelines
- IFC Performance Standards on Environmental & Social Sustainability (2012)
- World Bank Group Environmental, Health and Safety (EHS) Guidelines, including the General EHS Guidelines (2007) and relevant sector specific guidelines of Ports, Harbours and Terminals (2017) and EHS Guidelines for Shipping (2007).
- U.S. International Development Finance Corporation (DFC) Environmental and Social Policy and Procedures, 2020.

1.8 Structure of the ESIA Report

The structure of the report is as given in **Table 1-1**.

Table 1-1 Structure of the ESIA Report

Section No.	Section Title	Description
1.	Introduction	Introduction to the Project, ESIA scope and methodology adopted.
2.	Description of the Project	Technical description of the Project, related infrastructure, and activities.
3.	Regulatory Framework	Discusses the applicable environmental and social regulatory framework and its relevance for the Project.
4.	Approach and Methodology	Discusses the approach and methodology adopted to access environmental and social risks as part of the ESIA process.
5.	Description of the Baseline Environment	Outlines environmental, ecology and social baseline status in the study area of the Project.
6.	Information Disclosure, Consultation and Participation	Describes the process undertaken during project design and preparation for engaging stakeholders, including information disclosure and consultation with affected people and other stakeholders.
7.	Anticipation of the Impacts and Mitigation measures	This section includes details of identified environmental impacts and associated risks due to Project activities, assessment of significance of impacts and presents mitigation measures for minimizing and /or offsetting adverse impacts identified.
8.	Risk Assessment and Contingency Plan	Risk Assessment and Emergency Response Plan
9.	Environmental and Social Management Plan	Outline of the Environmental and Social Management Plan (ESMP) taking into account identified impacts and planned mitigation measures and monitoring requirements.

Section No.	Section Title	Description
		This section also includes details of institutional arrangements for the Project, monitoring and reporting indicators for performance of ESMP and budgetary allocation.
10.	Summary & Conclusion	This section summarizes the conclusion of the ESIA study.

1.9 ESIA Team

ERM formed a team composed of various experts to carry out the Study, as described in the table below. The team was supported by Environmental Laboratory and Consultancy Services (ELCS) Sri Lanka for baseline data collection, and by LHI, Sri Lanka for conducting social surveys and consultations.

Table 1.2 Team and their roles

Name	Project Position/ Specialization
Santoshkumar Kulkarni	Partner in Charge
Dr. Debanjan Bandyopadhyay	Team Leader
Salil Das	Project Manager and Environment Lead SME
Dhritiman Ray	Environment Expert
Rutuja Tendolkar	Social Expert
Dr. Sankalp Anand	Air & noise quality expert
Subhradeb Pramanik	Risk Assessment Specialist
Dr. Abhishek Roy Goswami	Ecology & Biodiversity Specialist
Dwaipayan Dutta	Social Specialist
Anandita Sengupta	GIS Expert
Arpan Shome	Environment Specialist

1.10 Limitations

This ESIA report is based on scientific principles and professional judgment applied to facts with resultant subjective interpretations. Professional judgments expressed herein are based on the analysis of available data and information. The report was prepared with the following limitations:

- The ESIA report has been prepared based on the site assessment undertaken in 9-12 November 2022. All public domain information sources have also been accessed until 15 December 2022. If there is any change in the site conditions, documented information and/or public domain information post the above cited dates, then the same has not been captured in the report.
- From the preliminary data review, it is understood that existing port facility has obtained EIA approval for CPEP including proposed WCT-1 and IEE approval for proposed offshore sand extraction area near Kerawalapitiya. This ESIA has therefore been prepared based on international lender requirements as defined in **Section 3**.
- The details pertaining to temporary facilities (contractor facilities, labour accommodation and storage yards etc.) were not determined at the time of the ESIA visit.

- This report is an updation of the existing regulatory EIA report prepared by SLPA by using information provided in the EIA report in 2006.
- Primary baseline data for ambient air quality, noise levels, ground vibration and sea water quality as per investigations carried out by Environmental Laboratory and Consultancy Services (ELCS) as directed by CWIT were used by ERM for this ESIA report.
- As part of the ESIA preparation, ERM had submitted a detailed Request for Information to the Project Proponent. This included information pertaining to the land procurement process and land use, at the time of procurement and present. However, as the land procurement was not undertaken by the Project Proponent and the fact that it was undertaken 25 years ago, the information available pertaining to the land procurement was extremely limited.
- This ESIA is prepared based on the WCT-1 project location fixed as per the EIA Report, 2005 which identified the location of the berths and designed the basin accordingly. The EIA Report 2005, as an option assessment exercise initially considered nine layout options, of which two were shortlisted after feasibility study. Detailed mathematical modelling and physical survey were conducted for both the short listed options. The current layout was selected as vis-à-vis other option as it had a less need for rocks for breakwater and construction of the harbor was deemed to be more sustainable, as this option could provide an integrated design of the breakwater and reclamation.

1.11 Uses of this Report

ERM is not engaged in consulting or reporting for the purpose of advertising, sales promotion, or endorsement of any client interests, including raising investment capital, recommending investment decisions, or other publicity purposes. Client acknowledges this report has been prepared for their and their clients' exclusive use and agrees that ERM reports, or correspondence will not be used or reproduced in full or in part for such purposes and may not be used or relied upon in any prospectus or offering circular. Client also agrees that none of its advertising, sales promotion, or other publicity matter containing information obtained from this assessment and report will mention or imply the name of ERM. Nothing contained in this report shall be construed as a warranty or affirmation by ERM that the site and property described in the report are suitable collateral for any loan or that acquisition of such property by any lender through foreclosure proceedings or otherwise will not expose the lender to potential environmental or social liability.

2 PROJECT DESCRIPTION

2.1 Introduction

This section of the EIA report presents information on the proposed project - location, accessibility, resource requirements, process description, pollution sources and identification of pollutions sources that may result from Project activities during the different stages.

2.2 Project Overview

As part of a major initiative to boost economic growth, the Colombo Port is improving the import and export capabilities of seaports along the coast of the state. As part of this effort, the Sri Lanka Port Authority (hereafter SLPA) has formerly issued to Adani Port Adani Port & Special Economic Zone Limited (hereafter, APSEZL) a Letter of Intent (LOI) to develop the West Container Terminal (WCT) at Colombo Port, Sri-Lanka on a Build, Operate and Transfer (BOT) basis.

2.3 Existing Port and its Facilities

The existing port of Colombo is located in an artificial harbour formed by breakwaters. A continuous security wall marks landward port boundary. There are six Port Gates, which provide access to the city road network. Existing development, immediately surrounding the port is a mixture of light industrial and commercial uses. Within the port boundary, the perimeter of the harbour area is occupied by vessel-related facilities and the land areas between the waterfront and the port boundary are fully developed. For the most part are used for cargo handling, facilities for vessel repair berthing of SLPA, Customs and Navy vessels and bunkering services.

The Colombo Port is broadly divided into inner harbours, which include the original terminals and the South Harbour with a new terminal with deep draught berths. The SLPA developed two container terminals in the port during 1983-to 2005, the Jaya Container Terminal (South, SCT) and the Unity Container Terminal (East, ECT). The South Asia Gateway Terminal (SAGT) was subsequently developed in 1999 on a BOT basis within the inner Port of Colombo. While the SCT and ECT are operated by SLPA, the SAGT operates as a private terminal managed by a Joint Venture (JV) and the SLPA. The current South Harbour of Colombo Port at Sri Lanka, which includes the SCT, ECT and SAGT is shown in below **Figure 2.1**.

2.4 Project Location and Accessibility

2.4.1 Location

The West Container Terminal 1 (WCT-1) site is located at the eastern side of western breakwater, inside the Colombo Port. The site considered is in proximity to the navigation channel and the turning radius of the container vessel.

The WCT-1 terminal area will be reclaimed by sand from the sea. The required sand will be sourced from SLPA sand borrow area at Kerawalapitiya, located 9 km away from Kepungoda and 7.2 km from Basiyawatta towards offshore and 20 km away from Colombo Port.

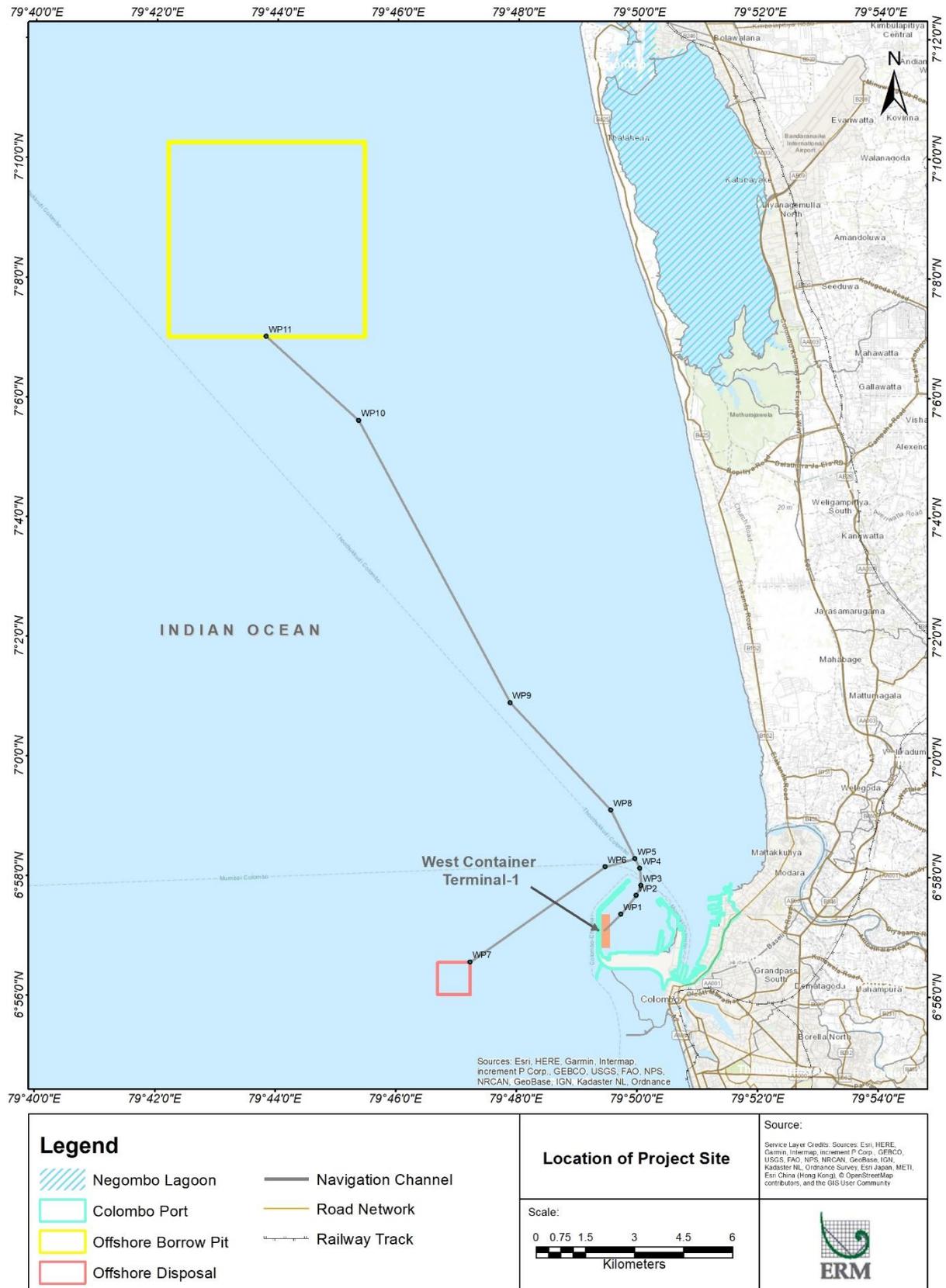
The dredge material (silt part) from the proposed WCT-1 area will be disposed in the existing offshore dredge material disposal area of SLPA, which is located south-eastern side of the proposed WCT-1 and approximately 4 km away from the proposed terminal.

The proposed location of the WCT-1, sand borrow area, dredge material disposal area is presented in **Figure 2.2**.

Figure 2-1 Layout of Existing Facility and WCT-1



Figure 2-2 Project Location Map



2.4.2 Site Accessibility

The site for the WCT and the marine facilities is proposed within the premises of the Colombo Port. The Colombo port is located adjacent to in the commercial center of the Colombo and connected with several major roads, including A2 (Galle Face Center Road), A1 (Olotte Mawatta) and road along Colombo Port (AC26). The major roads that are presently being used to access the Colombo port are shown in **Figure 2.3**. The map also indicated the route for the currently rail lines that serve the Western Region.

2.5 Key Features of the Site and Surroundings

Key features of the site and its surrounding area is given below.

- The proposed WCT-1 terminal is located on the eastern side of the west side breakwater. The other terminals are as follows:
 - CICT is located towards south;
 - ECT-1 is located towards south-eastern side of WCT-1;
 - SAGT on the eastern side of the WCT-1
 - JCT on the eastern side of the SAGT.
 - Proposed port city on southern side of CCIT;
 - Negombo lagoon is location towards eastern side (approx. 7 km) of the proposed sand borrow area;
 - Muthurajawela Wetland Sanctuary is located north-eastern side (approx. 9.7 km)
 - There are no of reefs, along the coastal area from WCT-1 site to sand borrow area. However, these reefs are not located in the project footprint. The reefs are:
 - Nearest reefs of the WCT-1 are Onagala (approx.1.5 km), and Kalapugala (approx. 4.3 km) towards north-east;
 - Other reefs are Godagala, Kalapugala and Hiriya located towards coast and approximately 4.96 km to 7.6 km from sand transport route;
 - The proposed sand transport route is passing through the Thambalagala reef;
 - Galmaga and Galmathagala reef are located towards north-western and northern side of the proposed sand borrow area.
 - Settlements along the costal line are
 - Negombo DSD
 - Wattala DSD
 - Colombo DSD
 - The environmental settings maps is presented in **Figure 2.4**.

Figure 2-3 Site Accessibility Map

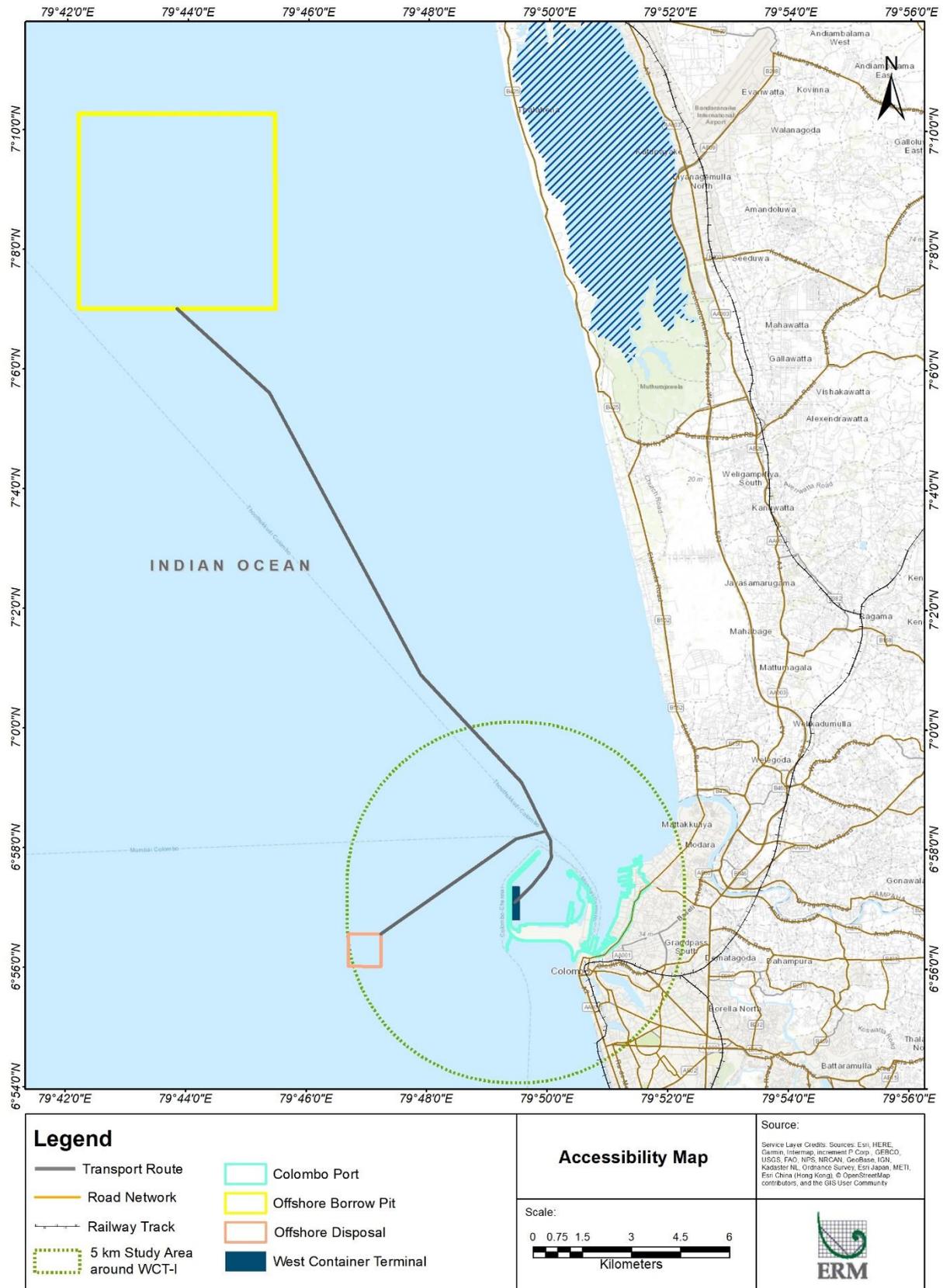
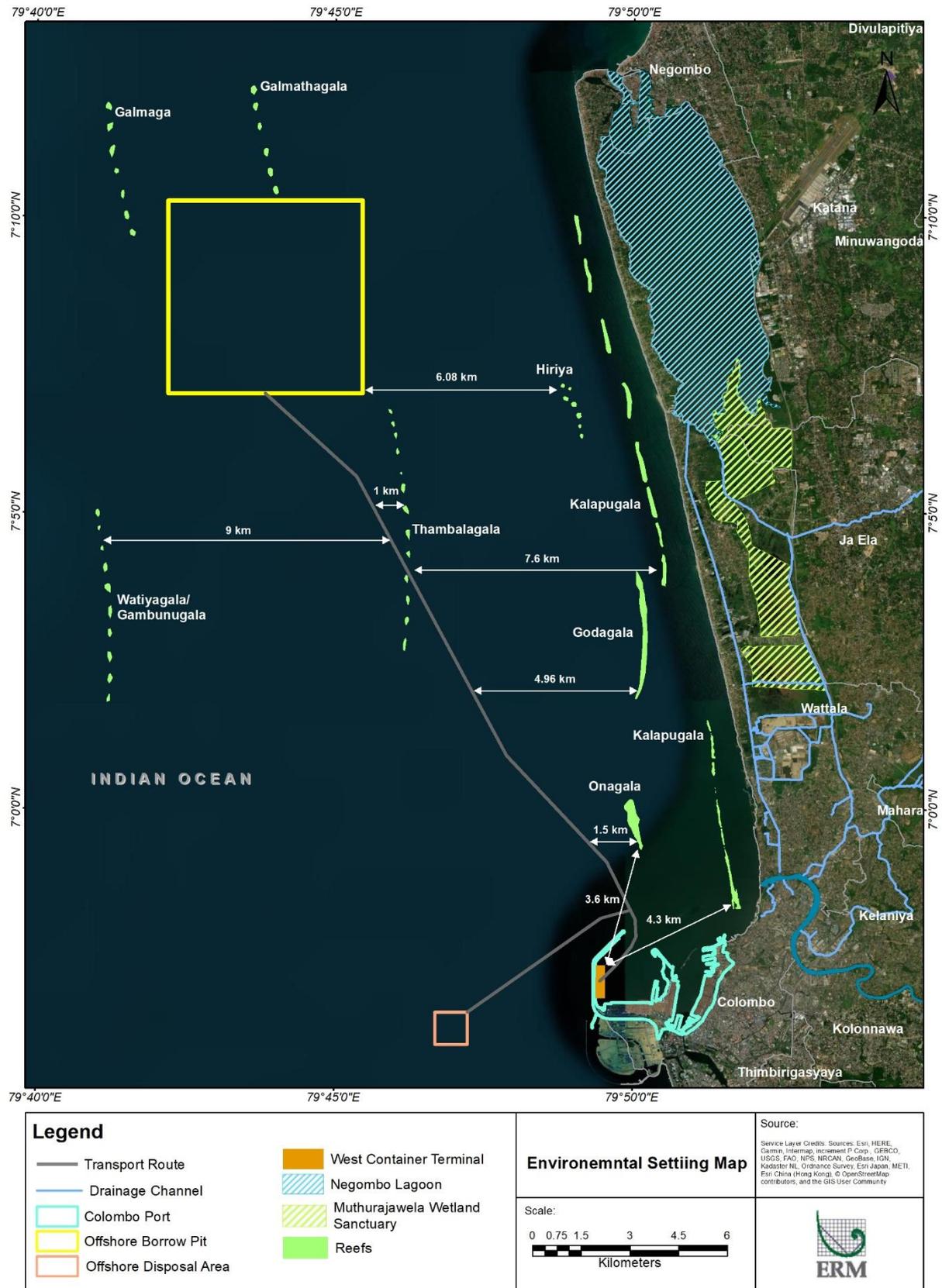


Figure 2-4 Environmental Setting Map



2.6 Description of Project Facilities, Components and Activities

2.6.1 Stage 1: Construction of Terminal

2.6.1.1 Terminal Development Plan

The proposed terminal will be developed in stage wise; the following elements of the project are part of the development facility.

- **Stage 1:** the construction of 600 meters of quay wall and the terminal area behind it on the basis of the Functional Specifications and Design Parameters as well as the installation of gantry cranes, paving, buildings, workshops, computer systems and all other elements required for this part of the Terminal to become fully functional, secure and operational. This Stage includes sufficient capital dredging of the Harbour basin to permit the safe navigation of ships from the access channel to the berth and land access for vehicles.
- **Stage 2:** the completion of the full length of the quay wall of fourteen hundred (1400) meters. This Stage includes all the capital dredging of the harbour basin and all work outside the Project Area, which are to be handed over to the Ports Authority.
- **Stage 3:** the completion of the Terminal, which shall inter alia include the availability of the full length of the quay wall of fourteen hundred (1400) meters and the terminal area behind it, fully equipped as to allow the entire Terminal to become fully functional and operational.

2.6.1.2 Site Reclamation

The site development sequence foreseen is as follows:

2.6.1.2.1 Removal of Soft (unsuitable) Soil

Prior to the placement of reclamation fill, the existing superficial soft material which is considered “unsuitable” shall be dredged by the TSHD and dumped at the designated offshore disposal area. According to the available soil investigation data, the thickness of the soft layer is about 2m. However, the Contractor is intending to perform surveys and additional soil investigations to be able to determine a more representative depth of the soft soil layer. CWIT project team informed that, it is proposed to remove the soft material up to the depth of 4 m. The estimated volume of soft dredge material is 1.6 million m³. The dredge material will be disposed in the SLPA offshore disposal area (Referred to **Figure 2.2**).

2.6.1.2.2 Installation of Underwater Bund

Once the soft soil is removed from the footprint of the proposed reclaimed area, underwater bund will be developed. For the development of underwater bund, the TSHD will bring sand from the offshore borrow area and place the material at the periphery of the reclamation area to the required level. This material shall serve as an underwater containment bund.

2.6.1.2.3 Dredging of suitable material from the Berth Pocket

Once the unsuitable material has been removed by TSHD, the remaining suitable material from the berth pocket shall be dredged and shall be used for reclamation of area. The TSHD will resume dredging in the berth pocket and bring it to the required design depth (-21m CD).

2.6.1.2.4 Initial Reclamation Filling

After completion of the underwater containment bund, initial reclamation will be carried out by direct dumping and rainbowing. The TSHD shall bring additional suitable material from the offshore sand

borrow area. These two methods are very effective disposal methods but can only be carried out up to a certain depth.

2.6.1.2.5 Reclamation Filling

Once the reclamation fill by rainbowing and direct dumping has been completed, the remaining disposal will be done through hydraulic fill and the suitable material shall be pumped towards the reclamation area up to the required levels. Suitable material originating from the dredging of the trench may be also disposed in the reclamation area by the same method.

2.6.1.2.6 Stockpile Formation

To fill the gap between the underwater bund and the quay wall, suitable material shall be stockpiled above the reclamation level. This material can be used in a later stage for backfilling by using dry earth moving equipment.

2.6.1.3 Sand Dredging for Reclamation

2.6.1.3.1 Fill Material Requirement

The sand quantity required for the proposed WCT-1 is estimated as 15 million m³. As the project proponent, the SLPA plans to develop the phase II of the East Container Terminal as well. The estimated sand requirement for the ECT- Phase II is about 5 million m³. It is proposed to utilize the site allocated for SLPA and use only 6 km x 6 km area to fulfil the total sand requirement of 20 million m³.

2.6.1.3.2 Location of the Borrow Area

The proposed extraction site (Referred to **Figure 2.2**) is located at about 7.2 km - 9km away from the existing coastline between Basiyawatta to Kepungoda. As per the details, the Thambagala reef is located just behind the site but rarely extended towards the sand extraction site.

2.6.1.3.3 Estimated Reserves

The geophysical survey was carried out during September 2021 to investigate the potential extractable sand volume and sedimentological status of the allocated sand borrow pit area. The estimated quantity of sand reserve in the proposed SLPA borrow pit site (6km x 6km) is found approximately 89 million m³. After leaving 0.5 m thick sediment unexploited as a safety margin, an amount of 71 million m³ of sand is available for extraction.

2.6.1.3.4 Proposed Mining Depth

Based on the results of the geophysical survey, the thickness of the sand layer in the area varies between 0.2m to 4.7m. In order to provide the facility to regenerate the ecology, it is recommended to leave at least 0.5m of sediment thickness over the area. However, to prevent the creation of scattered deep holes, mining depth would be limited to a maximum of 3m at a location. Therefore, dredgable sand thickness varies from 0m to 3m.

2.6.1.3.5 Method of dredging and time schedule

A Trailing Suction Hopper Dredger (TSHD) will be used for the sand dredging in the offshore sand extraction area. The dredger will be equipped with a Global Positioning System (GPS) to ensure accurate position fixing to restrict the dredging within the designated area. The TSHD is basically scratching the seabed horizontally and not digging into it. It is a self - propelled seagoing vessel fitted with a suction pipe dragged across the bottom which moves slowly through the water and scrape sand off the sea bed using a drag head connected to a suction tube and into the hopper. A Trailer

suction hopper dredger with a capacity of 10,000 m³ will be used for dredging and dumping operations in a continuous manner.

2.6.1.3.6 Transportation of sand

After loading the hopper, the TSHD starts sailing back to the discharge area. Since the same route will be followed as during sailing empty, identical speed restrictions are applicable. The sailing distance from the discharging area and the sand borrow area is approximately 15Nm (=28km).

2.6.1.3.7 Discharging

TSHD will properly positioning in the reclamation area, for dumping, rainbowing or connection of the floating pipeline to the TSHD through the bow connection, the discharging process can start. Once the hopper is empty, the dredge operator informs the crew of the dredger and the discharge process will be stopped.

2.6.1.3.8 Frequency of vessel movements and time frame for mining

The dredger will utilize for the dredging and dumping operations in a continuous manner. The cycle time for the dredging operations was calculated considering 80% of the hopper capacity for the dredged material. The estimated cycle time for dredging, transporting and unloading will be between 6 and 8 hours, resulting in 4-5 movements per day. The estimated time frame for the sand extraction will be a maximum of 8 months.

2.6.1.4 Boulder Requirement and Sourcing

The outer edge of the reclamation area will be trimmed to slope and then protected by graded core and armour rocks. The estimated requirement of rock/boulder is 2.5 million ton. The rock/boulder will be sourced from two operational quarries located at Thebuwana and Mirigama area. The road distance of Thebuwana quarry is approximately 60 km from WCT-1 and Mirigama quarry is approximately 45 km from WCT-1. CWIT has contracted M/s Access Engineering PLC (Access) for the supply of rock boulders required for the construction related work at WCT-1. Access has obtained necessary permits to operate both the quarries from (i) Geological Survey and Mines Bureau (GSMB) (Vide IML/A/HO/N/11976/R/4 for Mirigama Quarry and IML/A/HO/N//162of for Thebuwana Quarry), (ii) Environmental Protection License from Central Environmental Authority (vide CEA A 127139 for Mirigama Quarry and A06643/R8 for Thebuwana Quarry) (iii) Clearance from Department of Archaeology (vide) and (iv) Explosive Permit (vide A. No. 317391 for Mirigama Quarry and A.No. 316782 for Thebuwana Quarry) to operate two quarries at Thebuwana and Mirigama (Refer to **Appendix 2.1**).

The rock will be brought to site by road through dumper/ truck of 15 ton capacity (approx.). Estimated truck loads per day will be 150-200 from transportation of rocks. Boulders from quarry site; activity will be completed within 36 months. The rock/boulder from quarry to WCT-1, existing road network work will be utilised. For transport management, Access had obtain approval from Sri Lanka Police to use two designated routes within the Colombo city limits for the haulage of rocks and boulders as required by the local regulations (Refer to **Appendix 2.2**). The location of quarries and transport route has been presented in **Figure 2.5**.

2.6.1.5 Construction Equipment & Machineries

The construction equipment and machineries required construction stage is listed in the following table.

Table 2.1 List of Construction Equipment

Heavy Equipment	Capacity	Number
Crane	75 T and More	12
Hydraulic Rigs	250 KW and more	5
Excavator / backhoe	20 T and More	5
Rollers	8T and More	3
Dump Truck	3 Cube	10
Trailer	40ft	5
Transit Mixers	6 Cum	6
Batching Plants	0.3 - 0.6 Cum	3
Diesel Generators	15 to 180 KVA or more	10
Concrete Pumps	36 Cum/Hr or more	03
Dredgers	1400 Cum Hopper or more	01
Marine Tugs	1200 KW	01
Marine Tugs	200 KW and more	02
Dumb barges		03

Source: CWIT

2.6.2 Stage 2: Operation of Terminal

2.6.2.1 Proposed Facility

2.6.2.1.1 Container Berth

- Development of total 1400 m Container Berth.
- Container Berth with Block wall (supported on rock foundation at bed level) on the seaside with quarry run behind block wall along with steel pile (connecting RCC beam all along the length of Berth) underneath rear rail of RMQC and with pavement between two rail gauges.
- The berths will cater to handling vessels with a maximum vessel size of 24,000 TEU or 280,000 DWT to a Minimum vessel size of 500 TEU or 6500 DWT. The dredged bed level at the front of the berth shall be maintained at (-) 20.0m CD.
- RMQCs will have an outreach of 72m from the front rail center the and front rail center to the fender face is 5.55 m to handle 63 m beam vessels with extreme trim and a list of vessel conditions. Lifting height above wharf below spreader is 53 m. RMQC shall be a single trolley with a back reach of 20m. Under spreader, the load is 65T (Twin Lift). RMQC rail gauge is 35 m and the number of wheels is 8 no per corner.
- Design Dredge Level on waterfront shall be (-) 20.0m CD.
- Scour protection for avoiding the negative effect of the vessel's propeller on the Berth structure.
- Storm anchor and storm tie-down for RMQCs, as per requirement.
- Rubber molded ladders for emergency pilot boarding.
- Design provision to accommodate the interface between the piled Berth and the reclaimed Backup yard without affecting the terminal operations, in particular for any differential settlement to occur between the 2 structures.

- Capital Dredging for West Container terminal operations and Backup area reclamation as per requirement shall vary from (-)24.0m CD to (-) 26.2m CD, looking to firm strata for bearing of Gravity type, Block wall Structure.

2.6.2.1.2 Backup Yard

Total Container stack Yard area is about 64.1 hectares including building area, truck parking, gate complex, fuel station and other utilities. Development of container yard with paver block including pits for cables, electrical & conduits. Since reclamation of backup yard is proposed using dredging sand (hydraulic filling), all the container yard components / civil structures / stack yard / buildings will be designed with shallow / open foundations. In case of any poor / loose sub soil is encountered post reclamation, the necessary / suitable ground improvement will be carried out (if required). Development of gate area with parking, and adequate driving lanes.

2.6.2.1.3 Container Yard

The stacking yard will have CRMG crane configuration parallel to the quay length. Each CRMG block will have approximately 500 TGS.

2.6.2.1.4 Reefers Blocks

Separate Reefer monitoring platforms for separate sectional blocks providing access up to 5m high stacked containers. Reefer plugs at various levels above ground as per proposed numbers. Auto monitoring by remote should be possible. Reefer racks will be for 5m high container stacks. Adequate DG backup for reefers to be considered overall yard DG set.

2.6.2.1.5 Fire Fighting System

Fire protection system, fire detection and alarm system and public address system for container terminal and associated buildings will be designed as per NFPA / FM Global standard Local statutory authority requirements. A common dedicated Fire water tank and fire water pump house to feed fire water to entire container terminal including all phases.

2.6.2.1.6 Buildings

Following buildings shall be provided for operation of container terminal

- In Gate Canopy & Lockable Gate Complex
- Out Gate Canopy & Lockable Gate Complex
- Pass Section, Security Control Room, Medical Centre & training room building near Gate Complex
- In Gate Access Control Building
- Out Gate Access Control Building
- Custom Check & training room
- Sub-station building
- Electrical DG shed building
- Fire tender & ambulance parking shed
- Fire water tank & pump house building
- Port operation building (POB)
- Workers' canteen building
- Quay worker + driver shed & rest room

- Workshop & store building
- Toilet block for workers – Male + Female – 4 Nos.
- RMU room & wharf office building
- RMU building
- Fuel Station operator's cabin
- Dispenser shed for fuel station
- Pump house for fuel station
- RCMS towers

2.6.2.2 Utilities and Yard Infrastructure

2.6.2.2.1 Storm Water Drainage System

The hydraulic design for stormwater drainage system will be carried out with respect to design rainfall. The RCC drains to collect surface runoff from yard area. The drain section will be of closed drain with perforated slab. The drain in the yard where traffic movement may occur will be covered and designed for with heavy vehicular movement. Open drain with non-vehicular design wherever applicable. The location of drain will be separated from vehicular movement area with provision of kerb wall at regular interval. Final outfall will be connected to the sea at two locations.

2.6.2.2.2 Sewage collection and Treatment system

Sewage system for terminal area to consist of central sewage treatment plant, sewage pumping station at different location, sewage pumping line and gravity line, sewage chambers etc. Sewage generated from the WCT-1 site will be treated at central sewage treatment plant (STP) located in SLPA common utility area.

2.6.2.2.3 Approach Road

Each Container Block will have four lateral approaches one road along each edge and an approach road at the end of conjoining bays. The approach road will be connecting to the terminal gate to the port Main road.

2.6.2.2.4 Marine Facilities

The following marine facilities will be provided in WCT-1

- VTS, RADAR, AIS, VHF Base stations at Marine control room with monitoring stations
- Oil spill response equipment, Channel Marking Buoys, Lead Light etc as per requirement of marine condition
- Tugs of adequate capacity

2.6.2.3 Breakwater Maintenance and Maintenance Dredging

The breakwater has been constructed with a minimum design life of 60 years, although the useful life will be in excess of 100 years with minimum maintenance. The only maintenance envisaged is the replacement of some rock or armour units displaced in an extreme storm event. All breakwater structural units are designed to withstand a wave with 1 in 200 years return period and are designed to survive 1 in 1000 years wave. Maintenance requirements will be minimal.

The sediment transport modelling work carried out by SLPA revealed that the annual volume of material crossing the outer channel is minimal. Assuming that all material is deposited in the channel then the annual rate of deposition is only 24 mm. dredging the channel to -20.5m would mean that no maintenance dredging will required for around 20 years after the initial capital dredging.

Sediment transport and deposition at the entrance to the basin is more complex, as it is influenced by discharge from the Kelani River. Modelling suggests that maintenance dredging would not required for 6-7 years after initial works.

2.7 Resource Requirement

2.7.1 Power

2.7.1.1.1 Construction Stage

The power requirement during construction stage is 2 megavolt amperes (MVA). The required power will be sourced from SLPA sub-station connected to national grid (Ceylon Electricity Board) and Diesel Generator as backup power.

2.7.1.1.2 Operational Stage

The power demand for WCT-1 terminal is 16 megavolt amperes (MVA) or 16,000 kilo volt amperes (KVA). The required power will be sourced from national grid (Ceylon Electricity Board) and four numbers of 1.5 MVA Diesel Generator as backup power. Electrical distribution system for container terminal as per IEC / Sri Lanka's Local statutory authority requirements.

2.7.2 Water Requirement and Supply System

2.7.2.1.1 Construction Stage

Water requirement during construction stage will be 250 kilo liters per day (KLD) and during operational stage 35 KLD. The water will be sourced from the SLPA.

2.7.2.1.2 Operational Stage

Water requirement during operational stage 35 KLD. The water will be sourced from the SLPA. Dedicated water supply tank and water supply pumping system will be provided to feed service water to all buildings, facilities and service areas within port.

2.7.3 Manpower

2.7.3.1.1 Construction Stage

The work force requirement during peak construction stage will be approximately 1000 person. It is estimated that about 70% man power requirement will be sourced from the local area. About 100 to 150 workforce will stay inside the Project area. Potable water, power will be provided in the workforce accommodation area.

2.7.3.1.2 Operational Stage

During operational stage, work force requirement will be approximately 350-400 person, out of which ~40-50% will be for the yard operations. Yard operations are very specialized in nature and are unique to a terminal operation. It is estimated that about 50-60% work force will be sourced from local area based on the skill and requirement.

2.8 Pollution Sources and Management

The potential environmental issues associated with the expansion project may include:

- Air emissions;
- Noise generation;
- Wastewater generation;

- Generation of solid and hazardous wastes.

2.8.1 Air Emission

2.8.1.1 Site Development and Construction

During site development and construction stage, major emission will be fugitive dust from earth work and handling of construction material. Other source of emission will be back up DG and diesel operated construction equipment and vehicles. The potential air pollutants from the site establishment stage are as follows:

Table 2.2 Potential Air Emission Sources during Site Establishment

S. No.	Activity/ Source	Pollutants	Proposed Control Measures
1.	<ul style="list-style-type: none"> ■ Earth work for civil construction ■ Handling of construction materials (storage and uses) 	Particulate matter (PM)	<ul style="list-style-type: none"> ■ Water sprinkling on all non-sealed surface; ■ Covered storage area/ facility
2.	<ul style="list-style-type: none"> ■ Transport of construction materials and machineries and equipment. ■ Vehicular emission during transportation of construction materials. 	Particulate matter (PM) PM, SO ₂ , CO, NO ₂ , HC	<ul style="list-style-type: none"> ■ Construction material will be transported through covered trucks; ■ Use of fitness certified vehicles and their proper maintenance
3.	<ul style="list-style-type: none"> ■ Operation of diesel operated machineries, vehicle and DG set. 	PM, SO ₂ , CO, NO ₂ , HC	<ul style="list-style-type: none"> ■ Appropriate stack height for DG set. ■ Maintenance of DG sets

2.8.1.2 Operation and Maintenance Stage

During operation and maintenance stage, power will be sourced through grid source. However, for 16 MVA backup DG sets will be provided. During operation of back-up DG sets air emission will occurred. Other source of emission will be vehicular emission during transportation of container. The source of emissions during operation stages, their characteristics and control measures are as follows:

Table 2.3 Potential Air Emission Sources during Operation of Terminal

S. No.	Activity/ Source	Pollutants	Proposed Control Measures
1.	Operation of back up DG sets	PM, SO ₂ , CO, NO ₂ , HC	Appropriate stack height for back up DG set.
2.	Vehicular emission during transportation of unloaded materials from ships.	PM, SO ₂ , CO, NO ₂ , HC	Use of fitness certified vehicles and their proper maintenance
3.	Emission from ships	PM, SO ₂ , CO, NO ₂ , HC	Comply the emission standard as per MARPOL

2.8.2 Noise & Vibration Emissions

2.8.2.1 Site Development & Construction

The potential noise and vibration emission from the site development construction activities are as follows:

Table 2.4 Potential Noise Generation Sources during Construction

Activity/ Source	Proposed Control Measures
<ul style="list-style-type: none"> ■ Construction equipment ■ DG sets ■ Construction vehicles 	<ul style="list-style-type: none"> ■ Well maintained equipment and vehicles will be used; ■ DG sets would be provided with acoustic enclosures.

2.8.2.2 Operation and Maintenance Stage

During operation and maintenance stage source of noise emission, expected noise level and control measures are as follows:

Table 2.5 Potential Noise Generation Sources during Operation of Terminal

Activity/ Source	Proposed Control Measures
<ul style="list-style-type: none"> ■ Noise from ship (engines, auxiliary machines, ventilation systems, equipment) ■ Operation of ship to shore gantry (SSG) crane, rubber tyred gantry cranes ■ Back up DG sets ■ Vehicles 	<ul style="list-style-type: none"> ■ Well maintained equipment will be used; ■ DG set would be provided with acoustic enclosure.

2.8.3 Solid and Hazardous Wastes

2.8.3.1 Site Development & Construction

Construction and Demolition Waste

Construction and demolition (C&D) waste likely to be generated during site establishment stage includes mostly inert and non-biodegradable materials such as concrete, plaster, metal, wood and plastics. The construction and demolition wastes will be collected through Government approved waste collectors.

Municipal Solid Waste

Municipal solid waste (MSW) during the site development and construction stage is expected to be comprised of food waste and recyclables viz. packaging material, etc. Such waste will be disposed through Government approved waste collectors.

Hazardous Waste

Hazardous waste in the form of used oil, oily cotton rags and containers (for hazardous chemicals) will be generated. The used oil and oily cotton rags will be collected in HDPE drums and stored in an earmarked Hazardous Waste Storage Area. Containers with hazardous chemical residue will be also stored in the Hazardous Waste Storage Area. All such hazardous waste will be disposed through Government approved waste collectors.

2.8.3.2 Operation and Maintenance Stage

Municipal Solid Waste

Municipal solid waste (MSW) during the operation and maintenance stage is expected to be comprised of food waste and recyclables viz. packaging material, etc. Such waste will be disposed through Government approved waste collectors.

Other Solid Waste

The other wastes like ship supply (plastic) - 0.3 tons/ day and solid waste from vessel 0.5 tons/day is estimated to be generated. These wastes will be disposed through shipping agent or terminal operator.

2.8.4 Waste Water

2.8.4.1 Site Development & Construction Stage

Wash Water

The main source of wastewater during site development & construction stage would be wash water generated from the washing of construction equipment and machinery. This will be channelized through the storm water drainage system and treated by oil-water separation and sedimentation trap. The storm water drainage system has been provided in **Appendix 2.3**.

Domestic Wastewater

The sewage will be generated from on-site sanitation facilities and onsite workers accommodation facility. Sewage will be treated through sewage treatment plant (STP). The capacity of the STP will be 100 KLD. The details of STP has been provided **Appendix 2.4**.

2.8.4.2 Operation and Maintenance Stage

Domestic Wastewater

The sewage will be generated from on-site sanitation facilities and onsite workers accommodation facility. Sewage will be treated through sewage treatment plant (STP). The capacity of the STP will be 100 KLD.

Bilge/ballast water from vessels

During the periods of construction and the operation of WCT-1 the bilge/ballast water of vessels are collected by Government Approved waste collectors. This is handled by the shipping agent.

2.9 Project Schedule

The port is currently under construction and planned to be completed in three phases where Phase I with a capacity of 1.5 million TEU is scheduled to be operational by 2024.

2.10 Project Cost

As per DPR of the project, prepared by Howe Engineering Projects (I) Pvt. Ltd., the total investment was estimated at USD 845 million for development of the project. However, as per CPA, total cost of the project will be known once master plan of the project including phasing of various project component is finalised.

3 ADMINISTRATIVE FRAMEWORK

3.1 Introduction

This section of the report outlines the applicable reference framework that will guide this project and its components and includes both National policies and regulations that are applicable for this Project, as well as international standards (IFC PS and WB ESS and environmental and social policies and procedure of DFC), as good international industry practice.

3.2 Applicable Environmental and Social Acts and Regulations

The Government of Sri Lanka (GoSL) has specified regulations, policies and guidelines to address the environmental and social risks of proposed projects and associated components, as well as to protect and conserve the environment from any adverse impacts. This Section focuses on the reference framework that are relevant for the Project.

3.2.1 National Environmental Act (NEA)

A fundamental law regarding Environment in Sri Lanka is the National Environmental Act No. 47 of 1980, as amended by Act No. 56 of 1988 and Act No. 53 of 2000. The National Environmental Act establishes a Central Environmental Authority (CEA) to make provision with respect to the powers, functions, and duties of the authority, and makes provision for the protection and management of the environment.

Part IV C of the amendment act mandated that all "prescribed" development projects are required to be subjected to EIA. Large-scale development projects that are likely to have significant impacts on environment are listed as prescribed projects. In addition, "prescribed projects" if located in "environmental sensitive areas" are required to undergo EIA irrespective of their magnitude. The prescribed projects are listed in the Gazette No. 772/22 of 24th June 1993, 859/14 of 23rd February 1995, 1104/22 of 5th November 1999 and 1108/1 of 29th November 1999.

The National Environmental Act stipulates that approval for all prescribed projects must be granted by a Project Approving Agency (PAA). At present, 23 Government Agencies have been designated as PAAs. A single Project Approving Agency is established as responsible for administrating the EIA process for a project, which is Central Environmental Authority (CEA). When there is more than one PAA is involved, the appropriate PAA is decided by the CEA. Project Approving Agencies are listed in the Gazette Extra Ordinary No. 859/14 of 23rd February 1995 and Gazette Extra Ordinary, No. 1373/6 of 29th December 2004.

The National Environmental Act has also identified two levels in the EIA process. If the environmental impacts of the project are not very significant then the project proponent may be asked to do an Initial Environmental Examination (IEE), which is a relatively short and simple study. However, if the potential impacts appear to be more significant, the project proponent may be asked to do an Environmental Impact Assessment (EIA) which is a more detailed and comprehensive study of environmental impacts.

Following the said Act, an EIA was conducted by SLPA on the directive of PAA i.e., Coast Conservation and Coastal Resources Management Department (CCCRMD) in April 2005 for capturing the stage wise development of southern, eastern and western container terminal of the existing Colombo Port. Additionally, an IEE was carried out for the offshore sand borrow area of SLPA site in 2022.

3.2.2 Coast Conservation Act No. 57 of 1981 (CCA)

In Sri Lanka, EIA was first introduced by the Coast Conservation (Amendment) Act No. 57 of 1981¹ and 49/2011 to projects that come within the "Coastal Zone" - the area lying within a limit of 300 meters land ward of the mean high-water line and a limit of 2 kilometers seawards of the mean low water line. Under the Act, identification of projects that require EIA is left to the discretion of the Director, Coast Conservation Department (CCD). As per Part II of the Coast Conservation Act (CCA), EIA is mandatory to obtain permits for all "prescribed" development projects located within the coastal zone.

Section 16 of the Coast Conservation Act (CCA) confers on the Director General of Coast Conservation and Coastal Recourse Management Department (CC&CRM), the discretion to request a developer applying for a permit (to engage in a development activity within the Coastal Zone) to furnish an IEE or EIA.

As per CCA, the proposed WCT-1 project site is falling within the coastal zone. Hence, an initial EIA was carried out for the entire Port facility in 2005. Important to mention, even though the proposed sand extraction site is located beyond the coastal zone, and there is no requirement of obtaining an approval from the CC&CRM, however, it is considered that their active participation in the IEE evaluation process is vital. Subsequently, an IEE also conducted for the offshore sand borrow area of SLPA.

3.2.3 Fauna and Flora (Amended) Act No 49 of 1993

EIA provisions are also included in the Fauna and Flora (Amended) Act No. 49 of 1993. According to this Act, any development activity of any description whatsoever proposed to be established within one mile from the boundary of any National Reserve, is required to be subject to EIA, and written approval should be obtained from the Director General, Department of Wildlife Conservation prior to implementation of such projects.

3.2.4 Coastal Zone Management Plan of 1997 (CZMP)

The CZMP regulates the development within the jurisdiction of the CCD to ensure that development pressures are not detrimental to coastal processes. In this line, the CZMP has identified areas suitable for development and corresponding set-back limits.

However, the set back limits as prescribed do not apply to the proposed project as the project refers to an expansion of the existing Port of Colombo into the sea. Moreover, the proposed project is located within a restricted zone therefore will not cause further restrictions to the local fishing activities. The initial CZMP was developed in 1990 and subsequently reviewed to confirm the project is complying with the later version of CZMP.

3.2.5 Oil Spill Contingency Plan (OSCP)

As per the Marine Pollution Prevention Act, No. 35 of 2008, (section 39) developments like CSH should include sufficient facilities for pollution abatement of marine waters as well as contingency measures in place to cope with the failure of such systems. The purpose of the plan is to ensure that there is a timely, measured and effective response to pollution incidents.

Accordingly, an Oil Spill Contingency plan for responding to actual or threatened oil pollution incidents within the West Container Terminal-1 area in Colombo Port and proposed sand borrow area. This contingency plan applies to oil spills, which cause or could cause environmental damages and financial damages due to the development activities caused by movements of vessels related to Dredging, Reclamation, Surveying and Construction of the project.

¹ <http://citizenslanka.org/wp-content/uploads/2016/02/Coast-Conservation-Act-No-57-of-1981-E.pdf>

Additional policies in Sri Lanka, their key features and applicability to the Project are detailed in **Table 3-1**.

Table 3-1 Other Policies relevant to Environment

Policy	Key Features	Applicability
Water Resources Board Act No. 29 of 1964, Amended No. 42 of 1999	<ul style="list-style-type: none"> ■ Provides the control, regulation and development of the water resources in the country, ■ Prevention of the pollution of rivers, streams and groundwater resources 	Applicable in relation to the preservation of water resources
Marine Pollution Prevention Act No. 59 of 1981	<ul style="list-style-type: none"> ■ Mandates that all ships that enter the territorial waters of Sri Lanka should comply with appropriate measures for preventing and controlling pollution of the sea from a wide range of sources ranging from sewage to harmful chemicals. ■ Enables to carry out the requirements and conditions stipulated in the international convention for prevention of pollution from ships (MARPOL Convention) ■ Marine Pollution Prevention Authority is the executing agency of the act ■ Requires that proposed developments should include sufficient facilities for pollution abatement of marine waters as well as contingency measures in place to cope with the failure of such systems. 	Applicable in relation to prevent marine pollution
Mines and Minerals Act 33 or 1992	<ul style="list-style-type: none"> ■ According to Section 12 of MMA, Geological Survey and Mines Bureau (GSMB) regulates the mining activities in Sri Lanka. ■ No person can explore for any minerals or mine, transport, process, trade in and export any minerals except under the authority of, or otherwise than in accordance with a license issued on that behalf under the provisions of this Act and the regulations made there under. 	Applicable for sand mining from offshore borrow bit

3.2.6 Labour Regulations

Table below provides the list of applicable regulations pertaining to labour management and welfare aspects in Sri Lanka:

Table 3-2 Applicable Labour Regulations

S.No.	Aspect	Regulation	Details
1	Labour Welfare	<ul style="list-style-type: none"> ■ National Minimum Wages of Workers Act, 2016 ■ Industrial Disputes Act, 1950 ■ The Shop and Office Employees' Act, 1954 	<p>National Minimum Wages of Workers Act, 2016</p> <p>The minimum monthly wage for all employees, irrespective of industry is LKR 10,000 and the minimum daily wage is LKR 400. These rates are revised regularly.</p>

S.No.	Aspect	Regulation	Details
		<ul style="list-style-type: none"> ■ The Wages Boards Ordinance, 1941 ■ The Workmen's Compensation Ordinance, 1934 ■ The Employees' Provident Fund Act, 1958 ■ The Employees Trust Fund Act, 1980 ■ The Factories Ordinance, 1942 ■ The Maternity Benefits Ordinance, 1939 ■ Penal Code Amendment Act, 1995 ■ The Employment of Women and Young Persons, 1965 	<p>The Shop and Office Employees' Act, 1954 The maximum number of working hours is 9 in a day, including a 1-hour meal-break and 45 hours in a week. A rest-break will also be given to employees if they work for more than 8 hours. This rest-break must be given between 11 am and 2 pm during the day and the rest break for employees working during the night should be given between 7 pm and 10pm.</p> <p>Penal Code Amendment Act, 1995 The Penal Code Amendment Act of 1995 categorised sexual Harassment as an offence. A case of sexual harassment would be investigated by the employer and in the even credible evidence is found, disciplinary action will be taken.</p>
2	Worker Accommodation	<ul style="list-style-type: none"> ■ The Factories Ordinance, 1942 	<p>The Factories Ordinance, 1942 The Factories Ordinance provides the minimum standards for health, safety and welfare of workers in factories. It makes provisions regarding the following:</p> <ul style="list-style-type: none"> ■ Supply of drinking water ■ Regulations regarding washing facilities ■ Accommodation for clothing ■ Facilities for resting for female workers ■ Sanitary conveniences for persons employed in the factory, including a separate accommodation for persons of each sex.
3	Occupational Health and Safety	<ul style="list-style-type: none"> ■ The Workmen's Compensation Ordinance, 1934 ■ The Factories Ordinance, 1942 ■ National Institute of Occupational Safety and Health Act, 2009 	<p>The Workmen's Compensation Ordinance, 1934 and The Factories Ordinance, 1942 Both the Workmen's Compensation Ordinance, 1934 and the Factories Ordinance, 1942 cover the employer's responsibilities regarding employee's occupational health and safety. The WCO provides for the payment of compensation towards injuries faced by workers, while working. Aspects such as exposure to Electro Magnetic Force while working on electrical systems are covered under Factories Ordinance.</p> <p>National Institute of Occupational Safety and Health Act, 2009 The Act was passed to establish the National Institute of Occupational Health and Safety and the creation of policies and standards.</p>

3.3 License, Approvals and Consents

Furthermore, following License, Approvals and Consents related to **Construction Phase** need to be obtained:

Table 3-3 License, Approvals and Consents related to Construction Phase

License / Approvals / Consents	Issuing Authority	Responsibility	Applicability
CEA Approval	Central Environmental Authority (CEA)	Owner	CEA has given approval for extraction of sand for the project. Approval letter has been attached in Appendix 3.1 . The validity of approval is for three years, 28.01.2022 to 27.01.2025.
Generation License	Public Utility Commission of Sri Lanka (PUCSL)	Owner	Not directly Applicable SLPA being Project Proponent will arrange the same.
Approval for Sand exploration	Geological Survey and Mines Bureau (GSMB)	Owner	Exploration license obtained from Geological Survey and Mines Bureau. License has been attached as Appendix 3.2 . The licence validity is 24 months 31.08.2021 to 30.08.2023
BOI Approval	Board of investment of Sri Lanka	Owner	Obtained approval investment purpose from BOI, Sri Lanka (Refer to Appendix 3.3)
Approval of Coast Conservation Department	Coast Conservation Department (CCD)	Owner	Permission obtained from Coast Conservation obtained under Coast Conservation & Coastal Resource Management Act No. 57 of 1981. (Refer Appendix 3.4). The validity of permit is for one year, from 28.02.2021 to 27.02.2022 ²
Approval of Marine - Environment Protection Authority	Marine Environment Protection Authority (MEPA)	Owner	Approval of Oil Spill Contingency Plan has been obtained. Approval letter has been attached in Appendix 3.5 .

² SLPA is the process of renewing the approval.

			The validity of license is two years, from 24.09.2021 to 23.09.2023
Allocation of funds to provide relief and benefits to fishing community for sand dredging and transportation	Department of Fisheries and Aquatic Resource	Owner	No objection certificate from Depart. For sand extraction. NOC has been attached in Appendix 3.6.
Sea Dumping License	Marine Environment Protection Authority (MEPA)	Owner	Permission obtained from Marine Environment Protection Authority (MEPA) on 14 th December, 2021. (Refer Appendix 3.7). The permit is valid for three years, from 14.12.2021 to 13.12.2024.
Archaeological clearance for sand extraction area	Department of Archaeology	Owner	Obtained the permission from the department for operation of sand extraction (Refer Appendix 3.8)
Licensed Equipment for Pressure Vessels and Heavy Lifting as per Factory ordinance	Department of Labour, Sri Lanka	EPC Contractors	Applicable as the Project involved significant manpower in heavy lifting activity

The following License, Approvals and Consents related to **Operational Phase** need to be obtained

Table 3-4 License, Approvals and Consents related to Operational Phase

License / Approvals / Consents	Issuing Authority	Responsibility	Applicability
CCCRMD permit	Central Environmental Authority (CEA)	Owner	CEA has given approval for implementation of the proposed project. Approval letter has been attached in Appendix 3.4
Generation License	Public Utility Commission of Sri Lanka (PUCSL)	Owner	Not directly Applicable as SLPA being Project Proponent will arrange the same.
Ozone depleting substances and natural environmental (ambient air quality) regulations 1994	Central Environmental Authority (CEA)	Owner	Not Applicable
Environmental Protection License related to Noise testing	Industrial Technology Institute (ITI)	Owner	Applicable but license not yet obtained.
Environmental Protection License related to Stack Emission testing	National Engineering Research & Development Centre	Owner	Not Applicable

License / Approvals / Consents	Issuing Authority	Responsibility	Applicability
Environmental Protection License related to Fuel testing reports	DNV Singapore	Owner	Not Applicable
Effluent Water Quality	Industrial Technology Institute (ITI)	Owner	Applicable
<ul style="list-style-type: none"> ■ Human Safety under the factory's ordinance No. 45 ■ Examination of Hoists ■ Examination of lifting tackles ■ Examination of steam boiler when cold ■ Examination of economizer when cold ■ Examination of super heater when cold ■ Examination of steam boiler under normal steam pressure ■ Examination of steam receivers ■ Examination of air receivers 	Department of Labour, Sri Lanka	Owner	Applicable

3.4 Lenders' Environmental and Social Safeguard & Standards

3.4.1 IFC Performance Standards (PS) 2012

The IFC Performance Standards, 2012 ⁽³⁾ is widely followed by most international lenders, who prefer their projects/ invests to be consistent with the requirements of the performance standards. The Performance Standards may also be applied by other financial institutions choosing to support them in the proposed Project. These performance standards and guidelines provide ways and means to identify impacts and affected stakeholders and lay down processes for management and mitigation of adverse impacts. Together, the Client is required to meet the stipulations of all the eight Performance Standards throughout the life of an investment in the case such an investment is being sought either from IFC or any other institution which follows IFC standards (**Table 3.5**).

(3) <http://www.ifc.org/ifcext/sustainability.nsf/Content/PerformanceStandards>

Table 3-5 IFC Performance Standards and their Applicability

IFC PS	Description	Applicability to the Project
PS 1	<p>Assessment and Management of Environmental and Social Risks and Impacts</p> <p>This PS aims to assesses the existing social and environmental management systems and to identify the gaps with respect to their functioning, existence and implementation of an environmental and social management plan (ESMP), a defined EHS Policy, organization chart with defined roles and responsibilities, risk identification and management procedures as well as processes like stakeholder engagement and grievance management</p>	<p>Applicable</p> <p>Considering the proposed project activity being a public utility development project, it is essential to have a defined mechanism towards assessment and management of associated environmental and social risks and impacts.</p> <p>Thus, ensuring alignment with PS 1 will be applicable for the Project.</p>
PS 2	<p>Labour and Working Conditions</p> <p>This PS is guided by a number of international conventions and instruments on labour and workers' rights. It recognises that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of fundamental rights of workers. The PS covers following themes: human resource policy and management, workers' organization, non-discrimination and equal opportunity, retrenchment, protecting the workforce and occupational health and safety. The requirement set out in this PS have been in part guided by a number of international conventions and instruments.</p>	<p>Applicable</p> <p>The project activities involved hiring of skilled, semi-skilled and unskilled labourers during the construction phase as well during the operation phase. The project shall have to develop a human resource policy and ensure non-discrimination and equal opportunity, protection of the workforce and occupational health and safety. Labour and workers accommodation management plan needs to be developed.</p> <p>Thus, ensuring alignment with PS 2 is required for the Project.</p>
PS 3	<p>Resource Efficiency and Pollution Prevention</p> <p>PS-3 focuses on increased economic activity and urbanization often generate increased levels of pollution to air, water, and land, and consume finite resources in a manner that may threaten people and the environment at the local, regional levels. There is also a growing global consensus that the current and projected atmospheric concentration of greenhouse gases (GHG) threatens the public health and welfare of current and future generations. At the same time, more efficient and effective resource use and pollution prevention and GHG emission avoidance and mitigation technologies and practices have become more accessible and achievable in virtually all parts of the world.</p>	<p>Applicable</p> <p>Few impacts have been identified during the construction phase, but they can be considered as temporary. However, there are some minor changes to local ecosystems such as minor disturbances to marine and coastal ecosystems due to transportation of sand from offshore sand borrow pit to terminal which can be considered as permanent changes. The impacts relating to air quality, noise and vibration, solid and hazardous and waste disposal are also likely to persist in the operation stage too.</p> <p>Thus, ensuring alignment with PS 3 will be relevant to the Project.</p>

IFC PS	Description	Applicability to the Project
PS 4	<p>Community Health, Safety and Security</p> <p>This PS-4 requires due diligence to anticipate and avoid adverse impacts on the health and safety of the affected community during the project life. It also requires to ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the affected Communities.</p> <p>Key areas of alignment screened under PS-4 includes infrastructure/equipment safety, hazardous material safety, natural resource issues, exposure to disease, emergency preparedness and response, and security personnel requirements.</p>	<p>Applicable</p> <p>During construction as well as operation phase, transportation of utilities, construction equipment etc. may lead to accidents and other threats on community health and safety.</p> <p>Thus, ensuring alignment with PS 4 will be relevant to the project activity.</p>
PS 5	<p>Land Acquisition and Involuntary Resettlement</p> <p>PS-5 requires project proponents to anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts from land acquisition or restrictions on land use. The key themes covered under this are: compensation and benefits for displaced persons, consultation and grievance mechanism, resettlement planning and implementation, physical displacement, economic displacement.</p> <p>The PS-5 also prescribes private sector responsibility to supplement government actions and bridge the gap between governments assigned entitlements and procedures and the requirements of PS-5.</p>	<p>Not Applicable</p> <p>The project is proposed to be developed within the port area and owned by SLPA. Hence, PS-5 is not applicable for the project.</p>
PS 6	<p>Biodiversity Conservation and Sustainable Management of Living Natural Resources</p> <p>The requirements of this Performance Standard are applied to projects (i) located in modified, natural, and critical habitats; (ii) that potentially impact on or are dependent on ecosystem services over which the client has direct management control or significant influence; or (iii) that include the production of living natural resources (e.g., agriculture, animal husbandry, fisheries, forestry). PS-6 screens relevant threats to biodiversity and ecosystem services, especially focusing on habitat loss, degradation and fragmentation, invasive alien species, overexploitation, hydrological changes, nutrient loading, and pollution. The key themes covered under PS-6 are: natural habitat, critical habitat, legally protected areas, international introduction of alien species, and living natural resources (natural and plantation forest, aquatic resources etc.) are sustainably managed.</p>	<p>Applicable</p> <p>The project area is located within the existing port facility and will be reclaimed using offshore sand. The extraction of sand and transportation to basis area potential to have impact on marine habitat, ecosystem services and sensitive ecological habitat like coral reef.</p>

IFC PS	Description	Applicability to the Project
PS 7	<p>Indigenous Peoples</p> <p>This Performance Standard applies to communities or groups of Indigenous Peoples who maintain a collective attachment, i.e., whose identity as a group or community is linked, to distinct habitats or ancestral territories and the natural resources therein. PS-7 endeavour to ensure that the development process fosters full respect for the human rights, dignity, aspirations, culture, and natural resource-based livelihoods of Indigenous Peoples. Key themes covered under PS-7 are: avoidance of adverse impacts, consultation and informed participation, impacts on traditional or customary lands under use, relocation of IPs from traditional or customary lands, and cultural resources.</p>	<p>Not Applicable</p> <p>The proposed project will not procure any land and will be set up within an existing port. The potential impact on the community will be offshore fishing due to dredging activity. There is no direct/ indirect impact on natural resource-based livelihoods of Indigenous Peoples.</p>
PS 8	<p>Cultural Heritage</p> <p>For the purposes of PS-8, cultural heritage refers to (i) tangible forms of cultural heritage; (ii) unique natural features or tangible objects that embody cultural values; and (iii) certain instances of intangible forms of culture that are proposed to be used for commercial purposes. The requirements of PS-8 apply to cultural heritage regardless of whether or not it has been legally protected or previously disturbed.</p>	<p>Not Applicable</p> <p>The EIA study for proposed terminal area and IEE study for sand extraction area clearly indicate that presence of any significant cultural heritage site within the vicinity of Project facility as well as the offshore sand borrow area. Thus, compliance with PS 8 is not likely to be applicable for the Project.</p>

3.4.2 World Bank Environmental and Social Framework (ESF)

The World Bank ESF offers a broader and more systematic coverage of environmental and social risks. The ESF also requires attention to environmental and social issues throughout the preparation and implementation of a project, with increased focus on stakeholder engagement and monitoring. It clarifies roles and responsibilities between the World Bank and its Borrowers. The ESF sets out a risk management approach tailored to risks and impacts of projects. The ESF sets out 10 Environmental and Social Standards (ESS), which are applicable to borrowers.

Based on the review of Project facility and the corresponding operational details, the following World Bank ESS are found to be applicable to the Project in the current scenario (**Table 3.6**).

Table 3.6 WB Environmental and Social Standards

WB ESS	Description	Applicability to the Project
ESS 1	<p>Assessment and Management of Environmental and Social Risks and Impacts</p> <p>The WB will require borrowers to conduct environmental and social assessment of projects proposed for Bank support in accordance with ESS1. It classifies all projects (including projects involving Financial Intermediaries (FIs) into one of four classifications: High Risk, Substantial Risk, Moderate Risk or Low Risk. Borrower to carry out appropriate environmental and social assessment of subprojects, and prepare and implement such subprojects, as per this classification.</p>	Applicable

WB ESS	Description	Applicability to the Project
ESS 2	<p>Labour and Working Conditions</p> <p>It recognizes the importance of employment creation and income generation in the pursuit of poverty reduction and inclusive economic growth. Borrowers can promote sound worker-management relationships and enhance the development benefits of a project by treating workers in the project fairly and providing safe and healthy working conditions.</p>	Applicable
ESS 3	<p>Resource Efficiency and Pollution Prevention</p> <p>It recognizes that economic activity and urbanization often generate pollution to air, water, and land, and consume finite resources that may threaten people, ecosystem services and the environment at the local, regional, and global levels. This ESS sets out the requirements to address resource efficiency and pollution prevention and management throughout the project life cycle.</p>	Applicable
ESS 4	<p>Community Health, Safety and Security</p> <p>It addresses the health, safety, and security risks and impacts on project-affected communities and the corresponding responsibility of Borrowers to avoid or minimize such risks and impacts, with particular attention to people who, because of their circumstances, may be vulnerable.</p>	Applicable
ESS 5	<p>Land Acquisition and Involuntary Resettlement</p> <p>It requires borrowers to avoid involuntary resettlement. Where involuntary resettlement is unavoidable, it will be minimized and appropriate measures to mitigate adverse impacts on displaced persons (and on host communities receiving displaced persons) will be carefully planned and implemented.</p>	Not Applicable
ESS 6	<p>Biodiversity Conservation and Sustainable Management of Living Natural Resources</p> <p>It recognizes that protecting and conserving biodiversity and sustainably managing living natural resources are fundamental to sustainable development and it recognizes the importance of maintaining core ecological functions of habitats, including forests, and the biodiversity they support. ESS6 also addresses sustainable management of primary production and harvesting of living natural resources and recognizes the need to consider the livelihood of project-affected parties, including Indigenous Peoples, whose access to, or use of, biodiversity or living natural resources may be affected by a project.</p>	Applicable
ESS 7	<p>Indigenous People</p> <p>It ensures that the development process fosters full respect for the human rights, dignity, aspirations, identity, culture, and natural resource-based livelihoods of Indigenous Peoples/ Traditional Local Communities.</p>	Not Applicable
ESS 8	<p>Cultural Heritage</p> <p>It recognizes that cultural heritage provides continuity in tangible and intangible forms between the past, present and future. ESS8 sets out measures designed to protect cultural heritage throughout the project life cycle.</p>	Not Applicable

WB ESS	Description	Applicability to the Project
ESS 9	<p>Financial Intermediaries</p> <p>It recognizes that strong domestic capital and financial markets and access to finance are important for economic development, growth and poverty reduction. FIs are required to monitor and manage the environmental and social risks and impacts of their portfolio and FI subprojects, and monitor portfolio risk, as appropriate to the nature of intermediated financing. The way in which the FI will manage its portfolio will take various forms, depending on a number of considerations, including the capacity of the FI and the nature and scope of the funding to be provided by the FI.</p>	Not Applicable
ESS 10	<p>Stakeholder Engagement and Information Disclosure</p> <p>It recognizes the importance of open and transparent engagement between the Borrower and project stakeholders as an essential element of good international practice. Effective stakeholder engagement can improve the environmental and social sustainability of projects, enhance project acceptance, and make a significant contribution to successful project design and implementation.</p>	Applicable

3.4.3 IFC Industry Sector Guidelines: Ports, Harbors and Terminals

The IFC Environmental, Health and Safety Guidelines for Ports, Harbors and Terminals (2017) is a technical reference document with general and industry- specific examples of Good International Industry Practice (GIIP). This document contains relevant information pertaining to the operation and maintenance of ports and terminals.

Table 3.7 IFC EHS Guidelines for Ports, Harbours and Terminals, 2017

Guideline Aspect	Description	Applicability
Water quality	<p>Construction activities (such as clearing of vegetation, capital dredging, reclamation, paving, and construction of buildings), and operational activities (such as maintenance dredging, ship maintenance, and ship effluent disposal) can result in increased turbidity via suspension of sediment in the water column. In addition, the introduction of pollutants can have adverse impacts on aquatic flora and fauna. Port operators should provide collection, storage, and transfer and/or treatment services, and facilities of sufficient capacity and type for all wastewater generated by vessels at the port in accordance with MARPOL and national regulations.</p> <p>Projects should conduct a risk assessment for dredging activities as part of the development of a Dredging Management Plan. The Dredging Management Plan should be tailored to the project and should define the dredging methodology; identify and assess dredged materials disposal options and sites; characterize the chemical and physical composition and behaviour of the sediments to be dredged; characterize the environmental baseline where the port.</p>	Applicable
Air emissions	<p>Air emissions are generated from land- and sea-based sources during port and terminal activities. During the construction phase, port activities may result in combustion emissions from the use of vehicles,</p>	Applicable

Guideline Aspect	Description	Applicability
	equipment, and engines to undertake dredging, excavating, paving, material transport, and building construction activities. During operations of ports and terminals, combustion exhaust emissions result mainly from diesel engines used for the propulsion of ships, and ship-based auxiliary engines and boilers for power generation. In addition, combustion exhaust emissions are generated from land-based activities involving the use of vehicles, cargo handling equipment, and other engines and boilers.	
Waste management	Wastes originating at the port may include inert solid waste from cargo packaging and from administrative offices, as well as hazardous or potentially hazardous waste associated with vehicle maintenance operations, such as paint, scrap metal, used lubricating oils and engine degreasing solvents. Wastes originating from ships may include oily sludge, inert materials such as food packaging, and food waste. Port facilities should provide adequate means of receiving and managing effluents and wastes to meet the needs of the port and those of visiting ships that the port is designed to service. The provision of waste reception facilities should be developed in coordination with the local governments according to their commitments to the MARPOL Convention.	Applicable
Hazardous materials and oil management	Hazardous materials at ports typically include large volumes of hazardous cargo, as well as oil, fuels, solvents, lubricants and other hazardous substances used in port activities including vessel, vehicle, equipment and grounds maintenance. Spills may occur due to accidents, equipment failure, or improper operating procedures during cargo transfer or fuelling. Port operators should prepare a spill prevention, control, and countermeasure plan consistent with the IMO Manual on Oil Pollution Section II—Contingency Planning. Also, Ports should implement systems for the proper screening, acceptance, and transport of dangerous cargo based on local and international standards and regulations.	Applicable
Noise and vibration (including underwater)	Noise and vibration may be generated during land-based port and terminal construction activities such as dredging, reclamation, and construction of breakwaters and access/internal roads. High underwater noise and vibration levels may be generated from offshore pile driving, dredging, and ship traffic. Noise from these activities may adversely impact aquatic habitats. Assessments should be conducted to (i) identify where and when underwater noise has the potential to impact aquatic life significantly and (ii) to identify appropriate mitigation measures.	Applicable
Terrestrial and aquatic habitat alteration and biodiversity	Construction and operation of new port and terminal facilities, or the expansion of existing facilities, involves the reclamation, clearing and paving of land for loading/unloading zones, bulk dry/liquid and containerized cargo storage areas, fuel depots, buildings, and roads; the alteration of coast lines for construction of breakwaters, shipyards, dockyards, wharves, piers, and vessel berths; and the transformation of the seabed to establish vessel basins (including areas for vessel turning) and navigation channels through dredging. These activities and related infrastructure, in addition to typical port operational	Applicable

Guideline Aspect	Description	Applicability
	<p>activities, may result in alteration of terrestrial, freshwater, brackish and marine habitats, with impacts to flora and fauna and related biodiversity. Potential impacts to shoreline vegetation, wetlands, coral reefs, fisheries, bird life, and other sensitive aquatic and near-shore habitats during port construction and operation should be fully assessed and the results incorporated into the project's siting and design decisions to avoid, minimize, and offset adverse impacts to areas of high terrestrial and aquatic biodiversity value or those areas required for the survival of critically endangered or endangered flora and fauna.</p> <p>The construction and operation of port and terminal facilities such as piers and breakwaters⁶ can lead to changes in coastal processes resulting in alterations to seabed and coastal geomorphology due to the effects of these structures on water currents, wave patterns, and water levels. Resultant impacts could include adverse changes to land erosion, sediment transport and deposition, and coastal inundation profiles. As part of the design and siting of port facilities, assessment and modeling of hydrological, sedimentological and coastal geomorphological conditions should be carried out to identify potential adverse impacts on coastal processes such as erosion and accretion. Design, siting considerations and coastal protection measures should be considered to minimize adverse impacts from these structures.</p>	
Occupational Health and Safety	Specific occupational health and safety issues relevant to port operations primarily include Physical hazards, Chemical hazards, Confined spaces, Exposure to dust and Exposure to noise. These issues are common to those of most large infrastructure and industrial facilities, and their prevention and control as discussed in the General EHS Guidelines should be implemented.	Applicable
Climate change resilience	Port and terminal facilities are vulnerable to the direct and indirect impacts of climate change. Critical port and vessel related activities and the port's supply chain infrastructure (road and rail movement, intermodal hubs) may be vulnerable to risks related to climate variability such as increased intensity of rainfall, flash floods, heatwaves, storms and storms surge, and high wind speeds. Therefore, projected future climate change-related impacts and the development of adaptation measures to enhance resilience should be assessed in the design phase of new port projects to allow for the identification, analysis, and evaluation of climate change.	Applicable
Environmental monitoring	Environmental monitoring programs for this sector should be implemented to address all activities that have been identified to have potentially significant impacts on the environment, during construction and normal operations and upset conditions. Environmental monitoring activities should be based on direct or indirect indicators of emissions, effluents, and resource use applicable to a particular project.	Applicable

Guideline Aspect	Description	Applicability
Community Health and Safety	Community health and safety issues during the construction of ports are common to those of most large infrastructure or industrial facilities, and their prevention and control as discussed in the General EHS Guidelines should be implemented. Community health and safety issues during operational phase of ports are primarily Port marine safety and Port security. Port operators should therefore implement a Safety Management System (SMS) able to effectively identify and correct unsafe conditions. The Safety Management System should include procedures to regulate the safe movement of vessels within the harbor, protect the general public and communities from dangers arising from offshore activities at the harbor, and prevent events that may result in injury to workers and the public, including fishermen community.	Applicable

3.4.4 DFC’s Environmental and Social Policies and Procedures – ESPP

U.S. International Development Finance Corporation (DFC) is America’s development bank. DFC partners with the private sector to finance solutions to the most critical challenges facing the developing world today. DFC investments adhere to high standards and respect the environment, human rights, and worker rights

The guiding environmental and social policies and procedures are based in large part on environmental and social impact assessment procedures applied by organizations such as the World Bank Group, the European Bank, IFC, among others.

DFC’s business lines work closely with the Office of Development Policy to determine a project’s eligibility for DFC support. Each potential project is subject to a full policy review. Thorough, accurate, and complete information in the application and supplemental materials, such as a business plan, help expedite DFC’s project review.

All projects and Subprojects are categorized as Category A, B, C or D based on environmental and social factors. The categorization of the proposed WCT-1 project has been discussed in Section 3.7.2.

Companies must meet the requirements of the IFC’s Performance Standards. Included within this requirement are the risk and impact identification requirements of Performance Standard 2, which requires (1) Identification of all relevant environmental and social risks of the Project including issues identified in Performance Standards through 8; (2) Identification of all factors that define the Project’s Area of Influence; and (3) Identification of groups and communities that may be directly or indirectly affected by the Project (i.e., Project Affected People), including groups and communities that may be differentially or disproportionately affected by the project because of their disadvantaged or vulnerable status. The process of identifying risks, impacts, Area of Influence and Project Affected People shall be adequate, accurate, objective and appropriate to the severity of Project risks and significance of Project impacts.

3.5 Applicable International Conventions

International Conventions on environment and social aspects to which Sri Lanka has become a party have been provided in table below:

Table 3-8 International Conventions Ratified/ Signed by Sri Lanka

No	Conventions	D/A	D/R
1	The International Convention for the Regulation of Whaling	1946	
2	International Plant Protection Convention	06.02.1951 12.02.1952	27.02.1956 27.02.1956
3	International Convention for the Prevention of Pollution of the sea by oil	12.05.1954 29.11.1969 18.12.1971	11.07.1983 11.07.1987
4	Convention on the High seas	29.04.1958	
5	Convention on the Continental Shelf	29.04.1958	30.10.1958
6	Convention on Fishing and Conservation of the Living Resources of the High Seas	29.04.1958	
7	International Convention relating to intervention on the High Seas in cases of oil pollution casualties	29.11.1969	12.04.1983
8	Convention concerning the Protection of workers against ionizing radiations	22.06.1960	18.06.1986
9	Convention on Wetlands of International Importance Especially as Waterfowl habitats (Ramsar)	02.02.1971	15.06.1990
10	Stockholm Declaration of the United Nations Conference on the Human Environment	1972	
11	Convention on the prohibition of the development, production, stockpiling and use of chemical weapons and their destruction	10.04.1972	10.08.1994
12	Convention concerning the protection of the World Cultural & Natural Heritage	16.11.1972	06.06.1980
13	The international convention for the prevention of pollution from the ships (MARPOL-1973)	11.02.1973	24.06.1997
14	Convention on the prohibition of the Development, Production Stockpiling of bacteriological toxic weapons and their destruction (Rotterdam Convention)	10.08.1994	19.01.2006
15	Convention on International Trade in Endangered Species of Wild Fauna & Flora (CITES)	03.03.1973	04.05.1979
16	Convention on the prohibition of military or any other hostile use of environmental modification techniques	10.12.1976	25.04.1978
17	Convention on the conservation of Migratory Species of Wild Animals (CMS, 1979)	23.06.1979	06.06.1990
18	The Convention on the Conservation of Antarctic Marine Living Resource	1980	
19	United Nations Convention on the Law of the Sea (Amend)	10.12.1982	19.04.1994
20	Vienna Convention for the Protection of the Ozone Layer	22.03.1985	15.12.1989
21	Convention on early notification of a nuclear accident	26.09.1986	11.01.1991
22	Basal Convention of the Control of the Trans-boundary movements of Hazardous Wastes and their Disposal	22.03.1989	28.08.1992
23	United Nations Framework Convention on Climatic Changes	09.05.1992	23.11.1993
24	United Nations Convention to Combat Desertification (UNCCD)	17.06.1995	09.12.1998
25	Convention on Biological Diversity (CBD)	22.05.1992	23.03.1994

No	Conventions	D/A	D/R
26	Convention on Prior Informed Consent (PIC)		
27	Stockholm Convention on Persistent Organic Pollutants (POPs)	22.05.2001	22.12.2005
28	Agreement on the Network of Aquaculture Centers in Asia Pacific	08.01.1988	05.01.1989
29	International Tropical Timber Agreement	1994	
30	Agreement for the establishment of the Indian Ocean Tuna Commission	25.11.1993	13.06.1994
31	Plant Protection Agreement for Asia and the Pacific region	27.02.1956	27.02.1956
32	Agreement relating to the implementation of Part XI of the United Nations Convention on the Law of the Sea of 10.12.1982	28.07.1994 04.08.1995	28.07.1995 24.10.1996
<i>Fundamental ILO Conventions</i>			
33	C029 - Forced Labour Convention, 1930 (No. 29)	05-Apr-50	05-Apr-50
34	P029 - Protocol of 2014 to the Forced Labour Convention, 1930	10 Apr 2019	10 Apr 2019
35	C087 - Freedom of Association and Protection of the Right to Organise Convention, 1948 (No. 87)	15-Sep-95	15-Sep-95
36	C098 - Right to Organise and Collective Bargaining Convention, 1949 (No. 98)	13-Dec-72	13-Dec-72
37	C100 - Equal Remuneration Convention, 1951 (No. 100)	01-Apr-93	01-Apr-93
38	C105 - Abolition of Forced Labour Convention, 1957 (No. 105)	07-Jan-03	07-Jan-03
39	C111 - Discrimination (Employment and Occupation) Convention, 1958 (No. 111)	27-Nov-98	27-Nov-98
40	C138 - Minimum Age Convention, 1973 (No. 138) Minimum age specified: 14 years	11-Feb-00	11-Feb-00
41	C182 - Worst Forms of Child Labour Convention, 1999 (No. 182)	01-Mar-01	01-Mar-01

D/A - Date of Adopted D/R - Date of Ratified

3.6 Applicable Environmental Standards

The Project will comply with Central Environmental Authority (CEA) of Sri Lanka norms and guidelines stipulated in National Environmental Regulations. Therefore, the EHS standards as stipulated in National Environmental Regulations for air quality, noise level, ground vibration, and sea water quality will be applicable.

3.6.1 Air Quality

Ambient air quality standard as per National Ambient Air Quality Standard is given in the table below along with WHO Ambient Air Quality Guideline Values (2005 and 2000).

Table 3-9 Ambient Air Quality Standards/ Guidelines

Parameter	Unit	Average Time	National Ambient Air Quality Standard ⁴	Average Time	WHO Ambient Air Quality Standard ⁵
PM ₁₀	µg/m ³	Annual	50	Annual	15
		24 hr	100	24 hr	45
PM _{2.5}	µg/m ³	Annual	25	Annual	5
		24 hr	50	24 hr	15
SO ₂	µg/m ³	1 hr	200	24 hr	40
		8 hr	120		
		24 hr	80		
NO ₂	µg/m ³	1 hr	250	Annual	10
		8 hr	150	24 hr	25
		24 hr	100		
CO	µg/m ³	1hr	30,000	24 hr	4
		8 hr	10,000		
		Any time	58,000		
O ₃	µg/m ³	1 hr	200	Peak season	60
				8 hr	100

3.6.2 Vehicle Exhaust Emission Standard

Vehicle exhaust emission standard as per The National Environmental Act, 1980 is presented in **Table 3.10**.

Table 3-10 Vehicle Exhaust Emission Standard

Category of vehicles		Parameter	Emission limit				
			Maximum permissible limit for the vehicle	Average limit for the vehicle type			
Petrol/LPG motor vehicles	Passenger Cars		CO	1.92	1.15		
			NMHC	0,08	0.05		
			NO ₂	0.08	0.05		
			PM	0.007	0.005		
	Trucks and buses		Kei cars		CO	6.67	4.02
					NMHC	0.08	0.05
					NO ₂	0.08	0.05
					PM	0.007	0.005
			Light duty vehicles		CO	1.92	1.15
					NMHC	0.08	0.05
					NO ₂	0.08	0.05
					PM	0.007	0.005

⁴ https://www.cea.lk/web/images/pdf/airquility/1562_22E%20Ambient%20air%20quality%20-%20english.pdf

⁵ <https://www.drishtias.com/daily-updates/daily-news-analysis/new-who-global-air-quality-guidelines>

Category of vehicles		Parameter	Emission limit		
			Maximum permissible limit for the vehicle	Average limit for the vehicle type	
	Medium duty vehicles	CO	4.08	2.55	
		NMHC	0.08	0.05	
		NO ₂	0.10	0.07	
		PM	0.009	0.005	
	Heavy duty vehicles	CO	21.3	16	
		NMHC	0.31	0.23	
		NO ₂	0.9	0.7	
		PM	0.013	0.01	
Diesel motor vehicles	Passenger cars	CO	0.84	0.63	
		NMHC	0.032	0.024	
		NO ₂	0.11	0.08	
		PM	0.007	0.005	
	Trucks and buses	Light duty vehicles	CO	0.84	0.63
			NMHC	0.032	0.024
			NO ₂	0.11	0.08
			PM	0.007	0.005
		Medium duty vehicles	CO	0.84	0.63
			NMHC	0.032	0.024
			NO ₂	0.20	0.15
			PM	0.009	0.007
	Heavy duty vehicles	CO	2.95	2.22	
		NMHC	0.23	0.17	
			NO ₂	0.9	0.7
			PM	0.013	0.01

Notes: Only those vehicle types are mentioned which can be used during implementation of the project.

3.6.3 Noise Quality

Ambient standards with respect to noise have been notified by the Minister of Transport, Environment and Women's dated 21st May, 1996. Maximum permissible Noise levels at Boundaries for industrial activities, as per Schedule IV of National Environmental (Noise Control) Regulations No. 1 of 1996 and IFC ambient noise standards are presented in Table 3.11.

Table 3-11 Ambient Noise Quality Standards/ Guidelines

National Ambient Noise Standard ⁶			IFC Noise Level Guidelines ⁷		
Areas	Day Time (06.00- 21.00) ⁸	Night Time ⁹ (21.00- 06.00)	Receptor	Daytime hourly noise levels (07:00 – 22:00), dB L _{Aeq, 1hour}	Night-time hourly noise levels (22:00 – 07:00), dB L _{Aeq, 1hour}
Rural Residential Area	55	45	Residential; institutional Educational	55	45
Urban Residential Area	60	50	Industrial and commercial	70	70
Noise Sensitive Area	50	45			
Mixed Residential	63	55			
Commercial Area	65	55			
Industrial Area	70	60			

3.6.4 Ambient Water Quality Standard

National ambient surface National Environmental (Ambient Water Quality) Regulations, No. 01 of 2019 is presented in the **Table 3.12**

Table 3-12 Ambient Water Quality Standards/ Guidelines

Parameter	Category ¹⁰						
	Unit	Cat. A	Cat. B	Cat. C	Cat. D	Cat. E	Cat. F
Colour	Pt mg/l, max	20	-	-	100	-	-
Electrical Conductivity	µS/cm, max	-	-	-	-	700	-
Turbidity	NTU, max	5	-	-	-	-	-
TSS	mg/l, max	25	-	40	1500	2100	-
Total Hardness (as CaCO ₃)	mg/l	250 des 600 max	-	-	-	-	-
pH	-	6-8.5	6-9	6-8.5	6-9	6-8.5	5.5-9
DO at 25°C	mg/l, minimum	6	5	5	4	3	3
BOD ₅ , at 20°C	mg/l, max	3	4	4	5	12	15

⁶ <http://www.cea.lk/web/images/pdf/noise/reg924-12.pdf>

⁷ <https://www.ifc.org/wps/wcm/connect/4a4db1c5-ee97-43ba-99dd-8b120b22ea32/1-7%2BNoise.pdf?MOD=AJPERES&CVID=nPtgwZY>

⁸ Day time from 06.00-21.00 hours for construction activity area (Schedule III) and industrial/commercial urban/rural/mixed residential areas (Schedule VI)

⁹ Night time from 21.00-06.00 hours for construction activity area (Schedule III) and industrial/commercial urban/rural/mixed residential areas (Schedule VI)

¹⁰ Category A shall be water that requires simple treatment, for drinking ; Category B shall be bathing and contact recreational water ; Category C shall be water suitable for aquatic life ; Category D shall be water source that require to undergo general treatment process, for drinking ; Category E shall be water suitable for irrigation and agricultural activities ; Category F shall be water with minimum quality but does not fall into categories A to E

Parameter	Category ¹⁰						
	Unit	Cat. A	Cat. B	Cat. C	Cat. D	Cat. E	Cat. F
COD	mg/l, max	10	10	15	30	-	40
NH3 –N pH<=7.5	mg/l, max	-	-	0.94	-	-	9.1
7.5<=pH<8.5		-	-	0.59	-	-	4.9
8.5 <= pH		-	-	0.22	-	-	1.6
PO 4 –P	mg/l, max	0.7	0.7	0.4	0.7	-	-
Chloride (Cl)	mg/l, max	250	-	-	250	600	-
CN	mg/l, max	0.05	0.05	0.05	0.05	0.05	0.05
F	mg/l, max	1.5	-	-	1.5	-	-
SO ₄ ²⁻	mg/l, max	250	-	-	250	1000	-
Cd, total	µg/l, max	5	-	5	5	-	5
Cr, total	µg/l, max	50	-	20	50	-	50
Cu, total	µg/l, max	-	-	100	-	-	100
Fe, total	µg/l	300 des 1000 max	-	-	2000	-	-
Mn, total	µg/l, max	1000	1000	1000	1000	1000	1000
Hg, total	µg/l, max	1	1	1	1	2	2
Ni, total	µg/l, max	70	100	100	100	200	100
Se, total	µg/l, max	10	10	5	10	-	-
Zn, total	µg/l, max	1000	-	1000	1000	2000	24000
Pb, total	µg/l, max	50	-	2	50	-	-
Hardness<120				3			
120<=Hardness<180				4			
180<=Hardness							
B, total	µg/l, max	-	-	-	-	500	-
As, total	µg/l, max	50	50	50	50	50	50
Al, total	µg/l, max	200	-	-	-	5000	5000
Phenolic compounds	µg/l, max	2	5	2	5	5	5
Oil/Grease	µg/l, max	100	-	100	100	-	300
Anionic surfactants as MBAS	µg/l, max	1000	1000	1000	1000	1000	1000
MCPA	µg/l, max	2	-	-	20	-	-
Pendimethalin	µg/l, max	2	-	-	20	-	-
Total Coliform	MPN/100ml, max	10000	10000	-	10000	-	-
Faecal Coliform	MPN/100ml	500 des 1000 max	500 des 1000 max	-	-	-	-

Note: Category A shall be water that requires simple treatment, for drinking; Category B shall be bathing and contact recreational water; Category C shall be water suitable for aquatic life; Category D shall be water source that require to undergo general treatment process, for drinking; Category E shall be water suitable for irrigation and agricultural activities; Category F shall be water with minimum quality but does not fall into categories A to E.

3.7 Project Screening and Categorization

3.7.1 Project Categorization as per NEA 2000

As per National Environmental Act (NEA) of 2000 of Sri Lanka, the proposed Project falls under the 'Prescribed Project' category; hence required an EIA. As per requirement of NEA 2000, the proposed WCT-1 has conducted the EIA study and CCCRMD issued a Permit on 8th February 2006 and periodically renewed by the Project Proponent – SLPA.

3.7.2 Project Classification as per DFC Environmental and Social Policy and Procedure

DFC categorizes projects and subprojects are categorized as Category A, B, C or D based on environmental and social factors. An additional classification of Special Consideration may apply to projects that have heightened potential for adverse project-related social risks related to the involvement of or impact on Project Affected People including Workers. DFC uses the following categories for its projects.

- Category 'A' projects may have significant adverse environmental and/or social impacts that are irreversible, sensitive, diverse, or unprecedented in the absence of adequate mitigation measures. Category 'A' projects are considered high risk.
- Category 'B' projects are likely to have limited adverse environmental and/or social impacts that are few in number, generally site-specific, largely reversible and readily addressed through mitigation measures. Category 'B' projects are considered medium risk
- Category C projects are likely to have minimal adverse environmental or social impacts.
- Category D is reserved for initial approval of guaranties to Financial Intermediaries, which will make investments in or provide financing to projects or enterprises ("Subprojects,") engaged in activities within Categories A, B or C. Subprojects, originated by the Financial Intermediaries screened as Category D, are subsequently screened and subjected to the full scope of environmental and social assessment process including public disclosure and consultation, Greenhouse Gas emission accounting, and conditions and monitoring requirements as warranted by the nature and scope of the Subproject and its environmental and social risks and impacts

Environmental factors: The WCT-1 project is not a full-fledged Port and Harbor Project. The proposed terminal will be constructed within the Colombo Port area. Therefore, construction activities like capital dredging, construction of a break water, and associated infrastructure like roads, power supplies, etc., would not be required. The potential environmental impacts from the project can be associated with site reclamation activities and the civil construction of the terminal. The site will be reclaimed using sand, which will be sourced from an offshore sand borrow area. The borrow area is a government-approved site, and CWIT has conducted the IEE study and obtained all necessary approvals and permits. The mitigation measures proposed in the IEE and environmental clearance have been implemented during on-going sand dredging activity. CWIT also obtained environmental clearance and other permits and approvals (refer to Section 3.3). Implementation of the environmental mitigation measures proposed in the EIA and their approval may not have an impact on the baseline environment. The boulder quarry area which will be used for sourcing quarry materials is also an operational quarry, and have relevant environmental approvals. The boulders will be sourced from the third party operator, who will be responsible for the implementation of quarry specific environmental mitigation measures.

There is no ecological sensitive area of high biodiversity value which stand to be adversely impacted in the proposed borrow area; however, there are few reefs that are located towards northern and north-western side of sand borrow area, but at a distance where the influence of the dredging activities is anticipated to be limited. In addition, as the area has been utilised for sand borrowing during a considerable time for dredging of projects associated with the main Colombo project and also other infrastructure projects which entailed sand dredging. So, there is expected to be no irreversibility aspect related to any environmental impact from the borrow area. In the Bay area, there is no reef, however, some coral species were recruited in the inner harbour towards the northern part of the break water, but the same can be considered to be a modified habitat as it has formed on substrates created through an artificially developed structure. Potential impacts would happen to the marine areas adjacent to the terminal due to dredging; reclamation works during construction phase of the project and is expected to lead to limited long term loss or degradation of pelagic and benthic habitats at the local level, but the impact will occur on habitats which have already modified from their natural state due to the operation of the port for more than 2 decades. Sediment plume generated during dredging and reclamation works has the potential to affect the quality of aquatic habitats but these impacts are anticipated to be temporary in nature and last only for the construction phase of the project. Apart from that, noise generated during construction particularly underwater piling for foundation is a probable source of underwater noise, which can have potentially limited impacts on marine fauna including fishes.

Social factors: The proposed project would not require any additional land for the construction of the terminal, as it is located within the Colombo Port area. The offshore sand borrow area is located about 7.2 km–9 km away from the existing coastline between Basiyawatta and Kepungoda. The proposed sand borrow area is in the fishing zone of the nearby fishing communities of Negombo and Wattala DSDs. Approx. 2000 fisher folk families access the proposed sand borrow area and sand transport route, which may be impacted due to dredging and vessel movement.

However, the segment of the fishing population whose livelihood would be directly impacted will be limited to those engaging in fishing in and around the borrow pit area. Given the sand extraction area is 8km away from the shoreline, only a limited segment of the fishermen engaging in fishing particularly using Outboard-Engine Fiber Reinforced Plastic Boat (OFRPB) would engage in fishing in the vicinity of the sand borrow area and along part of dredger route. The fishermen involved in fishing activities in large scale (e.g. Multiday boats) require to cross the area for deep-sea fishing, hence will not have significant impacts. Similarly, fishing activities confined to the near shore area (e.g. beach seine, NTRB) within 7 km will not have a significant impact due to dredging activities.

In spite of limited socio-economic impact on the fishing community due to be caused by the dredging activity, the IEE recommends the Project Developer to undertake the following to ensure that adequate measures are in place to remedy the socio-economic vulnerabilities of the identified fishing community:

- Implementation of a Grievance Redress Committee (GRC) and a grievance redress mechanism
- Implementation of an Insurance Policy for Fishermen
- Implementation of Infrastructure Improvement Projects for Fishing Community

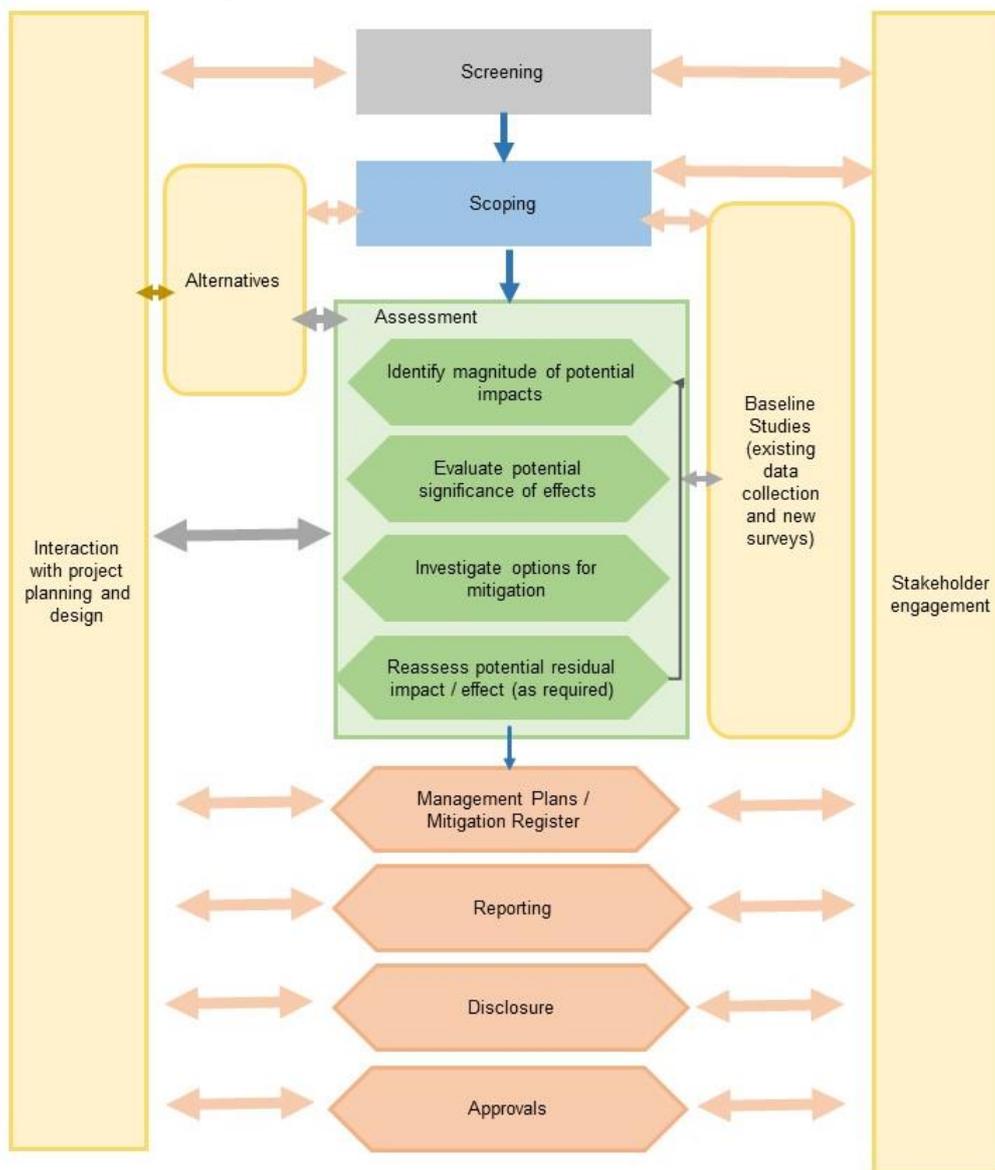
In light of the aforementioned conditions, the proposed WCT-1 terminal Project has been assessed as 'Category B' Project.

4 APPROACH AND METHODOLOGY

4.1 Introduction

The study has been undertaken following a systematic process that identifies and evaluates potential impacts the Project could have on aspects of the physical, biological, socio-economic and cultural environment. Furthermore, it identifies measures that the Project will take to avoid, reduce, mitigate, offset or compensate for potential adverse impacts and to enhance potential positive impacts where practicable. The Study methodology follows the overall impact assessment approach illustrated in Figure 4.1.

Figure 4-1 Impact Assessment Process



4.2 Screening

Screening has been undertaken in order to determine whether the Project has the potential to result in significant environmental or socio-economic impacts and identifies potential public concerns. The

main outcome from initial screening is the classification of the Project according to its likely or potential environmental sensitivity. This will also assist in determining whether a full Environmental Impact Assessment (EIA) is needed and, if so, to what detail individual environmental and social aspects are required to be assessed.

As per National Environmental Act (NEA) of 2000 of Sri Lanka, the proposed Project falls under the 'Prescribed Project' category; hence required an EIA. As per requirement of NEA 2000, the proposed WCT-1 has conducted the EIA study and CCCRMD issued a Permit on 8th February 2006 and periodically renewed by the Project Proponent – SLPA.

As per IFC categorizes projects according to the location, sensitivity and scale of the project as well as the nature and magnitude of its potential impacts, the proposed Project is categorised as 'B'

4.3 Scoping

The primary purpose of scoping is to determine the framework for carrying out the ESIA based on an initial assessment of potential impacts, available data, and current data gaps. Overall, scoping is a collaborative process involving all key disciplines of the Project team including planning, designing team, environment and government and community relations.

A scoping exercise was carried out involving all the relevant Project team disciplines with the aim of:

- Compiling all available Project information including location, cost, proposed design, construction time-frames, on-ground activities and resources (labour, materials and equipment) required;
- Defining the potential zone of influence (ZOI) of proposed activities and therefore the boundaries for the assessment area (Study Area) of the Project;
- Describing, in broad terms, the existing environmental and social conditions within the ZOI and undertaking an initial assessment of potential impacts (both positive and negative);
- Reviewing the relevant legislative and regulatory framework applicable to the Project;
- Undertaking a data gap analysis to determine what additional site data (environmental and social) would need to be collected, and what consultation would need to be undertaken, in order to better quantify/qualify existing baseline site conditions as well as potential impacts and mitigation measures;
- Determining if any potential impacts may occur as a result of the Project;
- Identifying, at an early stage, potentially significant impacts which are likely to require further assessment, including specialist studies; and,
- The development of management and mitigation measures.

4.4 Project Description

It is essential to understand the project correctly to assess the potential environmental impacts and to identify alternatives and mitigation measures. The actions that are part of a project are what may result in potential impacts. Consequently, the failure to obtain a thorough project description commonly results in an incomplete ESIA analysis.

4.5 Environmental and Social Baseline Conditions

In order to conduct the required impact assessment for the EIA report, it was necessary to collect relevant data from appropriate primary and secondary sources to fully establish existing baseline conditions for the relevant environmental (physical, biological and socio-economic) aspects. As part of this process, relevant stakeholders were also consulted in order to gather their comments, opinions and concerns about the proposed Project and the possible impacts in the ZOI.

4.5.1 Defining the ZOI

A 5 km radial zone around the offshore borrow pit and around the WCT-1 has been considered to find out presence of environmental and ecological sensitives receptor in this region. Also an area of 1km on

either side of transport route to disposal area and borrow pit is included in ZOI. However, all the GNDs located along the coast has been considered for socio-economic study. For ecological sensitivity, 10 km radius area has been considered.

The rock and boulders will be sourced from two operational quarries located in the Thebuwana and Mirigama areas. The road distance of Thebuwana Quarry is approximately 60 km from WCT-1, and Mirigama Quarry is approximately 45 km from WCT-1. CWIT has contracted M/s Access Engineering PLC (Access) for the supply of rock boulders required for the construction related work at WCT-1. For the operation and transportation of bolder Access, the company obtained the required environmental clearance and permits (refer to Section 2.6.1.4). As the quarry is not operated by CWIT and required environmental clearance and permits were obtained, it has not been considered in the ESIA's scope as well in the ZOI.

4.5.2 Geographical Information Systems

Geographical Information Systems (GIS) were used as a specialized analysis and presentation tool. Before commencing field investigations, spatial analysis of satellite imagery can identify and present administrative areas and other boundaries/constraints to be considered for both the environmental and social assessments. For example, the administrative boundaries of Local Government areas can be defined, and transport routes, settlement areas and drainage networks can be identified. It also supports more detailed on-ground survey, particularly spatial features that may be directly or indirectly influenced by Project activities.

The land use map was prepared using multispectral satellite imagery (LANDSAT 8) and World Imagery dated on 21 April 2022, along with ground truthing surveys undertaken during site reconnaissance (9 - 12 November 2022).

4.5.3 Environmental Data Collection and Analysis

In order to establish the baseline physical and biological conditions within the ZOI, relevant primary and secondary data was collected and reviewed - a comprehensive field visit was undertaken, and a number of specialist studies were carried out. This process also included consultation with various relevant agencies including Government Departments, CWIT, and members of the local community. The data generated allowed the Project team to better understand the complex interplay between the various biotic and abiotic factors within the ZOI and to accordingly establish the baseline conditions. Once this baseline was established (refer to Section 5), it was used as a reference point to identify potential changes to the environment that may occur as a result of the proposed project activities, as well as to allow development of measures to prevent, mitigate or manage these potential impacts.

4.5.3.1 Secondary Baseline Data Collection and Literature Review

A review was conducted of the literature relevant to the Project in order to assist in establishing baseline site conditions. Activities included:

- Data and information was collected from different government departments including Central Environmental Authority (CEA), Sri Lanka Meteorological Department for information relating to site aspects including drainage networks, flooding characteristics, climate (weather);
- An appraisal was made of all legislation having direct and indirect relevance to the environmental conditions and biodiversity within the study areas; and
- Previous environmental site studies, as available, were reviewed together with relevant scientific journals and literature.

4.5.3.2 Primary Baseline Data Collection

To comprehensively evaluate the existing Project area baseline conditions, a field visit and data collection program incorporating a number of physical and biological investigations was developed and implemented. This survey aimed to identify important environmental components and environmental issues within the ZOI.

4.5.3.2.1 Physical Environment

Environmental baseline data was collected through primary monitoring and surveys of the study area conducted by ELCS, an ISO accredited laboratory. Baseline data collection involved identification of the monitoring locations for air, noise & vibration, water, sediment, and biomonitoring as per sensitive receptors, key locations for the Project facilities and their surrounding areas. The baseline data collection, monitoring and analysis for environmental parameters were completed during the period from July to November 2022. Secondary data was also collected from different government departments, local bodies and through literature surveys etc.

4.5.3.2.2 Biological Environment

Desk-based assessment plays a significant role in the initial screening of the project activity and the project site. It is continuous process and throughout the period of assessment desk based studies provides curtail inputs in designing study, establishing baseline, complementing primary data and critical habitat assessment. Desktop survey and literature review helps in assessing probably critical habitat candidates based on species' distribution patterns, preferred habitat and factors that can influence the species distribution (e.g. anthropogenic development). Desk-based assessment is also used to identify habitat contiguity, habitats of conservation significance (e.g. protected areas) and probably hotspots for migratory and congregatory species. The EAAA for the critical habitat assessment is delineated as part of the desk-based review by determining ecological boundaries where the patterns, processes, features and functions are similar.

Prominent data sources used during this Critical Habitat Assessment are listed in the table below. Secondary information review was not restricted to the below-mentioned sources only, and all reviewed literature are mentioned as footnotes in respective sections.

Table 4-1 Data Sources for Biodiversity Study

S. No.	Source	Purpose	Link
1.	Integrated Biodiversity Assessment Tool (IBAT) for Business	The IBAT tool screens a potential location for ecological sensitivity and provides a list of species occurring in a 50 km radius. The tool also highlights potential critical habitat triggers by determining proximity to migration pathways, legally protected areas and key biodiversity areas.	None; IBAT is a licensed product that ERM has obtained for the purpose of biodiversity screening across projects.
2.	ENVIS Centre on Wildlife and Protected Area	The database provides information on the government undertaken conservation efforts and on National Park, Wildlife Sanctuary, Conservation Reserve, flagship species conservation landscapes, Biosphere Reserves, KBA, Biodiversity Heritage sites within India.	http://wiienvis.nic.in/

S. No.	Source	Purpose	Link
3.	IUCN Red List for Threatened Species Online Version [2022-1]	The IUCN Red List provides a list of threatened species by classifying them from Least Concern (LC) to Critically Endangered (CR) through an understanding of their global distribution, population numbers, and trends in population decline and stresses on the species. As part of the classification, the global distribution and habitat preference of the species is given.	https://www.iucnredlist.org/
4.	Birdlife Data Zone	BirdLife International maintains a database on Endemic Bird Areas (EBA) and Important Bird Areas (IBAs) that provides a list of species found in these designated areas, measure of sensitivity of these habitats and identifies migratory, congregatory and threatened species in the area.	http://datazone.birdlife.org/home
5.	ebird.org	ebird.org provides a geo-referenced list of identified bird species in a given area. The ebird.org database was used to confirm presence/absence of bird species found in the Blowout Landscape.	https://ebird.org/home
6.	Online database of “Conservation International” and “Critical Ecosystem Partnership Fund”	These data bases help in identifying and provide information on Global Biodiversity Hotspots.	https://www.conservation.org/ https://www.cepf.net/
7.	UNESCO World Heritage Site	This provides an insight into the network of “Biosphere Reserve” and “Natural World Heritage Sites”	whc.unesco.org
8.	Alliance for Zero Extinction Sites	To identify proximity to any declared Alliance for Zero Extinction Sites	https://zeroextinction.org/
9.	Global Biodiversity Information Facility (GBIF) and iNaturalist	Global Biodiversity Information Facility is an international network and research infrastructure funded by the world’s governments and aimed at providing anyone, anywhere, open access to data about all types of life on Earth. iNaturalist is an online social network of people sharing biodiversity information to help each other learn about nature.	https://www.gbif.org/

4.5.3.3 Socio-economic Environment

Secondary Baseline Data Collection and Literature Review

Secondary information, including census data, maps and reports, has been collected from various sources. The following activities were undertaken as part of the socio-economic baseline study:

- Collection of available information, data, maps and reports from CWIT;
- Site reconnaissance survey of the Project sites and ZOI;
- The meetings also sought Government cooperation with the study team in order to provide a better understanding of the study area and to collect any initial available data/information on all resources within this area;
- Meeting with local leaders and community members in order to source information, views and suggestions.

Primary Baseline Data Collection

A detailed socio-economic baseline data collection was carried out by LHI to identify the social and economic impact on the people living in the vicinity of the project site as well as citizens of Sri Lanka in general.

The detailed baseline characterisation for the project is provided in **Section 5** of this ESIA report.

4.6 Stakeholder Consultation

4.6.1 Information-Sharing

Providing factual information to stakeholders early in the project planning process assists in the development and maintenance of constructive stakeholder relationships. To facilitate this process, during the consultation, stakeholders were presented with information about the Project which was then used as a starting point for discussion.

4.6.2 Consultation Methods and Materials

A range of stakeholder consultation and engagement methods have been applied depending on the stakeholder group, their level of interest and likely concerns. These include:

- Face-to-face individual interviews- stakeholders are provided with a Project briefing and information is gathered through specific pre-prepared consultation checklists;
- Face-to-face small group discussion (3-5 persons)- stakeholders are provided with a Project briefing and information is gathered from them through specific pre-prepared consultation checklists;
- Face-to-face focus group discussions (5-15 persons)- stakeholders are provided with a Project briefing and information is gathered from them through specific pre-prepared focus group consultation protocols;
- Socio-economic baseline survey (household level) using pre-prepared questionnaires.

4.7 Impact Assessment Methodology

This section identifies and evaluates potential environmental, social (socio-economic), and public health impacts resulting from the proposed Project during site development & construction, operation & maintenance stages. The potential impacts are evaluated to assess possible consequences of the project activities to determine the severity and extent of identified potential impacts, and aid in the development of mitigation or enhancement measures to reduce or negate those identified potential impacts.

4.7.1 Identification of Potential Impacts

Identification of potential impacts is an objective exercise to determine what could potentially happen to the environment as a consequence of the Project and its associated activities. This effort builds on the identification step in scoping, whereby the potential interactions between the Project and the baseline environment are identified. From these interactions, the potential impacts to the various resources or receptors are identified and are described to the extent possible.

The nature and types of potential impacts addressed in this EIA are defined in **Box 4.1** below.

Box 4.1 Nature and types of potential impacts

- **Negative impacts:** Potential impacts that are detrimental to the impacted medium
- **Positive impacts:** Potential impacts that are beneficial to the impacted medium.
- **Direct impact:** Any change to the environment, surrounding communities or health of the community (whether adverse or beneficial) directly resulting from project activities.

- **Indirect impact:** Secondary or higher order potential impacts resulting from the potential direct impacts of the project. These indirect potential impacts are often later in time or further removed in distance.
- **Cumulative Impacts:** The additive potential impacts that may result from the incremental potential impacts of the planned Project plus the potential impacts of reasonably anticipated future projects.
- **Receptor:** The attribute of the environment (e.g., air, water, soil, sediment, etc.) or public, which may be potentially impacted by the project activities.
- **Duration of the potential impact:** Classified as either short-term (potential impacts lasting less than 1 year), medium-term (potential impacts lasting 1 to 10 years) or long-term (potential impacts lasting longer than 10 years).
- **Event Related Impacts:** Potential impacts stemming from a specific unintentional event - such as fire/explosion, etc.

4.7.2 Evaluation of Potential Impacts

4.7.2.1 Potential Impact Characteristics

Once the identification of potential impacts is complete, each potential impact is described in terms of its various relevant characteristics (e.g., type, scale, duration and extent). The terminology and designations used to describe potential impact characteristics is shown in **Table 4.2**.

Table 4.2 Potential Impact Characteristic Terminology

Characteristics	Definition	Designations
Type	A descriptor indicating the relationship of the potential impact to the Project.	<ul style="list-style-type: none"> ■ Direct ■ Indirect ■ Cumulative
Extent	The “reach” of the potential impact (e.g., confined to a small area around the Project Footprint, projected for several kilometres, etc).	<ul style="list-style-type: none"> ■ Local ■ Regional ■ National
Duration	The time period over which a resource / receptor is potentially affected	<ul style="list-style-type: none"> ■ Short Term ■ Medium Term ■ Long Term
Scale	Concentration of an emission or discharge with respect to standards of applicable legislation and international guidance, potential to be damaged or impacted, the fraction of a resource that could potentially be lost or affected, etc.	<ul style="list-style-type: none"> ■ Low ■ Medium ■ High

4.7.2.2 Likelihood (Event Related Impact Only)

For the purposes of this impact assessment, potential impacts that are dependent on the occurrence of a specific unplanned accident or event that has a finite probability, but might not occur at all, are referred to as “event-related impacts.” An example of event-related impacts that may occur as a result of this Project could be associated with an accidental, uncontrolled release of hydrocarbons that might occur under non-routine operating conditions. Because event-related impacts may not occur at all, assessment of potential impacts that are event-related may take into consideration the likelihood of occurrence. Not all potential impacts will be assessed with likelihood, and those “event-related impacts” will be identified as such.

Likelihood can be derived from historical information, modelling, industry data, and professional judgment. In addition, likelihood takes into account anticipated or planned mitigation measures, engineering controls, and procedures in place to prevent or reduce the potential consequences of the event. **Table 4.3** describes the Likelihood categories.

Table 4.3 Likelihood of Event-Related Impacts

Impact	Definition
Rare	The impact is rare or unheard of
Remote	The impact has occurred once or twice in the industry
Unlikely	The impact has occurred in the industry in the past but is not likely to occur on this project during the lifecycle of the facility (e.g. construction, operation, decommissioning).
Seldom	The impact could occur on this project during the lifecycle of the facility but only under exceptional conditions.
Occasional	The impact may occur on this project during the lifecycle of the facility.
Likely	The impact can reasonably be expected to occur on this project during the lifecycle of the facility.

4.7.2.3 Magnitude

Once potential impact characteristics are defined, the next step in the impact assessment phase is to assign each potential impact a 'magnitude'. Magnitude is typically a function of some combination (depending on the resource/receptor in question) of the following impact characteristics:

- Extent
- Duration
- Scale
- Likelihood (for Event-Related Impacts only)

Magnitude describes the intensity of the change that has the potential to occur in the resource/receptor as a result of the potential impact. The magnitude designations themselves are consistent, but the definitions for these designations vary depending on the resource/receptor. The magnitude designations are:

- Positive
- Negligible
- Small
- Medium
- Large

In the case of a potential positive impact, no magnitude designation (aside from 'positive') is assigned. It is considered sufficient for the purpose of the EIA to indicate that the Project has the potential to result in a potential positive impact, without characterizing the exact degree of positive change that may occur.

In the case of potential impacts resulting from unplanned events, the same resource/receptor-specific approach to concluding a magnitude designation is utilized, but the 'likelihood' factor is considered, together with the other impact characteristics, when assigning a magnitude designation.

4.7.2.4 Sensitivity/Vulnerability/Importance of the Potentially Impacted Resource/Receptor

In addition to characterizing the magnitude of a potential impact, the other principal impact evaluation step is definition of the sensitivity/vulnerability/importance of the potentially impacted resource/receptor. There are a range of factors to be taken into account when defining the sensitivity/vulnerability/importance of the resource/receptor, which may be physical, biological, cultural or effects to a vulnerable population. Other factors may also be considered, such as formal legal protection status, government policy, stakeholder views and economic importance. As in the case of magnitude, the sensitivity/vulnerability/importance designations themselves are consistent, but the definitions for these designations vary on a resource/receptor basis. The sensitivity/vulnerability/importance designations used herein for all resources/receptors are:

- Low

- Medium
- High

4.7.2.5 Potential Impact Significance Determination

Once magnitude of potential impact and sensitivity/vulnerability/importance of resource/receptor have been characterized, the significance can be assigned for each potential impact. Potential impact significance is designated using the matrix shown in Table 4.4.

Table 4.4 Potential Impact Significance

		Sensitivity/ Vulnerability/ Importance of Resource/ Receptor		
		Low	Medium	High
Magnitude of impact	Negligible	Incidental	Minor	Minor
	Small	Minor	Moderate	Major
	Medium	Moderate	Major	Severe
	Large	Major	Severe	Severe

4.7.3 Potential Impact Significance Determination

This will identify, assesses, and evaluate potentially significant impacts and prioritize those potential impacts that require mitigation. The determination of a potential impact's significance is based on professional judgment and industry experience. Professional judgment takes into consideration the knowledge and experience of resource specialists and is based on the local and regional/global context of the potentially impacted resource. Applicable local regulations are used as a basis for evaluating potential physical effects. In the absence of relevant local regulations in Sri Lanka relevant International standards for operation of port sector (where available) are used in the evaluation. Likewise, stakeholder considerations, and industry norms are also considered in determining the significance of potential impacts and prioritizing mitigation.

Each potential impact is assessed with information specific to the actions resulting in the impact, the impacted receptor, available baseline information, the extent and duration of the potential impact, and other factors. Consideration is given to reasonable best practices, planned engineering control measures, and anticipated mitigation measures. With this information, the EIA team determines the significance of the potential impact. The tables below provide high-level definitions for the potential impact significance designations for potential environmental (Table 4.5) and social (Table 4.6) impacts respectively. Potential impacts may stem directly from the proposed Project or from indirect and cumulative impacts.

4.7.3.1 Potential Environmental Impacts

The significance designations for potential environmental impacts take into consideration the impact characteristics, any additional relevant criteria, receptor sensitivity, duration and extent of impact, and the potentially impacted receptor's ability to return to its previous condition.

Table 4.5 Potential Environmental Impact Significance

Impact	Definition
Incidental	Potential impacts such as localized or short-term effects on habitat, species, or environmental receptor.
Minor	Potential impacts such as localized, long-term degradation of sensitive habitat or widespread, short-term impacts to habitat, species, or environmental receptor
Moderate	Potential impacts such as localized but irreversible habitat loss or widespread, long-term effects on habitat, species, or environmental receptor.
Major	Potential impacts such as significant, widespread, and persistent changes in habitat, species, or environmental receptor.
Severe	Potential impacts such as persistent reduction in ecosystem function on a landscape scale or significant disruption of a sensitive species.

4.7.3.2 Potential Social Impacts

Potential social impacts are inherently variable because community response to a potential impact, perceptions of existing and changing conditions, and the degrees of vulnerability are all heavily dependent on local conditions. The significance designations for potential social impacts take into consideration social science expertise and previous experience in country regarding the relationships between individuals, communities, government agencies, NGOs and special interest groups, and the oil and gas industry.

Table 4.6 Potential Social Impact Significance

Impact	Definition
Incidental	Potential impacts that are practically indistinguishable from the social baseline, with little to no potential impacts to or concerns from impacted external stakeholders.
Minor	Potential impacts that are inconvenient; potentially impacted external stakeholders concerned but likely able to adapt with relative ease.
Moderate	Potential impacts such as localized or short-term impacts; potentially impacted stakeholders concerned but likely able to adapt with relative ease.
Major	Potential impacts such as local-to-regional (sub-national) or medium-term impacts; potentially impacted stakeholders concerned and raise the issue as a high priority, but may be able to adapt with some targeted support or assistance.
Severe	Potential impacts such as local-to-national or long-term impacts; potentially impacted stakeholders concerned and raised as a high priority; may not be able to adapt without targeted support or assistance in order to maintain pre-impact livelihood.

4.7.3.3 Potential Public Health Impacts

To determine potential public health impacts, the assessment considers the public which could be exposed to various aspects and impacts of the project, whether a permanent resident with continuous exposure or a periodic exposure to any individual in the zone of influence (ZOI). The significance determinations for potential public health impacts take into consideration local and regional public health expertise and previous experience in the country regarding the relationships between individuals, communities, health care providers, government agencies, and the terminal workers.

Table 4.7 Potential Public Health Impact Significance

Impact	Definition
Incidental	No impact to the public
Minor	Potential illness or adverse effect with limited or no impacts on ability to function and medical treatment is limited or not necessary.
Moderate	Potential illness or adverse effects with mild to moderate functional impairment requiring medical treatment or management.

Impact	Definition
Major	Potential serious illness or severe adverse health effect requiring a high level of medical treatment or management.
Severe	Potential serious illness or chronic exposure of a few or more resulting in life shortening effects.

4.8 Develop the Impact Mitigation, Benefit Enhancement and Monitoring Measures

Once the significant negative potential impact (moderate, major and severe) has been characterised, the next step is to the development of mitigation, enhancement and monitoring measures. Under the Mitigation Hierarchy, preference is given first to measures in the following sequence:

- Avoid at source, reduce at source - avoiding or reducing negative potential impacts from the project through the designing of the project or through engineering control to prevent unplanned events;
 - Abate on site - add something to the design to abate the potential impact (e.g., pollution control equipment, sea traffic controls, etc.);
 - Abate at Receptor - if a negative potential impact cannot be abated on site then control measures can be implemented off-site;
 - Repair/ remedy - some potentially significant impacts involve the potential for unavoidable damage to a resource (e.g. water quality, fishery, etc.) and these potential impacts can be addressed through repair, restoration or reinstatement measures, if they occur; and
 - Compensate/Offset - where none of the above approaches are practicable, to compensate for potential project impacts by, for example, replacement of loss/damage at another location.
- For positive potential impacts, or project benefits, the EIA Team identifies opportunities to enhance potential project benefits.
 - In developing the mitigation and enhancement measures, following points will be considered:
 - The effectiveness of each potential mitigation measure will be assessed and potential synergies identified (i.e., where one measure mitigates several potential impacts);
 - The level of impact reduction or benefit enhancement that results by implementing each potential mitigation measure will be determined;
 - The preferred measures will be selected based on the previously described analysis;
 - All mitigation and benefit enhancement alternatives will be reviewed to:
 - Determine if there are potential conflicts or adverse cumulative effects;
 - Determine if there are potential implications for other project parameters, such as safety, security or stakeholder relationships;
 - Identify potential synergies.
 - The plan also identifies the monitoring to be conducted during the site development & construction and operation & maintenance stages of the project to provide data needed to assess:
 - Actual project impacts against those evaluated in the Impact Assessment;
 - The effectiveness of mitigation and enhancement measures being implemented.
 - When developing mitigation, enhancement and monitoring measures, the plan will clearly distinguish:
 - The measures implemented to mitigate potential negative impacts resulting from the project;
 - The measures taken to address potential multi-factorial indirect effects;
 - The measures taken to enhance potential positive project impact.

4.9 Environmental and Social Management Plan

Mitigation and management measures are the means by which potential negative impacts associated with the Project – both environmental and socio-economic – are avoided or reduced to levels which are not considered significant. This may be achieved in a number of ways, including modifications to the proposed design, changes to construction methods, the application of specific controls or changes to the location of the Project. The phrase *‘reducing potential impacts to levels which are not considered significant’* means that potential impacts are reduced to a point where they no longer pose a significant threat to the current or future status of the surrounding natural environment, biodiversity value and social or economic environment of the region. Where specific local regulations are not available, significant impact levels may be determined using international standards and guidelines, or generally-accepted industry-specific best-practice guidelines.

The ESMP developed for the Project is consistent with international best practice principles and documents and includes the following elements:

1. A description of the Project activities;
2. A breakdown of the scope and purpose of the Environment and Social Management Plan (ESMP);
3. An outline of the framework for compliance and regulatory requirements (Mitigation Plan, Monitoring Plan, Monitoring Indicator);
4. ESMP management responsibilities in the context of the overall Project management structure;
5. An overview for auditing and review;
6. Environmental Implementation Budget and source of fund;
7. Identification of environmental values and potential impacts, as well as mitigation measures and individual responsibilities.

5 DESCRIPTION OF EXISTING ENVIRONMENT

5.1 Introduction

This section describes the existing environmental and social baseline of the zone of influence (ZOI) of the Project. This includes relevant components of the physical, biological and socio-economic environment.

The purposes of describing the environmental, ecological and social settings of the ZOI are:

- To understand the project needs and environmental characteristics of the area; and
- To assess the quality of the existing physical environment, biological environment and socio-economic environment, as well as the potential impacts of the future developments being studied.
- The baseline environment study was studied through secondary sources, supplemented with findings from the site reconnaissance study and primary monitoring data.

5.2 Zone of Influence

A 5 km radial zone around the Site has been studied to ascertain the presence of sensitivities/sensitive receptors in this region. **Figure 5.1** shows the ZOI map for the Project. The zone of influence (ZOI) is characterized by a relatively flat area which is dominated by ocean, Port facility and built-up area.

5.3 Physical Environment

5.3.1 Topography and Geology

Geologically, different layers of fluvial, aeolian and lagoonal material have been deposited in and around the Colombo area at the mouth of Kelani River. Ancient crystalline rock occupies nine-tenths of the island, while the rest comprises sedimentary formations. The crystalline rocks are generally divided into two groups, namely, Highland Complex and Vijayan Complex and again Vijayan Complex is subdivided into two divisions based on the geological history of Sri Lanka as follows:

- (a) Wannai gneiss, and
- (b) Bintanna gneiss.

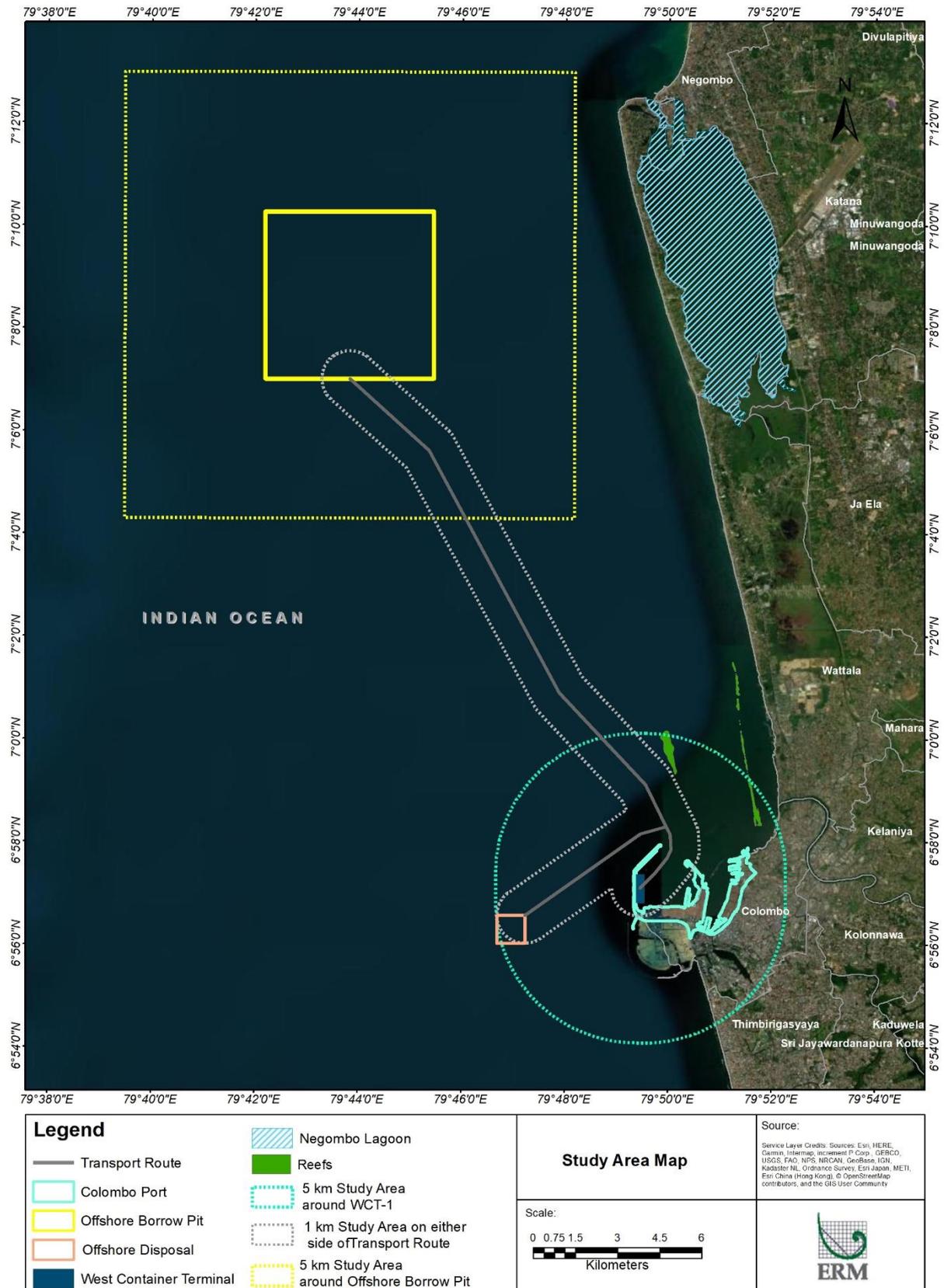
Hornblende gneiss, hornblende-biotite gneiss and biotite gneiss are included in granulite facies rocks of Highland Complex, which occupies the base of the City of Colombo area. The Quaternary deposits are recognized as Pleistocene and Holocene deposits and it is also reported that Sri Lanka has been identified as "Plateau Deposits", which are typically divided into two strata: the lower and upper strata.

- (a) The lower stratum belongs to the rubble debris
- (b) The upper stratum is made up of red beds, basal ferruginous gravel and terrace gravel.

The pebbly sand consists of rounded pebble and angular quartz grains of 0.5 to 8 cm with grey brown sandy clay. These are widely distributed in the lower parts of the flood plains, which overlie the above mentioned crystalline rocks. The white sand deposits of the City of Colombo and its environs consist of 99 percent of quartz grains. The quartz grains of this white sand are angular or sub-angular.

Well rounded quartz pebbles embedded in a matrix of laterite; pebble-free layer of laterite and pebbly sands consist of rounded pebble and angular quartz grains are widely distributed in the lower part of the Kelani river flood plain, where the study area is located.

Figure 5-1 Zone of Influence (ZOI) Map



5.3.2 Land Use

On review of the land use in the project Zone of Influence, it was observed that majority of the area comes under sea (approx. 80.73% of total area). The total land area in the Zol is 17.94 km². The predominant land use in the land based is built up area (approx. 43.09%), followed by port 18.62%, port city 16.78%, urban infrastructure (6.19%), inland surface water body (4.24%), etc. The land use statistics of the project ZOI has been provided in **Table 5.1** and **Figure 5.2**. The sand borrow and sand transport corridor is also falling in sea.

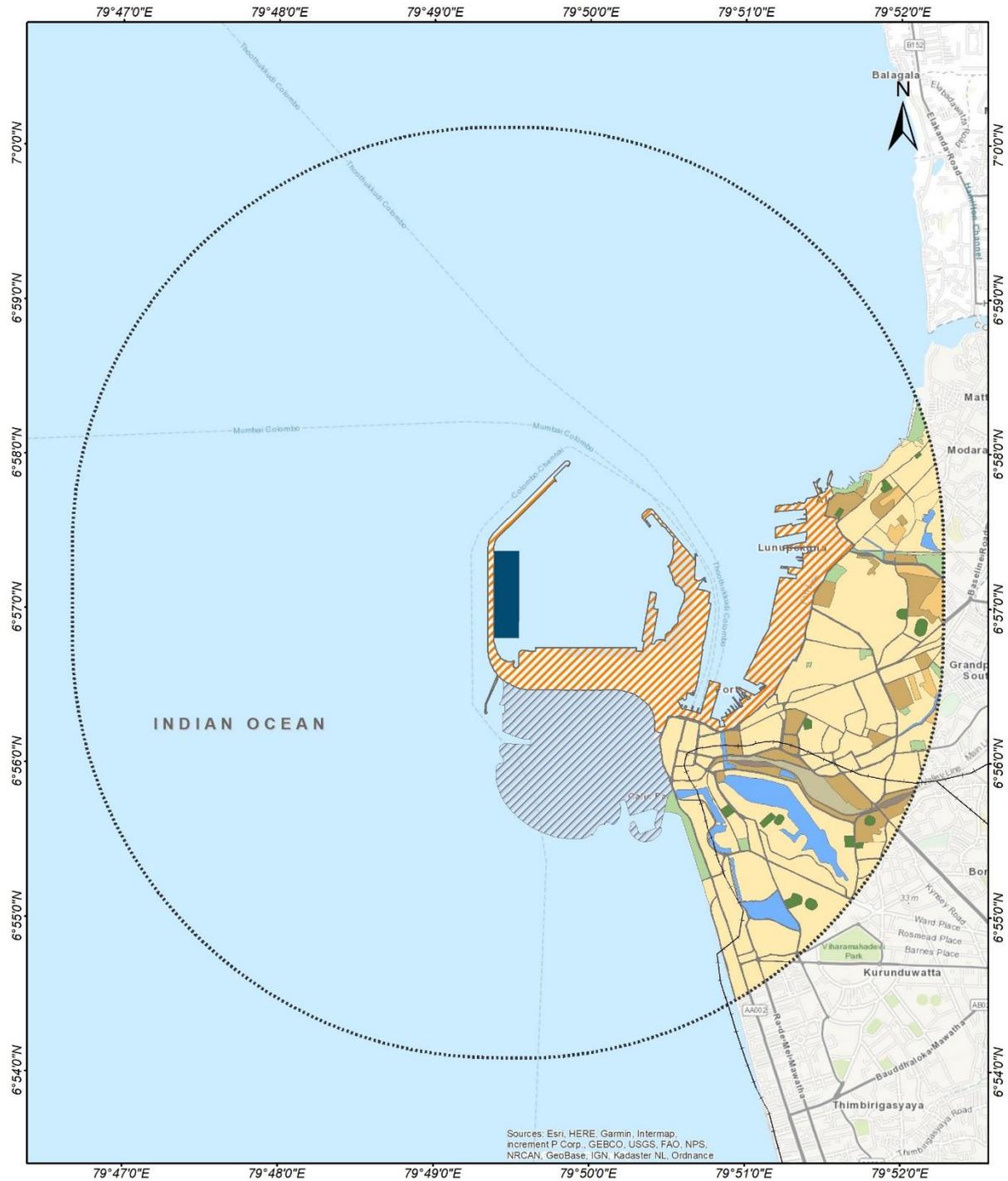
Table 5.1 Land use breakup of the project ZOI

S. No.	Land use/ Land cover Category	Area (sq.km)	Percentage
1	Beach	0.03	0.17
2	Canal	0.02	0.11
3	Industry	0.26	1.45
4	Port	3.34	18.62
5	Road	0.82	4.57
6	Waterbody	0.76	4.24
7	Urban Infrastructure	1.11	6.19
8	Railway Track/Yard	0.29	1.62
9	Port City	3.01	16.78
10	Park or Ground	0.19	1.06
11	Open Area	0.38	2.12
12	Built-up Area	7.73	43.09
	Total	17.94	100.00

Source: GIA based assessment of the Project

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Figure 5-2 Land Use Map of the ZOI



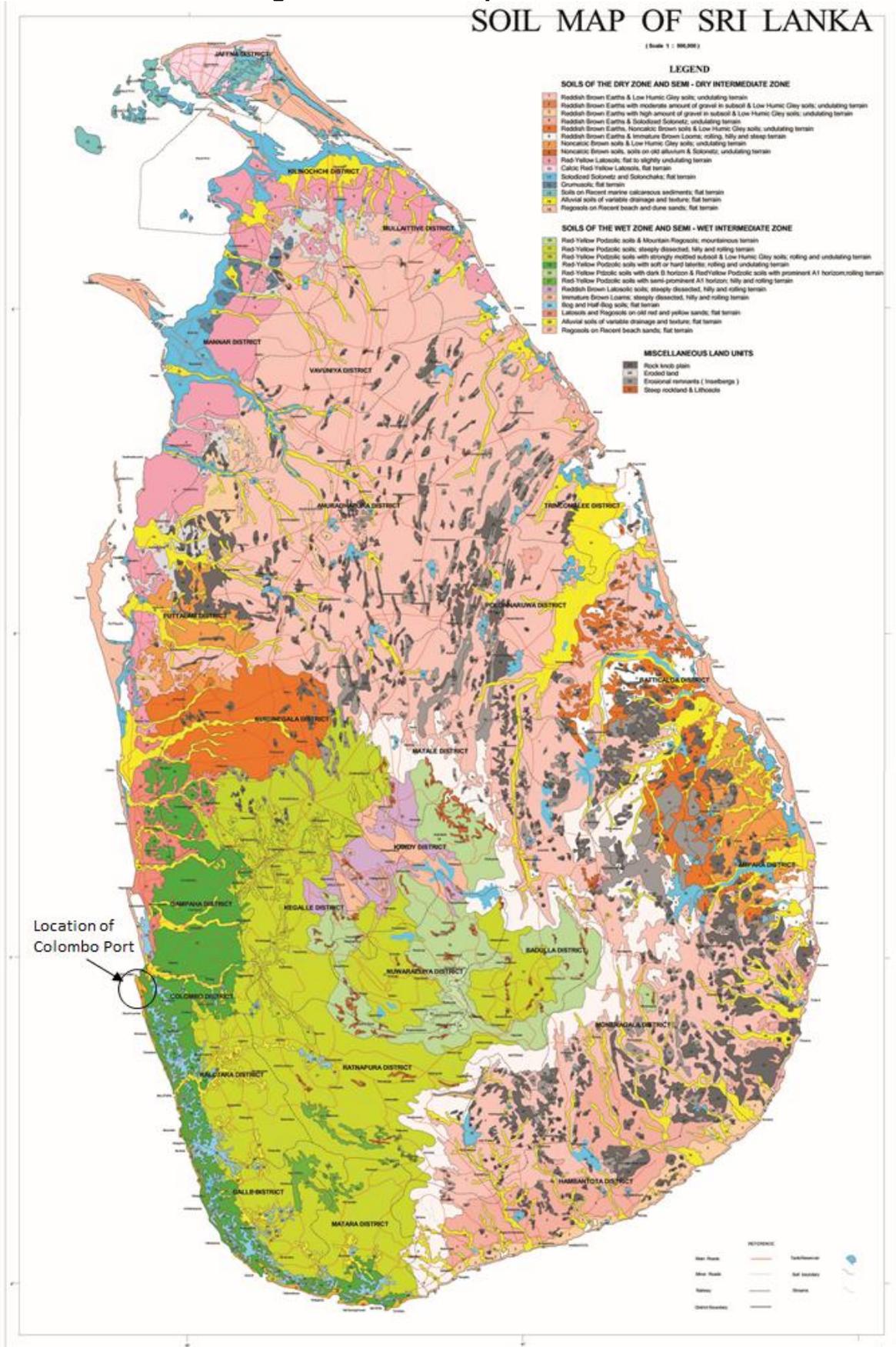
Legend			Landuse/Landcover Map (5 km around WCT-1)		Source:
Builtup Area	Beach	Port	Scale: 		Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), © OpenStreetMap contributors, and the GIS User Community
Industry	Road	Port City			
Open Area	Railway Track	WCT-1			
Park or Ground	Railway Yard	5 km around WCT-1			
Waterbody	Urban Infrastructure				

5.3.3 Soil Quality

Sri Lanka has a wide diversity of soil types which is due to diverse climate and topographic factors. The mean annual rainfall varies from 1250 – 5000 mm in the south western quarter of the island to less than 1250 mm in the northwest and south-eastern parts of the country. Based on the rainfall patterns, three geographic zones, dry, wet and intermediate zones have been identified in Sri Lanka. The topographical boundaries are low country 0 – 300m, mid country, 300-900m and the upcountry > 900m.

Based on the soil map of Sri Lanka is presented in **Figure. 5.3**, Red Yellow Podzile (RYP) is likely to be encountered within the ZOI, the major great soil groups in the low country. RYP is the predominant rice growing great soil group in the mid country wet and intermediate zones.

Figure 5-3 Soil Map of Sri Lanka



Source: NRM, Department of Agriculture

5.3.4 Sediment Quality

A number of sediment surveys have been carried out at the Port of Colombo over the years which include:

- Maunsell (2001) carried out a study in the Port and surrounds as part of the Feasibility Study.¹¹
- As part of the EIA Study for LNG/Gas Infrastructure Project, Joint Venture Company composed of Petronet LNG Ltd., Sojitz Corporation, Mitsubishi Corporation and Sri Lanka Gas Terminal Co. Ltd. (2019) marine sediment samples were collected.¹²
- SLPA (2022) has done monitoring to know the composition of the sediment of the borrow pit area as part of the Initial Environmental Examination Study.¹³

Sediment samples measured by Maunshell in 1996 indicate that Hg level in CSH development area was not complied with the trigger value of 0.15mg/kg dry wt, although levels were below the upper guideline value¹⁴.

Analysis of heavy metals carried out during the EIA study for LNG/Gas Infrastructure Project in 2019 indicates that no sediments samples contained heavy metal at a level of excess of defined higher guidelines values developed by the Australian and New Zealand Environment and Conservation Council (ANZECC).

Sediment samples were collected from five location (5) from the borrow area. Sediments samples under SLPA showed the physical characteristics of sediment. It indicates that surface sand layer is mainly composed of medium sand, coarse sand, medium coarse sand and gravelly sand with less than 10% fine grain and clayey grain with no swelling potential. The concentration of heavy metals like arsenic, lead, mercury, cadmium, copper and nickel also monitored. The concentration of arsenic varies from 2.89 mg/kg to 12.38 mg/kg, which was well below intervention value specified in the Dutch Standards¹⁵ (76 mg/kg). The concentration of other heavy metals (Pb, HG, Cd, Cu, Ni) was not detected.

CWIT has obtained approval from the Marine Environment Protection Authority (MEPA) for dredging and disposal of “unsuitable” material through sea dumping (2021). As per guidance received from MEPA, CWIT had conducted sediment quality monitoring at two (2) locations in proposed reclamation area. The concentration of heavy metals like arsenic, lead, mercury, cadmium, copper and nickel also monitored.

- The concentration of arsenic was 4.34 mg/ kg and 5.56 mg/kg, which was well below intervention value specified in the Dutch Standards (76 mg/kg).
- The concentration of lead was 1.04 mg/ kg and 2.75 mg/kg, which was well below intervention value specified in the Dutch Standards (530 mg/kg).
- The concentration of copper concentration was 1.53 mg/ kg and 3.64 mg/kg, which was well below intervention value specified in the Dutch Standards (190 mg/kg).
- The concentration of heavy metals like mercury, cadmium and nickel was not detected.

¹¹ Maunsell et.al. (2001) Colombo Port South Harbour Development: Part G- Environmental Impact Assessment. Asian Development Bank T.A. 3276 SRI

¹² Petronet LNG Ltd., Sojitz Corporation, Mitsubishi Corporation and Sri Lanka Gas Terminal Co. Ltd. (2019) EIA Study for LNG/Gas Infrastructure Development Project, Colombo

¹³ SLPA (2022) Initial Environmental Examination Report offshore sand extraction from SLPA and borrow area at Kerawalapitiya for reclamation of east container terminal-phase ii (ect- phase ii) and west container terminal-1 (WCT-I) in the port of Colombo

¹⁴ <https://www.waterquality.gov.au/sites/default/files/documents/anzecc-armcanz-2000-guidelines-vol1.pdf>

¹⁵ Soil Remediation Circular 2013, version of 1 July 2013

5.3.4.1 Sediment Quality Monitoring-Screening Level

Potential Contamination of sediment in the Bay area

Oil spill: According to SLPA, no major oil spills occurred in the port's influence area in the recent past. Furthermore, there are robust oil spill contingency plans in place for the port of Colombo that ensures that even if there is an adverse event, the spill is contained immediately and any resulting can be controlled with speed and accuracy.

Industrial Discharge: There is no major industrial area and industrial discharges that can potentially contaminate the surface water quality as well as sediment quality.

Discharge of Bilge water: Colombo is signatory to the MARPOL convention, and discharge from vessels is controlled under such international regulations. As per the IMO convention, SLPA and the MEPA maintains a strict record of the discharges made by the vessels that are not approved. The log books of the vessels are routinely checked to ensure the compliance (i.e. to prevent any form of illegal discharge). The collection of the oil and other wastes is undertaken by authorized agencies approved by MEPA and thus chances of vessels releasing untreated and uncontrolled discharges in the port area are remote.

Considering the above background situation, contamination of sediment in the Bay area is unlikely.

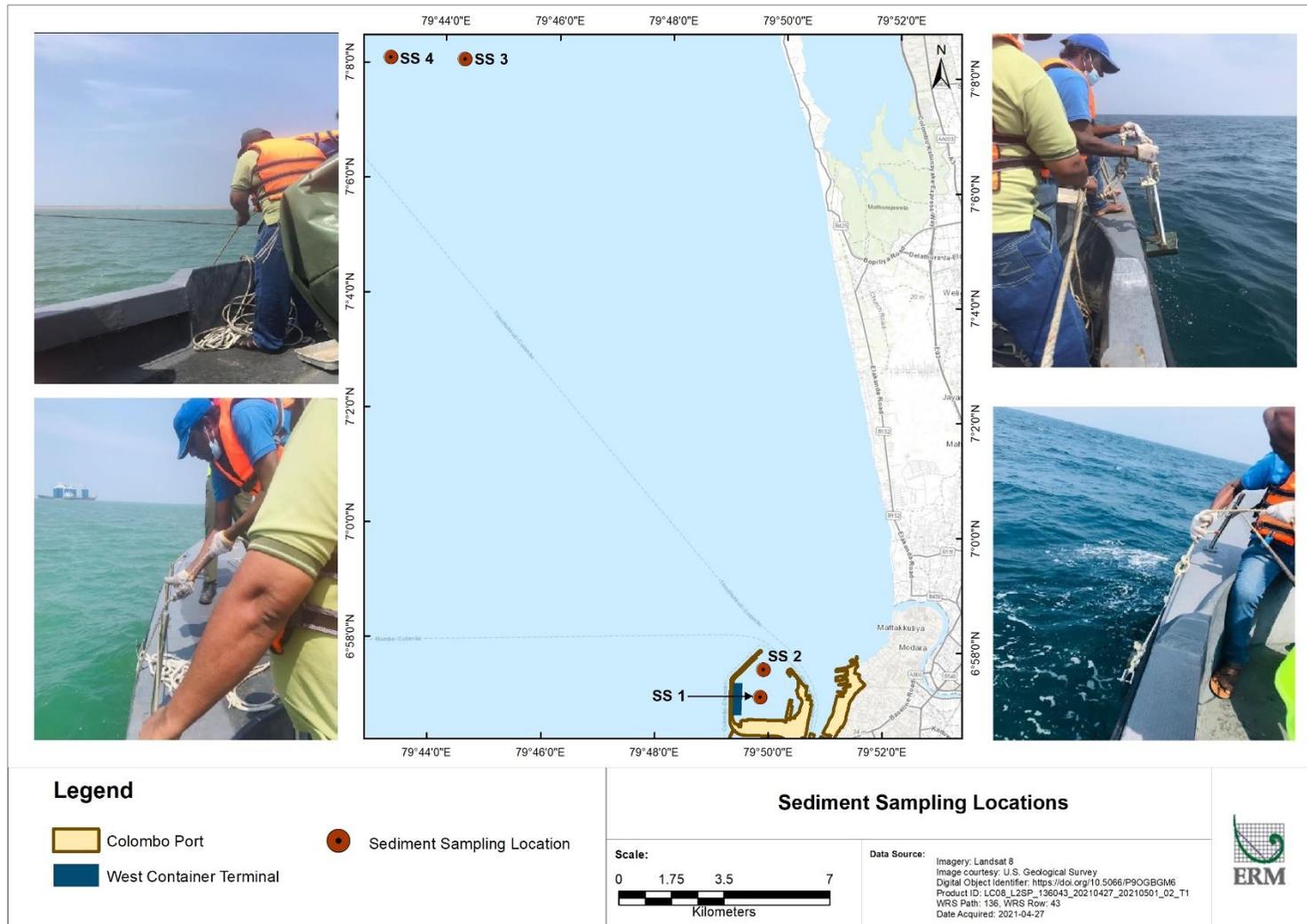
Monitoring Locations

As per IFC-WB EHS guidelines for Ports, Harbours and Terminal Projects – defining the dredging methodology; dredged materials disposal options and sites and characterize the chemical and physical composition of the sediments to be dredged; environmental baseline and potential impact on water and sediment quality and aquatic ecology. To assess any potential risk for dredging and disposal of unsuitable material, ERMs adopted a screening level assessment. Under this screening level assessment, marine sediment samples were collected at four locations. The samples were analysed for parameters covering physical and chemical characteristics. Details of the sampling locations are presented in **Table 5.2** and the sediment sampling locations are shown in **Table 5.3** and monitoring report attached in **Appendix 5.1**.

Table 5.2 Sediment Sampling Location

S No	Sampling Location	Code	Geographic Location
1	Terminal Area	SS1	6° 57' 37.0656" N, 79° 49' 54.9552" E
2		SS2	6° 57' 8.5968" N, 79° 49' 52.5072" E
3	Sand Dredging Area	SS3	7°08'06.164" N, 79°44'22.268" E
4		SS4	7°08' 05.953" N, 79°43' 04.053" E

Figure 5-4 Sediment Quality Monitoring Map



Analysis of Results-Screening Level

Analysis of sediment quality data is presented in **Table 5.3**. Copper content of the sample collected from SS1, SS2, SS3 and SS4 locations are found to be 0.1 mg/kg, 0.01 mg/kg, 0.05 mg/kg and 0.02 mg/kg respectively, which was well below intervention value specified in the Dutch Standards (190 mg/kg). Zinc content at SS3 and SS4 locations are found to be 0.08 mg/kg and 0.02 mg/kg respectively whereas no zinc is detected in SS1 and SS2 sample; which was well below intervention value specified in the Dutch Standards (720 mg/kg). The other heavy metals like Ni and Cd was not detected in all four monitoring location. The Polycyclic Aromatic Hydrocarbons (PAHs) were not detected in all the four monitoring locations.

Table 5.3 Sediment Analysis Results

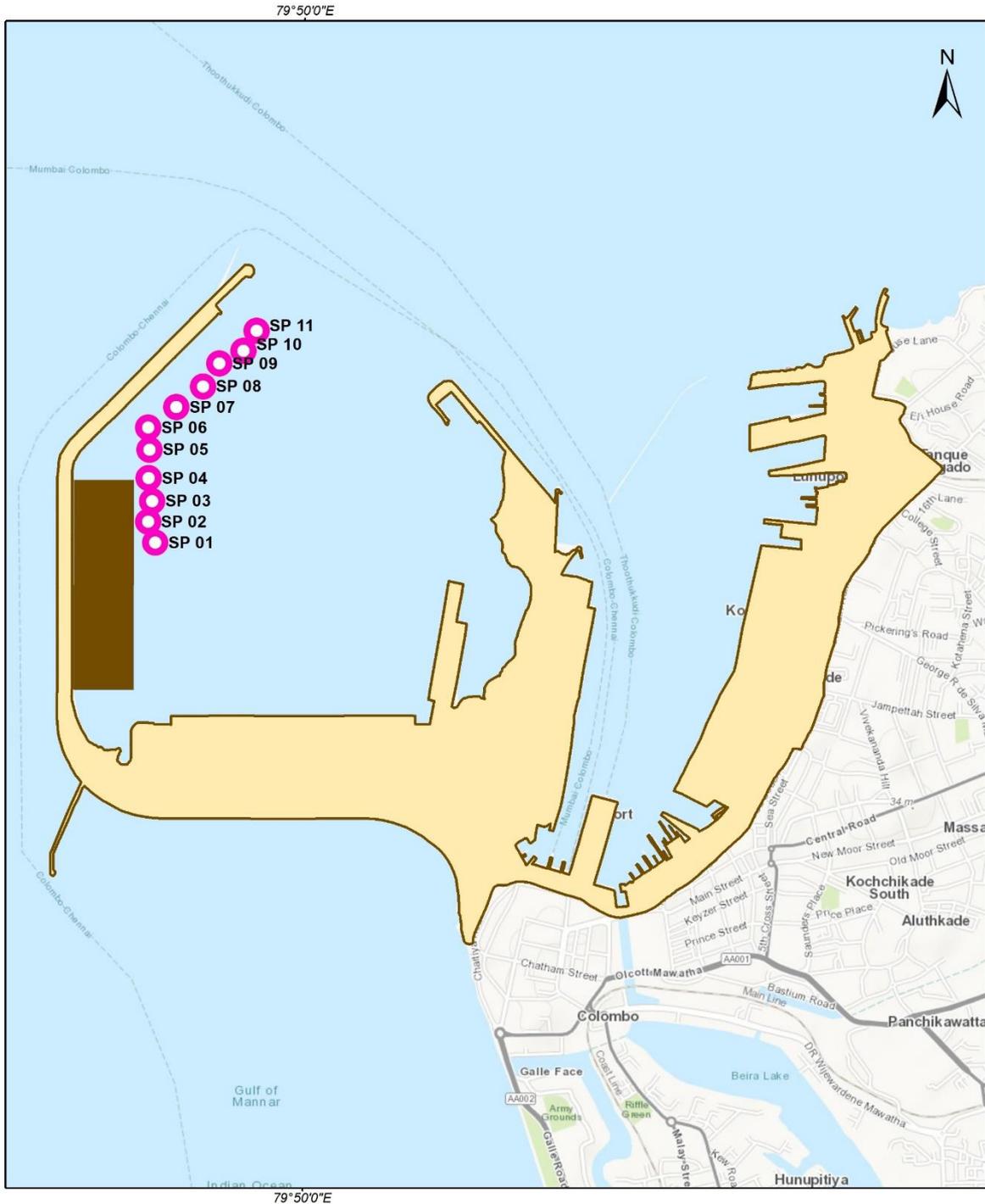
Parameter	Unit	SS1	SS2	SS3	SS4	Dutch Standard (Intervention Value)
Copper (as Cu)	mg/kg	0.1	0.01	0.05	0.02	190
Cadmium (as Cd)	mg/kg	ND	ND	ND	ND	-
Nickel (as Ni)	mg/kg	ND	ND	ND	ND	100
Zinc (as Zn)	mg/kg	ND	ND	0.08	0.02	720
Benzo (a) pyrene	mg/kg	ND	ND	ND	ND	PAHs (Total) – 40 mg/kg
Benzo (e) pyrene	mg/kg	ND	ND	ND	ND	
Benzo (a) anthracene	mg/kg	ND	ND	ND	ND	
Chrysene	mg/kg	ND	ND	ND	ND	
Benzo (b) fluranthene	mg/kg	ND	ND	ND	ND	
Benzo (j) fluranthene	mg/kg	ND	ND	ND	ND	
Benzo (k) fluranthene	mg/kg	ND	ND	ND	ND	
Dibenzo (a,h) anthracene	mg/kg	ND	ND	ND	ND	
Fluorene	mg/kg	ND	ND	ND	ND	
Phenanthrene	mg/kg	ND	ND	ND	ND	
Anthracene	mg/kg	ND	ND	ND	ND	
Fluoranthene	mg/kg	ND	ND	ND	ND	
Pyrene	mg/kg	ND	ND	ND	ND	
Indeno[1,2,3-cd]pyrene	mg/kg	ND	ND	ND	ND	
Benzo[g,h,i]perylene	mg/kg	ND	ND	ND	ND	

Source: Primary monitoring, November 2022

5.3.4.2 Additional Sediment Quality Monitoring

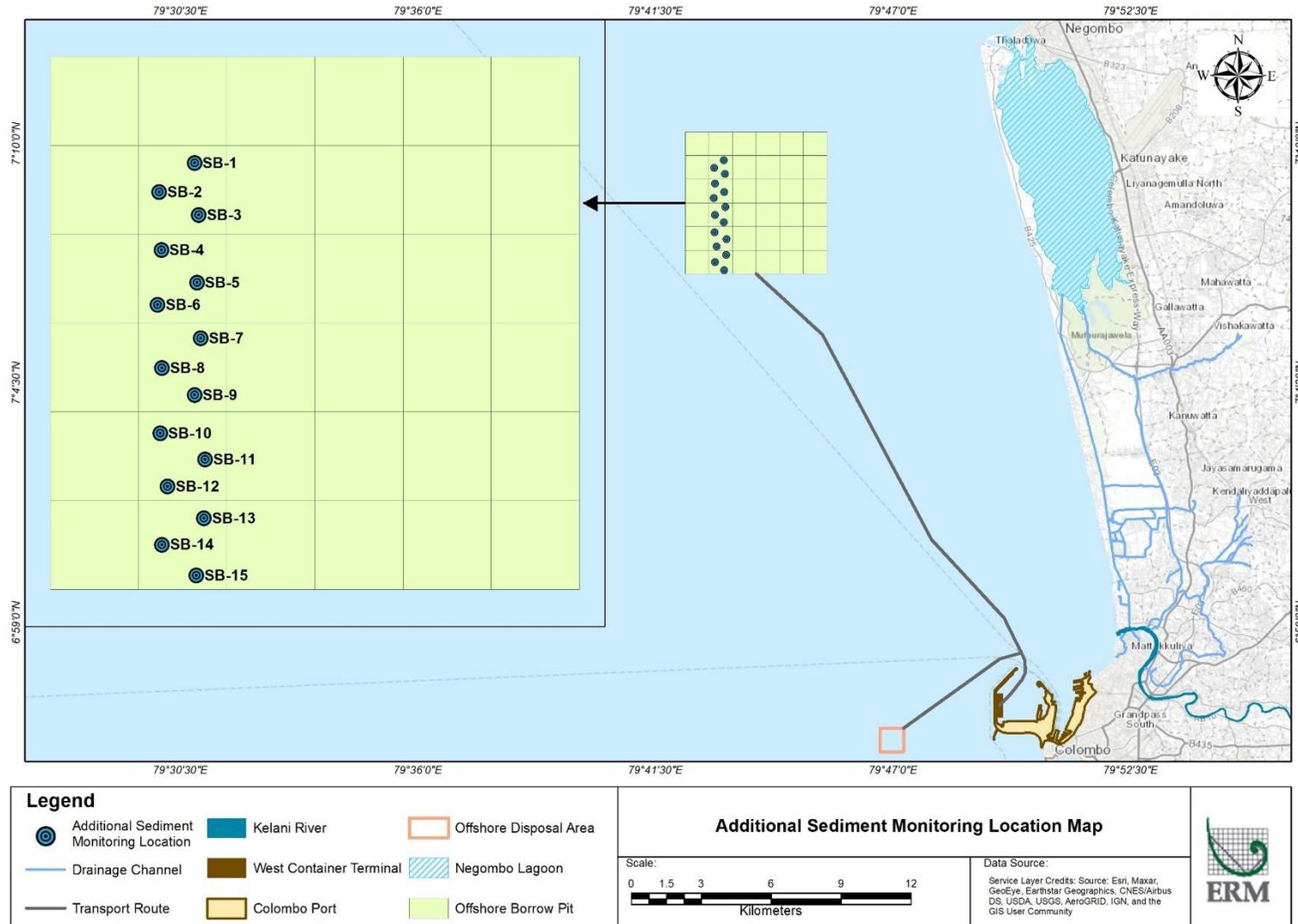
In discussion with DFC, detailed sediment quality was monitored in bay area (11 locations) as well as sand borrow area (15 location) to understand any potential contamination in the sediment. The additional monitoring location map has been presented in Figure 5.5 and Figure 5.6 respectively.

Figure 5-5 Additional Sediment Quality Monitoring Map in Bay Area



<p>Legend</p> <ul style="list-style-type: none"> ● Sediment Sampling Point Colombo Port West Container Terminal 	<p>Additional Sediment Monitoring Location Map (Bay Area)</p>	<p>Source:</p> <p><small>Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeBCO, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), © OpenStreetMap contributors, and the GIS User Community</small></p>
	<p>Scale:</p> <p>0 0.15 0.3 0.6 0.9 1.2</p> <p>Kilometers</p>	

Figure 5-6 Additional Sediment Quality Monitoring Map in Bay Area



Analysis of Results-Basin area

The detailed sediment quality data for basin area is presented in **Table 5.4**.

- Arsenic- concentration of arsenic in the 11 sample collected from basin area ranged between 8.32 to 12.16 mg/kg, which was well below intervention value specified in the Dutch Standards (76 mg/kg).
- Cadmium- concentration of cadmium in the 11 sample collected from basin area ranged between 1.09 to 1.41 mg/kg, which was well below intervention value specified in the Dutch Standards (13 mg/kg).
- Chromium- concentration of chromium in the 11 sample collected from basin area ranged between 20.68 to 26.99 mg/kg.
- Copper- concentration of copper in the 11 sample collected from basin area ranged between 4.74 to 6.59 mg/kg, which was well below intervention value specified in the Dutch Standards (190 mg/kg).
- Lead- concentration of lead in the 11 sample collected from basin area ranged between 5.48 to 7.06 mg/kg, which was well below intervention value specified in the Dutch Standards (530 mg/kg).
- Mercury- concentration of mercury in the 11 sample collected from basin area were below detection limit.
- Nickel- concentration of nickel in the 11 sample collected from basin area ranged between 6.43 to 8.87 mg/kg, which was well below intervention value specified in the Dutch Standards (100 mg/kg).
- Zinc- concentration of zinc in the 11 sample collected from basin area ranged between 17.21 to 24.75 mg/kg, which was well below intervention value specified in the Dutch Standards (720 mg/kg).
- Polychlorinated biphenyl's (PCB) – all the PCB-28, PCB 52, PCB 101, PCB 138, PCB 153, PCB 180 in the 11 monitored samples were below detection limit.

Table 5.4 Sediment Analysis Results- Basin Area

Parameter	Unit	SP-1	SP-2	SP-3	SP-4	SP-5	SP-6	SP-7	SP-8	SP-9	SP-10	SP-11	Dutch Standard (Intervention Value)
Heavy Metals													
Arsenic (as AS)	mg/kg	10.32	8.32	9.60	11.35	9.93	11.40	9.02	10.70	11.75	10.29	12.16	76
Cadmium (as Cd)	mg/kg	1.12	1.17	1.09	1.29	1.26	1.30	1.23	1.33	1.41	1.31	1.41	13
Chromium (as Cr)	mg/kg	22.83	23.28	20.68	23.90	24.15	24.02	22.02	24.99	26.67	24.34	26.99	-
Copper (as Cu)	mg/kg	5.32	5.57	4.74	5.73	5.63	5.82	5.59	5.94	6.41	5.76	6.59	190
Lead (as Pb)	mg/kg	6.17	6.19	5.50	6.41	5.99	6.59	5.48	6.54	7.06	6.48	6.96	530
Mercury (as Hg)	mg/kg	ND	36										
Nickel (as Ni)	mg/kg	6.57	7.30	6.43	7.83	7.67	7.85	7.33	8.16	8.85	7.67	8.87	100
Zinc (as Zn)	mg/kg	18.8	18.85	17.21	20.82	20.86	21.66	20.79	22.19	24.28	21.41	24.75	720
PCB													
PCB-28	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.0
PCB 52	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
PCB 101	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
PCB 138	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
PCB 153	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
PCB 180	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	

Source: Primary Monitoring March 2023

Analysis of Results-Sand Borrow area

The detailed sediment quality data for basin area is presented in **Table 5.5**.

- Arsenic- concentration of arsenic in the 15 samples collected from sand borrow area were not detected.
- Cadmium- concentration of cadmium in the 15 samples collected from sand borrow area were below detection limit.
- Chromium- concentration of chromium in the 15 samples collected from sand borrow area ranged between 7.62 to 12.33 mg/kg.
- Copper- concentration of copper in the 15 samples collected from sand borrow area ranged between 1.12 to 1.93 mg/kg, which was well below intervention value specified in the Dutch Standards (190 mg/kg).
- Lead- concentration of lead in the 15 samples collected from sand borrow area were below detection limit.
- Mercury- concentration of mercury in the 15 samples collected from sand borrow area were below detection limit.
- Nickel- concentration of nickel in the 15 samples collected from sand borrow area were below detection limit.
- Zinc- concentration of zinc in the 15 samples collected from sand borrow area ranged between 9.14 to 15.72 mg/kg, which was well below intervention value specified in the Dutch Standards (720 mg/kg).
- Polychlorinated biphenyl's (PCB) – all the Benzo(a)anthracene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Chrysen, Benzo(g,h,i)perylene, Benzo(a)pyrene, Indeno(1,2,3-cd) pyren in the 15 monitored samples were below detection limit.

Table 5.5 Sediment Analysis Results- Sand Borrow Area

Parameter	Unit	SB-1	SB - 2	SB - 3	SB - 4	SB - 5	SB - 6	SB - 7	SB -8	SB - 9	SB -10	SB -11	SB- 12	SB- 13	SB- 14	SB- 13	Dutch Standard (Intervention Value)
Heavy Metals																	
Arsenic (as AS)	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	76
Cadmium (as Cd)	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	13
Chromium (as Cr)	mg/kg	9.67	8.96	8.98	8.1	9.93	12.33	9.07	7.62	9.27	9.98	9.13	8.97	9.01	10.47	11.82	-
Copper (as Cu)	mg/kg	1.42	1.51	1.93	1.46	1.43	1.43	1.12	ND	1.47	1.28	1.29	1.33	1.78	1.44	1.53	190
Lead (as Pb)	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	530
Mercury (as Hg)	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	36
Nickel (as Ni)	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	100
Zinc (as Zn)	mg/kg	15.61	13.06	15.72	13.74	14.64	13.34	14.56	9.14	13.96	11.6	12.6	12.96	12.14	12.25	13.42	720
"Tri-Butyl tin (TBT)	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Polycyclic Aromatic Hydrocarbons (PAH)																	
Benzo(a)anthracene	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Total PCB 1000 µg/kg
Phenanthrene	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Anthracene	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Fluoranthene	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Pyrene	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	

Chrysen	µg/kg	ND															
Benzo(g,h,i)perylene	µg/kg	ND															
Benzo(a)pyrene	µg/kg	ND															
Indeno(1,2,3-cd) pyrene	µg/kg	ND															

Source: Primary Monitoring March 2023

5.3.5 Hydrology

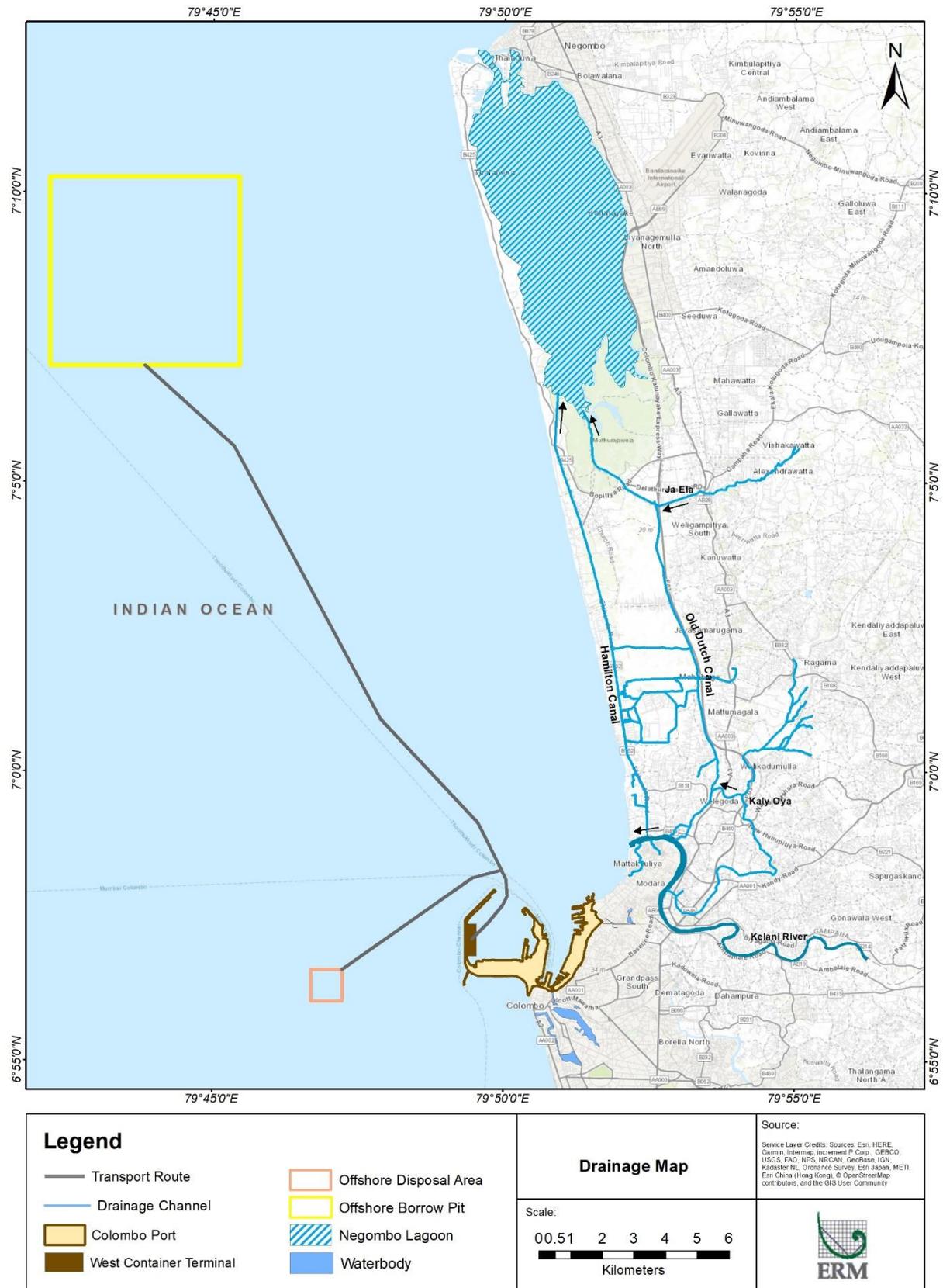
5.3.5.1 Drainage

The study area is located within the watershed of Kelani River. The Kelani River is 144 km long and originates from the western rim of the central highlands. The river eventually flows into the Indian Ocean on the west coast of Sri Lanka few km towards north of Colombo. The Kelani River drains an area about 2,300 km² and is the primary source of drinking water for the greater Colombo area¹⁶. The river flows from the eastern side of the study area towards northwest and opens into Indian Ocean.

There is a stream (called Mutwal Canal) at the south of the study area which flows north and meets the Kelani River. There is another stream (called Dutch Canal) which flows south ward from the northern side of the study area towards the Kelani River and meets the Kelani River in proximity to the junction of Hamilton canal and Kelani River. Hamilton canal is a manmade canal which flows in a north-south direction and is connected to Kelani River in proximity to the mouth of the Kelani River. There is a stream, called Beira Lake at the south of the project site which flows north and meets the Indian Ocean and flows north east through Sebastian canal and meets Kelani river. Drainage map of ZOI is presented in **Figure 5.7**.

¹⁶ S.D. Kottagoda and N.S. Abeysingha. 2017. Morphometric analysis of watersheds in Kelani river basin for soil and water conservation J.Natn.Sci.Foundation Sri Lanka. 45 (3): 273 – 285.

Figure 5-7 Drainage Map of ZOI



5.3.5.2 Marine Water Quality

5.3.5.2.1 Primary Monitoring

Marine water quality is analysed from four locations, which included two locations in the proposed land reclamation area (WCT-1) and two location in the proposed sand borrow area. Three water samples were collected from land reclamation area in the month of July, October and November. Two water samples were collected from sand borrow area in the month of October and November.

The samples were analysed for parameters covering physical and chemical characteristics. Parameters such as temperature, pH, total dissolved solids (TDS), electrical conductivity (EC), dissolved oxygen (DO) and salinity were measured onsite. The monitoring location and sampling photographs are presented in **Figure 5.6**.

Table 5.6 Marine Water Sampling Locations

S. No.	Location	Location Code	Co-ordinate		Justification
			Latitude	Longitude	
1	Proposed WCT-1 reclamation area	WQ1	6.960296 N	79.831932 E	To assess the potential impact due to dredging of soft sediment and reclamation work
2		WQ2	6.952388 N	79.831252 E	
3	Proposed sand borrow area	WQ3	7.13504556N	79.73951889E	To assess the potential impact due to dredging of sand from borrow area
4		WQ4	7.13498694N,	79.71779250E	

5.3.5.2.2 Monitoring Results

The marine water quality monitoring results has been given in following table and detailed monitoring report has been attached in **Appendix 5.2**.

5.3.5.2.3 Interpretation of Primary Monitoring Results

At present there are no statutory or guideline standards for marine water quality in Sri Lanka. Hence, guideline values as developed by the European Union (EU) on surface water quality with respect to fisheries and aquatic life has been adopted.

pH: pH values of the marine water samples were slightly alkaline varied between 8.1 to 9. pH values of all the samples were in compliance with the EU standard of 6.0 to 9.0.

Total Suspended Solid (TSS): TSS values of marine water samples were recorded in a range of below detection limit to 11 mg/l. TSS of all the samples were in compliance with the EU surface water standard of 25mg/l.

Dissolved Oxygen (DO): The DO value of WQ-1 and WQ-2 were lower than the EU standard of 5.0-9.0 mg/l in the month of July. In the month of November, the DO value of both the locations are 9.8 and 9.9 mg/l respectively, which is higher than the EU standard range of 5.0 – 9.0 mg/l. Increase in DO may be due to drop in water temperature as cold water hold more dissolved oxygen than hot water.

Salinity: An understanding of the salinity of marine water plays a critical role in understanding the hydrological cycle. Salinity can influence circulation and biological processes in the ocean. On average, the ocean has a salinity of 35 parts per thousand (PPT), which equates to 35 g of salt per 1,000 g of water. Major components of this salt include sodium, chlorine, magnesium, calcium,

potassium and sulphate, which compose a total of 99.4% of the salt in the ocean. Salinity values of four sample varies between 17.8 to 25.4 ppt.

Biochemical Oxygen Demand (BOD): BOD concentration in the marine water samples varied between 8 to 18 mg/l. The high BOD values may be due to tidal influence that increases organic matter in the marine water and it was observed from the below table that BOD value of the locations has decreased in the month of November.

Chemical Oxygen Demand (COD): COD concentration in the marine water samples varied between 232 to 264 mg/l. It was observed that COD of all the samples increased in the month pf November, which indicate presence of high level of decaying plant matter, human waste or industrial effluent.

Copper: Copper concentration in the marine water samples varied between 0.01 to 0.05 mg/l, which were complied with the EU surface water standards of 0.0005 to 0.112 mg/l.

Heavy Metals: Zinc concentration in all the marine water samples varied between 0.01mg/l to 0.08 mg/l, which were in compliance with the EU surface water samples of 0.03 to 2.0 mg/l. Manganese concentration in WQ1, WQ2 were 0.3 mg/l and 0.2 mg/l respectively in the month of July and manganese not detected in remaining samples. Mercury concentration in WQ1 and WQ2 were less than 0.005 mg/l and mercury was below detection limit in WQ3 and WQ4 samples.

Ammonical Nitrogen: Ammonical Nitrogen-Top varies from 4.1 to 6.9mg/l and Ammonical Nitrogen-Bottom varies from 4.2 to 6.6 mg/l, which were not in compliance with the EU surface water standard of 0.0005 to 0.025 mg/l.

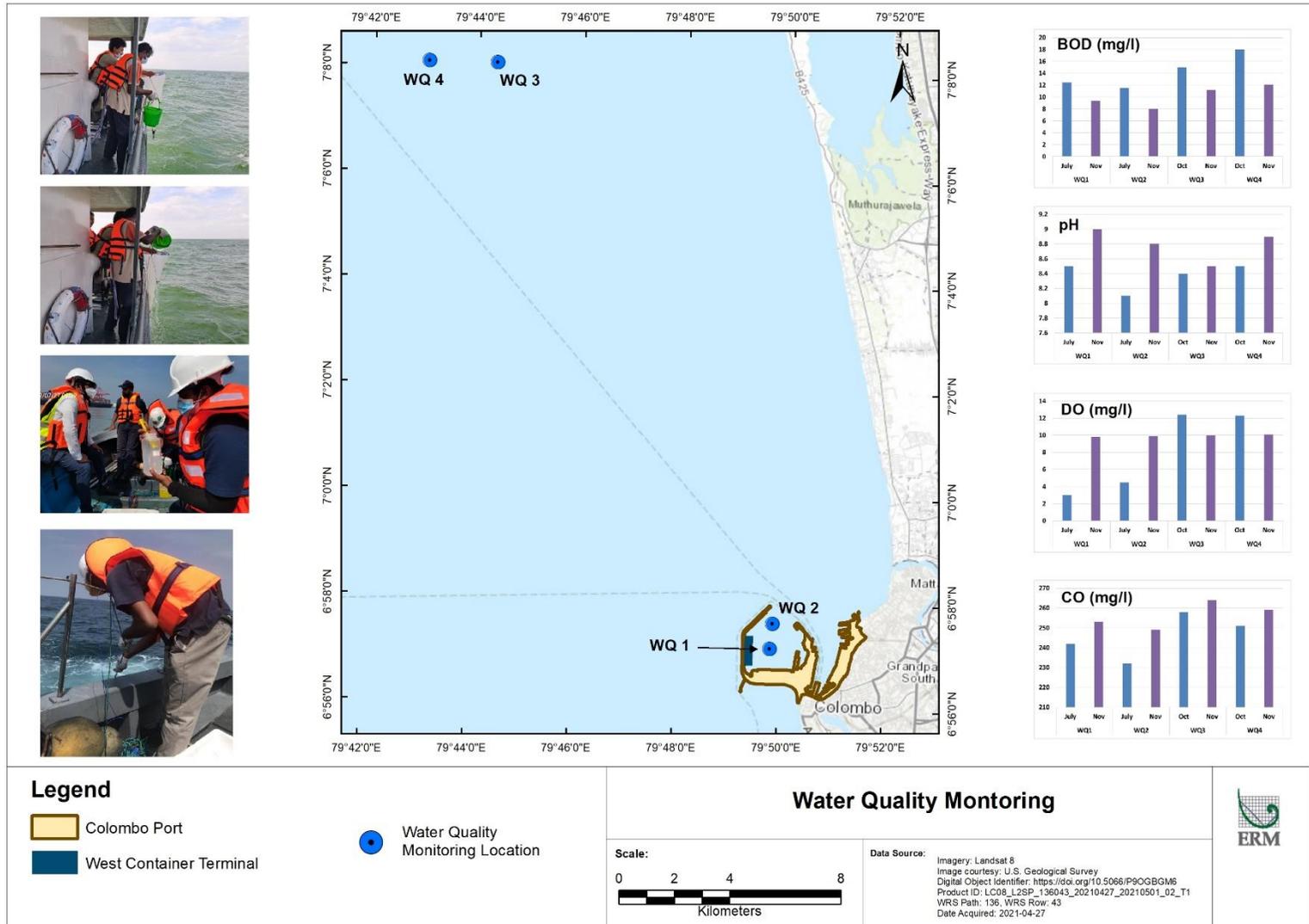
Table 5.7 Summary of Marine Water Quality Monitoring Report

Parameter	Unit	WQ1		WQ2		WQ3		WQ4	
		July	November	July	November	Oct.	Nov.	Oct.	Nov.
pH at 25°C		8.5	9	8.1	8.8	8.4	8.5	8.5	8.9
Temperature	°C	31.8	28.9	31.8	28.8	30.3	29.1	30.2	29.2
Turbidity at 25°C	NTU	<1	ND	<1	ND	ND	ND	ND	ND
Total Suspended Solid	mg/l	<5	7	<5	6.5	ND	5.5	5	11
Dissolved Oxygen	mg/l	3	9.8	4.5	9.9	12.4	10	12.3	10.1
Chemical Oxygen Demand	As mg O2/l	242	253	232	249	258	264	251	259
Biochemical Oxygen Demand	mg/l	12.5	9.4	11.5	8	15	11.2	18	12.1
Salinity	ppt	21	17.8	25.4	18	23.1	24.2	20.3	24.2
Total Phosphorus	mg/l	0.2	ND	<0.05	ND	ND	ND	ND	ND
Total Nitrogen	mg/l	8.7	5.5	5.7	5	7.1	5.6	6.4	5
Ammonical Nitrogen-Top	mg/l	4.1	4.9	4.8	5	6.1	6.9	4.5	6.4
Ammonical Nitrogen- Bottom	mg/l	4.2	6.1	5.2	5.5	6	7	4.7	6.6
Arsenic (as As)	mg/l	<0.005	ND	<0.005	ND	ND	ND	ND	ND
Cadmium (as Cd)	mg/l	<0.005	ND	<0.005	ND	ND	ND	ND	ND
Zinc (as Zn)	mg/l	0.05	0.03	0.05	0.40	0.01	0.04	0.01	0.08
Lead (as Pb)	mg/l	<0.005	ND	<0.005	ND	ND	ND	ND	ND
Mercury (as Hg)	mg/l	<0.005	ND	<0.005	ND	ND	ND	ND	ND
Nickel (as Ni)	mg/l	<0.005	ND	<0.005	ND	ND	ND	ND	ND
Copper (as Cu)	mg/l	0.01	0.02	0.01	0.03	0.03	0.03	0.05	0.04
Manganese (as Mn)	mg/l	0.3	ND	0.2	ND	ND	ND	ND	ND
Aluminium (as Al)	mg/l	0.34	ND	0.34	ND	ND	ND	ND	ND
Chromium (as Cr)	mg/l	<0.05	ND	<0.05	ND	ND	ND	ND	ND

Parameter	Unit	WQ1		WQ2		WQ3		WQ4	
		July	November	July	November	Oct.	Nov.	Oct.	Nov.
Aldrin	mg/l	ND	ND	ND	ND	ND	ND	ND	ND
Dieldrin	mg/l	ND	ND	ND	ND	ND	ND	ND	ND

Source: Primary monitoring 2022

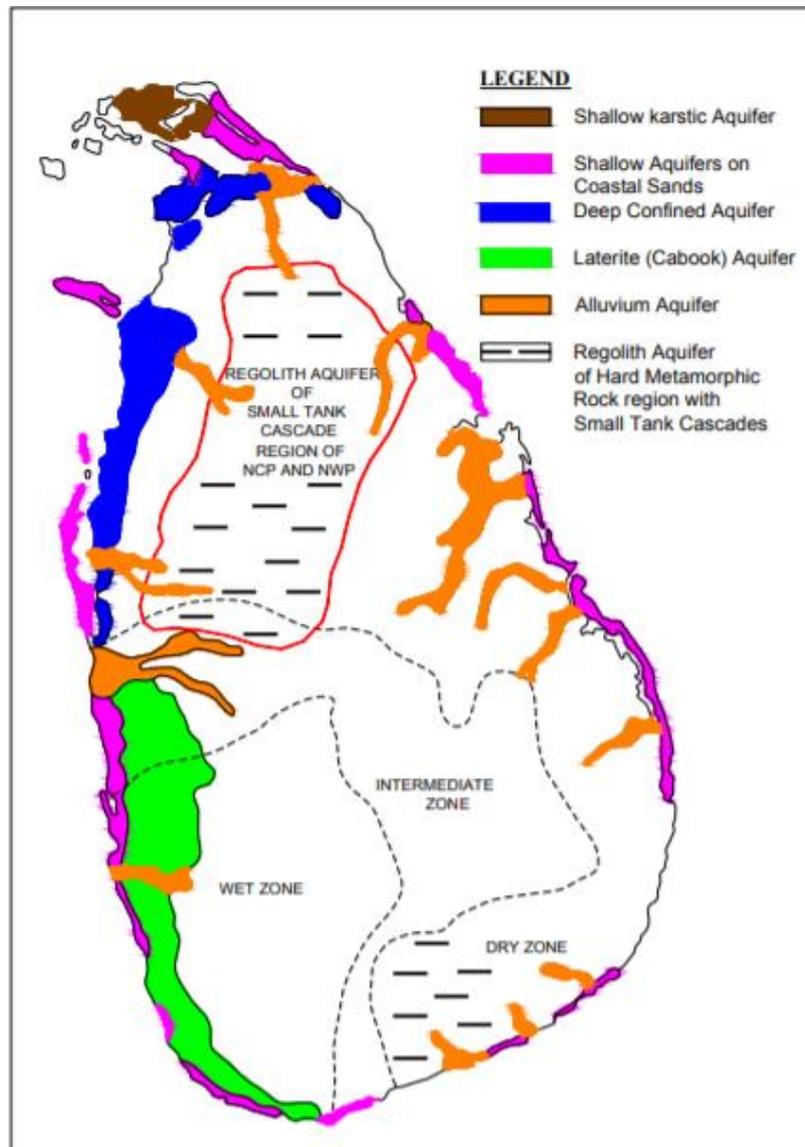
Figure 5-8 Surface Water Quality Monitoring Location Map



5.3.5.3 Ground Water Resource and Quality

There are six main type of groundwater aquifers demarcated and identified in Sri Lanka. They are shallow karstic aquifers, coastal sand aquifers, deep confined aquifers, lateritic (cabook) aquifers, alluvial aquifers and shallow regolith aquifers in the hard rock region. The following **Figure 5.9** shows the distribution of these aquifers within the country (Panabokke and Perera 2005¹⁷). In addition to these main aquifers, a large number of small groundwater pockets can be found throughout the country. These aquifers occur either in isolated patches of soil cover over the bedrock or in the fracture and weathered zones of the underlying metamorphic bedrock. Aquifers in the study area includes “*Shallow aquifers on coastal sands*”. Different types of aquifers in Sri Lanka is presented in **Figure 5.9**.

Figure 5-9 Different Types of Aquifers in Sri Lanka



Source: Panabokke and Perera (2005)

¹⁷ Panabokke, C.R. and Perera, A.P.G.R.L., 2005. Groundwater Resources of Sri Lanka. Report, Water Resources Board 2A, Gregory's Avenue, Colombo-7 Sri Lanka January, 2005

Groundwater Levels and Quality

It was reported that groundwater is not used by people due to pollution in the Kerawalapitiya area. Also within the Colombo urban area surface water was predominately used and use of ground water by communities is limited. As part of an earlier EIA Study for the Colombo Light Rail Transit (LRT) Project, groundwater levels and quality was monitored. Four groundwater monitoring locations were selected along the route of the LRT and distributed from east (near Colombo port) to west (Thalahena) of Colombo city. Review of the results indicate that groundwater levels varied between 9.3-11.0 metres below ground level. pH of the groundwater levels varied between 3.95-6.48 and were found to be not complying to the statutory limits of Sri Lanka Potable Standards 2013 for drinking water (SLS-614). Other parameters like total coliform values were also not complying with the SLS-614. Overall the groundwater quality was not found to be suitable for drinking purpose.

5.3.6 Coastal Features (Environment)

5.3.6.1 Bathymetry

The comprehensive bathymetric survey was carried out by SGS and Co., India as part of the IEE, Offshore Sand Extraction from SLPA Sand Borrow Area at Kerawalapitiya, January 2022. The bathymetry map of the ZOI is presented in **Figure 5.10**. The figure shows depth of proposed sand extraction area falls within -24 m to -30m. The depth of the proposed land reclamation area for WCT-1 is around -12 m to -18 m. The offshore disposal site falls within the depth of -36 to -42m.

5.3.6.2 Tides

The tidal regime in Sri Lanka are mixed, predominantly semi diurnal tides with pronounced diurnal inequality which means two high tides (spring tide) and two low tides (neap tide) per day with different heights. Tides are low, ranging from 0.2m (during the neap period) to 0.8m (during the spring period). Tidal current velocities are around 5cm/s. **Figure 5.11** shows the highest water level during the spring tide is 0.35m MSL and lowest is -0.39m MSL.

5.3.6.3 Current

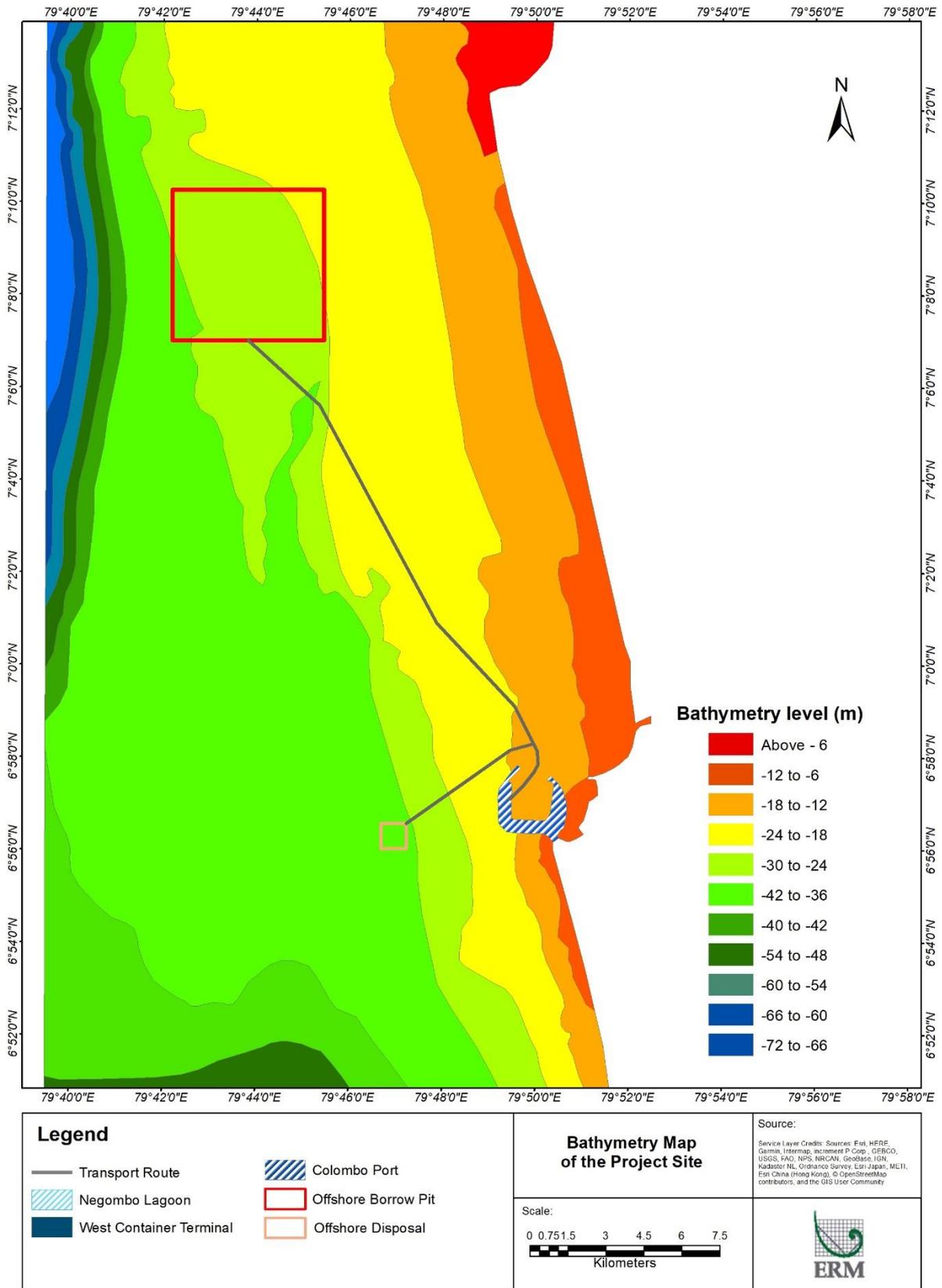
Both ocean currents and tidal currents affect the Sri Lanka coast. The ocean currents including wind driven currents are stronger than the tidal currents. As per the measurement carried out at the Port of Colombo on 2017, the maximum current speed recorded as 0.25 m/s and while mean was found as 0.13 m/s. As per **Table 5.8** direction of current was primarily from south. Current speed variation of 2017, is presented in **Figure 5.12** and also current data rose plots for different monsoonal seasons shown in **Figure 5.13**.

Table 5.8 Measured Current Velocity and Direction

Current Speed (m/s)	Measured Period			
	Jan-17	Jun-17	Sep-17	Dec-17
Minimum	0.049	0.07	0.06	0.03
Maximum	0.186	0.25	0.24	0.142
Mean	0.112	0.13	0.1	0.054
Direction (deg)	Measured Period			
	Jan-17	Jun-17	Sep-17	Dec-17
Mean	200	200	170	200

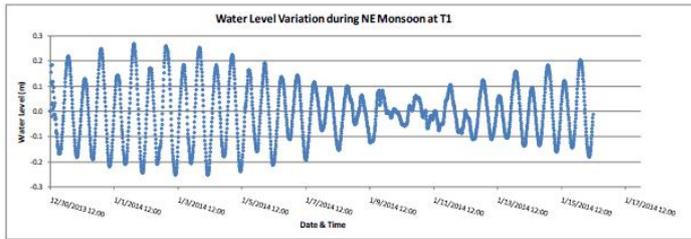
Source: LHI, 2018. Numerical Modelling. Development of Liquefied Natural Gas (LNG) Receiving, Storage and Regasification Terminal at Colombo Port

Figure 5-10 Bathymetric of ZOI

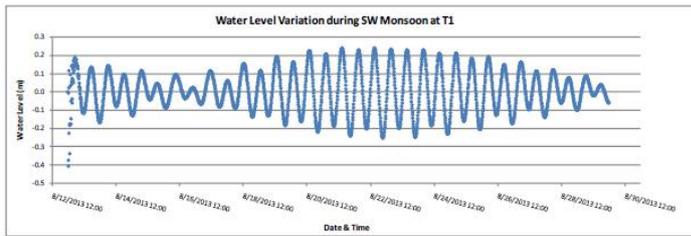


Source: IEE, Offshore Sand Extraction from SLPA Sand Borrow Area at Kerawalapitiya, January 2022

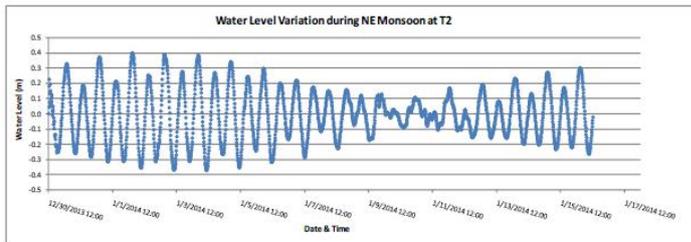
Figure 5-11 Water level data (2013-2014)



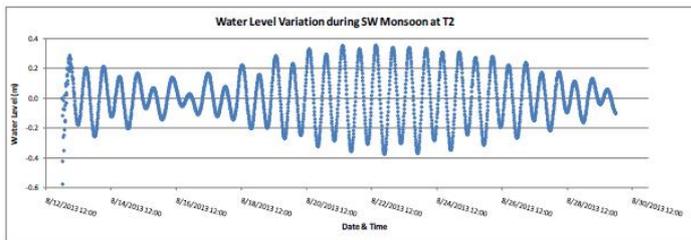
(a) NE Monsoon _ T1



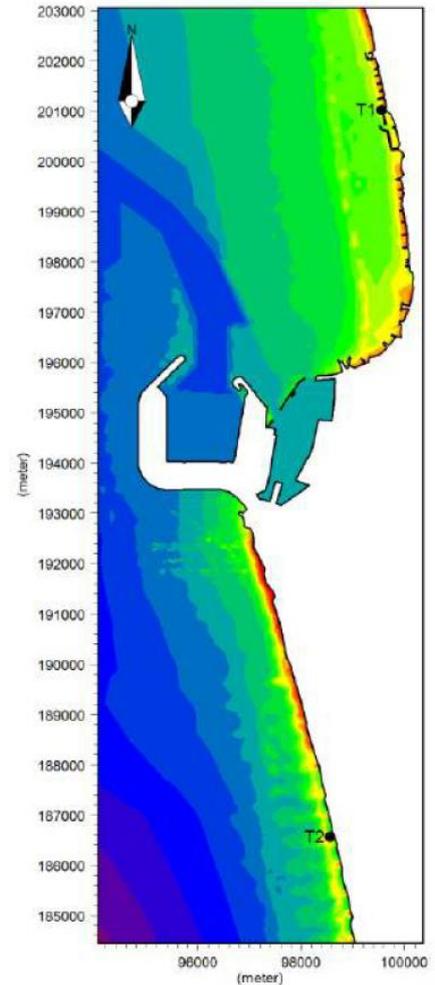
(b) SW Monsoon _ T1



(c) NE Monsoon _ T2

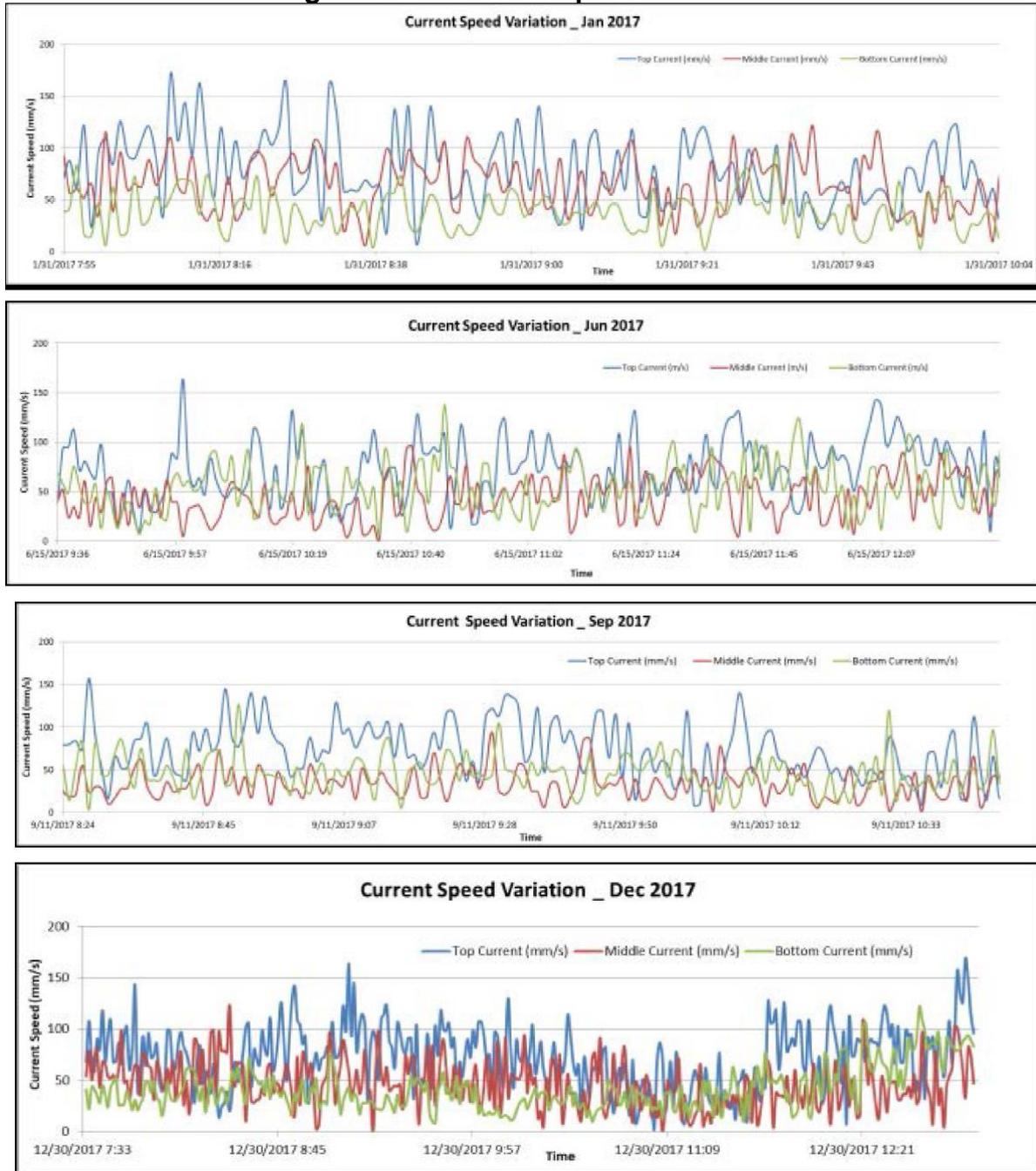


(d) SW Monsoon _ T2



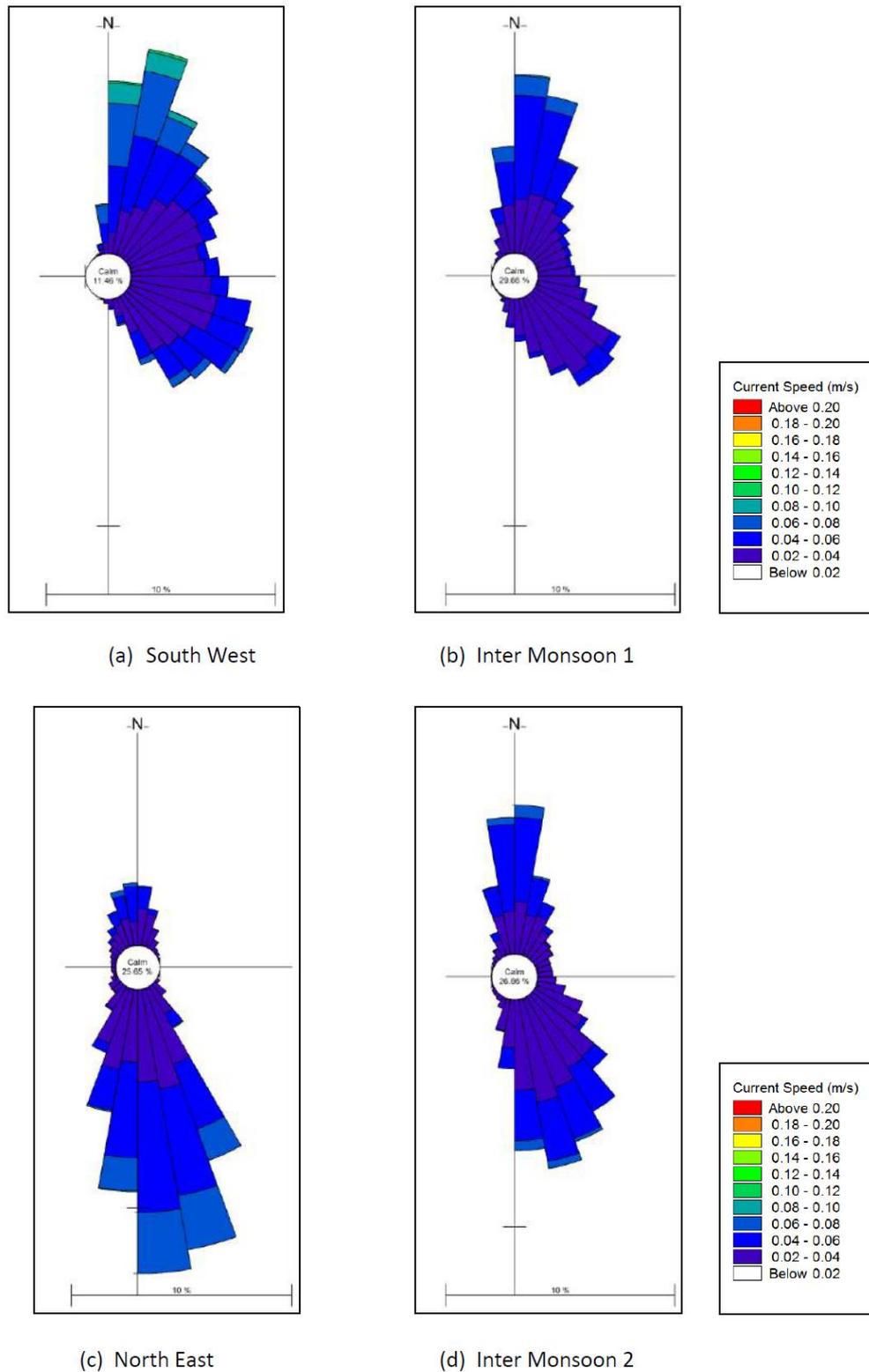
Source: IEE, Offshore Sand Extraction from SLPA Sand Borrow Area at Kerawalapitiya, January, 2022

Figure 5-12 Current Speed Variation



Source: LHI, 2018. Numerical Modelling. Development of Liquefied Natural Gas (LNG) Receiving, Storage and Regasification Terminal at Colombo Port

Figure 5-13 Current Data Rose Plots for Different Monsoonal Seasons



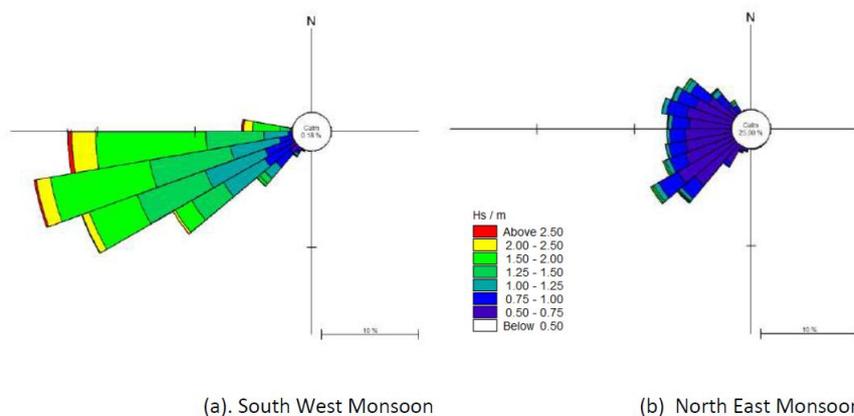
Source: IEE for Proposed Offshore Sand Extraction from SLPA Sand Borrow Area at Kerawalapitiya, January 2022

5.3.6.4 Waves

The wave climate is characterized by two simultaneous wave systems. Long periods swell with a southerly direction in deep water that becomes more westerly as it approaches the coast. This exhibits only small differences of height during the year. The other system is the shorted period sea waves which are generated by the local (monsoon) winds but are influenced to a certain degree by local sea breezes.

There are two distinct climatological periods; the southwest (SW) monsoon from May to September and the northeast (NE) monsoon from November to February. Considering the overall waves, SW monsoon is more dominant and more than 75% of the high waves can be seen from the directional sector of 210°-280°. During the NE monsoon low magnitude waves are observed in the directions of 210°-330°.

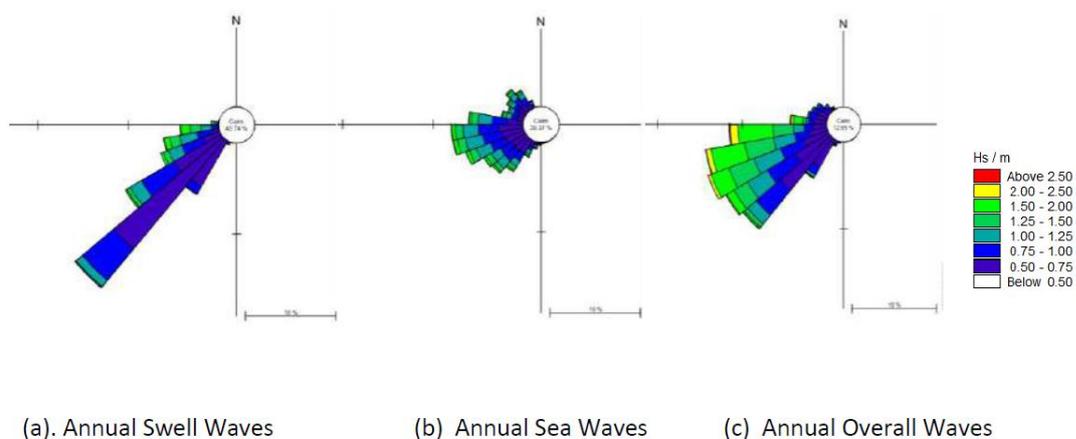
Figure 5-14 Wave Rose of Measured Wave Data (1998-2014)



Source: IEE, Offshore Sand Extraction from SLPA Sand Borrow Area at Kerawalapitiya, January 2022

The swell wave is underlying wave, which comes from the SW (210°-240°) throughout the year. The sea wave is created by local winds and is superimposed on the swell and forms overall waves. Direction of the sea waves has wider spread than the swell waves but limited to directions 210°-330°.

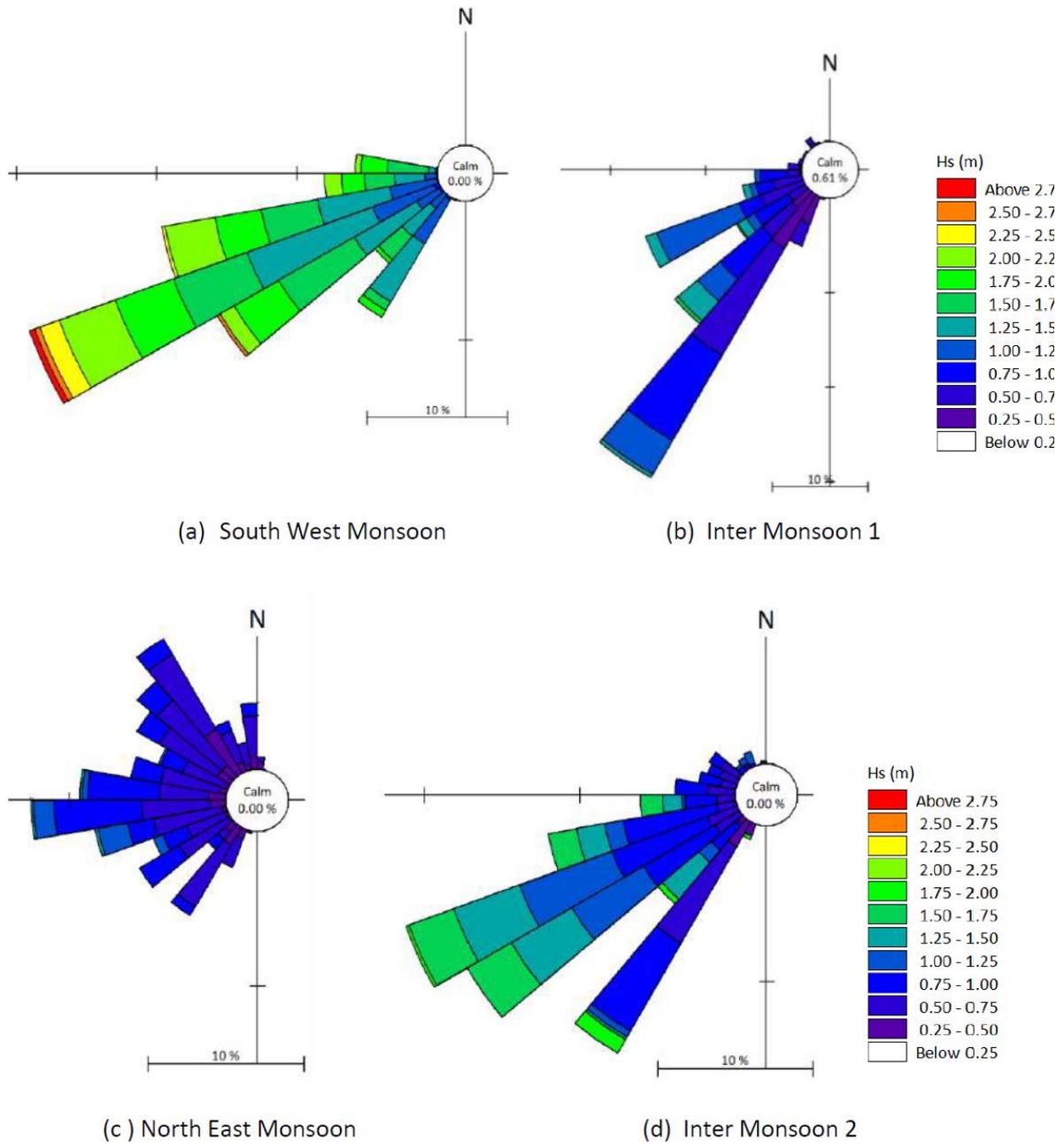
Figure 5-15 Wave Roses of Measured Wave Data (1998-2014)- Annual Swell, Sea and overall Waves



Source: IEE, Offshore Sand Extraction from SLPA Sand Borrow Area at Kerawalapitiya, January,2022

The following **Figure 5.16** show the wave conditions at the mid-point of the site for different monsoonal periods.

Figure 5-16 Wave Roses of Simulated



Source: IEE, Offshore Sand Extraction from SLPA Sand Borrow Area at Kerawalapitiya, January, 2022

5.3.6.5 Coastal Erosion and Accretion

Sri Lanka has coastline of length approximately 1600 km. Coastal erosion has been identified as a major hazard particularly along the southwest coastline of the country. In this region, the nearshore wave climate varies with the four climatic seasons caused mainly by the monsoonal winds. These seasons are the first inter-monsoon (March-April), southwest monsoon (May-September), second

inter-monsoon (October-November), northeast monsoon (December-February)¹⁸. Erosion levels at Colombo indicate the net erosion in the area is 0.1m/year. Erosion accretion level in Colombo is presented in **Table 5.7**.

Table 5.9 Erosion-Accretion Level in Colombo

Sector	District	Coast Line (km)	Erosion Percent of Coast (%)	Erosion Rate (m/ year)	Accretion Percent of Coast (%)	Accretion Rate (m/ year)	Net Erosion (m / year)	Net Sand Loss (100 m ³ / Year)
South West	Colombo	40	20 - 25	0.0 - 0.1	NA	NA	0.0 - 0.1	0 - 5

Source: Statistical Compendium on Natural Resources Management Sri Lanka 2000, Ministry of Forestry & Environment

Sediment Movement Pattern and Coastal Protection Measures

Due to wave climate, the net longshore sediment transport along Sri Lanka's west coast is primarily driven northward. Most of the net transport occurs during the southwest monsoon season. However, during the northeast monsoon, sediment transport is towards south though rates are relatively low.

Several stabilization schemes were implemented from 1987 targeting the coastal erosion at the west coast. After the first stabilization scheme to stabilize the coastal stretch of Negombo in 1987, i.e. DANIDA stage I, several breakwater and gryone were introduced in North Colombo as beach stabilization scheme under DANIDA stage II. Coastal stretch in Colombo North (Modara to Uswatakeiyawa) and the Maha oya-Lansigama stretch were built between 2001 and 2008 as part of the Coast Resources Management Project to stop the coastal erosion.

5.3.7 Meteorology

The climate of Sri Lanka is characterized as tropical and is dominated by the Southwest and Northeast monsoons. The climate experienced during 12 months period in Sri Lanka can be characterized in to four climate seasons as presented in **Table 5.10**.

Table 5.10 Climatic Variations in Sri Lanka

S. No.	Seasons	Months	Description
1	First Inter-Monsoon	March-April	Warm and uncomfortable conditions, with thunderstorm-type rain, particularly during the afternoon or evening. The distribution of rainfall during this period shows that the entire south-western sector at the hill country receives around 250 mm of rainfall, with localize area on the South-western slopes experiencing rainfall in excess of 700 mm. Over most parts of the island, the amount of rainfall various between 100 and 250 mm, the notable exception being the Northern Jaffna Peninsula (Jaffna- 78 mm, Elephant pass- 83 mm).

¹⁸ Wijayawardane I.S.K., Ansaf K.M.M., Ratnasooriya A.H.R., Samarawickrama S.P.2010. Coastal Erosion: Investigations in the Southwest Coast of Sri Lanka. International Conference on Sustainable Built Environment (ICSBE-2010), Kandy, 13-14 December 2010

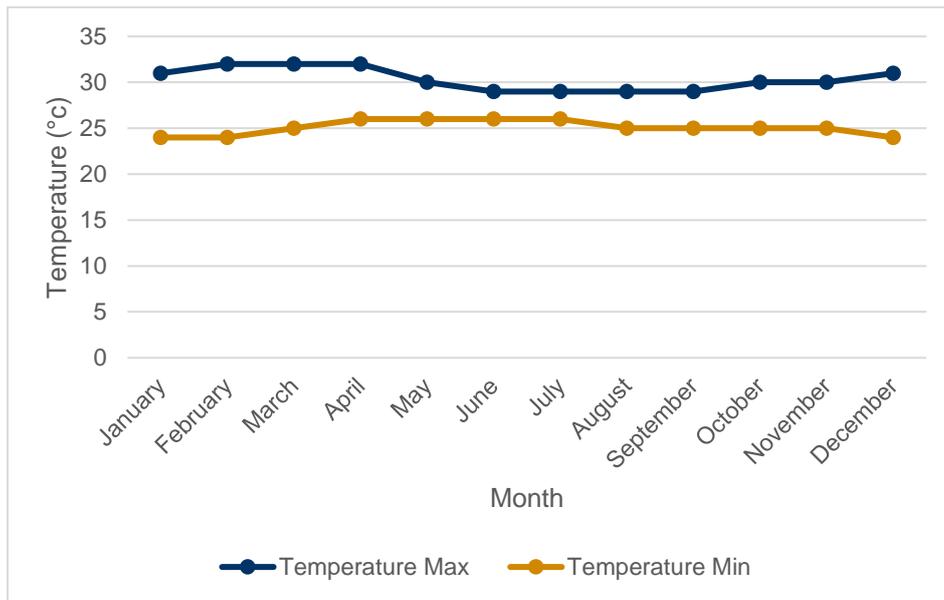
S. No.	Seasons	Months	Description
2	Southwest-monsoon	May-September	Windy weather during this monsoon eases off the warmth that prevailed during the first inter monsoon season. Amount of rainfall during this season varies from about 100 mm to over 3000 mm. The highest rainfall received in the mid-elevations of the western slopes (Ginigathhena- 3267 mm, Watawala- 3252 mm, Norton- 3121 mm). Rainfall decreases rapidly from these maximum regions towards the higher elevation, and in Nuwara-eliya drops to 853 mm. The variation towards the south-western coastal area is less rapid, with the south-western coastal belt experiencing between 1000 mm to 1600 mm of rain during this 5 month long period.
3	Second Inter-monsoon	October-November	The thunderstorm-type of rain, particularly during the afternoon or evening, is the typical climate during this season. But unlike in the inter-monsoon season, the influence of weather system like depression and cyclones in the Bay of Bengal is common during the second inter-monsoon season. Under such conditions, the whole country experiences strong winds with wide spread rain, sometimes leading to floods and landslides. The second inter-monsoon period of October – November is the period with the most evenly balanced distribution of rainfall over Sri Lanka. Almost the entire island receives in excess of 400 mm of rain during this season, with the south-western slopes receiving higher rainfall in the range 750mm to 1200 mm (Weweltalawa Estate in Yatiyantota recording 1219 mm)
4	Northeast monsoon	December-February	Sri Lanka's position between 5 and 10 north latitude endows the country with a warm climate, moderated by ocean winds and considerable moisture. The mean temperature ranges from a low of 15.8 °C in Nuwara Eliya in the Central Highlands (where frost may occur for several days in the winter) to a high of 29 °C in Trincomalee on the northeast coast (where temperatures may reach 37 °C). The average yearly temperature for the country as a whole ranges from 26 °C to 28 °C. Day and night temperatures may vary by 4 to 7 °C. January is the coolest month while May, the hottest period, precedes the summer monsoon rains.

Source: <http://www.meteo.gov.lk>

5.3.7.1 Temperature and Relative Humidity

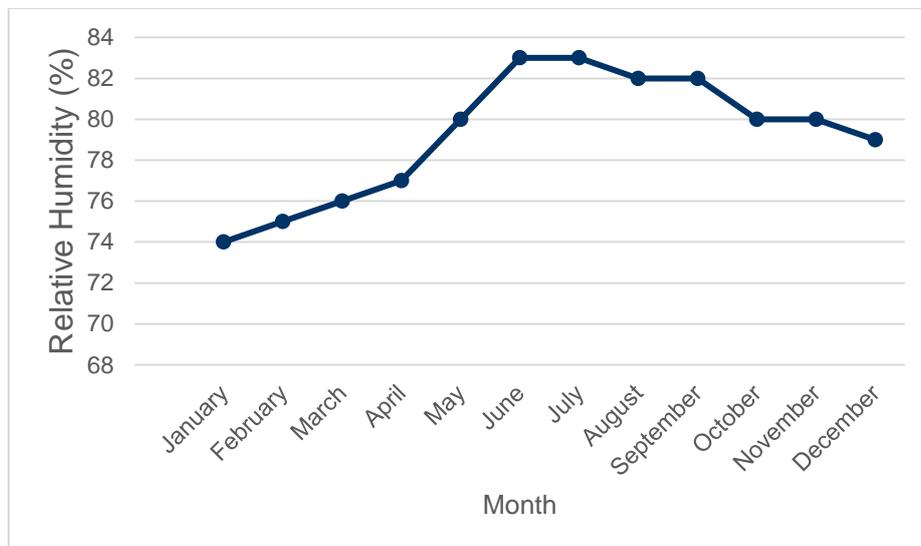
Regional differences observed in air temperature over Sri Lanka are mainly due to altitude, rather than to latitude. The mean monthly temperatures differs slightly depending on the seasonal movement of the sun, with some modified influence caused by rainfall. The mean annual temperature in Sri Lanka manifests largely homogeneous temperatures in the low lands and rapidly decreasing temperatures in the highlands. In the lowlands, up to and altitude of 100 m to 150 m, the mean annual temperature varies between 26.5 °C to 28.5 °C, with an annual temperature of 27.5 °C. In the highlands, the temperature falls quickly as the altitude increases. The mean annual temperature of Nuwaraeliya, at 1800 m sea level, is 15.9 °C. The coldest month with respect to mean monthly temperature is generally January, and the warmest months are April and August. The ambient temperature of the study area falls within range of 24°C to 32°C and relative humidity varies from approximately 83% to 74% **Figure 5.17** and **Figure 5.18**.

Figure 5-17 Monthly Variation of Temperature in Colombo (2009-2021)



Source: <https://www.worldweatheronline.com/colombo-weather-averages/western/lk.aspx>

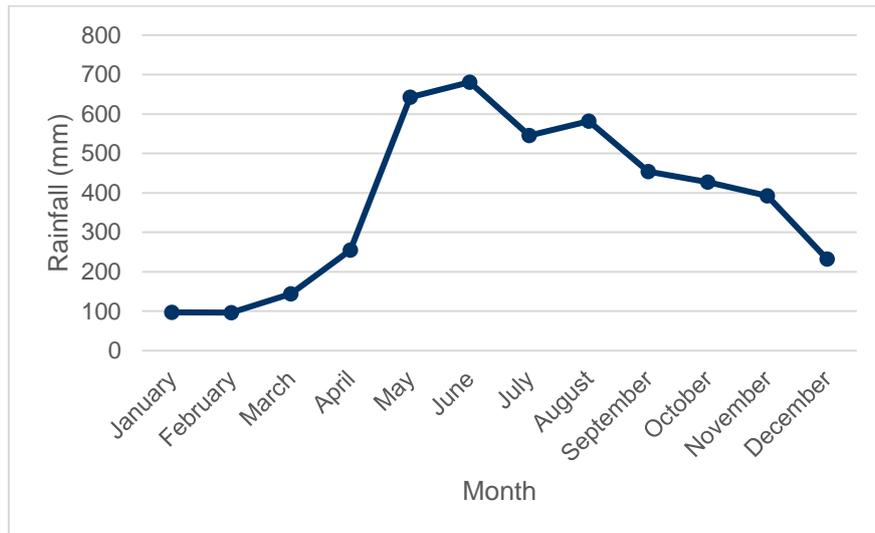
Figure 5-18 Monthly Variations in Relative Humidity Level in Colombo (2009-2021)



Source: <https://www.worldweatheronline.com/colombo-weather-averages/western/lk.aspx>

Rainfall mainly occurs in the NE and SW monsoon periods. Average annual rainfall is estimated to be between 2,000 to 2,500mm. As per **Figure 5.19** the highest rainfall is received in the months May and June. The site is within the area of influence of the Kelani River.

Figure 5-19 Monthly Rainfall Variation in Colombo (2009-2021)

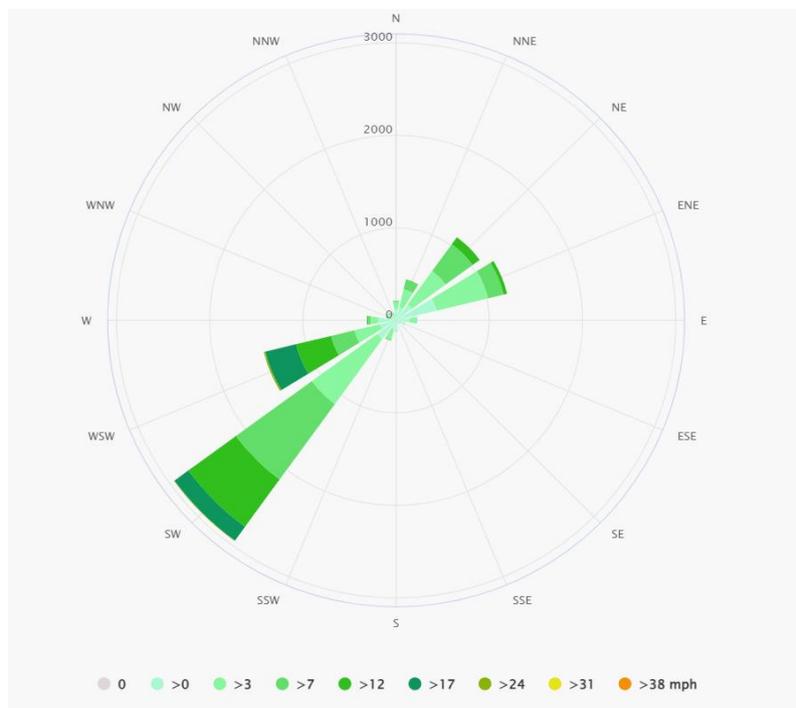


Source: <https://www.worldweatheronline.com/colombo-weather-averages/western/lk.aspx>

5.3.7.2 Wind Speed and Direction

The regional wind system is dominated by the monsoon effect and influenced locally by the daily variation of sea to land and land to sea winds. **Figure 5.20** shows the windrose for the period 2012-2021. Windrose diagram shows that most of the time wind speeds are between 7-20 mph and the direction is from SW and WSW.

Figure 5-20 Wind Rose (2012-2021)



Source: https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/sri-lanka_sri-lanka_1227604

5.3.8 Ambient Air Quality

5.3.8.1 Existing Air Emission Sources

The Colombo Port activity predominantly revolves around handling of containerized cargo which contributed to 91% and 94% of the annual throughput handled in 2021 and 2022 respectively. Bulk cargo is restricted to cement, fertilizer, steel, etc. and only contributed to 4% and 2% of the total throughput handled in 2021 and 2022 respectively. Given that the handling of bulk cargo is insignificant in the Colombo Port, the likelihood of air pollution from the handling of bulk cargo is minimal.

There is no major industries in the ZOI. There are one bulk cement storage facility (Mahaweli Merine Cement Pvt. Ltd), approximately, 3.0 km from Site, towards east; bulk petroleum storage facility (Ceylon Petroleum Corporation), approximately 4.3 km towards east.

5.3.8.2 Primary Monitoring

Ambient air quality was monitored at three locations within the ZOI during the month of July, October November and December to capture the existing ambient air quality of the area. CWIT has conducted ambient air quality tests in two locations within the port area under the ESMP monitoring program. The third monitoring location is located near the main gate of the port, towards a nearby human receptor. Colombo's annual windrose clearly shows the predominant wind directions of SW and WSW. There were no settlements in the SW/WSW direction. The potential emissions from the project are mostly fugitive emissions, and the impact zone may be 500 m. Considering this, to assess the potential impact on construction workers and others working in the existing port facility, two locations were set up. To assess the potential impact on the nearby community, a third monitoring location was selected.

The ambient air monitoring locations were selected within the ZOI to assess the baseline ambient air quality. The parameters studied were particulate matter (PM₁₀ and PM_{2.5}), nitrogen di-oxides (NO₂), sulfur dioxide (SO₂), carbon monoxide (CO). The major source of air pollutants within the ZOI include fugitive dust emissions from industries, roads, vehicular exhaust emissions from plying of vehicles and smoke from cooking. The ambient air quality monitoring carried out by Environmental Laboratory and Consultancy Services (ELCS) (ISO/IEC 17025:2017). The details of monitoring location have given in **Table 5.9** and **Figure 5.18** and ambient air quality monitoring report has been attached in **Appendix 5.3**.

Table 5.11 Ambient Air Monitoring Location

Location Code	Monitoring Location	Co-ordinate	Selection Criteria
AQ-1	Near CWIT office area	6.945905 N, 79.822897 E	To understand the existing ambient air quality and potential impact due to proposed construction activities and operation of the terminal.
AQ-2	Near Breakwater Bend	6.956374 N, 79.822888 E	
AQ-3	Main Port access road	6° 56.296'N, 79° 50.601'E	To understand the existing ambient air quality and potential impact due to transportation activity during construction operational stages

5.3.8.3 Primary Monitoring Results

The summary of primary monitoring results is presented in following table.

Table 5.12 Summary of Ambient Air Quality Monitoring Results

Monitoring Location	Monitoring period	PM ₁₀ (µg/m ³) (24hr)	PM _{2.5} (µg/m ³) (24hr)	SO ₂ (µg/m ³) (1hr)	NO ₂ (µg/m ³) (1hr)	CO (mg/m ³) (1hr)
AQ-1	July	20	10	78.47	131.61	<0.1
	October	-	-	-	-	-
	November	70	40	52.31	150	1.14
	December	170	80	78.47	150.41	<0.1
	Average	86.67	43.33	69.75	144.01	<0.1
AQ-2	July	30	10	52.31	112.81	<0.1
	October	-	-	-	-	-
	November	50	20	52.31	188	<0.1
	December	180	90	78.47	225.62	<0.1
	Average	86.67	40.00	61.03	175.48	<0.1
AQ-3	July	-	-	-	-	-
	October	80	40	52.31	150.41	<0.1
	November	80	40	52.31	169.22	<0.1
	December	200	100	78.47	225.62	<0.1
	Average	120	60	61.03	181.75	<0.1
	CEA Standard	100	50	200	250	30
	IFC/WHO Standard (2021) ¹⁹	45 µg/m ³ (24hr)	15 µg/m ³ (24hr)	40 µg/m ³ (24hr)	25 µg/m ³ (24hr)	4 mg/m ³ (24hr)

Source: Primary Monitoring, 2022

¹⁹ [https://www.who.int/news-room/fact-sheets/detail/ambient-\(outdoor\)-air-quality-and-health#:~:text=Guideline%20values,-NO&text=The%20current%20WHO%20guideline%20value,effects%20of%20gaseous%20nitrogen%20dioxide.](https://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health#:~:text=Guideline%20values,-NO&text=The%20current%20WHO%20guideline%20value,effects%20of%20gaseous%20nitrogen%20dioxide.)

5.3.8.4 Interpretation of Monitoring Results

The result of the parameters monitored has been discussed in the context of compliance to CEA standard and WHO standard.

5.3.8.4.1 Particulate Matter (PM₁₀)

The average 24 hourly concentration of PM₁₀ of three monitoring locations ranged between 86.67 to 120.0 µg/m³. The average concentration of PM₁₀ in the project site monitoring location (AQ-1 and AQ-2) found to be in compliance to the CEA value of 100 µg/m³, however, higher than the WHO standard, i.e. 45 µg/m³. The 24 hourly concentration for the month of July, October and November found to be in compliance to the CEA value of 100 µg/m³. Whereas, the average concentration of PM₁₀ of all the three locations for the month of December ranged between 170 to 200 µg/m³ which is higher than the CEA and WHO standard value of 100 µg/m³ and 45 µg/m³ respectively. The particulate matter concentration had increased due to the reclamation work in the vicinity of the sampling location. The higher particulate values in AQ-3 monitoring location could be attributed to vehicular emission and generation of re-entrained dust from plying of vehicles in the roads.

5.3.8.4.2 Particulate Matter (PM_{2.5})

The average 24 hourly concentration of PM_{2.5} of three monitoring locations ranged between 40.0 to 60 µg/m³. The average concentration of PM_{2.5} in the project site monitoring location (AQ-1 and AQ-2) found to be in compliance to the CEA value of 50 µg/m³, however, higher than the WHO standard, i.e. 15 µg/m³. The 24 hourly concentration for the month of July, October and November found to be in compliance to the CEA value of 50 µg/m³. Whereas, the average concentration of PM_{2.5} of all the three locations for the month of December ranged between 80 to 100 µg/m³ which is higher than the CEA and WHO standard value of 50 µg/m³ and 15 µg/m³ respectively. The particulate matter concentration had increased due to the reclamation work in the vicinity of the sampling location. The higher particulate values in AQ-3 monitoring location could be attributed to vehicular emission and generation of re-entrained dust from plying of vehicles in the roads.

5.3.8.4.3 Sulphur Dioxide (SO₂)

The average 1 hour concentration of SO₂ at all monitoring locations ranged between 61.03 to 69.75 µg/m³. The average concentration of SO₂ found to be in compliance to the CEA value of 200 µg/m³, however, higher than the WHO standard, i.e. 40 µg/m³.

5.3.8.4.4 Nitrogen Dioxide (NO₂)

The average concentration of NO₂ of all monitoring locations ranged between 144.01 to 181.75 µg/m³. The average concentration of NO₂ is found to be in compliance to the CEA 24 hourly value of 250 µg/m³, however, higher than the WHO standard, i.e. 25 µg/m³.

5.3.8.4.5 Carbon Monoxide (CO)

The average concentration of Carbon Monoxide (CO) of three locations are well within the limit of CEA value of 30 mg/m³ as well as WHO standard of 4 mg/m³.

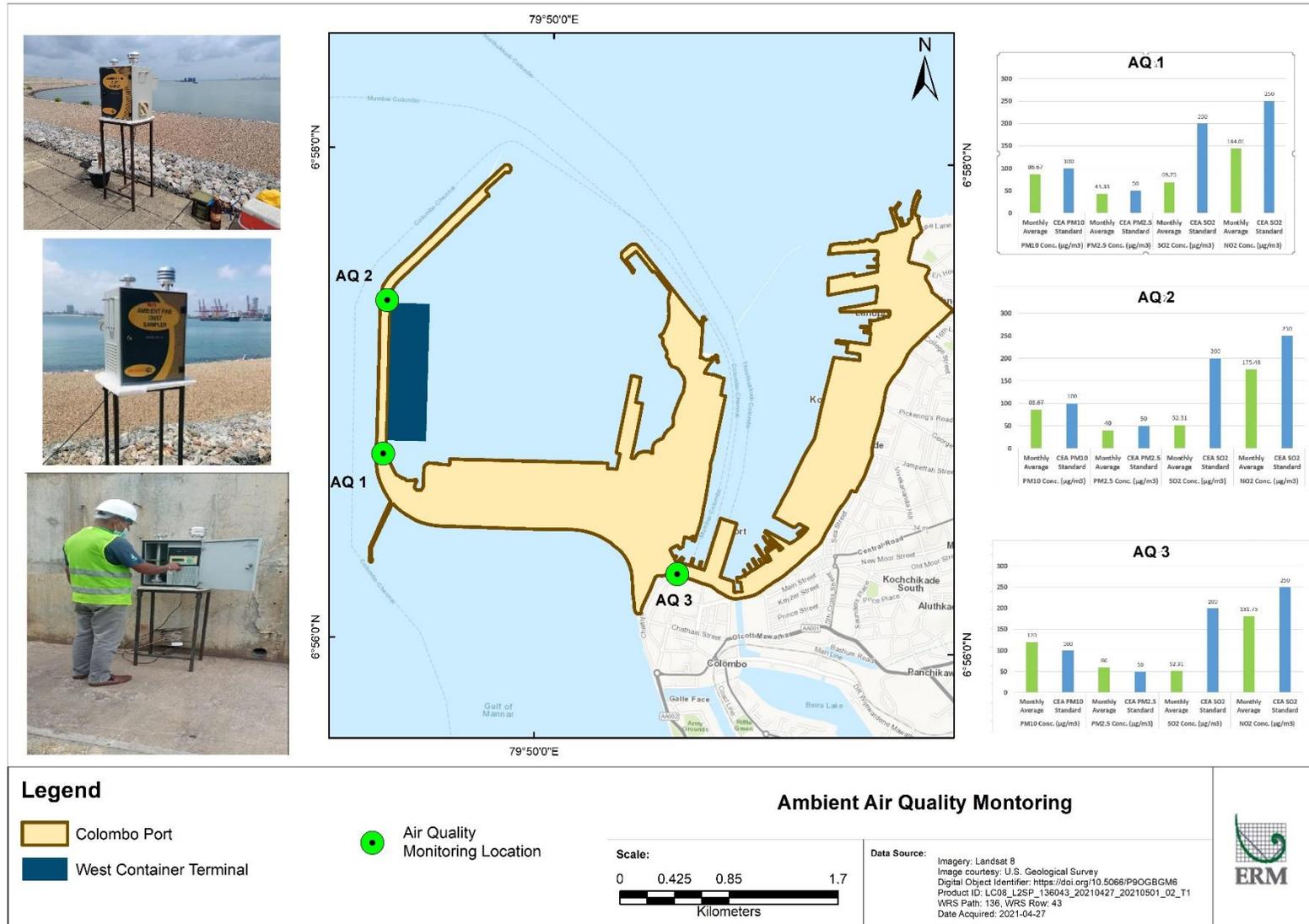
Conclusion

The higher concentration of PM₁₀, PM_{2.5} in the month of December may be due to site reclamation activities and movement of vehicle for transportation of rocks and boulders and temporary in nature.

The high value of SO₂ and NO₂ was observed in all the monitoring locations. One hour data was monitored as part of the baseline survey to denote concentrations during periods of peak activity at the port i.e. the sources during such peak activity would include emissions from ships, other diesel operated machines, vehicular emissions from trucks used for container transport. These emissions are anticipated to be further incremented to baseline air quality of the local air-shed with contributions

from urban sources on the Colombo urban district side lying adjacent to the port. This part of the city is one of the busiest parts of city and is expected to contribute a high level of air emissions from a variety of fixed and mobile sources.

Figure 5-21 Air Quality Monitoring Location & Summary Results



5.3.9 Ambient Noise Quality

5.3.9.1 Primary Monitoring

Ambient noise monitoring was conducted at three monitoring locations within the ZOI during study period (Refer to **Table 5.12** and **Figure 5.20**). The noise locations were selected within the ZOI to quantify the baseline ambient noise levels. **There is no human settlement within a 2.5-km radius of the proposed WCT-1 Project site. The nearest human settlement is located towards the main gate, which is approximately 2.5 km from the WCT-1 project boundary. The scoping study revealed that noise generated from the construction and operational stages is likely to be attenuated within 0.5 to 0.75 km from the source. Considering this, to assess the potential impact on construction workers and other workers in the existing port facility, two monitoring locations were set up in the proposed WCT-1 project site. The other sources of noise generation were due to transport activities, and to assess the potential impact on the nearby community, a third monitoring location was selected near the main gate. The data from selected locations will also help to determine the Project's impact on the ambient noise quality.**

The 24 hr baseline noise monitoring was conducted by using Casella 244 and Center (SE 392) noise level meter. Hourly continuous time integrated noise levels were measured in five minutes' intervals covering morning, evening and night times.

Daytime is considered between 06:00 to 21:00 hours and night from 21:00 hours to 06:00 hours.²⁰ The results so obtained were compared with ambient noise standards specified for respective category under the National Environmental (Noise Control) Regulation No.1 1996 and IFC Noise Level Guidelines.

Table 5.13 Noise Monitoring Location

Location Code	Monitoring Location	Co-ordinate	Category of area/zone
NQ-1	Near CICT Jetty	6.945432 N, 79.826157 E	Industrial area
NQ-2	Near Breakwater (bend)	6.955286 N, 79.822874 E	Industrial area
NQ-3	Main Port access road	6° 56.296'N, 79° 50.601'E	Industrial area

5.3.9.2 Primary Monitoring Results

The summary of primary monitoring results is presented in following table and detailed monitoring report has been attached as **Appendix 5.4**.

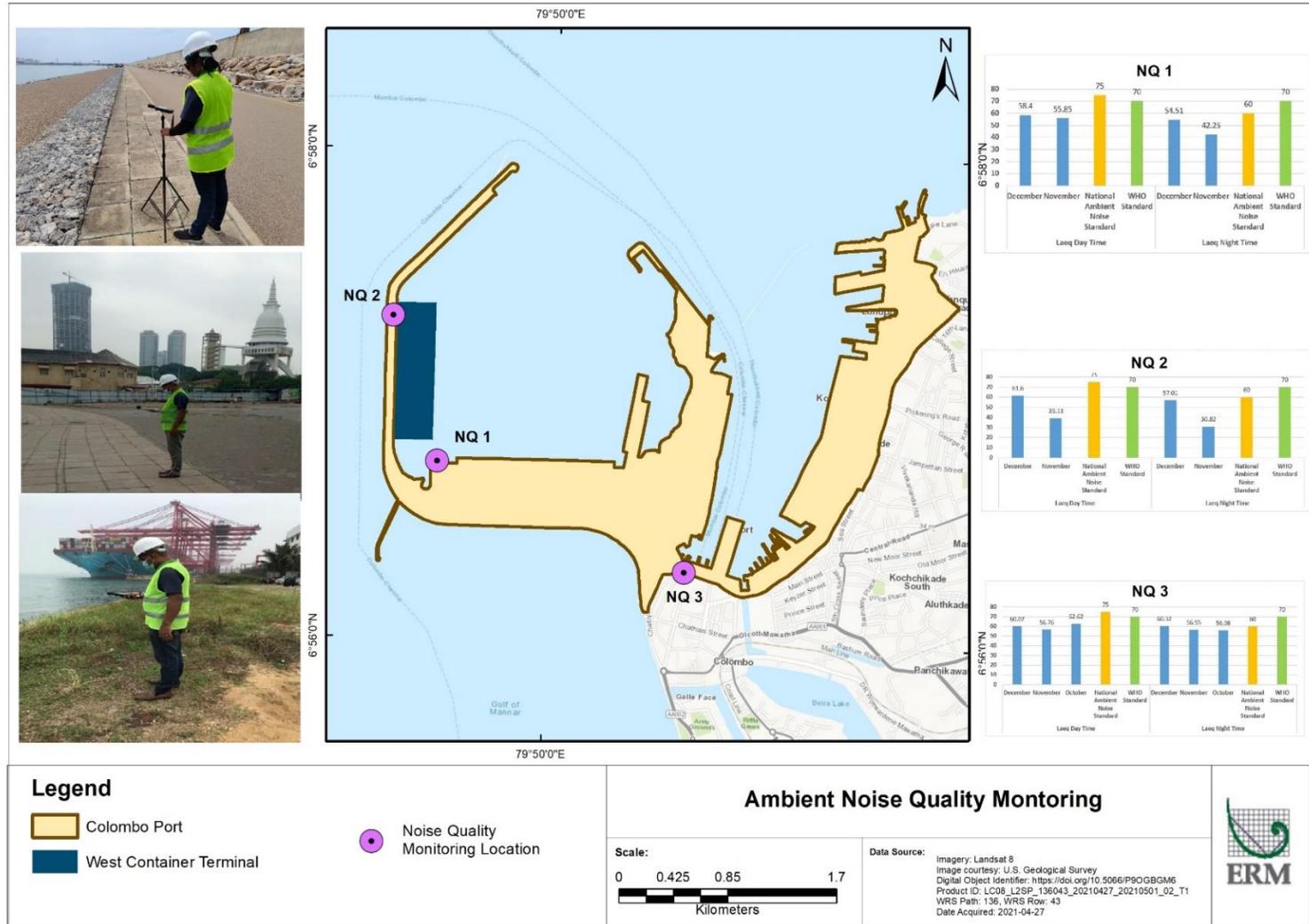
Table 5.14 Summary of Ambient Noise Quality Monitoring Results

Monitoring Location	Monitoring Period	Leq _{day} (dB(A))	Leq _{night} (dB(A))
NQ-1	November	55.85	42.25
	December	58.4	54.51
NQ-2	November	39.13	30.82
	December	61.6	57.01
NQ-3	October	62.62	56.08
	November	56.76	56.55
	December	60.07	60.32
CEA standard for industrial & commercial		75	60
IFC noise level guidelines for industrial & commercial ²¹		70	70

²⁰ <https://www.cea.lk/web/images/pdf/noise/reg924-12.pdf>

²¹ The IFC noise level guidelines are the hourly noise levels within the day and night time periods

Figure 5-22 Noise Quality Monitoring Location & Summary Results



5.3.9.3 Interpretation of Monitoring Results

The daytime equivalent noise levels at these locations varied from 39.13 dB(A) to 62.62 dB(A), which are in compliance with CEA standard for industrial area of 70 dB(A) as well as IFC guidelines for industrial & commercial area of 70 dB(A). The night-time equivalent noise levels at these locations varied from 30.82 dB(A) to 60.3 dB(A), which are in compliance with the CEA standard for industrial areas of 60 dB(A) but do not exceed the IFC guidelines. It is noted that the higher noise level was recorded in NQ-3, which could be attributed to traffic movement and existing port's operational activities near the monitoring location. The exceedance of noise level during the December monitoring period is not significant. The noise quality monitoring results are given in **Figure 5.22**.

5.3.10 Ground Vibration

Ground vibration testing was conducted in accordance with Central Environmental Authority (CEA) norms and guidelines stipulated in National Environmental Regulations. Ground vibration testing was conducted in two location- Location1- near CICT Jetty (6.945432 N, 79.826157 E) and Location 2- Near Water Barrier Bend (6.955286 N, 79.822874 E).

The 24 hourly testing results (**Refer to Appendix 5.5**) shows that vibration levels was 0.0 ppv (mm/sec). As observed in monitoring Location 1 the category of the structure of the building is Type 1 (CEA Interim Standard) and in Location -2 category of the structure cannot be determined as there were no building or nearby structures except breakwater (CEA Interim Standard).

5.3.11 Traffic

5.3.11.1 Primary Monitoring

There are 9 gates in the Port of Colombo, out of which 2 are permanently closed as of this moment. The gates 3, 6 and 8 were selected for the study for the following reasons:

- These gates are the most active gates in the Port of Colombo and have maximum traffic movement 24 hrs.
- The other gates (1, 1A and 2) are either used for small and light motor vehicles or for VIP movement, hence were not considered. Also, these gates are closed in the night thus traffic movement cannot occur from them.
- Gate no. 3 and 6 are located near heavy traffic movement outside the port of Colombo thus giving a picture on the impact of traffic movement due to operations. Also, these gates are used for container traffic having direct access to the highway and expressway thereby not needing to enter into the city.

Traffic survey was conducted continuously for 24 hours at three locations, i.e. Gate No.3, Gate No.6 and Gate No.8. The traffic survey was done for the both the way (up and down) movement of vehicles and categorized as light vehicles and heavy vehicles.

5.3.11.2 Monitoring Results

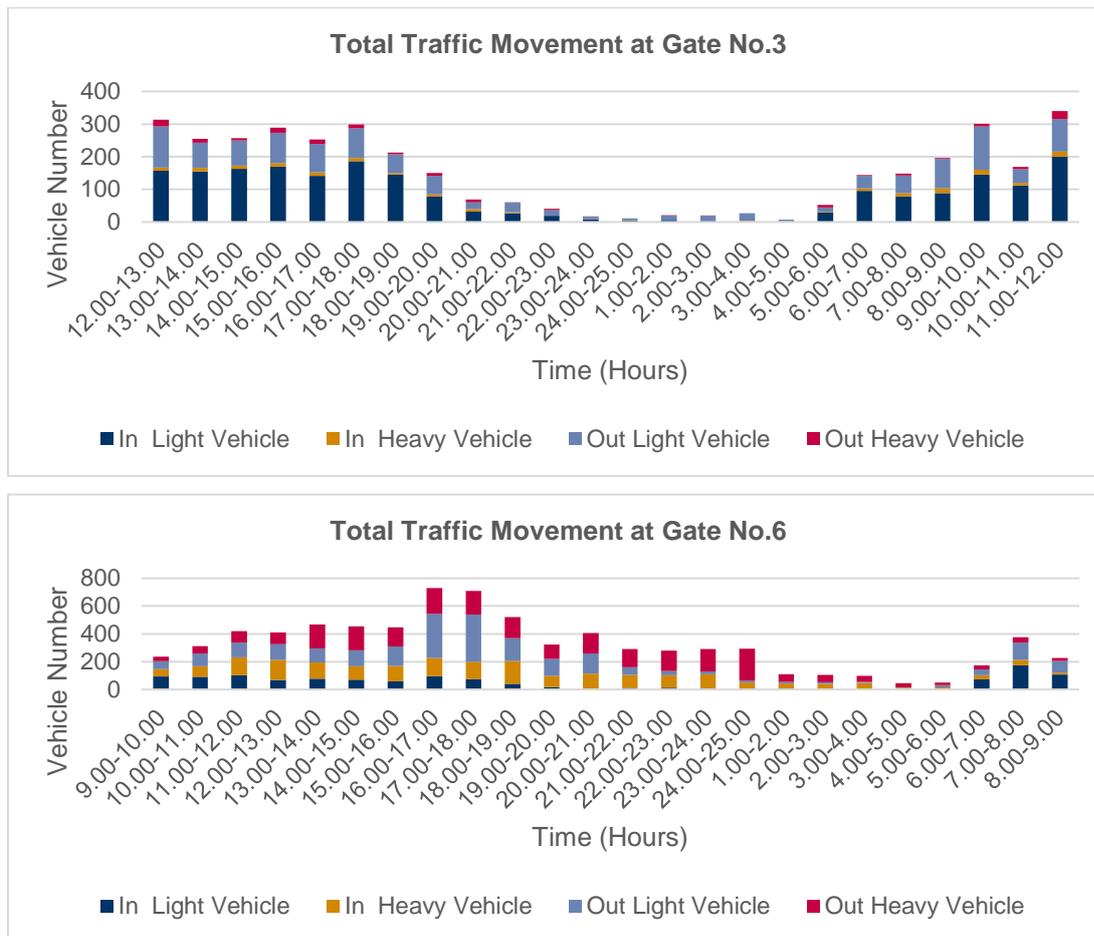
The recorded traffic values were converted to Passenger Car Units (PCU) for standardization. The summary of results is presented in **Table 5.15** and **Figure 5.23** and monitoring report has attached as **Appendix 5.6**.

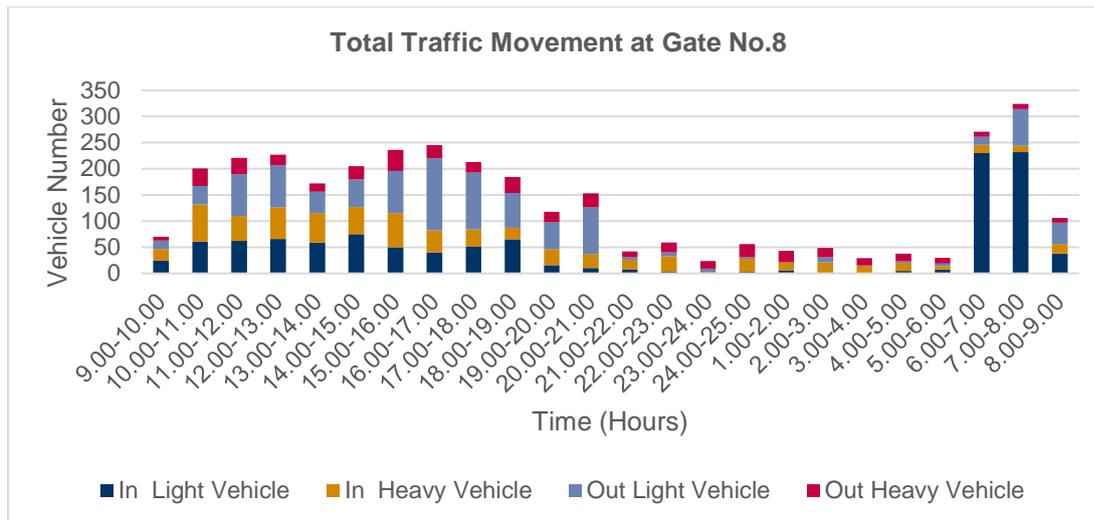
Table 5.15 Traffic Monitoring Data Observed in the ZOI

Description	Gate No 3	Gate No 6	Gate No 8
Heavy Motor Vehicles (in Number)	330	4367	1194

Light Motor Vehicle (in Number)	3322	3406	2122
Total PCU (Nos.) in 24 hr	4114	6943	4987
Average PCU Flow/Hr	171	578	207
Max PCU (Nos)/Hr	397	1173	354
Min PCU (Nos)/Hr	7	95	49
Maximum PCU Hours	11.00-12.00	16.00-17.00	7.00-8.00
Minimum PCU Hours	4.00-5.00	5.00-6.00	23.00-24.00

Figure 5-23 Traffic Movement at three Locations





5.3.11.3 Interpretation of Traffic Survey Result

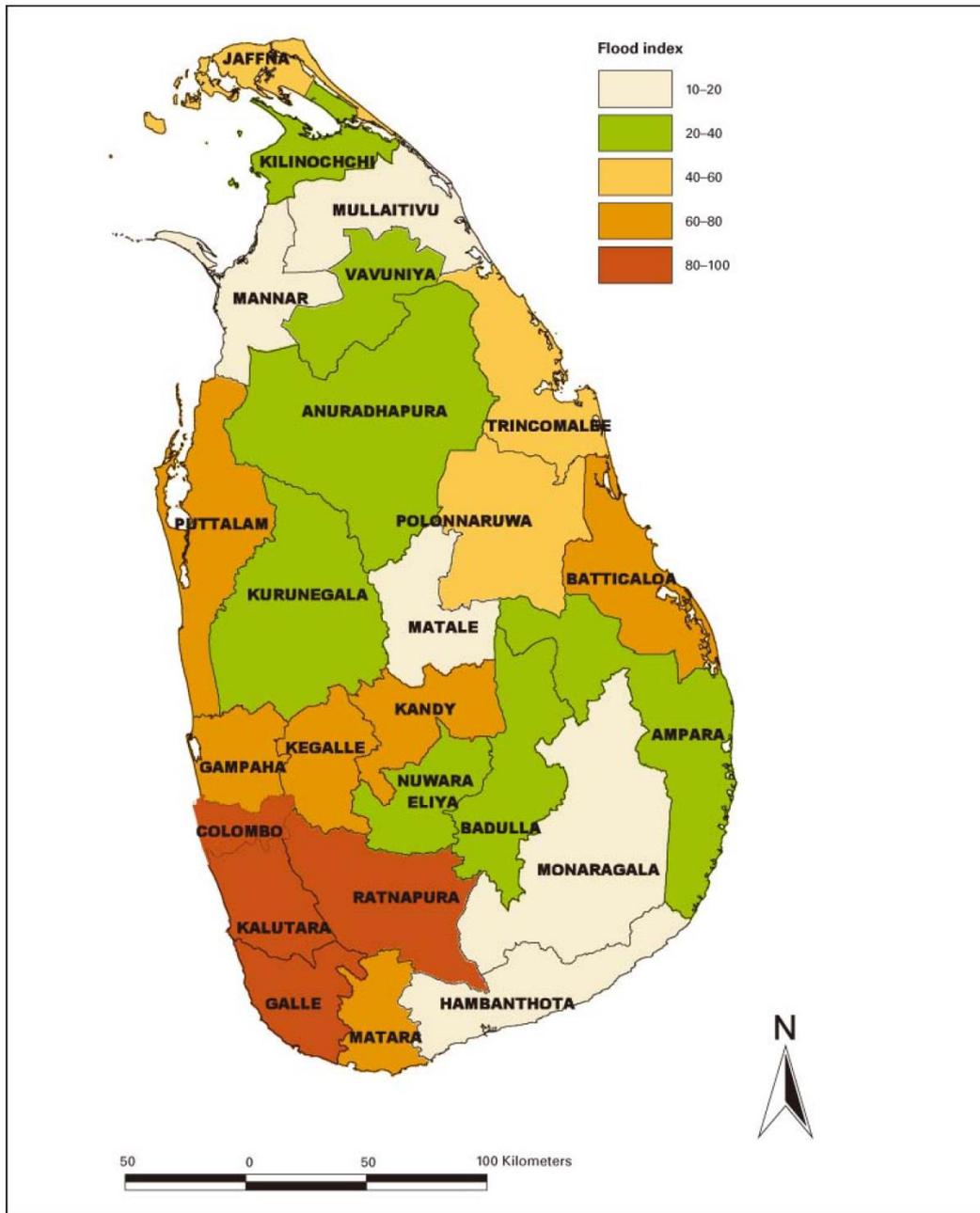
Total 4114 PCU recorded at the traffic monitoring station at Gate No.3 (in and out). As per the observation made on traffic density, on an average 171 PCU per hour recorded at the traffic monitoring location. It was also found that major contributor of the traffic load at Gate No.3 was light vehicle which constitute about 90% of the total traffic and whereas at Gate No.6 and Gate No.8, total PCU recorded 13886 and 4987 respectively. On an average 578 PCU per hour recorded at Gate No.6 and 207 PCU recorded at Gate No.8. At Gate No.6 majority of the traffic were heavy vehicle (56%), which indicate that trucks carrying containers used this gate and around 64% of the total traffic is light vehicle at Gate No.8.

5.3.12 Natural Hazard

5.3.12.1 Flood

The flood hazard map **Figure 5.22** shows high risk in the western, south-western, northern, north-eastern and eastern part of the country. The most flood prone districts are Kegalle, Ratnapura, Kalutara, Kandy, Colombo and Galle. These districts are located in the southwest part of the island.

Figure 5-24 Frequency Map of Flood Disaster Incident



Source: Lareef Zubair et al., Natural Disaster Risks in Sri Lanka, Ch.4

5.3.12.2 Earthquake

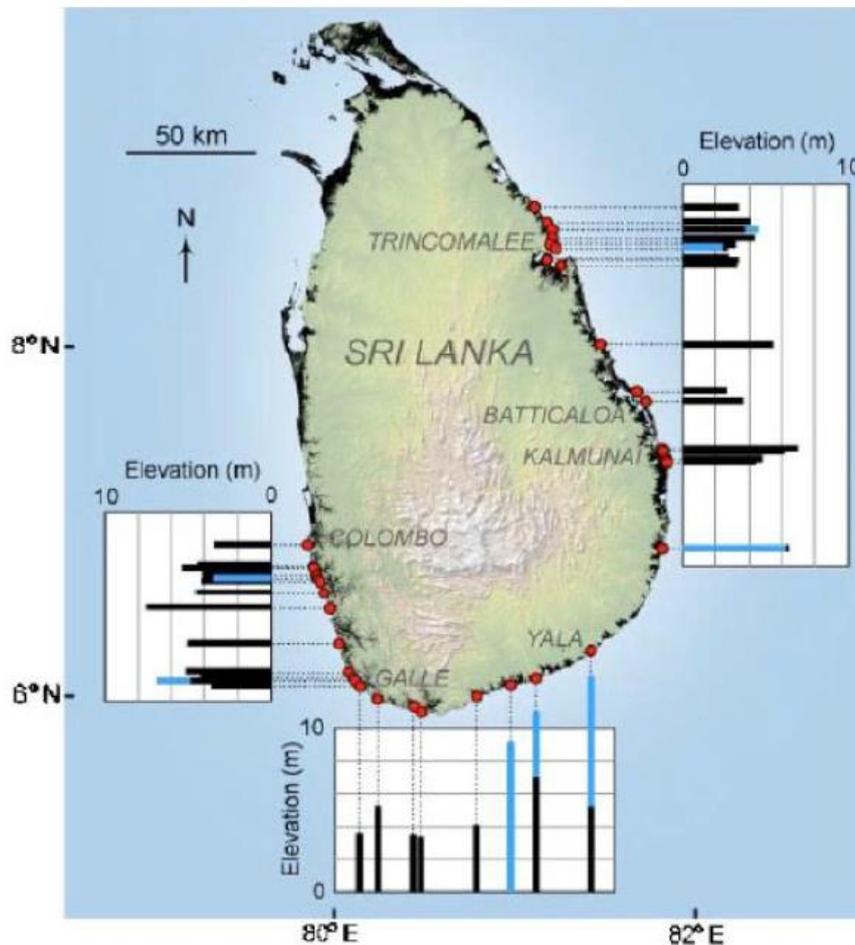
According to data obtained from the Global Seismic Hazard Assessment Program (GSHAP), Sri Lanka lies in a region with low seismic hazard. Historically, mild earthquakes have been experienced in different parts of the island but earthquake occurring near Colombo is not frequent.

5.3.12.3 Tsunami

Tsunamis are extremely infrequent in Sri Lanka. Sri Lanka is not located near any of the twelve or thirteen main plate boundaries that are prone to earthquakes, but it is close enough to the highly active seismic zone near Sumatra and other regions to its southeast. Earthquakes generated in these regions may lead to a Tsunami hazard in Sri Lanka. In the *Error! Reference source not found.* can be seen the distribution of the Tsunami wave heights and the inundation levels measured at several

locations along the Sri Lanka coast after the 2004 tsunami. Elevation measurement sites along the coastlines are indicated in red, and the areas on inundation above sea level, which were less than 10m, are shaded in black.

Figure 5-25 Measured tsunami run-up (blue bars) and maximum tsunami heights (black bars)



Source: Goff et al. (2006)

5.3.12.4 Cyclone

In Sri Lanka devastating cyclones are rare. Major storms usually affect sparsely populated coastal areas of the east and northwest parts. The cyclone season of Sri Lanka is from November to December, which has 83% of cyclone occurrences during this period. Out of the 28 cyclones that crossed Sri Lanka during the past years, only two have been formed in Arabian Sea and made landfall in either western or north-western coastlines of Sri Lanka; the rest have all been formed in Bay of Bengal and made landfall on the north and east coasts.

Table 5.16 Past Cyclones that made Landfall in Sri Lanka during 1881-2021

No.	Year / Month	Classification	Formed in	Landfall
1	1906 Jan	Cyclonic Storm	Bay of Bengal	North
2	1907 March	Severe Cyclonic Storm	Bay of Bengal	East
3	1908 Dec	Cyclonic Storm	Bay of Bengal	North

4	1912 Dec	Cyclonic Storm	Bay of Bengal	South
5	1913 Dec	Cyclonic Storm	Bay of Bengal	South East
6	1919 Dec	Cyclonic Storm	Bay of Bengal	North
7	1922 Nov	Severe Cyclonic Storm	Bay of Bengal	East
8	1925 March	Cyclonic Storm	Arabian Sea	North West
9	1931 Dec	Severe Cyclonic Storm	Bay of Bengal	North
10	1964 Dec	Severe Cyclonic Storm	Bay of Bengal	East
11	1966 Nov	Cyclonic Storm	Bay of Bengal	East
12	1967 Dec	Cyclonic Storm	Arabian Sea	West
13	1978 Nov	Severe Cyclonic Storm	Bay of Bengal	East
14	1980 Dec	Cyclonic Storm	Bay of Bengal	East
15	1992 Nov	Severe Cyclonic Storm	Bay of Bengal	
16	1993 Nov	Depression	Arabian Sea	-
17	2000 Dec	Very Severe Cyclonic Storm	Bay of Bengal	East
18	2002 Dec	Cyclonic Storm	Bay of Bengal	-
19	2005 Nov	Depression	Bay of Bengal	East
20	2006 Jan	Depression	Arabian Sea	-
21	2008 Nov	Cyclonic Storm	Bay of Bengal	Northeast, but crossed as a depression
22	2011 Nov/Dec	Depression	Arabian Sea	-
23	2017 Dec	Cyclonic Storm	Arabian Sea	Started at eastern end of SL as a Depression and move towards west
24	2019 May	Cyclonic Storm	Bay of Bengal	Did not make direct landfall
25	2019 Nov	Cyclonic Storm	Arabian Sea	Did not make direct landfall
26	2020 May	Cyclonic Storm	Bay of Bengal	Did not make direct landfall
27	2020 Dec	Tropical Storm	Bay of Bengal	East/North
28	2021 Dec	Tropical Storm	Bay of Bengal	Did not make direct landfall

Source: Department of Meteorology, Sri Lanka 2000 and Indian Meteorological Department

5.4 Biological Environment

5.4.1 Bio-Regions

The climatic and geomorphological variations in Sri Lanka have resulted in a clear demarcation into broad climatic, floristic and faunal zones, and this information was used for identifying bioregions. The Ministry of Forestry and Environment (Sri Lanka) with technical assistance from IUCN, came up with the Bio-Region classification of Sri Lanka in 1998. Analysis of climatic and geo-physical classifications, the faunal and floral distribution patterns, and the biodiversity richness of different parts of the country led to the identification of the terrestrial bio-regions. The coastal and marine biodiversity regions were defined within a belt extending 300 m inland from the level of high tide through to 22.2 km (12 nautical miles) into the ocean. A total of 15 bio-regions was recognized. The proposed project site and the EAAA is located within “Bio-region 4 Wet Lowlands” and the marine biome of EAAA is located within “Bio-region 12 Chilaw to Hikkaduwa”.

5.4.1.1 *Bio-region 4 - Wet Lowland*

This covers Colombo district and number of other districts like Gampaha, Kalutara, Galle, Matara and parts of the Ratnapura, Kandy and Kegalle districts. The region receives about 2500 mm to 5000 mm of rainfall, with no drought months. The altitude extends from sea level to about 1000 m. The mean annual temperature is 27°C at sea level. The soil type in this region is red-yellow podzolic soils with soft and hard laterite in the lower elevations. The terrain ranges from flat to rolling and undulating.

The tropical lowland wet evergreen forest best represents the climax vegetation of this bioregion. The south western section of this region is floristically the richest in Sri Lanka, with the highest percentage of endemic species among both the fauna and flora. The proposed project site is located in the north western corner of this bio-region and being located immediately north of Colombo (Capital of Sri Lanka), has one of the of the highest population densities in the country, resulting in modification of habitat and vegetation.

5.4.1.2 *Bio-region 12 - Chilaw to Hikkaduwa*

This coastal bioregion is mostly dominated by marshes and lagoon, mangroves and rocky reefs of sandstone. Coastal areas located close to the proposed project is located within the subsection between Chilaw in north to Peliyagoda in south, which is mostly characterized by marsh and lagoon systems. Muthurajawale marsh system (wetland sanctuary) within 9km West and Negombo Lagoon is located approximately 10km west of the proposed project. The nearest point of the Chilaw to Hikkaduwa is approximately 12km east from the proposed sand borrow area and approximately 8km northeast from the Colombo port.

5.4.3 *Methodology of data collection*

The following surveys were conducted or referred for delineation of the ecological baseline of the area. The following are the sources of information included in the ecological baseline section:

- Overall observations and photographs taken during ERM field visits to the site in November, 2023
- Primary plankton and benthos analyses conducted for the borrow areas during 2022
- Studies conducted as part of IEE for the borrow area
- Survey conducted by ERM as part of LNG terminal ESIA in the area, which is located adjacent to the Colombo Port (ocean side of the breakwater) – comprised of terrestrial ecological surveys, marine surveys including marine transects surveys during 2019
- Consultations with marine biodiversity experts as part of ESIA conducted for the Kerawalapitiya Power Plant (within 10 kms of Colombo Port) – Consultation with local biodiversity experts of University of Colombo and University of Sri Jayewardenepura (2022).
- Reports, scientific papers etc. available in the Public domain.

5.4.3.1 *Primary Surveys*

Primary surveys of plankton and benthos conducted by CWIT during 2022

5.4.3.2 *Primary Surveys conducted by ERM during 2018 at Colombo Harbour Area*

Surveys conducted as part of ERM's previous studies in the area during 2018 including marine and terrestrial surveys were also referred. Local biodiversity experts viz. Prof. Mayuri Wijesinghe, University of Colombo and Dr. R R M K P Ranatunga, University of Sri Jayewardenepura were involved in conducting the terrestrial and marine surveys respectively. Methodology of data collection on for marine and terrestrial surveys presented below;

Methodology of Terrestrial Surveys

The natural habitat surveyed was the marshy area near the Dikowita fishery harbour. This area is a remnant patch of the Muthurajawela marsh which is one of the largest wetlands in Colombo and a part of which is declared as a Sanctuary under the Department of Wildlife Conservation (DWLC).

A thorough literature review was conducted to formulate a list of species that have been recorded within or in close proximity to the broader marsh area because such species could potentially occur within the area impacted by the project. This was followed by a field survey on three days which included a preliminary drive or walk through the project trace to identify any habitat, natural, semi-natural or anthropogenic, along the way. Attention was paid to waterways – canals, streamlets and low lying habitats that might serve as possible refuges for urban wildlife species. One of the key water ways that would be traversed by the proposed pipeline is the Hamilton canal. A rapid assessment was conducted in the marshy area and alongside the canal which was to be intercepted by the pipeline. The rapid assessment was useful to record the habitat types, trees that require to be felled and species that would be affected by the project due to clearance or disturbance. Species lists were constructed for vertebrates and selected groups of invertebrates.

Methodology of Marine Surveys

Underwater Visual Surveys (UVS)

A rapid underwater survey was carried out in the sampling sites to identify major habitat types, biodiversity, substrate type, sediments and to assess the overall health of the ecosystems at present. Shore-perpendicular transects of which 30 m length and 2 m wide were conducted using underwater visual survey technique in each site assisted by timed videos and still photographs to identify the community composition targeting qualitative and quantitative data. Noteworthy marine flora and fauna, substrate types, and sensitive areas observed were recorded.

Classification of Underwater Habitats

In order to identify and classify major marine habitat types, in addition to visual observations, underwater surveys were carried out through diving and snorkelling. In order to estimate the percent cover, belt transect method was used. Quadrates of 50 cm x 50 cm were used for quantification and percent cover estimates. Minimum of six quadrat samples were obtained systematically along the 30 m transect 5 m apart. Snapshot of each quadrat was obtained and all the fauna and flora encountered in the quadrates were photographed. Timed video was obtained in full length of the quadrat. In each sampling site, fauna and flora encountered were recorded on a slate by a diver observer and specimens unable to be identified were later identified using photographs. Sediment sample was collected in non-reef areas for classification of sediments based on texture.

Underwater video transects were obtained along the belt transect. Underwater cameras with both video and still imaging capability was used and strobe for light enhancement. Digital photographs and videos documented various habitats for descriptive analysis of the communities of the benthic and vertical relief and also used for further identification and also to have a permanent visual record of the underwater habitats. Data collected from snorkelling, diving, photos and video were used to record seabed habitats and identification of ecologically sensitive habitats. All the images and video were obtained along with GPS data for georeferencing. The colours of the photographs were adjusted using Adobe Photoshop to improve the quality and the visibility of the images when underwater visibility was very poor.

In actual field work however, it was necessary to take into account the small size of local reefs, limitations in underwater visibility and the prevalence of rough seas and some slight adjustments are unavoidable. In order to record the depth, a handheld depth sonar was used.

The underwater surveys were carried out under difficult conditions. Poor underwater visibility, heavy surf and strong currents restricted the number of sites surveyed, and the number of transects that

could be carried out. Such conditions would also reduce the opportunity of observing fast moving and cryptic species.

Limitation in Marine Ecological Surveys

The marine survey limitation pointed out in the ESIA for LNG terminal indicate the following:

“The underwater surveys were carried out under difficult conditions. Poor underwater visibility, heavy surf and strong currents restricted the number of sites surveyed, and the number of transects that could be carried out”

However, in spite of these difficulties, the surveys conducted and the data collected was considered to be representative of the marine ecosystem of the area. These are standard obstructions that a survey team experiences, however, the same has been balanced and complemented through the knowledge and experience of Dr. Ranatunga and his team’s workings in the area. It is to be noted that Dr. Ranatunga cited his previous studies in the area as necessary to draw a representative baseline for the survey.

The study area included sand borrow area site and adjacent areas which can be affected by the sand extraction facility.

The following surveys were conducted as part of the IEE study between September to October 2021;

5.4.3.3 Surveys conducted as part of IEE study for the borrow area

- Coastal fisheries monitoring survey
- Marine mammal siting survey
- Turtle nesting survey
- Fishing ground survey

Other relevant study reports were also referred for the survey. The survey reports has been attached in **Appendix 5.7**.

5.4.4 Terrestrial and Aquatic Habitat

Regarding the habitats, three major habitats are found in and around the proposed project site.

- **Marsh Land Habitat** – comprising reeds and rushes that spring up in waterlogged areas, around 10 % of the land contains such habitats;
- **Village Woodland/Plantation Areas** – high ground which is now dominated by the invasive *Acacia auriculiformis* an exotic and a potential invasive plant in Sri Lanka, and
- **Canals** - The southern-most end is bordered by a canal and a marsh area dominated by the invasive plant known as Pond Apple (*Annona glabra*) [LC (IUCN v 2022.1)].

The land area in EAAA was filled in the past and subsequently been invaded by the exotic and potentially invasive plant *Acacia auriculiformis* [LC (IUCN v2022.1)], which is now the dominant species in the high ground areas (terrestrial habitats like Woodland/Plantation Areas), and the fact that the site is small and surrounded by a built-up environment and heavily industrialized landscape, “Woodland/Plantation Habitat” is considered as “Modified Habitat”.

“Marshlands Habitat” and “Canals” located in the EAAA of the proposed project site is expected to be under anthropogenic pressure arising from human settlement and industries, so these habitats located in the EAAA of the project site is considered “Modified Habitat”.

However, considering the protected status of “Muthurajawale Wetland Sanctuary” and open access to Negombo Lagoon, “Marshland Habitat” located within “Muthurajawale Wetland Sanctuary”, can be considered as “Natural Habitat”.

5.4.5 Marine Habitat

Desk based assessment of the proposed project site confirmed the types of marine habitat in the vicinity of the project. Those are shore shallow sea and rocky reefs. Nearshore marine environment around the project site was mostly a sandy terrace and sea bottom is mostly flat with a gradual slope.

- **Near Shore Shallow Sea** – Substrate in shallow waters is sand with a lot of mud and fine sands making underwater visibility very poor. Mainly due to the Kelani river flowing nearby which empty a large volume of sediments to the coastal zone. These sediment plume which stirs up the fine sediment deposited in the seafloor making less visible underwater.
- **Rocky Reef** – Bathymetry shows that a narrow rocky reef known as "Kalapu gala" runs close and parallel to the coast between at 8 m depth contour. The top of the rocky area was as shallow as 2.5 m in a certain place at low tide. Another rocky reef patch referred to as "Onagala" or "Unagala" is located around 3.7 km offshore at the 13m depth contour. The highest point of the rocky area recorded as 10.2 m. Both Kalapu gala and Onagala were favourite fishing spots. Ona Gala reef forms north of the Colombo harbor and extents further north far up to Pamunugama. It lies relatively in deeper depth; 7-11 m, at an angle position, about 3-4 km from the coast. It has two parallel ridges namely; Shallow Ridge (East reef) and Deep Ridge (West reef). The East Ridge is comparatively shallow (7-11 m) and the West ridge is at a depth range from 10 to 15 m. Reef shows a range of topographic complexity including reef-flats, sandstone rocks and deeply incised gullies. At both ends, this rocky reef is somewhat discontinuous and fragmented²². Both Kalapu Gala and Ona Gala significantly influenced by sediments from the Kelani River, with high turbidity as well as accumulated sediments on the reef surface¹. Thamba Gala exists off Uswetakeiyawa, about 7 km from the shore, running towards South – North direction. And lying at the depth of around 25-45 m. It is also a bolder field, highly discontinuous and expansion is limited. The isolated rocky fields of this reef are lying scattered but rarely extent towards the sand extraction site¹. Thamba Gala is also low productive reef as the influence of Kelani River. A few coral species form small colonies were reported from the reef area.

Marine transect surveys conducted by ERM in 2019²³ revealed the following observations from Colombo Inner Harbour and Onagala Reef

Inner Harbour Transect 1: The site is along the proposed access bridge connecting the jetty to the land. Benthic substrate of the site is mostly sand covered with fine particles Average depth is 7 m. The sandy sea floor was devoid of sea weeds or other biota other than dead shells and shell breakoffs. Towards the breakwater sandstones were visible from the floor. Schools of fish such as *Caesio cuning* (Yellow-tail Fusilier) and surgeon fishes were found in the shades. No much species diversity was observed other than fouling organisms encrusting on hard rock substrates.

Inner Harbour Transect 2: The site is close to the middle of the western breakwater. Average depth was 9 m with poor underwater visibility due to fine sediments scattered in the water. Sediment was mostly sand with some fine particles. No live organisms were recorded other than shell breakoffs. Towards the breakwater, some communities were observed in the rocky boulders in the breakwater dominated by recently recruited corals. Corals seems to be recruited within last 2-3 years from the present level of growth. Corals were dominated by *Acropora* sp. and *Goniastrea* sp. to a lesser extent. Some tunicates and reef associated fishes were also recorded.

Inner Harbour Transect 3: The study site is towards the end of the breakwater close to the entrance channel. Substrate is mostly fine to coarse sand with average depths of 14 m. The sea floor was

²² Proposed Offshore Sand Extraction from SLPA Sand Borrow area at Kerawalapitiya for Reclamation of East Container Terminal-Phase II (ECT- PHASE II) and West Container Terminal-1 (WCT-I) In The Port Of Colombo 2022.

²³ Petronet LNG Ltd., Sojitz Corporation, Mitsubishi Corporation and Sri Lanka Gas Terminal Co. Ltd. (2019) EIA Study for LNG/Gas Infrastructure Development Project, Colombo

devoid of any biota, having only shell breakoffs. However, diverse community of corals and associated biota found along the rocky boulders along the breakwater. Rocks were covered with around 3-5% from live corals. Corals were dominated by *Acropora* sp. followed by *Goniastrea* sp., *Davis* sp., *Favites* sp. and *Montepora* sp.

Onagala Reef: Onagala is a narrow ridge that has a least depth of 6.4 m north of the Kelani river mouth. Average depth of the study site was 14 m. Substrate was rocky with some crevices. The diversity of the substrate was very poor and dominated by false moorish idol, *Heniochus diphreutes*, Finelined Surgeonfish, *Acanthurus grammoptilus*. Some whip corals (black corals) were observed.

5.4.6 Ecological Appropriate Area of Analysis (EAAA) for Critical Habitat Assessment

Ecological Assessment was carried out for flora and fauna within the proposed project site and EAAA. Online tools like Integrated Biodiversity Assessment Tool (IBAT) for Business, IUCN Red List for Threatened Species Online Version [2022-2] Birdlife Data Zone etc. were used to understand the flora and fauna of the proposed project site.

5.4.6.1 EAAA for Critical Habitat Assessment

Detailed Guidelines for delineation of Ecological Appropriate Area of Analysis (EAAA), has been provided in Guidance Note (2019) of IFC Performance Standard 6 (2012). Marine EAA delineation also considered guidance provided by Cousins and Pittman (2021)²⁴. It is probable, that a project may be sighted within a greater area recognized as critical habitat, but the project site itself has been highly modified. A critical habitat assessment therefore must not focus solely on the project site²⁵. Ecologically Appropriate Area of Analysis²⁶ (EAAA) should be identified, to determine the presence of critical habitat for each species with regular occurrence in the project's area of influence, or ecosystem, covered by Criteria 1-4. EAAA will take into account the distribution of species or ecosystems [within and sometimes extending beyond the project's area of influence] and the ecological patterns, processes, features, and functions that are necessary for maintaining them. In all cases, the critical habitat should consider the distribution and connectivity of such features in the landscape/seascape and the ecological processes that support them.

During delineation of the EAAA Ecological factors like habitat type available and features such as conspicuous features like rocky reef, mangrove swamp (Muthurajawela Wetland Sanctuary IBA), lagoons (Negombo lagoon) are considered as part of the aquatic EAAA. Moreover, there are no evidence of occurrence (permanent or periodic) of long range migratory species (viz. blue whale) or range restricted species (particularly reef associated) from areas in the vicinity of the project sites. So, separate taxa specific or function specific EAAA were not considered for the Critical Habitat Assessment. The EAAA covers different habitat features that represent different functions of local ecology and covers entire spatial extent of the impact of the project, (eg. extent of sediment plume).

Marine EAAA: Considering the factors like majority marine habitat like shallow nearshore sea, rocky reefs in proximity to the proposed project site a 10 km radius were considered as EAAA for marine components. The area considered from the Jetty/reclaimed areas and sand borrow areas because of presence of reefs in the area, bathymetric profile, sediment plume modelling etc.

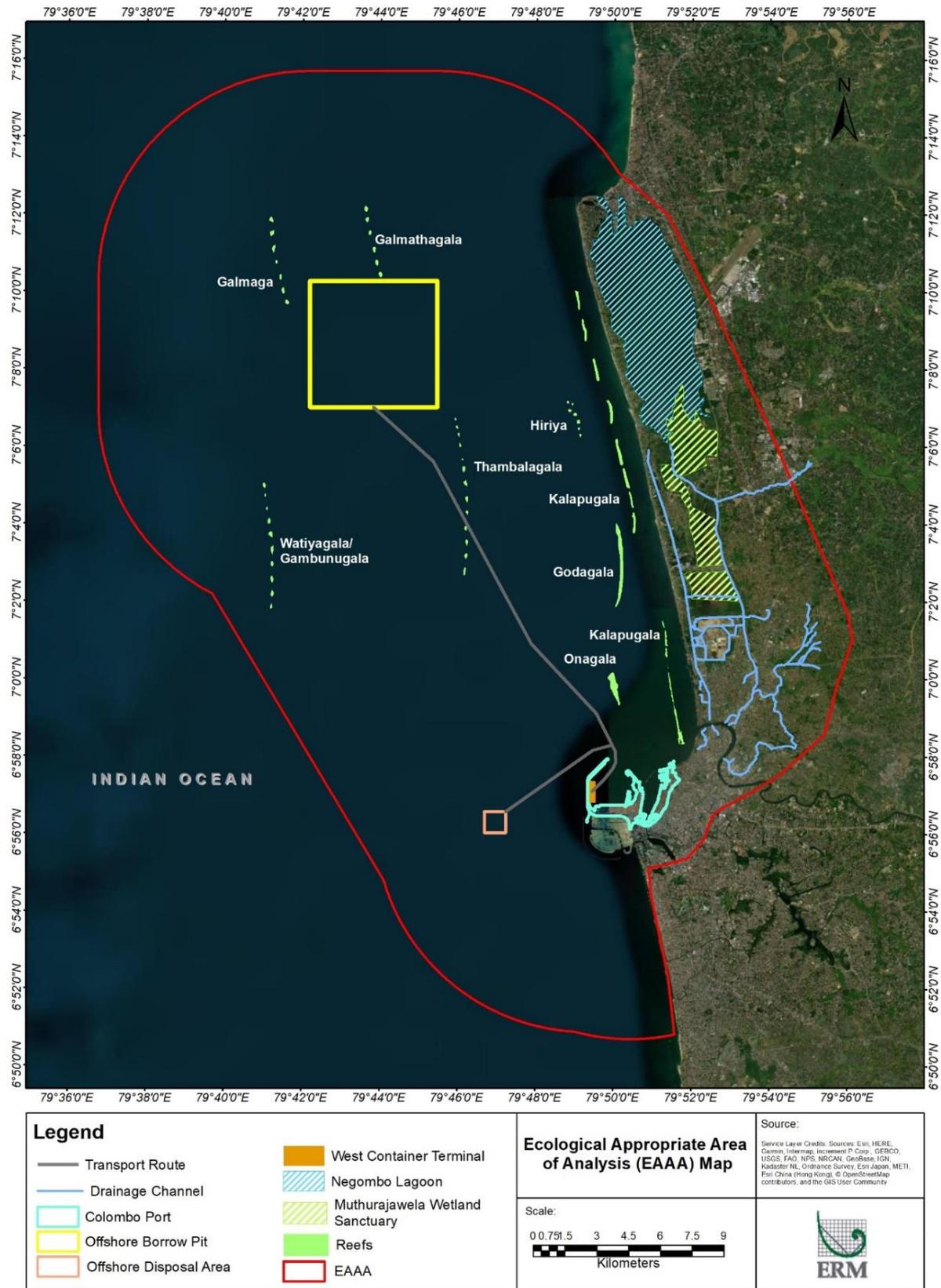
Terrestrial EAAA: Approximately 2 km area were considered as a part of EAAA on the terrestrial side. The EAAA covers Negombo lagoon, Muthurajawela Wetland Sanctuary IBA, major canals and rivers in the terrestrial region. The EAAA map of the area is provided in following figure.

²⁴ Cousins N. and Pittman, S.J. 2021. Guidance for defining Ecologically Appropriate Scales of Analysis for Marine Biodiversity in relation to IFC Performance Standard 6. Bluedot Guidance report.

²⁵ GN59. IFC Guidance Note (2019) of PS6 (2012).

²⁶ GN59. IFC Guidance Note (2019) of PS6 (2012).

Figure 5-26 Ecologically Appropriate Area of Analysis Map



5.4.7 Modified and Natural Habitats

The modified habitats and natural habitats within the EAAA has been delineated and presented in **Figure 5.27**.

Modified Habitats: Modified habitats within the EAAA include the marine part of Colombo Port area; sand borrow areas designated by SLPA for borrow of sands for multiple projects including the area for the current project, offshore disposal area etc.

The marine areas within the break water of Columbo port does represents a modified habitat. The justifications are provided below:

1. The breakwater area does not experience standard wave actions, currents, tidal actions that a natural marine reef experiences.
2. Ranatunga (2015)²⁷ referred that majority of the fish species recorded within the Colombo port environment were reef-associated. However, he referred that reef associated fish species were declined due to change in water quality, urban pollution, increased freshwater flow due to upstream irrigation schemes, construction of the south harbour and development of the north harbour and all these anthropogenic activities may caused site specific damages in developing fish community associated with reef areas. All these indicate that any natural habitats present within the Colombo port area has been degraded due to pollution from developmental activities.
3. Ranatunga (2015) also referred that presence of considerable population sizes of pollution tolerant species *Mugil cephalus* also indicate considerable pollution in the area resulting in a higher reproductive potential of the species.
4. The Colombo harbour area also experiences impacts on water quality from the moving of vessels in the area.

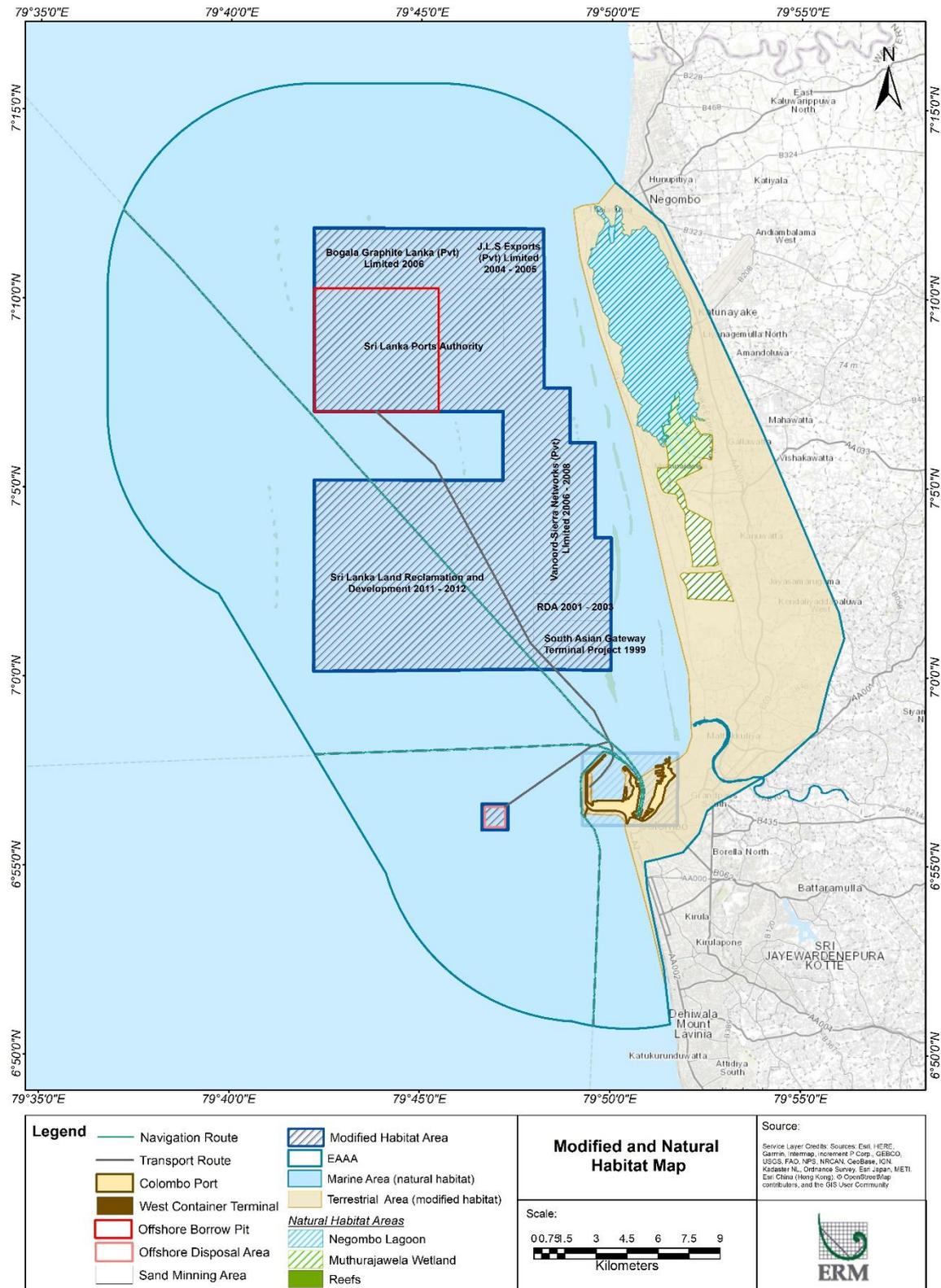
On the terrestrial side, settlement, industrial and commercial areas of Columbo and its outskirts excepting the Negumbo lagoon and Maturajawella Wetland can be considered as modified habitat.

Natural Habitats: The marine areas outside the Colombo port, vessel movement routes and designated sand borrow areas including the rocky reefs within the EAAA can be considered as natural habitats.

On the terrestrial side Negumbo lagoon and Maturawawella Wetland can be considered as Natural Habitat.

²⁷ Ranatunga, R R M K P, H B Asanthi, M D S T de Croos, H B Jayasiri, P B T P Kumara, R A Maithreepala, and M M Pathmalal (2015). Port Biological Baseline Survey Report Volume I –Port of Colombo. Marine Environmental Protection Authority, Ministry of Mahaweli Development and Environment, Sri Lanka.

Figure 5-27 Modified and Natural Habitat Map



5.4.8 Biodiversity Profile of the Study Area

5.4.6.1 Flora

The desk-based assessment conducted for the study site and EAAA revealed the presence of 123 plant species, which included 77 natives and 46 exotics. None of the plant species found here are endemic to Sri Lanka. Species such as Ceylon ebony (*Diospyros ebenum*) [DD(IUCN v2022-1)], Amla (*Phyllanthus emblica*) [LC(IUCN v2022-1)], Indian mahogany (*Chukrasia tabularis*) [LC(IUCN v2022-1)], Chinese salacia (*Salacia chinensis*) [DD(IUCN v2022-1)] and Chinese chaste tree (*Vitex negundo*) [DD(IUCN v2022-1)] were observed in ERM's earlier surveys in the EAAA. Number of cash crops are commonly identified from homestead plantations such as Coconut (*Cocos nucifera*) [Not Assessed (IUCN v2022-1)], Cashew (*Anacardium occidentale*) [LC(IUCN v2022-1)], intermixed with banana cultivation (*Musa spp.*)²⁸.

Significant part of the EAAA is dominated by marine and marshland habitat. Earlier surveys by ERM ecologist team recorded, luxuriant growth of Lesser Bulrush (*Typha angustifolia*) [LC(IUCN v2022-1)] was found in the marshy areas and they have taken up most of the space of the marshlands. *Typha angustifolia* is an "obligate wetland"²⁹ species that is commonly found in across northern hemisphere and can tolerate brackish water. Wherever there are some open water bodies, a growth of common water hyacinth (*Eichhornia crassipes*) [Not Assessed (IUCN v2022-1)] was found. Tree species such as Acacia (*Acacia mangium*) [LC(IUCN v2022-1)], Pond Apple (*Anona glabra*) [LC(IUCN v2022-1)] and white leadtree (*Leucaena leucocephala*) [Not Assessed (IUCN v2022-1)] were found growing along the margins of marshland.

Appendix 5.8 provides list of all floral taxa recorded or reported from the study area and Critical Habitat Assessment of threatened and range restricted tree species has been provided in **Appendix 5.9**.

5.4.1.3 Plankton

Plankton samples collected from 4 stations (2 samples at the Colombo harbour basin near the proposed terminal areas and 2 from borrow areas) during 2022 by SLPA reveal presence of following planktonic organisms.

Harbour basin areas: Plankton encountered from the Colombo harbour basin area include rotifers (*Colurella adriatica*), calanoid copepod, harpacticoid copepods etc. Other planktonic specimens include crustacean larvae, annelid larvae etc.

Sand borrow areas: Plankton encountered from the sand borrow areas include copepods including *Diaptomus* sp. and other calanoid copepods, ostracods and rotifers. Other planktonic specimens include fish embryo, fish eggs, crustacean larvae, *Helicopsyche* larva etc.

Planktonic study conducted by ERM (2019)³⁰ at the Colombo harbour basin and outer harbour area reveal presence of phytoplanktonic organisms³¹ viz. *Ceratium macrocerus*, *Ceratium tripos*, *Ceratium furca*, *Rhizosolenia* sp., *Dinobryon* sp., *Peridinium* sp., *Chaetoceros* sp. Zooplanktonic organisms recorded during ERM (2019), Copepod Nauplius, Copepod -Order Cyclopoida, Copepod-Order Harpacticoida, Copepod -Order Calanoida, Bivalve veliger larvae Fish egg, Barnacle nauplii, Bryozoan cyphanautes larvae, Tunicate larvae, Mysid shrimp, *Sagitta* sp., *Oikopleura* sp

²⁸ ERM earlier survey in the region.

²⁹ https://www.gbif.org/species/search?via=data.gbif.org&dataset_key=d7dddbf4-2cf0-4f39-9b2abb099caae36c&q=13754397%2F

³⁰ Petronet LNG Ltd., Sojitz Corporation, Mitsubishi Corporation and Sri Lanka Gas Terminal Co. Ltd. (2019) EIA Study for LNG/Gas Infrastructure Development Project, Colombo

³¹ Petronet LNG Ltd., Sojitz Corporation, Mitsubishi Corporation and Sri Lanka Gas Terminal Co. Ltd. (2019) EIA Study for LNG/Gas Infrastructure Development Project, Colombo

5.4.1.4 Benthos

Benthic samples were also collected from 4 stations (2 samples at the Colombo harbour basin near the proposed terminal areas and 2 from borrow areas) during 2022 by SLPA. The following benthic organisms were encountered.

Harbour basin areas: Benthic samples collected from the harbour basin areas include gastropod molluscs (family Haminoeidae) and bivalve molluscs (families Veneriidae & Tellinidae).

Sand borrow areas: Benthic samples collected from the sand borrow areas include gastropods of family Trochidae and Cerithiidae.

Coral species recorded by study conducted by ERM (2019) revealed presence of the following coral species *Acropora sp.*, *Acropora stoddarti*, *Montipora sp.*, *Tubinaria sp.*, *Favia sp.*, *Favites sp.*, *Goniastrea sp.*, *Platygyra sp.*, *Symphyllia sp.*, *Symphyllia sp.*, *Pocillopora sp.*, *Pocillopora verrucosa*, *Goniopora sp.*, *Porites sp.*, *Siderastea sp.*

5.4.6.2 Fauna

A total of 270 species of the seven taxonomic groups – the vertebrates (fish, amphibians, reptiles, birds and mammals) and the two selected invertebrate groups (butterflies and dragonflies) are likely to occur here. Of these 234 are native / resident species whereas 17 species were exotic/ introduced species and 20 were endemic. **Appendix 5.10** to **Appendix 5.15** provides list of all faunal taxa recorded or reported from the study area.

The amphibians included a total of eight species in the three families Bufonidae, Dicroglossidae and Rhacophoridae. There were two endemics Common Shrub Frog (*Pseudophilautus popularis*) [VU(IUCN v2022-1)] and Common Hourglass Tree-frog (*Polypedates cruciger*) [LC(IUCN v2022-1)]. Both these species are assessed as probable Critical Habitat Candidate species, in *Section 5.4.8.7* and all amphibian species recorded are listed in **Appendix 5.10**.

A total of 27 species of reptiles which include a crocodile, turtles, agamid lizards, geckos, skinks, monitor lizards and snakes. Among these are four endemics, viz. Sri Lankan Keelback (*Xenochrophis asperimus*) [LC(IUCN v2022-1)], Schokari's bronzeback (*Dendrelaphis schokari*) [VU(IUCN v2022-1)], Flowery wolf snake (*Lycodon osmanhilli*) [LC(IUCN v2022-1)] and Dumerul's kukri snake (*Oligodon sublineatus*) [VU(IUCN v2022-1)]. Among the reptiles is an exotic species Red-eared slider (*Trachemys scripta*) [LC(IUCN v2022-1)]. The crocodile has not been recorded within the site but considering its range and movement capabilities it may be found in the marshes just around the landfill site, particularly during periods of flooding. As part of Critical Habitat Assessment, reptilian species has been assessed in *Section 5.4.8.8* and all reptilian species recorded are listed in **Appendix 5.11**.

As many as 105 bird species belonging to 48 families were recorded. This includes four endemics Sri Lanka Green-pigeon (*Treron pompadora*) [LC(IUCN v2022-1)], Sri Lanka Crimson Fronted Barbet (*Psilopogon rubricapillus*) [LC(IUCN v2022-1)], Sri Lanka Swallow (*Cecropis hyperythra*) [LC(IUCN v2022-1)], and Lesser Sri Lanka Flameback (*Dinopium psarodes*) [LC(IUCN v2022-1)]. A total of 14 migrant species have been recorded in the vicinity during the migratory season and may therefore occur here. It must be noted here that the faunal survey was not conducted during the migratory season. However, **Appendix 5.12** have included avian species that are likely to be found in the study area and surrounding marshlands during the migratory season. As part of Critical Habitat Assessment, Avian species has been assessed in *Section 5.4.8.9*.

17 species of mammals belonging to 10 families would potentially use the village woodland/plantation and marsh habitats³². These include shrews, bats, two wildcats [Rusty spotted Cat and fishing cat], mongoose, otter, civets, porcupine, bandicoots and rats, squirrels and the hare. These did not include any endemics but of these four species are threatened species. The Rusty Spotted Cat (*Prionailurus*

³² Petronet LNG Ltd., Sojitz Corporation, Mitsubishi Corporation and Sri Lanka Gas Terminal Co. Ltd. (2019) EIA Study for LNG/Gas Infrastructure Development Project, Colombo

rubiginosus) [NT(IUCN v2022-1)], is rare but since the range of this species is extensive, its occurrence is possible. The Fishing Cat (*Prionailurus viverrinus*)[VU(IUCN v2022-1)] on the other hand is more common. As part of Critical Habitat Assessment, Mammalian species has been assessed in *Section 5.4.8.10*. The mammalian species recorded are listed in **Appendix 5.13**.

Being a semi-aquatic habitat, fish fauna are of particular significance. With respect to the fish, only six species were observed within the marsh and open water habitat within the site. None of these is endemic or threatened. One is an exotic species. As part of Critical Habitat Assessment, fish species has been assessed in *Section 5.4.8.5* and *Section 5.4.8.6*.

Among the invertebrates are 57 species of butterflies representing six families. This also included the two endemics *Appias galena* (Sri Lankan Lesser Albatross) and *Potanthus satra* (Sri Lankan Dart/Tropic dart). Interestingly one exotic species *Cephrenes trichopepla* (Yellow Palm Dart) were also recorded. Also included were 33 species of dragonflies with none of these being endemic. A few threatened dragonfly species were recorded. As part of Critical Habitat Assessment, invertebrate species has been assessed in *Section 5.4.8.2* to *Section 5.4.8.4*.

Diverse community of corals and associated biota found along the rocky boulders along the breakwater of Colombo Port . Rocks were covered with around 3-5% from live corals. Most of the corals seems to be healthy despite the heavy sedimentation from nearby development work. Reefs were found to be developed within last 2-3 years of the survey after construction of the breakwater under the harbour expansion project. Corals were dominated by *Acropora* sp. followed by *Goniastrea* sp., *Davis* sp., *Favites* sp. and *Montepora* sp.

As part of IEE, underwater surveys revealed that the sand extraction site is devoid of any coral reefs or rocky habitats. Few submerged rocky reefs are located in proximity to the sand borrow area which includes Kalapu Gala and Ona Gala lying in shallower depths and Thamba Gala and Diyaba Gala (Negombo Suda) lying in greater depths. Both Kalapu Gala and Ona Gala had low species diversity and abundance and are influenced by sediments from the Kelani River and hard corals were not reported from both reefs. Diyamba Gala or Gal Maga lies Northwards of the sand borrow area and supports about 14% live coral cover where 19 coral species belonging to 13 coral families were reported, where *Favia* sp. was dominant. Thamba Gala exists south of the sand extraction site and is also low productive reef with presence few coral species.

5.4.7 Critical Habitat Assessment

Both natural and modified habitats may contain high biodiversity values, thereby qualifying as “Critical Habitat”³³. Critical habitats³⁴ are areas with: “high biodiversity value, including:

- (i) Habitat of significant importance to Critically Endangered and/or Endangered species³⁵;
- (ii) Habitat of significant importance to endemic and/or restricted-range species;
- (iii) Habitat supporting globally significant concentrations of migratory species and/or congregatory species;
- (iv) Highly threatened and/or unique ecosystems; and/or
- (v) Areas associated with key evolutionary processes”.

³³ GN28. IFC Guidance Note (2019) of PS6 (2012).

³⁴ Paragraph 16. IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources (2012)

³⁵ As listed on the International Union for the Conservation of Nature (IUCN) Red List of Threatened Species. The determination of critical habitat based on other listings is as follows: (i) If the species is listed nationally / regionally as critically endangered or endangered, in countries that have adhered to IUCN guidance, the critical habitat determination will be made on a project by project basis in consultation with competent professionals; and (ii) in instances where nationally or regionally listed species' categorizations do not correspond well to those of the IUCN (e.g., some countries more generally list species as “protected” or “restricted”), an assessment will be conducted to determine the rationale and purpose of the listing. In this case, the critical habitat determination will be based on such an assessment.

Critical habitats are areas of high biodiversity value that include at least one or more of the five criteria³⁶ specified. Critical Habitat may not be limited to pristine or highly biodiverse areas, but rather may include both modified habitat and natural habitats across the broader landscape that supports the biodiversity values that trigger the Critical Habitat criterion. Critical Habitats can therefore be a subset of both modified habitat and natural habitat.

Assessment for Critical Habitat is undertaken as a screening process against the criteria defined within IFC PS 6 Guidance Note. This involved analysis of desk-based data collection, habitat mapping and incorporation of field survey results. Critical Habitat criteria are defined in PS6 (2012) Guidance Note 6 (GN6, 2019), paragraphs GN69 to 97. **Table 5.15** provides detail of the qualifying requirements for Criteria 1 to 4 (i.e. thresholds), while details of the likely qualifying interests for Criterion 5 will be defined based on research and expert opinion. The criteria listed have been used to complete this assessment.

The five criteria are ‘triggers’; if an area of habitat meets any one of the criteria, it will be considered Critical Habitat irrespective of failing to meet any other criterion. This approach is generally more cautious but is used more widely in conservation. Critical Habitat criteria therefore have two distinctive characteristics. First, components of biodiversity are essentially assigned to only two levels of conservation significance, those that trigger Critical Habitat and those that do not (Tier considerations being secondary to this primary Critical Habitat determination). Second, each criterion is applied separately and not in combination, meaning that the scores are not cumulative.

Table 5-17 Quantitative thresholds for critical habitat

Criteria	Thresholds
Criterion 1: Critically Endangered (CR) / Endangered (EN) species;	(a) Areas that support globally-important concentrations of an IUCN Red-listed EN or CR species (0.5 % of the global population AND 5 reproductive units of a CR or EN species); (b) Areas that support globally-important concentrations of an IUCN Red-listed VU species, the loss of which would result in the change of the IUCN Red List status to EN or CR and meet the thresholds in (a). (c) As appropriate, areas containing nationally/regionally-important concentrations of an IUCN Red-listed EN or CR species.
Criterion 2: Habitat of significant importance to endemic and/or restricted-range species;	Areas that regularly hold ≥ 10 % of the global population size AND ≥ 10 reproductive units of a species.
Criterion 3: Habitat supporting globally significant concentrations of migratory species and/or congregatory species;	(a) Areas known to sustain, on a cyclical or otherwise regular basis, ≥ 1 % of the global population of a migratory or congregatory species at any point of the species’ lifecycle. (b) Areas that predictably support ≥ 10 % of the global population of a species during periods of environmental stress.
Criterion 4: Highly threatened and/or unique ecosystems; and/or	(a) Areas representing ≥ 5 % of the global extent of an ecosystem type meeting the criteria for IUCN status of CR or EN. (b) Other areas, not yet assessed by IUCN, but determined to be of high priority for conservation by regional or national systematic conservation planning.
Criterion 5: Areas associated with key evolutionary processes	No set thresholds.

Source: IFC, PS6 (Guidance Note 2019)

Notes: Restricted-range/ Endemic Species (GN74) = For marine systems, restricted-range species are provisionally being considered those with an EOO of less than 100,000 km²; Migratory species = Any species of which a significant proportion of its members cyclically and predictably move from one geographical area to

³⁶ GN53. IFC Guidance Note (2019) of PS6 (2012).

another (including within the same ecosystem); Congregatory Species = Species whose individuals gather in large groups on a cyclical or otherwise regular and/or predictable basis.

5.4.2 Critical Habitat Assessment (Criterion 1-3)

5.4.2.1 Critical Habitat Assessment for Plants

Cynanchum tunicatum, a climber species was recorded from homestead plantation habitat. Under the National Red List³⁷ (2012), *Cynanchum tunicatum* has been evaluated as Endangered, however global red list status has not been evaluated (IUCN v2022-1). This species has been evaluated under Criterion 1 of Critical Habitat Assessment Criterion.

Apart from *Cynanchum tunicatum*, five other plant species were screened in during IBAT screening done for the proposed project, site. Five of these species were identified to be threatened and range restricted species [distribution range >50,000km²], so were assessed under both Criterion 1 and 2. Critical habitat assessment for plant has been presented in **Appendix 5.9**.

5.8.4.2 Taxonomic Group – Phylum - Cnidaria (Corals)

As discussed in the Habitat section, reefs namely Galmaga, Galmathagala, Thambalgala and the Kalapu Gala are small narrow reefs system located in the marine component of the EAAA. But, these are not coral reefs rather, these are rock reefs have very little hard coral cover. Earlier survey by ERM team indicates that most of the areas of the reef were exposed whereas some areas were covered with some soft corals dominated by gorgonian sea fans, black corals and other soft coral such as *Dendronephthya* sp.³⁸ Some hard corals colony such as *Montastrea valencienesi* [NT (IUCN 2022-v1)] have been recorded rarely (earlier surveys not related to this project).

Critical Habitat Assessment for Cnidaria (Coral)

Though earlier surveys did not record any threatened coral species, two globally Threatened (IUCN 2022-v1) coral species were screened in during IBAT screening done for the proposed project site. These coral species were identified to be threatened and range restricted species, so were assessed under Criterion 1.

A total of 19 coral species belonging to 13 coral families were recorded in the IEE³⁹, where *Favia* sp. was dominant. Reported species at Diyamba Gala reef are *Acropora* sp., *Pachyseris* sp., *Pavona* sp., *Turbinaria* sp., *Galaxea* sp., *Cyphastrea* sp., *Fungia* sp., *Lobophyllia* sp., *Goniastrea* sp., *Platygyra* sp., *Pectinia* sp., *Leptoria* sp., *Favites* sp., *Symphyllia* sp., *Favia* sp., *Montastraea* sp., *Oxypora* sp., *Pocillopora* sp., and *Porites* sp¹. Critical Habitat Assessment of Coral Species has been presented **Appendix 5.15**.

5.8.4.3 Taxonomic Group – Phylum – Echinodermata (Sea Urchin & Sea cucumbers)

Critical Habitat Assessment for Echinodermata (Sea Urchin & Sea cucumbers)

Though there are no records of any threatened sea cucumber species, four globally Threatened (IUCN 2022-v1) sea cucumber species were screened in during IBAT screening done for the proposed project site. These sea cucumber species were identified to be globally threatened (IUCN 2022-1), so were assessed under both Criterion 1. Critical Habitat Assessment of Echinoderms has been presented **Appendix 5.17**.

³⁷ MOE 2012. The National Red List 2012 of Sri Lanka; Conservation Status of the Fauna and Flora. Ministry of Environment, Colombo, Sri Lanka. viii + 476pp

³⁸ Environment and Social Impact Assessment (ESIA) for 350 MW RLNG Combined Cycle Power Plant at Kerawalapitiya, Sri Lanka ERM 2022.

³⁹ IEE for Proposed Offshore Sand Extraction from SLPA Sand Borrow area at Kerawalapitiya for reclamation of East Container Terminal- Phase II (ECT- Phase II) and West Container Terminal-1 (WCT-I) in the Port of Colombo

CH Rationale for Echinoderms

Appendix 5.16 Indicates that marine and estuarine habitat types present within the EAAA are not suitable for *Holothuria nobilis* and *Thelenota ananas*, as they are mostly associated with coral reef habitat, and such habitats are not present within the EAAA. However, suitable habitat such as shallow lagoon and protected banks are found within the EAAA, for two species viz. *Holothuria scabra* and *Holothuria lessoni*. In absence of population abundance of these species in wild, information regarding sea cucumber fishing in Sri Lanka were used as an indicator of abundance of sea cucumber species within the EAAA.

A sea cucumber fishery has existed in the northern parts of the island for many years, but in the south, along the coast from Negombo to Dondra (this sections includes the EAAA), sea cucumber fishery began to develop in the 80's and 90's. Once abundant in the shallow coastal waters of southern Sri Lanka, wild stock of sea cucumber in the southern coasts depleted by mid 2000's, resulting in the collapse of sea cucumber fishery in Southern Sri Lanka^{40 41}. Presently the sea cucumber fishery is mostly restricted to still productive areas (in terms of sea cucumber harvest) off the north-western coast, from Puttlam to Mannar and on the eastern coast of the country⁴², refer to **Figure 5.28**. Moreover, crime related to poaching and smuggling of sea cucumber, in recent times⁴³ (from 2015 to 2020) are mostly reported from north western, northern and eastern coasts of Sri Lanka, indicating harvest is mostly done in these areas. Considering the EAAA is located outside the productive areas, it can be assumed that sea cucumber abundance is not high enough to sustain a fishery industry, so even if these species are present in the EAAA, their population is unlikely to cross thresholds of Criterion 1.

So none of the four species of sea cucumber viz. *Holothuria scabra*, *Holothuria lessoni*, *Holothuria nobilis* and *Thelenota ananas* are considered as Critical Habitat Candidate for the EAAA.

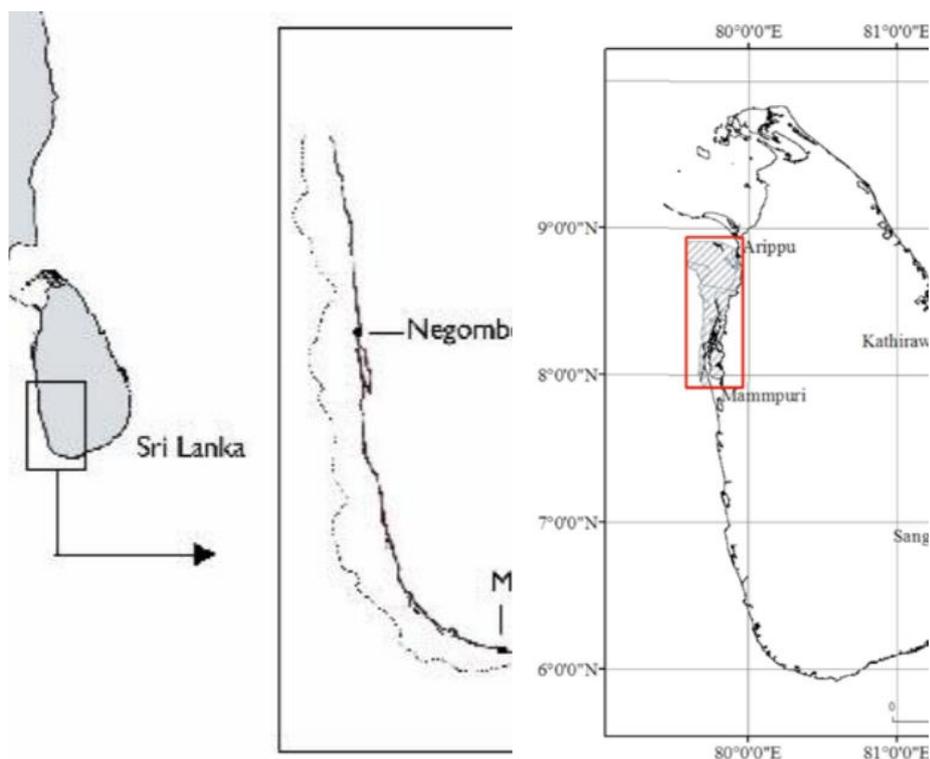
⁴⁰ Kumar. P.B.T.P., Cumaraanantunge. R., Linden. O. 2005. Present Status of the sea cucumber Fishery in Southern Sri Lanka: A resource Deplited Industry.

⁴¹ Rodrigo. M. (2019, August 10th). Sri Lanka pushes for protection of sea cucumber amid overexploitation. Mongabay. <https://news.mongabay.com/2019/08/sri-lanka-pushes-for-protection-of-sea-cucumbers-amid-overexploitation/>

⁴² Dissanayake. D.C.T., Athukoorala, S. 2010. Present status of the sea cucumber fishery in Sri Lanka.

⁴³ Bondaroff. T.P. 2021. Sea cucumber crime in India and Sri Lanka during the period 2015-2020.

Figure 5-28 Major Sea Cucumber Fishing Areas of Sri Lanka



Major sea cucumber fishing areas and landing stations of Southern Sri Lanka
Source: Kumar. P.B.T.P., Cumaraanunge. R., Linden. O. 2005.

Major sea cucumber fishing areas on the north western and eastern coasts of Sri Lanka.
Source: Dissanayake. D.C.T., Athukoorala, S. 2010.

5.8.4.4 Taxonomic Group – Phylum - Arthropoda (Crabs, Shrimp, insects)

Earlier surveys by ERM ecology team recorded total 56 butterfly species³¹. None of these species were identified to be threatened range restricted or migratory, so these species were not assed against the criterion of Critical Habitat Assessment, but IBAT screening done for proposed Kerawalapitiya project site, screened in one range restricted and threatened species Malabar Rose (*Pachliopta jophon*) [EN (IUCN 2022-1)]. So, this species was assessed under Criterion 1 & 2.

Total 33 dragonfly and damselflies were recorded by ERM team in earlier surveys³¹. None of these species were identified to be threatened range restricted or migratory, so these species were not assed against the criterion of Critical Habitat Assessment. In addition to the species identified in earlier surveys, IBAT screening done for proposed project site, screened in four threatened and range restricted Odonates (dragonfly and damselflies), so these species was assessed under Criterion 1 & 2.

Though earlier survey did not record any freshwater crab species, IBAT screening done for proposed project site, screened in 10 freshwater crab species. So this species was assessed under Criterion 1 & 2. Critical Habitat Assessment of Arthropoda has been presented **Appendix 5.18**.

5.8.4.5 Taxonomic Group – Class – Actinopterygii (Bony Fish)

Bony fish species typically has endoskeletons made of bones and are found in both freshwater, brackish and marine environment. Earlier surveys and consultation with local fishermen has established presence of twenty three freshwater and brackish water species from the waterbodies, canals and marshes surrounding the proposed project site. Among the recorded fish species, one is globally Critically Endangered species (IUCN 2022-1) Desilvai's Blind Eel (*Monopterus desilvai*).

Monopterus desilvai is also a range restricted species and assessed as Critically Endangered by the National Red List of Sri Lanka (2012). Day's Killifish (*Aplocheilichthys dayi*) recorded during earlier survey by ERM team is also a range restricted species and assessed as Endangered by both global IUCN (2022-v1) and National (2012) IUCN Red list. Apart from these two species none of the other species are globally threatened (IUCN red List v2022-1), however one species Asian Swamp Eel (*Ophisternon bengalense*) is assessed as Critically Endangered by the National Red List (2012) and another species, Sri Lankan Silver Carpet (*Amblypharyngodon grandisquamis*) has been assessed as Endangered by the National Red List (2012). In addition to the two globally threatened and two nationally threatened species, IBAT screening done for the proposed project site, has screened in additional 16 threatened and range restricted freshwater fish species, so these species were assessed against Criterion 1 & 2.

In addition to the freshwater fish species, earlier marine survey has recorded total 19 marine fish species. None of the recorded fish species are nationally or globally threatened. However, two globally Threatened (IUCN 2022-v1) marine Actinopterygii species were screened in during IBAT screening done for the proposed project site. These marine fish species were identified to be globally threatened (IUCN 2022-1), so both were assessed under both Criterion 1.

Critical Habitat Assessment for Actinopterygii (Bony Fish)

Total 22 freshwater and marine species were assessed for Critical Habitat Assessment. Critical Habitat Assessment of Actinopterygii has been presented **Appendix 5.19**.

5.4.8.6 Taxonomic Group – Class – Chondrichthyes (Sharks, Rays, Guitarfish & Sawfish)

Chondrichthyes fish species typically has endoskeletons made of cartilage and with exception to very few species of sharks and rays, most of the Chondrichthyes are marine or estuarine. No Chondrichthyes species were recorded from earlier surveys³¹ carried out by ERM ecology team in Marine component of the EAAA. IBAT screening done for the proposed project, has screened in 22 Threatened [IUCN (2022-v1)] Chondrichthyes species, which were assessed against Criterion 1. None of the screened species are range restricted, but some show migratory behavior. So, species that shows migratory behavior were assessed against Criterion 3. Critical Habitat Assessment of Chondrichthyes has been presented **Appendix 5.20**.

5.4.8.7 Taxonomic Group – Class – Amphibia (Frogs)

During earlier survey by ERM team⁴⁴, four frog species were recorded (amphibian). Out of four species one is Globally Vulnerable [IUCN (2022-v1)], viz. Common Shrub Frog (*Pseudophilautus popularis*)³¹. The species was recorded from marsh as well as homestead plantation habitat of the EAAA. Apart from these species, two more globally Threatened (IUCN 2021-v2) Amphibian species were screened in during IBAT screening done for the proposed project site. All these three species were assessed against Criterion 1 & 2 of Critical Habitat Assessment.

Critical Habitat Assessment for Amphibians

Total three frog species were assessed for Critical Habitat Assessment. Critical Habitat Assessment of Phylum has been presented **Appendix 5.21**.

⁴⁴ Petronet LNG Ltd., Sojitz Corporation, Mitsubishi Corporation and Sri Lanka Gas Terminal Co. Ltd. (2019) EIA Study for LNG/Gas Infrastructure Development Project, Colombo

5.8.4.8 Taxonomic Group – Class – Reptilian

Total six reptilian species were recorded during earlier survey by ERM team⁴⁵. Out of all these six species Water Monitor (*Varanus salvator*) was recorded from almost all habitat types, viz. marsh, waterbodies and homestead plantation. Water Monitor is assessed as a Least Concerned species by Global 2022-v1) as well as National (2012) red list. Saltwater Crocodile (*Crocodylus porosus*) [LC(IUCN 2022-v1)] was not recorded during earlier survey, but number of literature^{46 47} indicate presence of the species within the EAAA. Though globally the species has been assessed as Least Concerned(IUCN 2022-v1), The species is assessed as “Critically Endangered” by Sri Lanka’s National Red List (2012), So considering National status of Saltwater crocodile has been assessed against Criterion 1 of Critical Habitat Assessment. Apart from these species one more globally Threatened (IUCN 2022-v1) reptilian species were screened in during IBAT screening done for the proposed project site.

Critical Habitat Assessment for Reptiles

Total two reptilian species was assessed. Critical Habitat Assessment of Reptiles has been presented **Appendix 5.22**.

5.8.4.9 Critical Habitat Assessment for IUCN Threatened Avian Species

Taxonomic Group – Class – Aves (Birds)

During earlier survey by ERM ecology team total 33 resident (non-migratory) birds were recorded from the study area⁴⁸. All these species are Least Concern species [IUCN(v2022-1)].

Apart from these species literature⁴⁹ indicates presence of 17 migratory species during winter migratory season in the EAAA. Out of 17 species assessed under Criteria 3, two are Near Threatened [IUCN(v2022-1)] viz. Curlew Sandpiper (*Calidris ferruginea*) and Pallid Harrier (*Circus macrourus*). Rest of the species are Least Concern [IUCN(v2022-2)]. All these migratory species were assessed against Criteria 3 of Critical Habitat Assessment.

Moreover, IBAT screening done for the proposed project site, screened in additional 2 threatened species [IUCN(v2021-2)]. These species were assessed against Criteria 1 of Critical Habitat Assessment. Critical Habitat Assessment of Avifauna has been presented **Appendix 5.23**.

CH Rationale for Migratory Avian Fauna

All assessed migratory species has a huge EOO as well as Wintering range. Moreover these species have multiple winter migration site and most of these sites are spread across multiple regions through multiple continent or within same continent. Apart from that, there are no evidence of these species congregating in huge numbers within the EAAA, so it is highly unlikely that the EAAA will periodically hold >10% of global population of all these species.

So, the EAAA is not considered critical habitat for these migratory avian fauna. Critical Habitat Assessment of migratory Avifauna has been presented **Appendix 5.24**.

⁴⁵ Petronet LNG Ltd., Sojitz Corporation, Mitsubishi Corporation and Sri Lanka Gas Terminal Co. Ltd. (2019) EIA Study for LNG/Gas Infrastructure Development Project, Colombo

⁴⁶ Bambaradeniya, C. N. B., S. P. Ekanayake, L. D. C. B. Kekulandala, V. A. P. Samarawickrama, N. D. Ratnayake and R. H. S. S. Fernando. 2002. An Assessment of the Status of Biodiversity in the Muthurajawela Wetland Sanctuary. Occ. Pap. IUCN, Sri Lanka., 3:iv-48pp.

⁴⁷ A.A.T. Amarasinghe, M.B. Madawala, D.M.S.S. Karunarathna, S.C. Manolis, A. de Silva, R. Sommerlad. 2015. Human-Crocodile conflict and conservation implications of Saltwater Crocodiles *Crocodylus porosus* in Sri Lanka.

⁴⁸ Petronet LNG Ltd., Sojitz Corporation, Mitsubishi Corporation and Sri Lanka Gas Terminal Co. Ltd. (2019) EIA Study for LNG/Gas Infrastructure Development Project, Colombo

⁴⁹ Bambaradeniya, C. N. B., S. P. Ekanayake, L. D. C. B. Kekulandala, V. A. P. Samarawickrama, N. D. Ratnayake and R. H. S. S. Fernando. 2002. An Assessment of the Status of Biodiversity in the Muthurajawela Wetland Sanctuary. Occ. Pap. IUCN, Sri Lanka., 3:iv-48pp.

5.4.8.10 Taxonomic Group – Class – Mammals

Total thirteen mammalian species were recorded during earlier survey³¹. Least Concerned [IUCN (v2022-1)] species like Common musk shrew (*Suncus murinus*), Palm Civet (*Paradoxurus hermaphoditus*), Porcupine (*Hystrix indica*), Greater bandicoot rat (*Bandicota indica*), Indian house mouse (*Mus musculus*), Common rat (*Rattus rattus*), Palm squirrel (*Funambulus palmarum*) and Black-naped hare (*Lepus nigricollis*) was recorded from Homestead Plantation, during primary survey. Apart from these two least concerned [IUCN (v2022-1)] species were also recorded from the study area viz. Short-nosed fruit bat (*Cynopterus sphinx*) and Indian Flying fox (*Pteropus giganteus*).

Apart from these a globally Vulnerable species [IUCN (v2022-1)], viz Fishing Cat (*Prionailurus viverrinus*) and Near Threatened [IUCN (v2022-1)] Rusty Spotted Cat (*Prionailurus rubiginosus*) was reported from the study area. Both these species are assessed as Endangered by national red list of Sri Lanka (2012), so both these species were assessed under Criterion 1 of Critical Habitat.

In addition to these species IBAT screening done for the proposed project site, screened in additional six mammalian species. So, these species were also assessed for Critical Habitat.

Marine Mammals

During the IEE study, two species of dolphins; Common dolphin (*Delphinus delphis*- IUCN Least Concern) and Spinner dolphin (*Stenella longirostris*- IUCN Least Concern) were reported in more offshore seas of Negombo. IEE report also stated that some records of stranded whales from the Negombo area is reported.

Blue whales in the northern Indian Ocean, including the Sri Lanka, appear to be pygmy blues (*B. musculus breviceuda*) although their exact taxonomic status is uncertain. The first records of blue whales in Sri Lankan waters date from 1894 (Haly, 1894 as referenced in De Silva, 1987). Since then they have been observed all around the island. It is widely accepted that northern Indian Ocean stock migrates seasonally (CMS Appendix I). During the SW monsoon, the long-shore flow of the West Indian Coastal Current induces upwelling along the SW coast of India, promoting a major phytoplankton bloom there. This productive water is carried southward around the west and south coasts of Sri Lanka, which results in congregation of Blue whale along the Western Coast of Sri Lanka during South West Monsoon (from April to October). Apart from Western Coast of Sri Lanka, North Eastern coast and Southern Coast of the country are also significant as Blue Whale congregation site.

Studies conducted on Blue whales in Sri Lanka (Kirumbara et al., 2022 , Russel et al., 2020) , indicate that Blue whales are recorded at much deeper areas. Kirumbara et al, (2022) reported blue whales at depth over 200 m. Minimum depth where blue whales are reported by Russel et al., (2020) is 84 m. The IEE study also does not indicate presence of blue whale in the sand borrow area

Critical Habitat Assessment for Mammals

Total eight mammalian species were assessed under Criterion 1 and range restricted species were assessed under Criterion 2. Critical Habitat Assessment of Mammals has been presented **Appendix 5.25**.

Conclusion of Critical Habitat Assessment (Criteria 1-3)

None of the species assessed under Criteria 1, 2 and 3 of IFC PS6 was found to be Critical Habitat Trigger for the project site or the EAAA.

Critical Habitat Criterion 4: Highly Threatened and/or Unique Ecosystems

For Criterion 4, the EAAA has not been assessed by the IUCN against relevant IUCN threatened status (Criterion 4 threshold a). Given that the areas have not yet been assessed by IUCN, an assessment is required to determine whether the habitat would be of high priority for conservation by regional or national systematic conservation planning.

Muthurajawela Important Bird Area (IBA) is located in the northern part of the EAAA, along the southern shore of Nogombo Lagoon and located approximately 10km west of the project site. Based on Birdlife international's Data Zone⁵⁰, the IBA trigger species is Intermediate Egret (*Ardea intermedia*), which is a "Least Concern" species [IUCN Redlist (v2022-1)]. Population of the species is not available from the Muthurajawela IBA, but the species was triggered under A4i IBA Criteria (Congregation site). Intermediate Egret (*Ardea intermedia*) has a distribution range spread across South Asia, Southeast Asia and East Asia. EOO of the species is huge and spread across 30300000 km². Though Intermediate Egret has certain degree of affinity towards waterbodies, the species inhabits wide variety of habitats covering forests, grasslands, marine neritic, marine intertidal, coastal etc.

Guidance Note (2019) of PS6 (2012) sets following thresholds for Criterion 4 :

- a) Areas representing ≥5% of the global extent of an ecosystem type meeting the criteria for IUCN status of CR or EN.
- b) Other areas not yet assessed by IUCN but determined to be of high priority for conservation by regional or national systematic conservation planning.

The EAAA typically represents coastal/estuarine marshland mangrove ecosystem, such ecosystems are found all through tropical parts of the globe, particularly along the coast. So ecosystem types within the EAAA is less likely to hold ≥5% of the global extent of an ecosystem type

Muthurajawela Wetland Sanctuary (IUCN Management Category IV⁵¹) covers certain section of Muthurajawela marshland for protection and conservation. Nearest section of the sanctuary is located approximately 10 km from the boundary of project site and there are industrial areas, landfill sites and marshlands located between the protected area and the project site. The project is not located within the protected area and less likely to have direct impact on the protected area.

Based on the assessment, Criterion 4 will not be triggered.

Critical Habitat Criterion 5: Key Evolutionary Processes

Criterion 5 has no tiered system though IFC PS6 describes this Criterion to be one of the following:

- Physical features of a landscape that might be associated with evolutionary processes (for example isolated areas, areas of high endemism, spatial heterogeneity, environmental gradients, edaphic interfaces, biological corridors or sites of demonstrated importance to climate change adaptation); and/or
- Subpopulations of species that are phylogenetically or morpho-genetically distinct and may be of special conservation concern given their distinct evolutionary history. The latter includes evolutionarily significant units and evolutionarily distinct and globally endangered species.

The EAAA is not categorized to have any of the above-mentioned features.

Based on the assessment, Criterion 5 will not be triggered.

Therefore, to conclude the project is not located within a "Critical Habitat".

5.5 Archaeological Significant

This section presents a discussion of the existing built heritage and underwater cultural heritage of the study area. As seafaring nation, there is a particular maritime linkage between Sri Lanka and these European colonial powers. Of those features remaining from colonial times, many have been gazetted for protection under the Antiquities Ordinance (No.9 of 1940), whilst others have been recognised as being of interest within the City of Colombo Development Plan, (1999).

⁵⁰ <http://datazone.birdlife.org/site/factsheet/muturajawela-iba-sri-lanka/details>

⁵¹ [Explore the World's Protected Areas \(protectedplanet.net\)](https://www.protectedplanet.net/)

As part of the Feasibility Study EIA52 a total of seven heritage structure was identified which are either been gazetted for protection under the Antiquities Ordinance, or are recognised as being of interest within the City of Colombo Development Plan, these are:

- The light house on the NW breakwater built in 1881
- The light house on the N breakwater built in 2876
- Customs House- now used as SLPA Headquarters
- Ancient Ramparts- remnants of Battenburg Battery
- Ancient Dutch Warehouse- now used as the SLPA Maritime Museum
- A lighthouse on the NE breakwater built in 1907
- Port Commission Building – now used by SLPA and the Ministry

Other places of cultural or religious significance in the southern end of the port are:

- The Chaitya
- Governor’s Bath
- The new lighthouse on Marine Drive

5.6 Socio-economic Environment

5.6.1 Introduction

Based on an assessment of project, for collection of socio-economic baseline information, following ZOI has been considered. Project site is located in Divisional Secretary’s Divisions (DSD) of Colombo, Negombo, Wattala and covers Gram Niladhari Divisions (GND) in the aforementioned DSDs are shown in the **Table 5.16**. The socio economic features of the above mentioned DSD are discussed in this section.

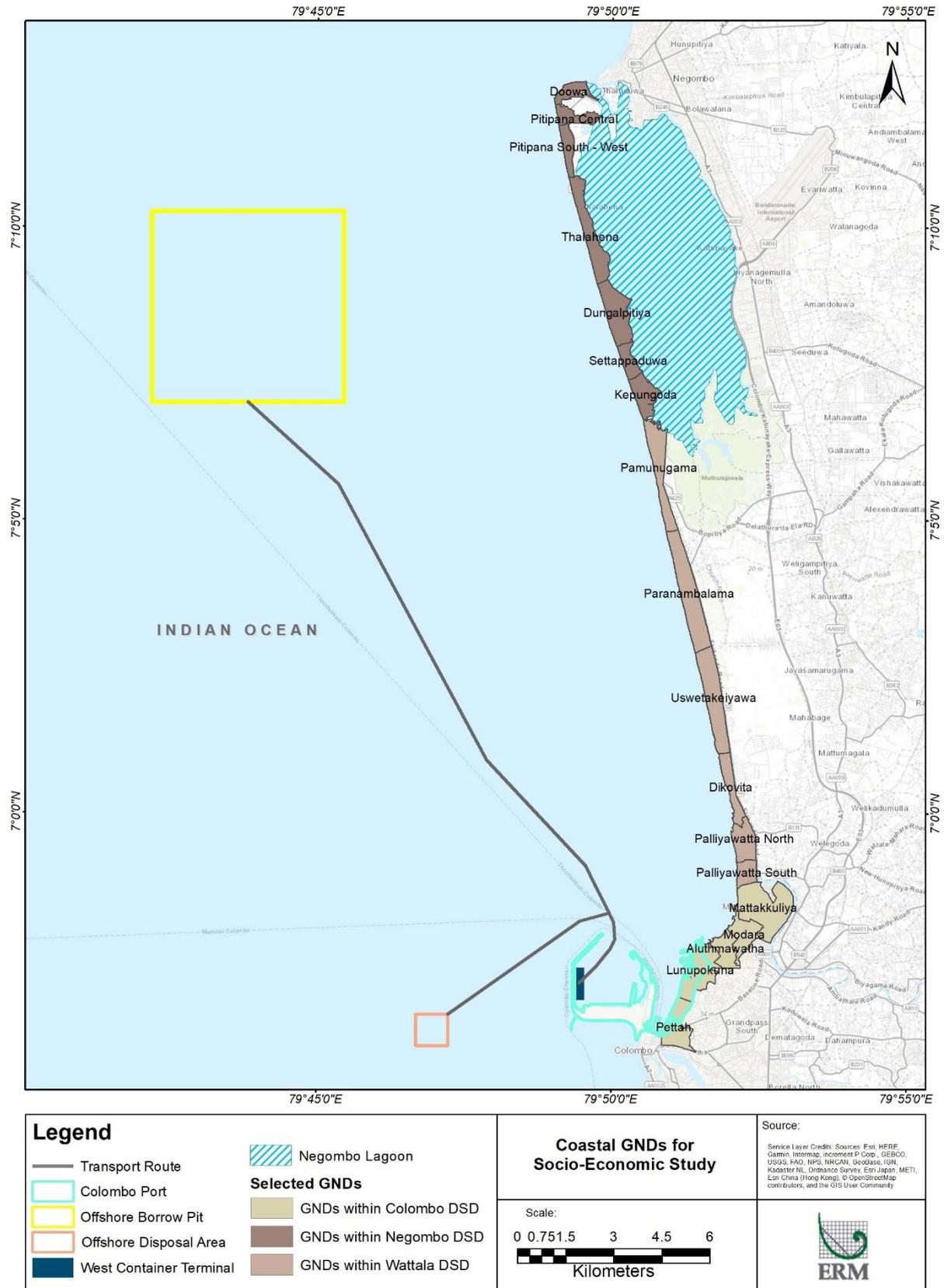
Table 5.18 ZOI- Administrative Structure

Divisional Secretary’s Divisions (DSD)	Grama Niladhari Divisions (GND)
Colombo	Pettah, Lunupokuna, Aluthmawatha, Modara, Mattakkuliya
Negombo	Palliyawatta South, Palliyawatta North, Dikovita, Uswetakeiyawa, Paranambalama, Pamunugama
Wattala	Kepungoda, Settappaduwa, Dungalpitiya, Thaladena, Pitipana South-West, Pitipana Central, Doowa

The maps showing the GNDs and DSDs within the ZOI is presented in **Figure 5.29**.

⁵² Maunsell et al. (2001) Colombo Port South Harbour Development: Part G – Environmental Impact Assessment, Asian Development Bank T.A.3276 SRI.

Figure 5-29 GNDs and DSDs within the ZOI



5.6.2 Demographic Profile of ZOI

5.6.2.1 Population

DS wise total population of the study area is as follows – Colombo 2479518, Negombo 165316, Wattala 203985. The **Table 5.17** gives a representation of the above mentioned information.

Table 5.19 Population of DSDs falling in the ZOI

Divisional Secretary's Divisions (DSD)	Total Population
Colombo	2479518
Negombo	165316
Wattala	203985

Source: Resource profile of Negombo DS Office 2019

Colombo is the most populated DS and Negombo is the least of all the ZOI DS. GNs within the Colombo DSD sharing only 3.15% of the total population and whereas GNs within Negombo shares 11.78% of total Negombo population. Details of GN wise population showed in **Table 5.18**. For better understanding of the impacts on the population residing adjacent to the project site, the sex percentage data needs to be studied. The following **Table 5.19** gives the information regarding the DSD and GND wise sex percentage and the age group.

Table 5.20 Summary of Total Population in ZOI related GNDs

Name of DSD	Total Population in GNDs	Percentage of Total Population
Colombo	78173	3.15%
Negombo	19490	11.78%
Wattala	22530	11.04%

Source: Resource profile of Negombo DS Office 2019

Table 5.21 Gender Segregated Population Data

Name of DSD	DSDs				Coastal GNDs			
	Female		Male		Female		Male	
	No	%	No	%	No	%	No	%
Colombo	1,262,910	50.93	1,216,608	49.07	38871	49.72	39302	50.28
Negombo	85,673	51.82	79,540	48.11	10049	51.56	9441	48.44
Wattala	106,453	52.19	97,532	47.81	10788	47.95	10711	47.48

Source: Resource profile 2019

As per the **Table 5.17**, Wattala DS recorded the highest female percentage, i.e. 50.93 percent and lowest recorded in Colombo DS, i.e. 50.93 percent. And GND of Negombo DS, recorded the highest percentage of female population which is 51.56 percent and whereas GND of Wattala DS recorded 47.95 percent of female population which is the lowest among ZOI GNDs.

5.6.2.2 Ethnic Group

As per the data presented, Sinhala is the major ethnic group in the all GNs of ZOI with 73%. Islam is the second most common ethnic group with approximately 15 percent of the population. The information regarding the ethnic group is shown in **Table 5.20** and represent in the **Figure 5.26**.

Table 5.22 Ethnic Group wise Population in Zol GNDs

GNDs	Sinhala		Tamil		Muslim		Burgher		Other	
	No	%	No	%	No	%	No	%	No	%
Negombo	19367	99.37	86	0.44	26	0.13	7	0.04	4	0.02
Wattala	19515	86.51	2665	11.94	70	0.31	132	0.59	34	0.15
Colombo	25634	32.79	6652	8.51	37070	47.42	6254	8.00	2563	3.28

Source: Resource profile 2019

5.6.2.3 Religious Profile

As shown in the **Table 5.21**, Catholic is majority religion in ZOI GNDs with 63.3 percent followers. At GNDs of Negombo 93.63 percentage of population follows Catholic religion, followed by Wattala where around 91 percent people are catholic. In Colombo, almost 33 percent believes in Christianity, followed by Wattala where 3.84 percent people follow Christianity. Islam is second most popular religion in Colombo GNDs with approximately 23 percent of population following it. **Figure 5.27** represents the religious profile of the ZOI.

Table 5.23 Religious Data in ZOI GNDs

GNDs	Buddhist		Catholic		Christian		Hindu		Islam		Other	
	No	%	No	%	No	%	No	%	No	%	No	%
Negombo	370	1.9	18,249	93.63	680	3.49	83	0.43	50	0.26	58	0.3
Wattala	2886	7.39	19,055	91.1	1,498	3.84	1,732	4.44	239	0.61	120	0.23
Colombo	19349	24.75	4,110	5.26	25685	32.86	6,370	8.15	18,497	23.66	4,162	5.32

Source: Resource profile 2019

Figure 5-30 Ethnic Group of ZOI

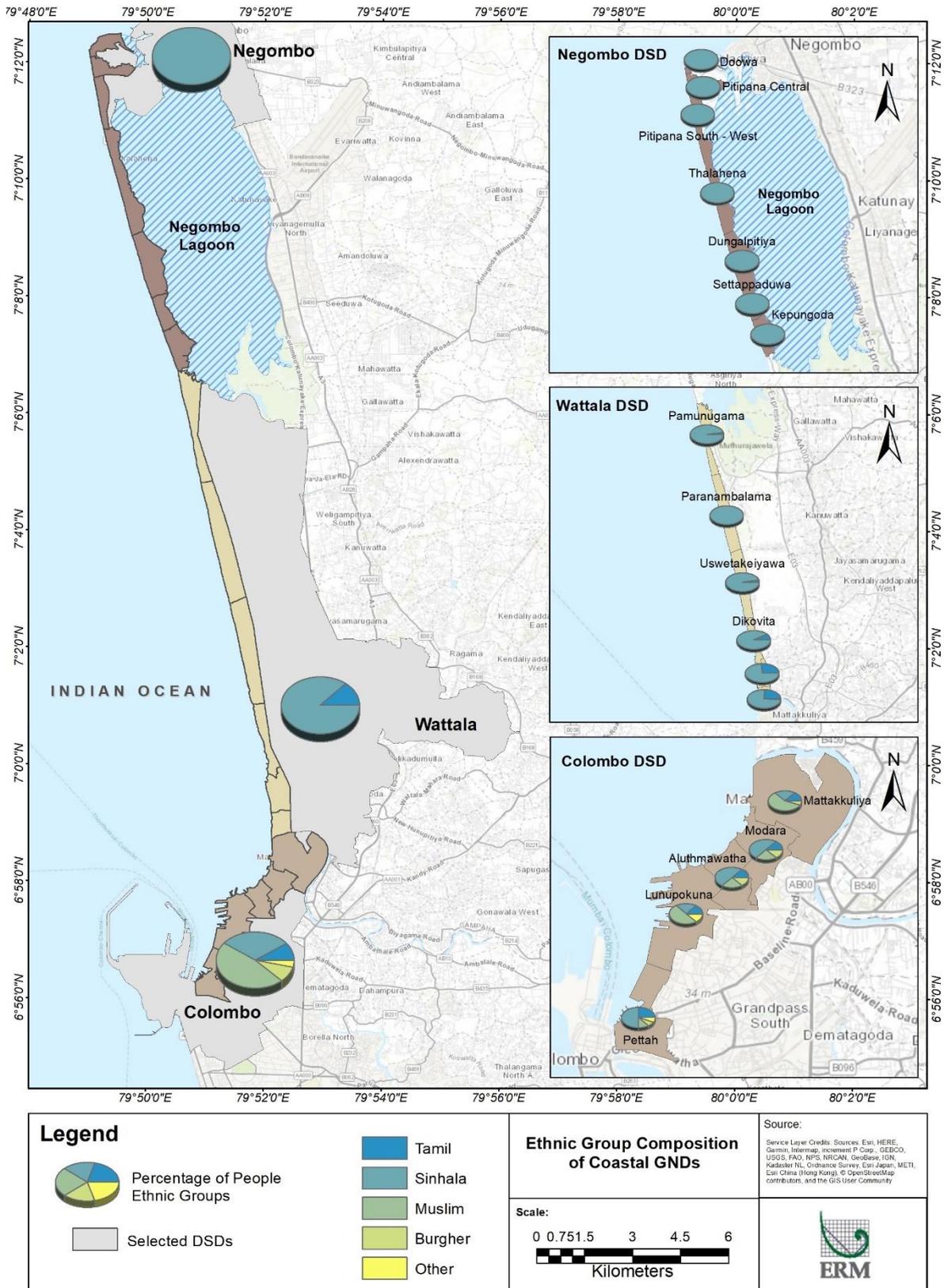
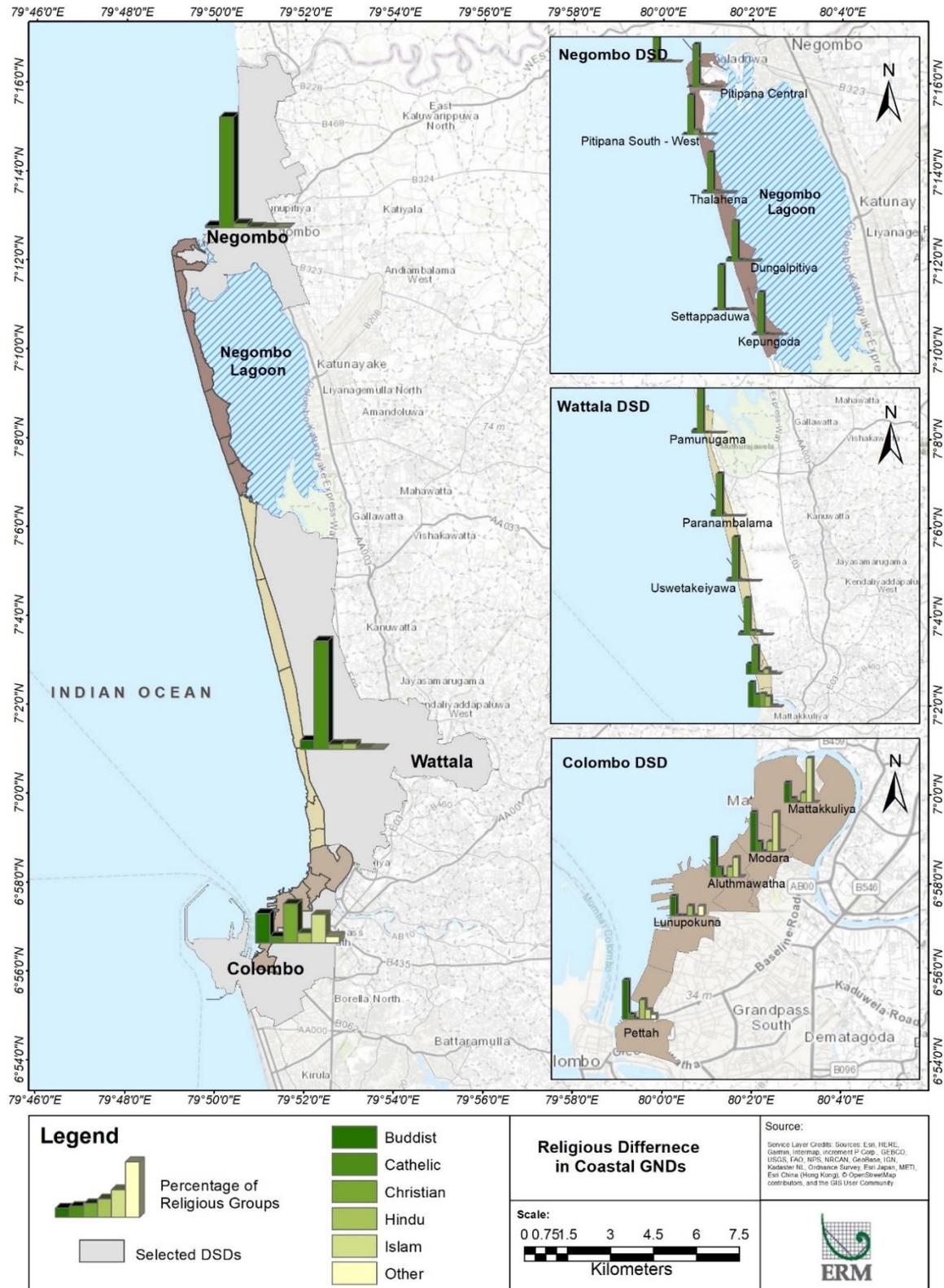


Figure 5-31 Religious Group of ZOI



5.6.3 Educational Facilities in ZOI

As the **Table 5.22** shows the education level of the people in these coastal GNDs is found to be significantly low compared to national level. The low level of education is depicted by 33% of people with formal education up to Grade 5 in the GNs failing under Negombo and Wattala DSD, which is even lower for those coastal GNs under Colombo DSD with 17%. The university education in these coastal GNDs is found to be extremely low ranging between 1% to 5%.

Table 5.24 Educational Level in Coastal GNs

Education Level	Administrative unit					
	Negombo DSD		Colombo DSD		Wattala DSD	
	No	%	No	%	No	%
Pre-school	1276	5.66	7286	9.32	1276	5.66
Up to Grade 5	7463	33.12	13548	17.33	7463	33.12
Grade 6 - O/L	5648	25.07	22586	28.89	5648	25.07
O/ L passed	4458	19.79	18379	23.51	4458	19.79
A/L passed	3419	15.18	11587	14.82	3419	15.18
University degree	228	1.01	4102	5.25	228	1.01
Higher Degree	38	0.17	685	0.88	38	0.17
Total	22530		78173		22530	

Source: Resource profile 2019

5.6.4 Water Supply Infrastructure in the Zoi

The major sources of water to household for domestic use are pipeline water. At Wattala 96.13% and at Negombo 75.52% of water demand is meeting through pipeline water. Whereas tube well water meeting the 95.26% of water demand of Colombo GNs. The number of water sources present in the Zoi is given DS wise in the following **Table 5.23**.

Table 5.25 Water Supply Sources in ZOI

GNs	Well Water		Tube Well Water		Pipeline		Public Tap	
	No	%	No	%	No	%	No	%
Colombo	1	0.01	11475	95.26	212	1.76	358	2.97
Negombo	171	3.60	235	4.94	3590	75.52	758	15.94
Wattala	83	1.60	15	0.29	4995	96.13	103	1.98

Source: Resource profile 2019

5.6.5 Fishing profile in ZOI

The fisheries sector plays a major role in the social and economic life of the people of Sri Lanka. Sri Lanka being an island country with a vast coastline and rights over 24-200 nautical miles (nm) of ocean as part of the exclusive economic zone (EEZ) declaration 1976, provides ample avenues in this sector.

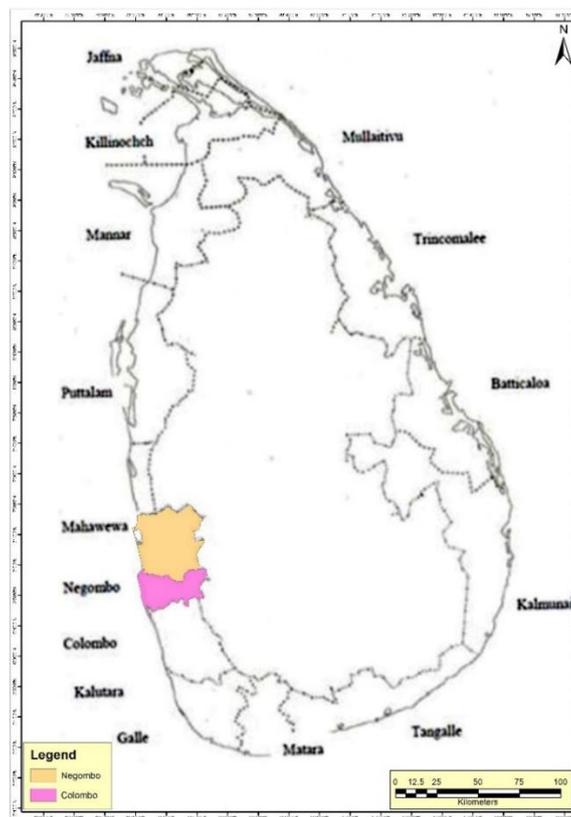
According to a report close to 2.4 million direct and indirect⁵³ employments are being generated in this fishing sector; the key stakeholders being the fishermen, breeder, processors, logistics, cold chain, packaging and other allied services. Fisheries contribution to the country’s Gross Domestic Production (GDP) was 1.3 percent in 2016 [as reported by Central Bank of Sri Lanka (CBSL), 2016]. The total fish production of the country in 2016 was 530,920 metric tons (Mt) and of them marine fish production was 456,990 Mt while the rest (73,930 Mt) was from inland and aquaculture.⁵⁴

5.6.5.1 Approach to the Fisheries Study

The coastal area of the island country has been divided into fifteen fishing districts for development and managing this sector. Of the fifteen districts, Colombo and Negombo have been considered under the project study due to their proximity to the project location. These two fishing districts have a large population which is dependent on this fishing sector for their livelihood. The fishermen residing in this region are one of the major stakeholders in this project, especially those who are residing the coastal area.

Secondary information for the baseline section has been collected from the fisheries department. Focus Group Discussions (FGDs) and key informant interviews were conducted with fishermen from the project area, the officials of the fisheries department, local administration and representatives of aquatic research institutes.

Figure 5-32 Fishing Districts falling in ZOI



Source: Development of Central Database for Marine Fisheries in Sri Lanka, Department of Fisheries & Aquatic Resources, Colombo, Sri Lanka, Final Project, 2009

⁵³ Data shared as per the Industry Capability Report, Sri Lankan Fisheries Sector, prepared by Export Development Board (EDB), Sri Lanka, March 2017.

⁵⁴ Fisheries Industry Outlook – 2016, Socio –Economic and Marketing Research Division National Aquatic Resources Research and Development Agency (NARA)

5.6.5.2 Fishermen in Colombo and Negombo Districts

There is total 67 Fishery Inspectors Divisions (FI division) of which 52 FI divisions are at Negombo Assistant Director divisions (AD divisions), 9 FI division at Colombo AD and 6 at Wattala division. Information gathered from the Colombo Regional Office indicates the presence of 9 registered fishing societies along with 525 active fishermen who are registered under Fisheries Department in Colombo Division.

Negombo Regional Office indicates the presence of 52 registered fishing societies along with 8704 active fishermen who are registered under Fisheries Department in Negombo Division.

Wattala Regional Office indicates the presence of 6 registered fishing societies along with 591 active fishermen who are registered under Fisheries Department in Wattala Division. The details of the fishermen at 3 AD divisions are given in **Table 5.24**.

Table 5.26 Fishermen details at AD division

AD division	FI division	No of GNDs falling within FI division	Fishing HHs in FI division	Fishing Population FI division	Active Fishermen	% of Fishery households/families
Negombo	Kammalthurai	5	492	1600	566	35.38
	Aththukala	4	397	1688	459	27.19
	Kudapaduwa	3	750	3095	851	27.50
	Negambo Town I	4	914	3970	1154	29.07
	Negambo Town II	4	591	2252	706	31.35
	Negambo Town 111	3	953	3675	1263	34.37
	Duwa	1	590	2964	662	22.33
	Pitipana	4	956	4510	1024	22.71
	Aluthkuruwa	2	526	2175	455	20.92
	Kepungoda	3	742	2975	700	23.53
	Ja-ela	11	349	1710	272	15.91
	Uswetakeyiyawa	8	457	1417	592	41.78
Wattala	Wattala	6	605	2773	591	21.31
Colombo	Modara	5	250	1250	350	28.00
	Mattakkuliya	4	120	600	175	29.17
Total		67	8692	36654	9820	26.79

Source: Negombo, Wattala and Colombo Assistant Director divisions (AD divisions)

During consultation with Ministry of Fisheries and Aquatic Resources Development the details of the fishermen at GN division at coastal belt of Negombo, Wattala is given below. The maximum percent of fishermen population is at Doowa and Settapaduwa GN division of Negombo DS which is 80% and 40% fishermen population at Palliyawatta South GN division of Wattala DS.

Table 5.27 Fishermen details at GN divisions of coastal area

Name of GN	Total HHs	Fishermen HHs	Percent
Negombo DS			
Doowa	300	240	80%
Dunagalpitiya	900	350	40%
Kepungoda	700	450	65%

Name of GN	Total HHs	Fishermen HHs	Percent
Pitapana Central	820	410	50%
Pitapana SW	1100	330	30%
Settapaduwa	700	580	80%
Thalahena	1400	560	40%
Wattala DS			
Palliyawatta	2100	300	15%
Palliyawatta South	823	325	40%
Pamunugama	685	175	30%
Paranaambalama	823	247	30%
Uswatakeiyawa	1100	220	20%

Source: Department of Fisheries & Aquatic Resources, Colombo

5.6.6 Fishing Practices

5.6.6.1 Type of Fishing

Types of fishing practiced by the fishermen of these regions can be classified into:

- Near Shore Fishing (Coastal Fishing)
- Deep Sea Fishing (Marine Fishing)
- Daily Fishing (Offshore Fishing)

Deep-Sea Fishing

Deep sea fisheries are majorly a way of catching medium and large pelagic species mostly fishes like tuna. It is further categorized into a gill net fishery and a long-line fishery which extends from the edge of the continental shelf to the outer limits of the country and often beyond its EEZ. Deep sea fisheries operate mostly in 3 areas depending on both oceanographic conditions and fisheries. Depending on the monsoons, there are two periods of fishing operations in the country i.e. from December to February for the North-West monsoons and the South-West one from May to September. Though, in the southern region of the country fishing operations are carried out throughout the year.

Daily Fishing

Mostly the fishermen go out twice daily to harvest fishes. The ones who go out early in the morning (maybe approximately during 3 AM to 6 AM) return to the landing sites by 10 AM and the ones who go out late in the evening (say about 8 PM) return early the next day. They mostly used OFRP⁵⁵ crafts (In Board Single-Day Boats) for this purpose. The fishing grounds keep changing depending on the seasons (2-5 km from the shore). The daily fish markets are supplied by their catch.

Near Shore Fishing

Marine fisheries of the country is still dependent on shoreline or coastal fisheries, which according to many recent studies have been exploited to the brim. This is a labour intensive sector since there are many small- scale fishing crafts engaged in it. This is an open access common property apart from a few areas such as beach seine and stake-net fishery. This type of fishing is customarily multi species and multi gears operative. It's open access nature has augmented fishing effort for over the years.

⁵⁵ Fibre reinforced Plastic boats powered by outboard motor engines. 6-7 m Fibre Reinforced Boats powered by 15-25 HP outboard motors operated primarily in the coastal waters.

Owing to population growth and lack of alternative sources of employment pressure on coastal fisheries has increased the pressure on coastal fisheries. This is confined to waters of the narrow continental shelf and the consequent slope area which is 22 km wide on average. The total area of the shelf is 26,000 km²; approximately 11% of the EEZ of Sri Lanka. It has contributed to about 80% of the total marine fishery in the past three decades.

5.6.6.2 Types of Fishing Gear

The common types of fishing gears in use are trolling nets, long line, draw nets and floating cutting nets. Trawling nets are basically used for capturing the marine species inhabiting the bottom of the ocean column. Such bottom trawling is used for shrimp trawling purposes. Long lines are usually used for large pelagic species capturing such as tuna, giant trevally, bigeye scad, sail fish, katla, grouper etc. floating cutting nets are the ones used for all sorts of species and often in use the entire year. The following table shows the types of fishing gear in use along with their period of use and the species best captured by them. Another fishing gear used by the community is stake net which is locally called kattudel. This is an ancient (from early 1950s) lagoon fishing technique in many regions of Sri Lanka to catch prawn, lobster, crab.

The small mesh gillnet fishery is normally conducted year-round, mostly by OFRP boats targeting small pelagic fish. The smallest mesh size (6mm) is commonly used for small fish such as anchovies. Mesh sizes ranging from 6mm to 38mm are commonly used for the exploitation of small pelagic species. The major target species for this gear are herring (*Amblygaster sirm*) and sardines, caught in gillnets of mesh sizes 22–38 mm. Mesh sizes >38mm (large mesh gillnets) are used in the fishery when relatively larger pelagic species such as Indian mackerel and Indian scads are targeted.

Fishing rods are one of the traditional methods used by people for fishing in the coastal area located in parallel to the proposed sand mining area. Some young groups in the area used to follow this method as recreation and also for catching fish for domestic consumption. Some other marginal fishermen catch fish using this method as their primary livelihood activity.

Table 5.28 Types of Fishing Gear in Use, Species Captured and Period of Use

Types of Fishing Gear	Fish Type	Period Used
Trawling nets	Prawn/Shrimp	April - October
Long line	Rock fish / Oysters	Annual
Draw nets (My net)	All types of fish	September - October
Floating cutting nets	All types of fish	Annual

Source: Discussion with the Colombo Region Director of the Department of Fisheries & Aquatic Resources

Stakeholder consultations with the fishermen at Negombo DS and Wattala DS and key informant interviews (KIIs) revealed that they use trawling system of fishing in the months of May to November, when the sea is rough. But such form of fishing is prohibited under the law in the country.

5.6.6.3 Fishing Craft

Different types of fishing crafts/ boats are used to harvest the catch from the sea, these are categorized into 6 types namely- Inboard Multi-Day Boats (IMUL), Inboard Single-Day Boat (IDAY), Out-Boat Engine Fiberglass Reinforced Plastic Boats (OFRP), Motorized Traditional Boats (MTRB), Non-Motorized Traditional Boats (NTRB) and Inland fishing crafts. The following **Table 5.2** provides a detailed view on the number of fishing crafts operating in Colombo, Wattala and Negombo region for the year 2020.

Total number of operating fishing craft/boats in year 2022 is 4187. Majority of marine fishing craft/boats were OFRP (1770) and NTRB (1456). OFRP and NTRB are operated in coastal fisheries while IMUL in deep-sea fisheries. Mainly, two types of fishing crafts are in operation in the area as, OFRP, and NTRB (also called as Theppam). Theppams could only be operated at the sea during the

non-monsoonal months and some of them are operated at the Negombo Lagoon during the monsoon months. The fishing operations conducted by NTRB are mostly confined to an area up to a maximum of 5 km from the coastal line.

The prominent craft operated in the area is OFRP. The OFRP boats launch their fishing operation up to 20 km from the shore. OFRPs normally operate at the sea throughout the year and they could operate in a relatively wider sea area targeting a wide range of species. The IDAY boats and MTRB boats are operated 2 to 5 km from the shore, when they operate trawl fishery and small meshed gill net fishery respectively. The beach seine operation (NBSB) reaches about 1-2 km from the shore.

Table 5.29 Number of Boats by Types in Colombo and Negombo Region

AD division	FI division	Types of Boats and number from each type						Total
		IMUL	IDAY	OFRP	MTRB	NTRB	NBSB	
Negombo	Kammalthurai	0	0	195	0	26	0	221
	Aththukala	0	0	108	0	16	6	130
	Kudapaduwa	16	2	280	0	5	1	304
	Negambo Town I	0	0	345	0	43	0	388
	Negambo Town II	16	6	50	0	105	0	177
	Negambo Town 111	171	1	37	0	124	0	333
	Duwa	449	1	98	0	57	0	605
	Pitipana	12	0	188	3	48	0	251
	Aluthkuruwa	0	0	28	0	200	0	228
	Kepungoda	0	0	40	0	323	28	391
	Ja-ela	0	0	0	0	210	0	210
Uswetakeyiyawa	0	0	88	0	103	0	191	
Wattala	Wattala	210	21	208	2	146	0	587
Colombo	Modara	3	2	80		32		117
	Mattakkuliya	3	8	25		18		54
Total		880	41	1770	5	1456	35	4187

Source: Statistics Unit, Ministry of Fisheries and Aquatic Resources Development

Note: IMUL - Inboard Multi-day Boats, IDAY - Inboard Single-day Boats, OFRP-Out-board Engine Fiberglass Reinforced Plastic Boats, MTRB - Motorized Traditional Boats, NTRB - Non-motorized Traditional Boats, NBSB -Non Motorized Beach Seine Crafts

There are motorboats/dingy boats, rafters and canoes used for fishing in Colombo region. There are 171 such boats in Mattakkuliya and Modara FI Division both registered and unregistered, 587 such boats in Wattala FI division and 3429 such boats in Negombo FI division. These sail between 6 – 10nm from the shore. Some boats sail beyond the 10 nm. Fishermen use cutting nets, long line, gill nets, small nets, and fishing rods to facilitate fishing operations. Some boats use trawling nets which are illegal to use. Small boats fish between 7 km to 20 km range in Negombo region.

5.6.6.4 Fishing Ground and Season

Sri Lanka being an island country has an extensive coastline and about 200 miles of EEZ, which contributes to large scale fishing. The major fishing ground near the sand borrow area is up to 6.5 km from the shore and the season and type of catch to be targeted sets the requirements of the fishing ground. There is no specific time period for boats to leave for fishing. They either leave early in the morning like 3.00 AM and returns by 6.00 PM. Some of them venture late in the evening and returns the next day. Specifically for some seasons fishermen drop nets in worked out to minimise impact on the navigation route.

There is no particular fishing ground; in the EEZ, due to the monsoon and the currents, the location for fishing differs time to time. However, as there are restrictions near the Colombo port area most of the daily fishing is done at the Negombo area.

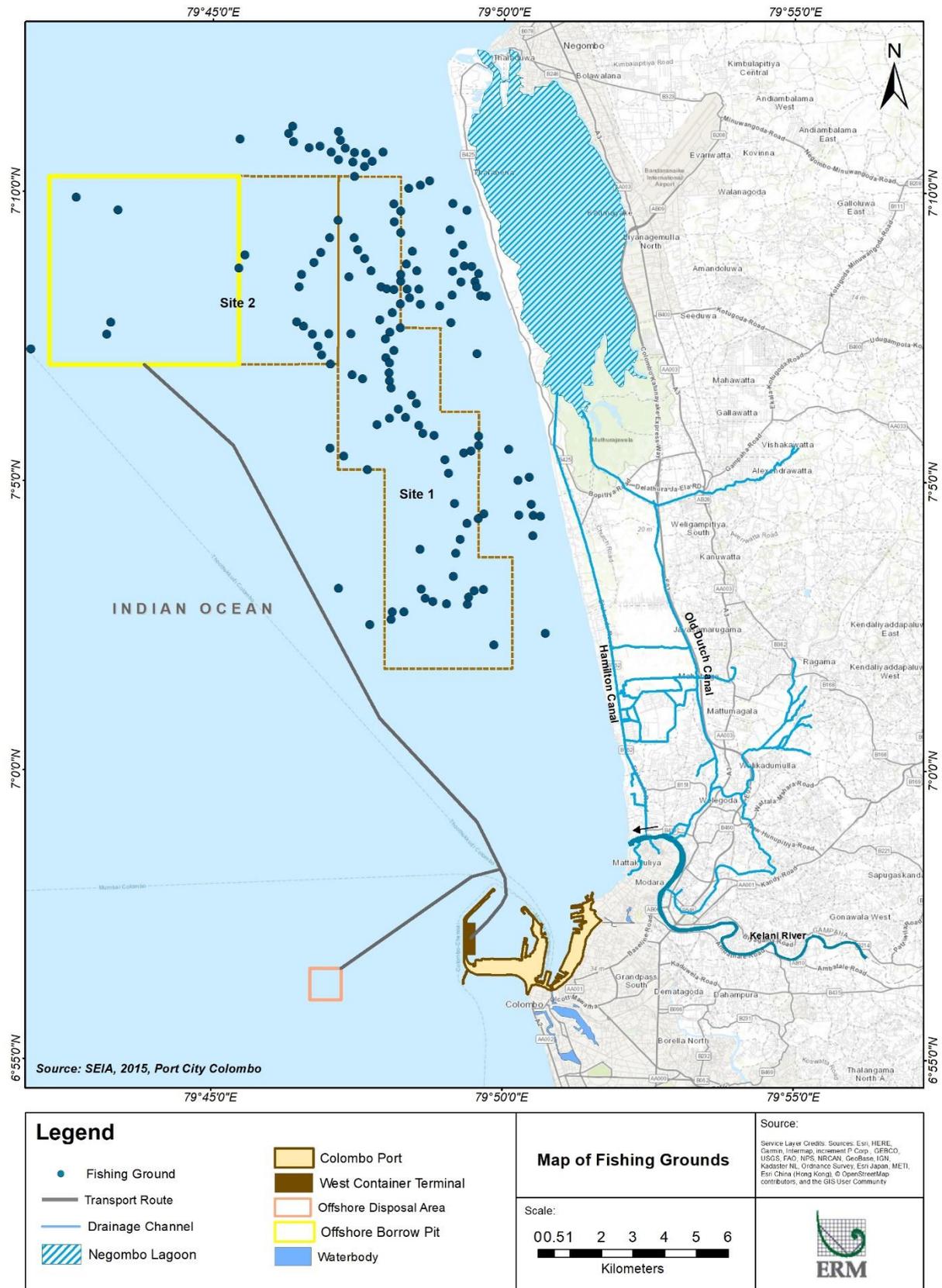
Owing to the effects of monsoons there are two well defined fishing seasons:

- North-east monsoon – fishing season ranges between October to May, fishing efficiency is more during this period. This is the major fishing season
- South-west monsoon – fishing season is between June to September, fishing is done but fish catch is comparatively low and the sea is rough.

Except shrimp catching, there is no specific fishing locality for other fishery resources. Fishing activities of OFRP, shift from one target species to the other, depending on the availability of the resources, weather etc., and using different methods. Fishermen shift their operations away from the local sea front to more distance water both north and south direction as well as towards offshore waters. However, field observations made during previous studies showed there were limited fishing activities in the proposed sand extraction site.

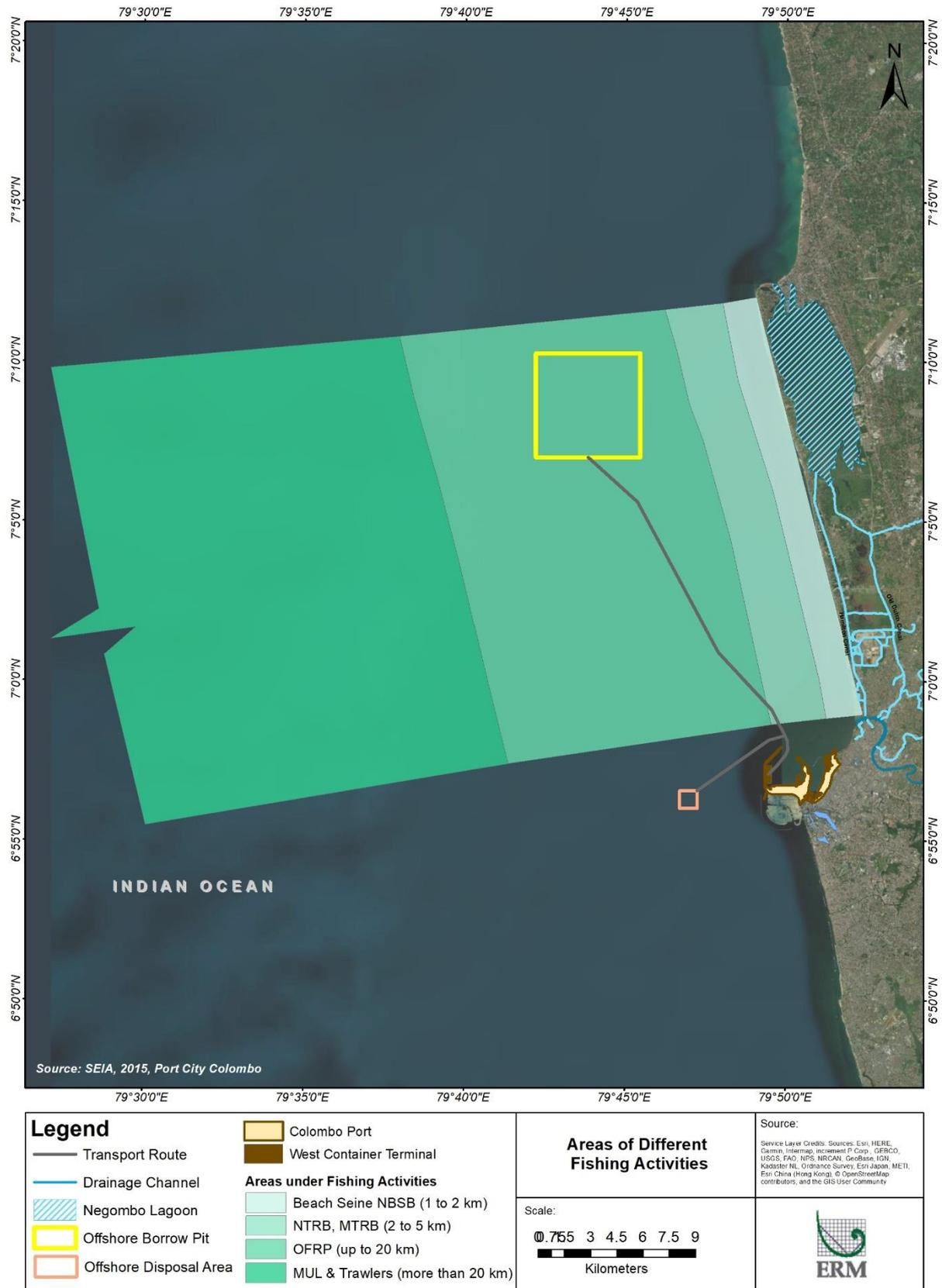
The activities of non-motorized traditional crafts (NTRB) and beach seine (NBSB) are confined to the clam seasons, October to May and both types are operated more close to the shore. Although there are 28 registered Madel fishing areas within the Negombo Fisheries district, their operation area is limited to 1 – 2 km from the shore. Hence the dredging activity will not create any disturbances for the NBSB fishermen. Only the OFRP boats will have some disturbances during the dredging activities as they are operating within 20 km area from the shore and the dredging site is located within their operational area.

Figure 5-33 Fishing Ground Map



Source, SEIA, 2015, Port City Colombo

Figure 5-34 Areas of Different Fishing Activities



5.6.6.5 Summary

- Mainly two types of fishing crafts are in operation in the area: the Out-Boat Engine Fiberglass Reinforced Plastic Boats (OFRP), and the Non-Motorized Traditional Boats (NTRB)
- Mainly, OFRP fishing crafts are in operation in and around the borrow area, as they can operate up to 20 km from the shore (refer to Figure 5.34);
- OFRPs normally operate at sea throughout the year, and they could operate in a relatively wider sea area, targeting a wide range of species.
- The fishing zone demarcated map (Figure 5.33) indicated that the proposed sand extraction area and transport route have no major fishing grounds. The major fishing ground is up to 6.5 km from the shore. Again, the basin area is not a major fishing ground.
- However, the stakeholder consultations with fishermen revealed that the fishermen believed that the area demarcated for sand extraction and the transport route is fairly rich. It is difficult to identify the exact number of fishermen and their fishery resources, including catch and income, directly affected by the proposed project operations.
- The field observations made during the IEE study for the sand borrow area reveal that there were limited fishing activities in the proposed sand extraction site.
- Key fishing activities conducted in the coastal fishery in the sand extraction area and the adjacent waters are small meshed gillnet operations targeting small pelagic fish, while large meshed gillnet fishing operations targeting medium and large pelagic fish are conducted in more deep waters.
- The activities of non-motorised traditional crafts (NTRB) and beach seine (NBSB) are confined to the clam seasons, October to May, and both types are operated closer to the shore. Although there are 28 registered Madel fishing areas within the Negombo Fisheries district, their operation area is limited to 1–2 km from the shore. Hence, the dredging activity will not create any disturbances for the NBSB fishermen.
- Only the OFRP boats will have some disturbances during the dredging activities and transport of dredge material to the basin area as they are operating within a 20 km area from the shore. and the dredging site is located within their operational area.

5.6.6.6 Fish Production of the area

The annual fish production of Negombo and Wattala Fisheries District (NFD) by FI Divisions is given in **Table 5.29**. Maximum fish production has recorded in 2018 and it was 30,370 mt. The highest contribution to fish production was by Duwa FI Division where multi-day boats are landed. Wattala and Kudapaduwa FI divisions also contribute high fish production in the area. Fish production of the directly impact area (Aluthkuruwa, Kapungoda, and Pitipana FID) is about 1,218 mt (as per 2018 statistics) and it represent a 4% of the total fish production in the Negombo Fisheries District.

Table 5.30 Annual fish production (in MT)

AD division	FI division	Production (MT)
Negombo	Kammalthurai	747
	Aththukala	352
	Kudapaduwa	1552
	Negambo Town I	932
	Negambo Town II	205
	Negambo Town III	102
	Duwa	6250
	Pitipana	431
	Aluthkuruwa	140

	Kepungoda	347
	Ja-ela	80
	Uswetakeyiyawa	136
Wattala	Wattala	12756
Total		24030

The fishermen during the consultations informed on the fish-catch in terms of monetary value and not in terms of quantity. During the month of May to November which is called Warakan locally i.e. high sea season/ south west monsoon period the average fish catch per trip at shallow sea worth Rs. Upto 40 thousand and at deep sea its Rs.1 lakh. During Harawa season which is December to March i.e. low sea season that is fish intensive season. The fish catch at shallow sea worth Rs.70 thousand and at deep sea its 1.5 lakh. The fishermen mentioned different type of fish catch as per distance. Like Prawns and mullet fish catch usually within 2 km. Giant Trevally, Grouper, Cuttlefish catch till 6 km. Skipjack Tuna, Amblygaster sirm, Bigeye scad catch upto 10 km and sail fish, Red snapper are deep sea fish catch which is more than 10 km.

The fishery resources in the area demarcated for sand extraction and transport route are fairly rich according to the fishermen and other stakeholders in the fishing industry interviewed. It is difficult to identify the exact number of fishermen and their fishery resources including catch and income directly affected due to the proposed project operations. In general, some fishermen stay long time from their fishing time period in the sea in the area demarcated for fishery activities. Some other fishermen travel with their fishing vessels to reach other areas of the sea across the sand mining sea block. The study team collected data related to average daily fish production from 10 fishery associations operating in 3 FI Divisions. According to the FIs and the leaders of fishery associations the fishermen in these 3 FI Divisions are the groups involved in either fishing or moving across demarcated project footprint in the sea. The collected data on the daily fish catch is shown in **Table 5.29**.

Table 5.31 Fish catch details within the selected FI divisions

FI Division	No of fishermen	Daily fish catch - kg
Pitipana	1024	3500
Aluthkuruwa	455	1400
Kepungoda	700	2700
Total	2179	7600

5.6.6.7 Description and assessment of present fishery and fishery related activities

The fishermen in general use different methods to catch fish during their operation period in the sea. These methods used for catching fish are mentioned below:

- Fishing rods – this is one of the traditional methods used by people for fishing in the coastal area located in parallel to the proposed sand mining area. Some young groups in the area used to follow this method as recreation and also catching fish for domestic consumption. Some other marginal fishermen catch fish using this method as their primary livelihood activity.
- Fishing boats/ rafts – these vessels are also used for shallow sea operations. According to the local fishermen interviewed persons using these methods mostly involved in fishing in the area where quarry layer is available in the bottom of the sea.
- Engine boats – engine boats are used for one-day fishing mostly in shallow area but, some of them reach even the area demarcated for sand extraction and its transport route.
- Multiday boats – these are larger size of engine boats used for multiday operations in the sea. They reach the deep sea area and in some occasions they run across area demarcated for sand mining for their deep sea operations. They also travel across the sea area identified for barge transportation of sand.
- Trollers – these are used for long stay in the sea for fishing activities. They always reach deep sea significantly far from shallow area. Therefore, this group can be identified as least affected

fishermen due to the proposed project. They might get disturbances only during their travelling period across sand mining area

- Madel operation – madel operation is group based fishery activity operated in the coastal zone including shallow sea. Madel operation activities will not reach the area demarcated for sand extraction and sand transportation.

5.6.6.8 Income from fishing

Information was gathered during consultations with the fishermen at Doowa GND, Dunagalpitiya GND, Kepungoda GND, Pitapana Central GND, Pitapana SW, Settapaduwa GND, Thalahena GND of Negombo DS and Palliyawatta GND, Palliyawatta South GND, Pamunugama GND, Paranaambalama GND, Uswatakeyiawa GND of Wattala DS that enabled the ESIA team to develop a comprehensive understanding regarding the local fishing sector. The commonly sold fish and seafood during the August to December period are crabs, prawns, mullet, tuna, katla, moralla, pony fish, swordfish and ribbon fish. According to the information gathered during visits to local fish markets; majority are small fish vendors who generally sell small fishes in their roadside fish huts since the large fishes are costly for them to afford. These small fish huts are functional from 8:00 AM in the morning to 8:00 PM in the evening every day.

In consultation with the local fishermen selling fishes in the market, it was found that on a day to day basis a small vendor buys about 50 Kg of various fish from the small boats per day and sells about 25-50 Kg of it on a daily basis. During the festive seasons they earn about 18,000 LKR of fish with an average income of 100,000 LKR per day. Sundays and special Christian holidays such as Christmas, is the peak period for business. During Hindu religious events during the month of September, October the income reduces to about 6000 LKR. These shops are accessed by the local residents to buy fish for their daily consumption. The large shops incur more profit since they sell large quantities of fish on a daily basis.

In consultation with the boat owners it was stated that first the total cost for boat operation (like fuel cost and other maintenance of the boat) is deducted from the total income and then balance income is divided into two parts. 50% is taken by the boat owner and the balance 50% is shared among persons involved in the boat operation. If boat owner is involved in fishing activities, he also got the sharing of the 50% additionally.

5.6.7 Physical Infrastructure

Road Network

Overall, Sri Lanka's Road network spans a total distance of ~12,537 km National Highways, constituting Class A (4217 km), Class B (8007 km) and Class E roads (312 km). The WCT-1 Project is located in Colombo, which is the commercial and financial capital of Sri Lanka. Colombo is Sri Lanka's prime hub of transportation with its seaport and its international airport which is located 35km north of the city. The connectivity from Colombo to other strategic locations have been strengthened over the years with the development of Highways/Expressways as shown in **Figure 5.35**. The details of highway and expressway are indicated below:

- Colombo-Katunayake Expressway: 25.8 Km linking Bandaranaike International Airport and the capital of the country.
- Outer Circular Highways: 28.86 Km located in the Colombo metropolitan region.
- Southern Expressway: 200 Km connecting Mattala airport and Hambantota sea port to the Commercial Capital, Colombo.
- Central Expressway Project- ongoing project - 170 Km.

New Kelani Bridge - The opening of the New Kelani Bridge at Peliyagoda in late November 2021 was a key milestone in terms of ongoing initiatives to mitigate traffic congestion in the Colombo metropolitan area. This project is located in the midst of a key transportation hub that links the BIA

and the Port of Colombo. The newly opened six-lane bridge with its elevated road leading to the city is expected to alleviate the traffic congestion that could be seen in the area over the past several years.

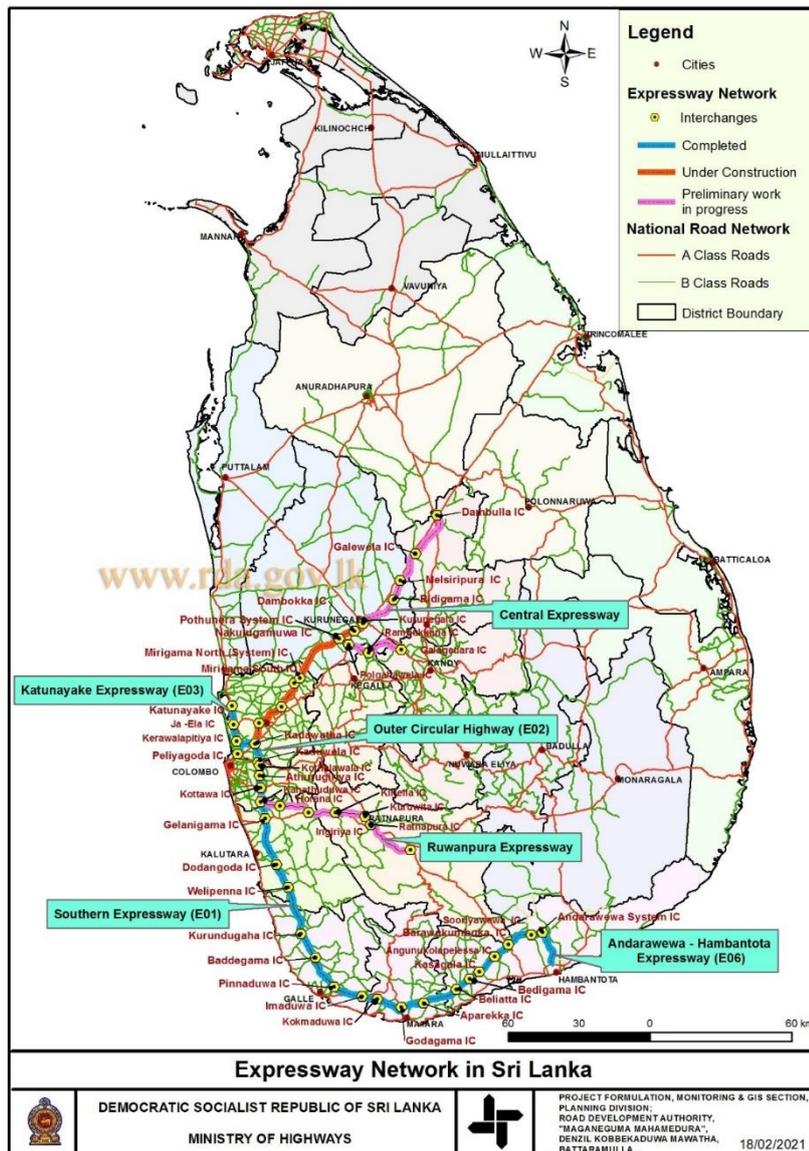
Power Generation and Supply

Electricity in Sri Lanka is generated using three primary sources: thermal power (which includes coal and fuel oil), hydropower, and other non-conventional renewable energy sources (solar power and wind power). The total installed capacity of power 4265 MW in 2021⁵⁶. The gross electricity generation in 2020 was 16,392 GWh and maximum demand in 2020 was 2717 MW. The Sri Lankan government aims to achieve 70 percent electricity production by renewable sources by 2030 and net carbon zero by 2050. The objective is to increase the power generation capacity of the country from the existing 4,265 megawatts (MW) to 6,900 MW by 2025 with a significant increase in renewable energy.

Sri Lanka has already achieved a grid connectivity of 98 percent, which is relatively high by South Asian standards.

⁵⁶ CBSL Annual Report 2021

Figure 5-35 National Road Network in Sri Lanka with the Expressway Network



6 STAKEHOLDER ENGAGEMENT

The subsequent section sheds light on the parameters of identification of and engagement with the key stakeholders, in order to assess the impact of the project on them. “Stakeholder Analysis” is understood as the process of identifying the individuals or groups that are likely to affect or be affected by a proposed project and sorting them according to their impact on the project and the impact the project will have on them. This information is then used to assess the manner in which the interests of the stakeholders should be addressed in the project plan, policy, program, or other action.

The importance of such an analysis lies in the role played by this understanding in the assessment of the socio-political environment surrounding the project. It allows for the:

- Identification of key stakeholders, their primary groupings and sub groupings;
- Identification of the interests, concerns and potential risks surrounding the stakeholders, as well as conflicts of interests (if any);
- Key groups/ individuals to be pin pointed who need to be informed about the project;
- Identifying stakeholders (those who are likely to have an adverse impact on the project) and taking appropriate measures to combat their influence;
- Identification of the impact and influence of the project on the stakeholders and of the stakeholders on the project;
- Generation of information essential to the planning, implementation and monitoring of the project; and;
- Development of a framework for participatory planning and implementation of various project activities.

6.1 Stakeholder Assessment

A stakeholder is defined as “a person, group, or organization that has direct or indirect stake in a Project/organization because it can affect or be affected by the Project or its Proponent’s actions, objectives, and policies”. Stakeholders vary in terms of degree of interest, influence and control they have over the Project or the proponent. The stakeholders associated with this WCT-1 project is categorised as per the following:

Table 6-1: Identification of Key Stakeholders

S. No.	Stakeholder Category	Key StakeholdersWCT-1
1	Primary Stakeholder	<ul style="list-style-type: none"> ■ CWIT ■ Fishermen Community (permanent and seasonal) including the local parishes- (Negombo and Wattala DS of Gampaha district and Colombo DS of Colombo district) ■ Negombo DS- Doowa, Pitapana Cental, -SW, Thalahena, Dungalpitiya, Kepungoda, Settippaduwa GN ■ Wattala DS- Pamunugama, Paranambalama, Uswetakeiyawa, Dikovita, Palliyawatta N & S GN ■ Colombo DS- Mattakkuliya, Modara, Aluthmawatha, Lunopokuna, Pettah GN ■ Women Family members of fishermen family ■ Boat Owners at fish Landing point ■ Local community from coastal villages at Negombo, Wattala and Colombo DS ■ Central Environment Authority (CEA) ■ Coast Conservation & Coastal Resource Management Department (CC&CRMD) ■ Sri Lanka Port Authority (SLPA) ■ Master Contractors for terminal development ■ Dredging contractor ■ Quarry contractors & quarry material transporters
2	Secondary Stakeholder	<ul style="list-style-type: none"> ■ Department of Fisheries & Aquatic Resources (DFAR)- Negombo and Colombo ■ Grama Niladhari/ village officer of respective Grama Niladhari division ■ Marine Environment Protection Authority (MEPA) ■ Geological Survey and Mines Bureau (GSMB) ■ Municipal Council, Colombo ■ Emergency response agencies (Police/Fire Brigade / Hospital) ■ Central Environmental Authority & Disaster Management Centre

6.2 Stakeholder Mapping

Stakeholder mapping is a process of examining the relative influence that different individuals and groups have over a project as well as the influence of the project over them. The purpose of a stakeholder mapping is to:

- Identify each stakeholder group;
- Study their profile and the nature of the stakes;
- Understand each group's specific issues, concerns as well as expectations from the project that each group retains.
- Gauge their influence on the Project.

Apart from categorization, stakeholders have also been classified in accordance with the level of influence they have over the Project as well as their priority to the Project proponent in terms of importance. The influence and priority have both been primarily rates as:

- **High Influence/Priority:** Which implies a high degree of influence of the stakeholder on the Project in terms of participation and decision making or a high priority for the Project proponent to engage that stakeholder
- **Medium Influence/Priority:** Which implies a moderate level of influence and participation of the stakeholder in the Project as well as a priority level for the Project proponent to engage the stakeholder who are neither highly critical nor are insignificant in terms of influence.
- **Low Influence/Priority:** Which implies a low degree of influence of the stakeholder on the Project in terms of participation and decision making or a low priority for the Project proponent to engage that stakeholder

The overall significance of the stakeholder group is assessed as per the matrix provided below in **Table 6.2**.

Table 6.2 Stakeholder Significance and Engagement Requirement

Magnitude of Influence / Impact	Urgency / Likelihood of Influence on / by Stakeholder		
	Low	Medium	High
Negligible	Negligible	Negligible	Negligible
Small	Negligible	Minor	Moderate
Medium	Minor	Moderate	Urgent
Large	Moderate	Urgent	Urgent

The following **Table 6.3** provides brief profiles of the various stakeholders in the project as discussed in the previous sub section along with their key concerns about the project and their degree of influence.

Table 6.3 Stakeholder Profile and Influence Mapping

S. No.	Relevant Stakeholder	Profile/ Status	Magnitude of Influence/Impact (Negligible, Small, Medium, Large)	Urgency/ Likelihood of Influence (Low, Medium, High)	Rating of Stakeholder Influence		
A Primary Stakeholder							
1.	<p>Fishermen Community from Community at large around Doowa, Pitapana Cental, SW, Thalahena, Dungalpitiya, Kepungoda, Settippaduwa GN of Negombo DS, Pamunugama, Paranambalama, Uswetakeiyawa, Dikovita, Palliyawatta N & S GN of Wattala DS, Mattakkuliya, Modara, Aluthmawatha, Lunopokuna, Pettah GN of Colombo DS</p> <p>Boat Owners at fish Landing point</p>	<p>Fishermen Community Level</p> <ul style="list-style-type: none"> Fishermen community Fishermen involved with deep-sea fishing Active fishermen societies in Negombo, Wattala and Colombo <p>There are approximate 1000 numbers of active fishermen in Negombo, Wattala and Colombo DS as per the data Fisheries department Negombo, Colombo and Wattala division.</p>	<ul style="list-style-type: none"> Restriction of fishing in the area demarcated for sand mining and the immediate vicinity at the time of dredging activity. Disruption of fishing while the dredger is transporting sand.. The deep-sea fishing boats may face temporary disruption during dredger movement. 	Medium	<p>Concerned about safety due to the operation of the dredger in fishing route.</p>	Medium	Moderate

S. No.	Relevant Stakeholder	Profile/ Status	Magnitude of Influence/Impact (Negligible, Small, Medium, Large)		Urgency/ Likelihood of Influence (Low, Medium, High)		Rating of Stakeholder Influence
2.	Women Family members of fishermen family at different GNs of Negombo, Wattala and Colombo DS	Women of project influence GNs	As reported during consultation with community women are mostly staying at home for household work as there are no employment opportunities for them within the villages Women are not associated with fishing activities.	Small	As the women group may get impacted indirectly if any impact on income activities of the fishermen. As reported during consultation with community women are mostly staying at home for household work as there are no employment opportunities for them.	Low	Negligible
3.	CWIT		CWIT would have a high magnitude of influence on the project, as being the primary stakeholder of the project, with a need to engage with all other primary and secondary stakeholders.	Large	The project is directly in the zone of influence of the CWIT and has a high likelihood of being influenced by their plans /activities.	High	Urgent

S. No.	Relevant Stakeholder	Profile/ Status	Magnitude of Influence/Impact (Negligible, Small, Medium, Large)		Urgency/ Likelihood of Influence (Low, Medium, High)		Rating of Stakeholder Influence
4.	Central Environment Authority (CEA)	<p>The CEA is responsible for administering the provisions of the National Environmental (Amendment) Act, No. 53 of 2000</p> <p>According to Part IV C of the NEA, which requires the submission of an IEE or EIA report in respect of offshore mining project.</p> <p>The CEA is mandated to manage the Environmental Protection Licensing (EPL) system nationally</p> <p>CEA is also responsible for ensuring compliance with air quality, and noise, regulations.</p>	<p>The project obtained Environment Clearance from CEA</p> <p>Responsible for monitoring the Project's Environmental compliance throughout the Project lifecycle.</p>	Small	Periodical monitoring of clearance from CEA	High	Moderate
5.	Coast Conservation & Coastal Resource Management Department (CC&CRMD)	<p>The department is mandated under the Coast Conservation (Amendment) Act, No. 49 of 2011 (Government of Sri Lanka, 2011) to conserve the "coastal zone", as defined in the Act;</p> <p>Responsible for shoreline management projects and maintenance of the existing coast protective structures</p>	<p>The project has obtained development permit for construction of terminal;</p>	Small	Renewal of development permit may be required from CC&CRMD	Medium	Moderate

S. No.	Relevant Stakeholder	Profile/ Status	Magnitude of Influence/Impact (Negligible, Small, Medium, Large)		Urgency/ Likelihood of Influence (Low, Medium, High)		Rating of Stakeholder Influence
6.	Sri Lanka Port Authority (SLPA)	SLPA executed the Colombo Port Expansion Project (CPEP) to build a deep-water harbour basin (Colombo South Harbour) with three container terminals on its three sides (south, east, and west)	SLPA has obtained all the regulatory permits for WCT-1 project	Small	Periodic renewal of permits; Providing common port facility and infrastructure to WCT-1 project	High	Moderate
7.	Master Contractors for terminal development	Responsible for construction of terminal area	Construction of terminal as per design	High	Regulatory compliance and implementation of ESMP during construction stage	High	Urgent
8.	Dredging contractor	Responsible for dredging and transportation of dredge material from sand borrow area	Dredging contractor will supply entire dredge material from sand borrow area	High	Regulatory compliance and implementation of ESMP during construction stage	High	Urgent
9.	Quarry contractors & quarry material transporters	Responsible for operation of quarry and transport of bolder for the project	Contractor agreement signed for supply of required quantity of stone/boulder from approved mine	Medium	Regulatory compliance for mining operation and transport of material with minimum impact on environment and community health and safety	Medium	Moderate
B.	Secondary stakeholder						

S. No.	Relevant Stakeholder	Profile/ Status	Magnitude of Influence/Impact (Negligible, Small, Medium, Large)	Urgency/ Likelihood of Influence (Low, Medium, High)	Rating of Stakeholder Influence
1.	Department of Fisheries & Aquatic Resources- Negombo and Colombo	<p>For the easy implementation of its functions Department of Fisheries and Aquatic Resources (DFAR) has been decentralized into Coastal Fisheries Districts and each district is divided into number of Fisheries Inspectors Divisions (FIs).</p> <ul style="list-style-type: none"> Assistant Directors (AD) Office of the concerned districts within the project area – Colombo and Negombo fishing Districts 	<ul style="list-style-type: none"> The borrow site area being on the coastal region, the area has high dependence on fishing as the livelihood option. The fishermen are registered with the fisheries department who are responsible for enforcing the laws and manage the fishermen and their activities and development at the local level. Laws and regulation abiding the sustainability fishing practices in the region Responsible for registration of fishermen and provide Fisherman Card 	<p>Medium</p> <p>Concern about temporary disruption of fishing route and fishing zone.</p>	<p>Medium</p> <p>Moderate</p>
2.	(Grama Niladhari/ village officer of respective Grama Niladhari division)	They are the main administrative group who are responsible for the development activity of the villages	<ul style="list-style-type: none"> Concerned about dredging activity and any potential risks associated with it. 	<p>Medium</p> <ul style="list-style-type: none"> Local administration may be required to play a role in grievance redress mechanism to address issues related to any impact on fishermen due to dredging activity. 	<p>Low</p> <p>Minor</p>

S. No.	Relevant Stakeholder	Profile/ Status	Magnitude of Influence/Impact (Negligible, Small, Medium, Large)		Urgency/ Likelihood of Influence (Low, Medium, High)		Rating of Stakeholder Influence
3.	Marine Environment Protection Authority (MEPA)	MEPA is mandated under the Marine Pollution Prevention Act (Government of Sri Lanka, 2008) MEPA is responsible for: the Sri Lanka National Oil Spill Contingency Plan	Project has obtain approval for oil spill management plan and has obtained approval for reclamation at WCT-1 and the dumping of unsuitable material for reclamation at MEPA approved site.	Small	Periodical renewal required from MEPA	Medium	Minor
4.	Geological Survey and Mines Bureau (GSMB)	To identify and assess the mineral resources of Sri Lanka. To regulate the exploration and mining for minerals and processing, trading and export of minerals by issuing licenses.	The project has obtained permits for operation of sand borrow area	Small	Renewal of permits may be required from GSMB for operation of sand borrow area	Medium	Minor
5.	Municipal Council, Colombo	Responsible for sanitation (waste, sewage) health and environmental issues. emergency services	Municipal solid waste management required for project and city road for project vehicle movement	Medium	Regular service required during entire project lifecycle	Medium	Moderate
6.	Emergency response agencies (Police/Fire Brigade / Hospital)	Responsible of public services	Emergency support	Small	Support during emergency	High	Moderate
7.	Disaster Management Centre (DMC)	DMC within the Ministry of Disaster Management (MDM), is mandated under the Disaster Management Act No. 13 of 2005	The DMC works closely with the Climate Change Secretariat (CCS) on climate change related disaster management issues.	Small	Support during emergency	High	Moderate

6.3 Summary of Stakeholder Consultation

The key points discussed in the stakeholder consultations has been presented in Table 6.4.

Table 6.4 Stakeholders and Key Points Discussed

S. No.	Stakeholder Category	Key Points Discussed
1	<p>Stakeholder associated with fishing activities</p> <p>DS: Negombo Doowa GND, Dunagalpitiya GND, Kepungoda GND, Pitapana Central GND, Pitapana SW, Settapaduwa GND, Thaladena GND</p> <p>DS: Wattala Palliyawatta GND, Palliyawatta South GND, Pamunugama GND, Paranaambalama GND, Uswatakeiyawa GND</p>	<ul style="list-style-type: none"> ■ The fishermen reported that there are three types of fishing activities i.e. Deep sea fishing, daily/ one day fishing and near shore fishing, ■ 65% of the fishermen undertake daily/one day fishing, 25% near shore and 10% deep sea fishing; ■ The fishermen from Wennappuwa and Chilaw comes to Doowa GND and fishermen from Wattala and Pamunugama comes to Kepungoda GND for fishing activities; ■ Consultation with the fishing communities identifying the different types of boats that are used for different types of fishing like OFRP (One day boat) which is 25-40 HP, Multiday boat including roller which is 250-300 HP and I.M.U.L. (mainly for catching prawns/ shrimp) which is 700-1000 HP; ■ Each boats contains nearly 3, 8 and 5 number of fishermen; ■ For OFRP/ one day boat the fish catch may be upto 50-80 kg in one trip. The one day boat mostly sail upto 6-10 km.; ■ The IMUL boats and lagoon rafts mostly use for prawn catch. 40-50 kg prawn catches per trip with this type of boat; ■ There are 100 numbers of OFRP, 15 number of Multiday boat and 14 number of IMUL at Doowa GND; ■ The common fishing gear used by the community is stake net which is locally called <i>kattudel</i>. This is an ancient (from early 1950s) lagoon fishing technique in many regions of Sri Lanka to catch prawn, lobster, crab; ■ Fish catches are mostly big fishes like Giant Trevally, Grouper, Cuttlefish, Skipjack Tuna, Amblygster sirm, Bigeye scad, red snapper. The price of these catch varies accordingly the type of fish; ■ It was reported that 10-12 people at this GND are associated with boat repairing work and 20 people associated with net weaving; ■ Boat owners make a contract with boat repair worker for their boat repairing. The contact amount differs as per the type of the boats. For multiday boats including trollers usually charges Rs. 2 lakh. It took 7 days to repair a boat. The OFRP and IMUL boats charges Rs.10000-15000 and it takes 1-2 days to repair; ■ Average cost of net weaving is Rs.5000.; ■ Cost of net- Dello Net is Rs.10000, Kattu net 15000 and other types of net is Rs.60000; ■ As per the discussion with fishermen a place called '<i>harasna</i>' locally which is a rock reef area habitat of large number of prawn population. This place is 10 km from the shoreline of Negombo. ■ The fishermen express their concern regarding there has been change in fish catch in the last 5 years due to sand mining activities, dredging at sea for port city project. Also, climate change is another reason which impact on overall fish population; ■ The fishermen mentioned different type of fish catch as per distance. Like Prawns and mullet fish catch usually within 2 km. Giant Trevally, Grouper, Cuttlefish catch till 6 km, Skipjack Tuna, Amblygster sirm, Bigeye scad catch upto 10 km and sail fish, Red snapper are deep sea fish catch which is more than 10 km. ■ During the month of May to September which is called <i>Warakan</i> locally i.e. high sea season/ south west monsoon period the average

S. No.	Stakeholder Category	Key Points Discussed
		<p>fish catch per trip at shallow sea worth Rs. Upto 40 thousand and at deep sea its Rs.1 lakh. During <i>Harawa</i> season which is December to March i.e. low sea season that is fish intensive season. The fish catch at shallow sea worth Rs.70 thousand and at deep sea its 1.5 lakh.</p> <ul style="list-style-type: none"> ■ The market price of Tuna fish varies in between Rs.800-1000, price of prawn varies Rs.1000-1500, price of Mullet fish varies in between Rs.750-850. ■ As stated by the fishermen the fish catch is directly brought to the landing point cum selling centre. The auctioneer auctions the price of 90% of the fish catch. Only the small fish catch directly sell by the fishermen at fish selling centre or local market; ■ on a day to day basis a small vendor buys about 50 Kg of various fish from the small boats per day and sells about 25-50 Kg of it on a daily basis. During the festive seasons they earn about 18,000 LKR of fish with an average income of 100,000 LKR per day. Sundays and special Christian holidays such as Christmas, is the peak period for business. During Hindu religious events during the month of September, October the income reduces to about 6000 LKR. These shops are accessed by the local residents to buy fish for their daily consumption. The large shops incur more profit since they sell large quantities of fish on a daily basis; ■ Majority are small fish vendors who generally sell small fishes in their roadside fish huts since the large fishes are costly for them to afford. These small fish huts are functional from 8:00 AM in the morning to 8:00 PM in the evening every day; ■ As reported during consultation the landing points or the fish selling points is reported to be the main center where the buyers and sellers especially the middlemen/fish trader would collect/buy the fish-catch from the fishermen. Fish is directly sold to middlemen or taken by the boat/trawler owners; ■ First the total cost for boat operation (like fuel cost and other maintenance of the boat) is deducted from the total income and then balance income is divided into two parts. 50% is taken by the boat owner and the balance 50% is shared among persons involved in the boat operation. If boat owner is involved in fishing activities, he also got the sharing of the 50% additionally; ■ The fishermen also mentioned that the proposed project has national level significant benefits, but activities such as sea sand extraction will generate some negative impacts. Therefore, such impacts should be properly mitigated. Also, completion of the sand extraction should be done within a short period of time. The sand mining locations and also transport route may be demarcated with illuminate measures for fishermen to identify such locations even from far distance; ■ The fishermen stated that due to sand mining activity coastal sand erosion happen at Negombo area. The authority should keep this in mind;
2	GN Officer, Doowe	<p>Expressed some positive opportunities like</p> <ul style="list-style-type: none"> ■ Opportunities for short and long term employment and other income generation, Opportunity to country to generate foreign income, Further improvements to the Colombo port, as one of the most important economic infrastructure of the country. <p>Expressed some negative impacts like</p> <ul style="list-style-type: none"> ■ There can be reduction of fish population in shallow sea area close to the sand extraction locations due to noise and sediments generated during sand extraction activities; ■ There can be tendency for generated sediments during sand extraction to get deposited in fish breeding locations of rock reefs in the area. This will lead to reduce the fish population in the long run;

S. No.	Stakeholder Category	Key Points Discussed
		<ul style="list-style-type: none"> ■ A rock reef known as “<i>harasna</i>” might get affected with sea sediments. This is one of the important locations of fish breeding in the area; ■ There can be incidents of damages to the fishing nets operated in the sea sand transportation route in the sea; ■ The operations of sea sand transportation equipment may also create disturbances of the free moment of fishing boats. There also can be rare incidents of damaging to the fishing boats in this area. <p>The mitigation measures will be mentioned below:</p> <ul style="list-style-type: none"> ■ Minimum number of machines for sand extraction and transportation may be used in the sea; ■ Possibilities should be explored to avoid disturbances to the fish breeding locations especially rock reefs in the area; ■ Action should be taken to complete the sand extraction activities within a short period of time; ■ The fishermen should be informed with sand extraction time schedule in the sea. This communication can be implemented through leaders of the fishery associations and fishery inspectors in the respective area; ■ Operation activities in the sea sand extraction and sand transportation may not be carried out during night; ■ Whatever employment opportunities emerge should be provided to the suitable local youth in the area, depending on their qualifications <p>Also, few points which will be benefitted for the community can be implemented by project proponents like:</p> <ul style="list-style-type: none"> ■ Possibilities should be explored to provide high quality fishing nets to the fishermen in project affected area, especially in Negombo; ■ Project investors may consider to provide some financial assistance to the fishery associations located in the project impacted area; ■ The boat owners also stated that company provide insurance for their boats.
3	Boat Owners at fish Landing point Doowa GND, Negombo	<ul style="list-style-type: none"> ■ Name of fish landing point- Mahalellama which is controlled by fisheries association; ■ Daily fish unloading quantity is 150 thousand kg.; ■ During <i>Harawa</i> season which is December to March i.e. low sea season daily fish unloading is 180 - 200 thousand kg of different fishes like Tuna, Amblygaster sirm, Bigeye scad, mullet, <i>Thora</i>, <i>Madu</i> and during the month of May to September which is called <i>Warakan</i> the daily fish unloading is 60-70 thousand kg.; ■ The office of fish landing point reported that there has been change in fish unloading in the last 5 years due to sand mining activities, dredging at sea for port city project; ■ The fishermen from Chilaw, Wennappuwa, Mulative, Nayaru and also from southern province come at this fish landing point for unloading and selling fishes; ■ As reported the fish catch is directly brought to the landing point cum selling centre. The auctioneer auctions the price of 90% of the fish catch. Only the small fish catch directly sell by the fishermen at fish selling centre or local market; ■ 2 labours work at every fish landing points for unloading the fishes. These labours are usually from local villages.
4	Women Family members of fishermen family	<ul style="list-style-type: none"> ■ As reported during consultation with community women are mostly staying at home for household work;

S. No.	Stakeholder Category	Key Points Discussed
		<ul style="list-style-type: none"> ■ Some women are associated with tailoring work, daily wage work, housekeeping work, pickle making, and animal husbandry; ■ For daily wage work women need to travel at Negombo, Katunayake, Colombo. They work in different industries there; ■ Women are not associated with fishing activity; ■ Weaving net, maintenance of fishing gears etc are usually done by male. ■ The women community stated that they have small group account under Samurdhi program. These small groups are mainly involved in providing credits to the group members; ■ Also, many of them have account in different microfinance institution; ■ As an option for alternative livelihood, women groups proposed following options- poultry farming, food processing; ■ The women communities also mentioned that if there is no disturbances of fishing activity they are not against the project.
5	Local community from coastal villages at Negombo, Wattala and Colombo DS	<ul style="list-style-type: none"> ■ The coastal area of Negombo, Wattala and Colombo DS consists mainly of fishing families. They engage in traditional coastal, near shore and deep-sea fishing activities throughout the year; ■ As reported during consultation due to sand dredging activity the beach at Negombo coastal region may get unstable; ■ There is not any active tourism activity at the offshore region in the proposed sand dredging area; ■ The locals expressed their concern regarding any job opportunity during construction phase for WCT-1 project; ■ Most of the fishermen in Negombo area used to do fishing in the sea area demarcated for sand extraction. Therefore, there can be negative impact on fishermen in Negombo area due to sand mining and sand transportation;
6	CWIT	<ul style="list-style-type: none"> ■ Consultations were done with the CWIT team regarding the existing grievance redress mechanism and the institutional arrangement for the project implementation; ■ The proposed extraction site is located at about 7.2km - 9km away from the existing coastline; ■ The dredger hopper transportation will be used to transport extracted sand to the Colombo port. The distance of the transport route is about 20km; ■ The sand extraction from the identified location of the sea may create some disruption to the fishermen involved in fishing in the coastal waters in the Negombo area. However, since the dredging activities will be limited to a small area, the disturbances for the fishing activities will not affect the entire fishing population. The disturbances will be only limited to the dredging location and along the sailing route of the dredger, at the time of dredging being undertaken ■ A mechanism of providing Life Insurance and Personal Accident Cover has been implemented for all registered fishermen falling under the dredging area during the entire dredging period. ■ CWIT has also implemented an insurance program to safeguard the fishermen. The insurance program will be effective/ confined for the period of the project implementation. The needs for compensation through insurance will also be monitored through proper institutional mechanism to avoid possible conflicts. ■ Formal mechanism has been set up with the consultation of the Fisheries Department to address any damages to fishing boats and other related equipment due to dredging operations. Based on the evaluation and approval of this committee, CWIT will compensate

S. No.	Stakeholder Category	Key Points Discussed
		<p>damages arising due to dredging activity, through the insurance proceeds.</p> <ul style="list-style-type: none"> ■ If fishing vessels get damaged due to activities of the proposed project such damages will be compensated through proper institutional mechanism to monitor and asses the degree of damages. ■ Regular awareness programmes are being conducted for fishing community, government officials etc. in the area to enhance their knowledge on the project activities ■ Apart from the implementation of legitimate obligatory measures for possible impact mitigation the project developer as responsible and accountable private sector institution intends to assist community development and environment enhancement projects to be implemented in the affected areas. The intended assistance is proposed as Corporate Social Responsibility (CSR) of reputed private industry.

Figure 6-1 Photographs of Stakeholder Consultation

	
<p>Consultation with GN Officer (M.K.C. Nissanka Fernando) Doowe</p>	<p>Consultation with Milton Christopher Fernando – Secretary of Doowe fisheries Association,</p>
	
<p>Consultation with H. M. G. Inoka Chaturanganie Grama Niladari of Kepungoda</p>	<p>Consultation with M. C. Meriel Nirmal Perera, President, Kepungoda Rural Fishery society</p>



Consultation with P. Pradeep Kumara – Secretary, Fisheries Association, South-west, Pitipana



Consultation with local Fish Vendor Pitipana South-West



Consultation with Net Weaver at Pitipana South



Consultation with Percy Leonard – President of Settappaduwa fishery association



Consultation with women community at Palliyawatta, Wattala



Consultation with fisherfolks at Palliyawatta, Wattala



Consultation at GN Division Paranaambalama, Wattala



Consultation at GN Division Uswatakeiyawe, Wattala



7 IMPACT ASSESSMENT

7.1 Introduction

This section assesses the manner in which the Project will interact with elements of the physical, ecological, social, cultural or human environment that have the potential to impact resources or receptors. This section has been organised as per the various stages of the project life cycle to understand the potential impacts associated with each of these individual stages.

The potential environmental and social impacts associated with Project activities are considered in the three distinct stages of the Project life cycle: (a) Stage 1: Site development and construction, (b) Stage 2: Operation and maintenance,

Potential impacts are identified and evaluated based on the analysis of the information collected from the following:

- Project information (as outlined in **Chapter 2**); and
- Baseline information (as outlined in **Chapter 5**).

Potential environmental, ecological and social impacts have been identified through a systematic process whereby the activities (both planned and unplanned) associated with the Project stages have been considered with respect to their potential to interact with environmental and social resources or receptors. The impact assessment methodology is provided in **Chapter 4**.

7.2 Scope of the Assessment

The identification is represented through a 'Scoping Matrix'. The Scoping Matrix displays project activities against resources and receptors and supports a methodical identification of the potential interactions between each project activity and resource or receptor within the ZOI.

Entries in the matrix cells are coloured to indicate whether:

- An interaction is not reasonably expected (white);
- An interaction is reasonably possible but none of the potential impacts are likely to result in significant effects (grey);
- An interaction is reasonably possible and potential impacts may result in significant effects (black); or
- An interaction which results in positive impact (green).

All potential interactions, regardless of the probability of occurrence, are considered at this stage. The Scoping Matrix of potential interactions of the Project during the project life cycle, i.e., construction and operation stages, has been presented in **Table 7.1**.

Table 7.1 Scoping Matrix of Potential Interactions

S. No.	Project Activity/ Hazards	Environmental Resources								Ecological Resources			Social Resources						
		Soil & sediment quality	Coastal Morphology	Geology and Hydraulics	Surface water quality	Groundwater quality	Ambient Air quality	Ambient noise and vibration	Underwater noise & vibration	Road & Traffic	Terrestrial ecology	Aquatic ecology	Protected species	Socio- economic opportunity	Economy & livelihoods	Infrastructure & public services	Cultural resources & heritage	Community health & safety	Occupational health & safety
A	Stage 1: Construction of Terminal																		
A.1	Dredging at reclamation area for unsuitable soil																		
A.2	Disposal of unsuitable soil at offshore disposal site																		
A.3	Dredging of sand at borrow area																		
A.4	Transportation of sand to reclamation area																		
A.5	Reclamation filling activity																		
A.6	Transportation of boulders through roadways																		
A.7	Site levelling and compaction at reclamation																		
A.8	Construction of offshore structures																		
	Civil construction at land area																		
A.9	Fuel, lubricant and chemical storage & handling																		
A.10	Construction material storage and handling at site																		
A.11	Manpower requirement and sourcing																		
A.12	Operation of construction equipment & machinery																		
A.13	Generation and disposal of construction waste																		
A.14	Hazardous waste generation and disposal																		
A.15	Municipal solid waste generation and disposal																		
A.16	Generation and disposal of sewage																		

S. No.	Project Activity/ Hazards	Environmental Resources								Ecological Resources			Social Resources						
		Soil & sediment quality	Coastal Morphology	Geology and Hydraulics	Surface water quality	Groundwater quality	Ambient Air quality	Ambient noise and vibration	Underwater noise & vibration	Road & Traffic	Terrestrial ecology	Aquatic ecology	Protected species	Socio- economic opportunity	Economy & livelihoods	Infrastructure & public services	Cultural resources & heritage	Community health & safety	Occupational health & safety
A.17	Surface runoff from spillage area																		
B.	Stage 2: Operation of Terminal																		
B.1	Container vessel Movement																		
B.2	Handling of Container																		
B.3	Transportation of container																		
B.4	Operation of back-up DG sets																		
B.5	Operation heavy machineries and equipment																		
B.6	Discharge of operational waste water																		
B.7	Storage and handling of hazardous waste																		
B.8	Surface runoff from accidental spillage area																		
B.9	Manpower requirement and sourcing																		
C.	Unplanned Event (Multiple Project Stages)																		
C.1	Tsunami / Storm surge																		



= Represents the absence of interactions that can be reasonably expected



= Represents interactions that are reasonably possible but will not lead to a significant impact



= Represents interactions that are reasonably possible with one or more of outcomes that may lead to a significant impact



= Represents the positive impact

7.3 Stage 1: Potential Impacts during Site Development and Construction

7.3.1 Potential Impact to Soil and Sediment Quality

Potential Impact Sources

Potential sources of impacts to soil due to activities during construction stage include:

- Site development (reclamation, levelling and compaction)
- Accidental spillage of fuel, lubricant from storage site ;
- Accidental spillage of fuel from machineries, transport vehicles and diesel generator (DG);
- Accidental spillage of oil & grease from dredger & vessels;
- Storage and disposal of construction and demolition (C&D) debris and municipal solid waste (MSW) in non-designated area;
- Accidental spillage of hazardous waste from storage area.

Embedded control measures

The following mitigation measures are in place and will be implemented for the site establishment stage of the project:

- All the construction material will be stored in dedicated storage area;
- A designated machinery and equipment storage area will be developed for the Project;
- Fuels, lubricants will be stored in dedicated storage area having secondary containment;
- On completion of work all temporary structures, surplus materials and wastes will be completely removed from site;
- Construction and demolition waste (inert materials) will be utilised for filling of site, stored in designated area and finally disposed through third party vendor;
- Separate bins will be provided at construction area for collection of segregated MSW as per waste management procedure, and finally disposed through third party vendor;
- Different types of hazardous waste collection bins will be provided for oily substances and non-oily hazardous waste at construction area;
- Hazardous wastes generated from the site establishment stage will be stored in designated waste storage area, having secondary containment;
- Hazardous waste will be finally disposed through third-party vendors.
- A spill response procedure and associated spill kits to contain any incidental spillage of fuel, chemicals and hazardous waste;

Impact Assessment

As discussed in **Section 5.3.2** and **5.3.3**, soil and sediment quality in the ZOI were found to be below the limits of detection.

Site development (filling and compaction): The proposed terminal site will be developed by reclaiming the bay area through filling of sand, levelling and compaction. Changes to soil structure may be caused by mechanical disturbance to the soil, either through site importation of foreign fill material, or as a result of compaction of the soil surface. However, these changes will be limited to proposed site selected for terminal area, which is a brownfield area. The sand from Indian Ocean will be used for the site development. During site development activity, the site will be periodically compacted to reduce erosion. The storm water drains with sedimentation pit and oil-water separator will be provided.

Soil contamination from spillage of fuels and lubricants: Fuels and lubricant will be stored in designated storage areas. Thus, the contamination of soil can happen only due to accidental spillage of fuels and lubricants from storage areas and during handling. Diesel operated machineries & equipment, and diesel generator (DG) would be operated during site development. Accidental leakage and spillage of fuel has the potential to impact soil quality.

Accidental spillage can occur due to error in manual handling of fuel and lubricants or due to mixing of these substances with surface runoff generated during a rainfall event. The accidental spillage from manual handling would be limited to a small area within the project site; however, may be spread to larger area but is expected to be confined within the project boundary. The contamination of fuels and chemicals may affect soil microbes and bacterial growth, which can lead to a change in soil quality.

The fuel and lubricant will be stored in the existing storage area (impervious areas), having secondary containment. Spill kits are available at site for clean-up of any accidental spillage of fuel and lubricant. This mitigation measures will reduce the potential for mixing with the surface runoff during rain events.

Soil contamination from C&D waste and MSW storage and disposal at non-designated area:

Construction and demolition waste will be generated at the project site during the site development stage of the project. General C&D waste will consist of surplus of materials such as concrete, steel cuttings and filings, wooden planks, packaging paper or plastic, wood, plastic pipes, metals, etc. The C&D waste is not chemically active and can be reused for site development and also recycled through third party vendor. As per CWIT's existing waste management procedure, these wastes will be stored in designated storage area and finally disposed through third party vendor for recycling purpose or final disposal. As this waste is not chemically active, these waste materials do not influence the chemical properties of the soil; but if the C&D waste is stored on the bare soil it can influence the physical properties of the soil.

MSW consisting of food waste, plastic, glass, aluminium cans and waste packages will also be generated by the construction workforce. CWIT has a waste management procedure covering MSW which includes collection of segregated waste in separate bins in temporary storage area and finally disposal through third party vendor. Any non-adherence to the waste management procedure, resulting in storage in non-designated areas and disposal on bare soil, can influence the soil pH and nutrient level of the soil.

Accidental spillage of oil & grease from dredger & vessels: The potential sediment quality impacts consist of oil spills from dredgers or tug vessels during dredging or transportation or accidents. The spillage of small quantity of oil & lubricant may not contaminate the sediment layer, which is situated in around 18 m depth from sea surface.

Hazardous waste storage and disposal: Some proportion of the waste generated during construction will be hazardous and may include:

- Oily substances -rags, gloves, spill pads, oily debris, lube oils;
- Non-oily hazardous waste: used batteries.

CWIT has a waste management procedure covering hazardous waste which includes collection of waste in different containers as per characteristics, temporarily storing in dedicated storage area (impervious floor with secondary containment) and disposal through third-party vendor for recycling or disposal. Any non-adherence to the waste management procedure resulting in any accidental spillage can affect the soil quality.

If spillage occurs on bare soil, it may take a long time for natural attenuation to occur, unless corrective action is taken. These substances may be toxic to soil fauna and microbes. Additionally, many of these substances are slow to decompose and have low mobility meaning that they may persist in the affected area for an extended period of time.

Significance of Potential Impact

The significance of potential impacts to soil due to site establishment stage is assessed in following table.

Table 7.2 Assessment of Potential Impact to Soil and Sediment during Project Stage 1 activities

Criteria	Rating	Comment
Potential Impact Sources		
<ul style="list-style-type: none"> ■ Site development (reclamation, levelling and compaction) ■ Accidental spillage of fuel, lubricant from storage site ; ■ Accidental spillage of fuel from machineries, transport vehicles and diesel generator (DG); ■ Accidental spillage of oil & grease from dredger & vessels; ■ Storage and disposal of construction and demolition (C&D) debris and municipal solid waste (MSW) in non-designated area; ■ Accidental spillage of hazardous waste from storage area 		
Nature	Negative	Potential impacts to soil and sediment quality would be considered to be negative
Type	Direct	Potential impacts to soil and sediment quality is likely to be direct.
Duration	Long term	Construction work will last approximately 5 years. If the soil and sediment is impacted by hazardous materials and hazardous waste, it may take a long time for natural attenuation to occur, unless corrective action is taken.
Extent	Local	Potential impacts would be limited to the Project site and its immediate vicinity.
Scale	Low	Accidental release of hazardous materials/ wastes, or impacted storm water runoff can potentially affect the soil and sediment quality of the project site and also around the surface runoff discharge location. Considering, existing mitigation measures, the potential impacts are unlikely to result in a significant change to baseline soil quality.
Frequency	Construction activities will happen for the duration of Project Stage 1. Any releases would be accidental, and therefore are expected to be infrequent, if any.	
Magnitude	Small	Considering the duration, extent and scale of potential impact, magnitude of impact is assessed to be small.
Receptor/Resource Sensitivity	Medium	Existing soil and sediment quality in the Project site and ZOI is generally good, near the proposed terminal site and immediate surrounding area is under port. The sea bed at sand quarry area and terminal side has provided the benthos habitat.
Potential Impact Significance	Moderate	As per the impact assessment methodology defined in Section 4, the combination of a medium resource sensitivity and small potential impact magnitude will result in an overall moderate potential impact significance.
Proposed Mitigation Measures	<ul style="list-style-type: none"> ■ The Site Specific Emergency Response Plan (SSERP) for soil clean-up remediation, in case of any accidental spills ■ Implement the standard operating procedures for the transfer and use of fuel to prevent accidental releases; ■ Once a spill incident has occurred, the Contractor will identify the chemical involved and check hazardous property of the chemical from the Safety Datasheet (SDS); ■ The substance will be properly collected and stored in a separate labelled container and disposed through third party vendor. ■ Waste management plan has been developed for the project. Periodic monitoring, verification and check for implementation of waste management plan will be carried out as per plan (<i>Refer to Appendix 9.1</i>) 	
Potential Residual Impact Significance	Minor	Implementation of the above mentioned mitigation measures would significantly reduce the potential extent and scale of the potential impact

Criteria	Rating	Comment
		on soil, which would reduce the potential impact magnitude to be negligible. If the recommended control measures are implemented, potential residual impact significance would be Minor.

7.3.2 Potential Impact to Coastal Morphology

Potential Impact Sources

Potential sources of impacts to coastal morphology due to activities during construction stage include:

- Dredging at reclamation area for unsuitable soil;
- Disposal of unsuitable soil at offshore disposal site;
- Dredging of sand from sand extraction area.

Embedded control measures

The following mitigation measures are in place and will be implemented for the dredging activities:

- Trailer suction hopper dredgers (TSHD) will used for dredging activity;
- Unsuitable soil from reclamation area will be disposed in the SLPA designated disposal site;
- Sand extraction is limited to a maximum of 3m at a location to avoid creation of scattered deep holes in the area;
- Sand extraction would be initially restricted to the grid area specified in the SLPA letter No. PD/WCT/02- D&R dated 25.01.2022.

Impact Assessment

Dredging at reclamation area for unsuitable soil and disposal in offshore disposal site: The proposed WCT-1 will be constructed within the South Colombo Harbour (SCH). Breakwater for the SCH already been constructed, capital dredging for harbour approach channel already been conducted. The proposed WCT-1 site will be developed by reclaiming the basin area. Prior to the placement of reclamation fill, the existing superficial soft material which is considered “unsuitable” will be dredged by the TSHD and dumped at the designated offshore disposal area. The proposed dredging activity may cause some change to the hydrodynamic flow, the magnitude and type of effect will be related to the nature of the environment, overall size of the excavation compared to the overall size of the system.

The proposed dredging area located within the harbour and offshore disposal area is located a minimum distance of approximately, 6 km away from the coast. Bed profile changes within the dynamic coastal zone will influence the changes of the hydrodynamic pattern of the area and accordingly, there could be impacts to the coastal morphology of the area.

Dredging of sand from sand extraction area: The proposed extraction site is located a minimum of 7.2km away from the south west coast and a depth exceeding of 15m which is far away from the dynamic coastal zone. Bed profile changes within the dynamic coastal zone will influence the changes of the hydrodynamic pattern of the area and accordingly, there could be impacts to the coastal morphology of the area.

Since the proposed dredging site is located far away from the dynamic coastal zone, any activities at the site will not alter the coastal hydrodynamics of the area. Further offshore sand is not the sediment feeder to the dynamic coastal sedimentary budget and hence extraction from offshore locations does not affect any sediment unbalance in the system. Therefore, offshore sand extraction does not cause any coastal erosion in adjacent areas.

Dredging is proposed to carry out using trailer suction hopper dredgers (TSHD). Since the suction method is used to extract the surface sand, there will be no damage to the secondary strata or existing reefs in the area. The normal practice is to extract the sand while moving the dredger at a speed about 1-2 knots. Since the dredger is not stationary at a place, formation of deep cavities will not be possible.

Further sand extraction is limited to a maximum of 3m at a location to avoid creation of scattered deep holes in the area. The depth at the extraction site is between 20m to 38m and it belongs to the deep water area. A maximum of 3m of morphological changes in deep water does not create a significant difference in the coastal hydrodynamic pattern of the area.

With the proposed methodology, the mining would not have a significant impact on the coastal stability of this area.

Significance of Potential Impact

The significance of potential impacts to coastal morphology during construction stage is assessed in following table.

Table 7.3 Assessment of Potential Impact to coastal morphology during Project Stage 1 activities

Criteria	Rating	Comment
Potential Impact Sources		
<ul style="list-style-type: none"> ■ Dredging at reclamation area for unsuitable soil; ■ Disposal of unsuitable soil at offshore disposal site; ■ Dredging of sand from sand extraction area. 		
Nature	Negative	Potential impacts to coastal morphology would be considered to be negative
Type	Direct	Potential impacts to coastal morphology is likely to be direct.
Duration	Short term	The dredging activities in the proposed land reclamation area and sand dredging area will be completed within eight months.
Extent	Local	Potential impacts would be limited to the Project site and its immediate vicinity, considering mitigation measures
Scale	Low	Coastal morphological changes in terms of accretion and erosion is not expected. Dredging of unsuitable soil from land reclamation area disposal in offshore disposal area may not cause significant changes of coastal morphology.
Frequency		The dredging and discharge activity will be completed within 8 months from the start of the activity. Any releases would be accidental, and therefore are expected to be infrequent, if any. Frequency can be categorised as likely.
Magnitude	Small	Considering the duration, extent and scale of potential impact, magnitude of impact is assessed to be small.
Receptor/Resource Sensitivity	Medium	Along the 40 km coast line in Colombo accretion rate is 0.0 to 0.1 m/year. The stakeholder consultation with local people also raised the concern about the erosion in the coastline villages in Negombo area.
Potential Impact Significance	Moderate	As per the impact assessment methodology defined in Section 4, the combination of a medium resource sensitivity and small potential impact magnitude will result in an overall moderate potential impact significance.
Proposed Mitigation Measures		<ul style="list-style-type: none"> ■ Sand extraction should be limited to the prescribed area only; ■ Use suction method to extract the sand; ■ Measurement of beach profile should be carried out covering from the beach area of Sarakkuwa to Negombo mentioned in the CEA approval.
Potential Residual Impact Significance	Minor	Implementation of the above mentioned mitigation measures would significantly reduce the potential extent and scale of the potential impact on coastal morphology, which would reduce the potential impact

		magnitude to be negligible. If the recommended control measures are implemented, potential residual impact significance would be Minor.
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7.3.3 Potential Impact on Surface Water Quality

Potential Impact Sources

Potential sources of impacts to surface water quality due to activities during site development and construction stage include:

- Dredging of sand at borrow area and discharge in the reclamation area;
- Dredging and disposal of soft (unusable sediment) at land reclamation area;
- Accidental spillage of oil & grease from dredger and vessels used for transportation of dredge and construction materials;
- Contaminated Surface runoff from land based construction area;
- Discharge of untreated sewage from construction site;
- Discharge of untreated bilge and ballast water.

Embedded control measures

The following mitigation measures are in place and will be implemented for the site development and construction stage of the project:

- Trailer suction hopper dredgers (TSHD) will used for dredging activity;
- Unsuitable soil from reclamation area will be disposed in the SLPA designated disposal site;
- A designated machinery and equipment storage area will be developed for the Project;
- Fuels, lubricants will be stored in dedicated storage area having secondary containment;
- Different types of hazardous waste collection bins will be provided for oily substances and non-oily hazardous waste at construction area;
- Hazardous wastes generated from the site establishment stage will be stored in designated waste storage area, having secondary containment;
- Hazardous waste will be finally disposed through third-party vendors;
- WCT-1 has a well defined spill response procedure and associated spill kits to contain any incidental spillage of fuel, chemicals and hazardous waste;
- Offshore: All sewage generated will be treated and disinfected onboard and disposed offshore beyond 3 nautical miles (nm) complying with the MARPOL requirements.
- Onshore: Provision of STP to treat wastewater from construction sites / labour camp proposed to be located within the Port Premises

Impact Assessment

Dredging at sand borrow area: Sand will be extracted from sand borrow area for reclamation work. The dredging process has the potential to mobilize fine seabed sediments into suspension and hence increase the turbidity level. High levels of fine suspended sediment over long periods may have an adverse environmental impact.

Dredging activities often generate no more increased suspended sediments than commercial shipping operations, bottom fishing or generated during severe storms (Parr et al 1998). Furthermore, natural events such as storms, floods and large tides can increase suspended sediments over much larger

areas, for longer periods than dredging operations (Environment Canada 1994). It is therefore often very difficult to distinguish the environmental effects of dredging from those resulting from natural processes or normal navigation activities (Pennekamp et al 1996).

The degree of resuspension of sediments and turbidity from dredging and disposal depends on four main variables (Pennekamp and Quaak 1990):

- The sediments being dredged (size, density and quality of the material),
- Method of dredging (and disposal),
- Hydrodynamic regime in the dredging and disposal area (current direction and speed, mixing rate, tidal state), and
- Existing water quality and characteristics (background suspended sediment and turbidity levels).

The methods of dredging release suspended sediments into the water column, during the excavation itself and during the flow of sediments from hoppers and barges. Turbidity resulting from hopper loading and transport to site can be due to the following:

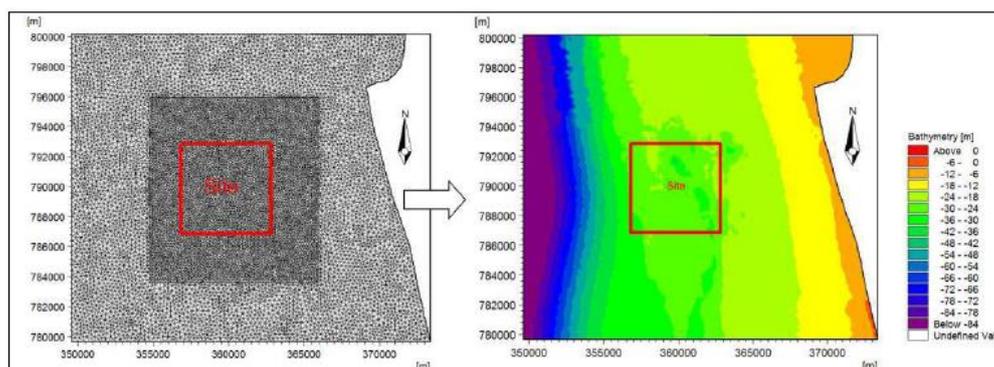
- Overflowing of the hopper: here fines are discharged with the overflow through the keel. When the flow reaches the propeller stream of the vessel, suspended sediment may be further distributed;
- Lean mixture overboard: if the suction flow is of a very low density, it may be pumped overboard in order not to dilute the load. This will increase turbidity in the top water layer; and
- During the excavation: While suction there can be a possibility of releasing fine sediments

A detailed study on dispersal of dredged sediment movement was undertaken during IEE study through LHI to explore the transport and dispersion of suspended sediments release from the borrow area due to dredging processes. The summary of the sediment dispersion modelling section has been presented below:

The Particle Tracking module of MIKE 21 Flow Model FM (MIKE 21 HD/PTOF⁵⁷) is used to simulate the transport and track of the suspended substances discharged during dredging process for the proposed development. Hydrodynamic model (MIKE 21 HD) was used to provide a description of tidal current flows and water level variations based upon an unstructured triangular mesh. This model was combined with the particle tracking model (MIKE 21 PT) which extends the model capabilities to consider the transport, deposition, erosion and re-suspension of fine sediments and used to simulate the operational cycle of the dredger based on the dredging work plan and sediment release rates.

⁵⁷ MIKE 21 PT is a Particle Tracking module which simulates the transport and fate of dissolved and suspended substances discharged or accidentally spilled in lakes, estuaries, coastal areas or in the open sea. The pollutant is considered as particles being advected with the surrounding water body and dispersed as a result of random processes in two dimensions. Each particle is assigned a corresponding mass, which can change during the simulation due to decay or deposition. The particles may settle with a constant settling velocity and settled particles may be re-suspended. A corresponding mass is attached to each particle which may be reduced during the simulation due to decay.

Figure 7-1 Bathymetry of the Study Area with Computational Mesh



For our equipment deployment calculations, a trailer suction hopper dredger (TSHD) with hopper capacity of 10,000m³ to be deployed for dredging operations in a continuous manner. Actual equipment deployment will be based on availability in the market and TSHD capacity can vary. A TSHD trails its suction pipe when working, and loads the dredged spoil into hoppers in the vessel. When the hoppers are full, the TSHD sails to a disposal area and pumps the material out of the hoppers.

It is likely that during operations, most sediment will be released into the marine environment due to overspill at the dredge location. When dredge material is pumped onto the vessel the fines are partially separated from sand sized sediments. A proportion of the fines are returned to the water column due to over-spilling, and the sand sized sediments are retained. This technique allows the most efficient use of dredging operations and results in a higher quality material for fill and reclamation. Therefore, it is proposed to utilize 7,500m³ of sand through the overflowing process.

Each dredge produces specific types of losses during dredging process that result in suspended sediment entering the water column. Particles that are suspended in the water column (surface and bottom plumes) will have varying effects on water quality depending on which stage the particles are in:

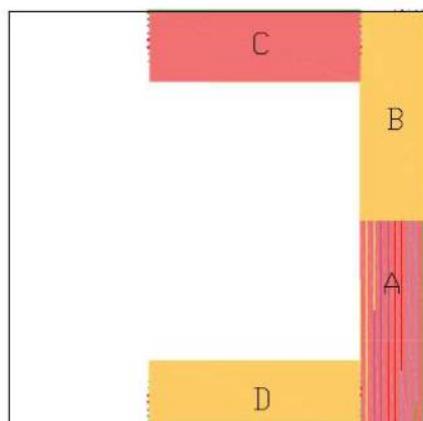
- water stage (where the particles are suspended in the water column/ surface & bottom plumes); and
- settlement stage (where the suspended particles have settled on the seabed/ bottom blanketing).

The dispersion of suspended particles or turbidity plume is generally a temporary impact. The length and shape of the surface plume generated depends on the hydrodynamics of the water and the sediment grain size.

Native sediment data was provided in the form of grain size distribution for surface sediment samples at the site. Samples were taken from five locations within the site to obtain sediment properties. The dispersion of suspended particles during dredging operations was specified as moving point sources. Model simulations were done considering several dredging cycles in continuous operation (including both dredging and bottom dumping operations) with one dredger at a time to observe the impact if any. While calculating the dredging cycle, dumping process is taken as the bottom dumping and the dumping time is considered as 15 min. This is to consider the worst case scenario, as the both rainbow dumping and pumping through the pipeline will take more time than the bottom dumping. The total duration of each cycle is 425min.

Total dredging process is assumed to be carried out continuously throughout the year and hence all possible seasons were considered during the modelling simulations. Months of July 2017 and Jan 2017 were selected to represent the wind and wave conditions in SW and NE respectively while Nov 2017 and April 2017 were selected to represent inter monsoon periods. Several locations in dredging site specially in the western and southern ends were selected to represent the different stages of dredging operation.

Figure 7-2 Selected Areas in Dredging Site for Modelling



Under dredging operations releasing of fine sediments at the suction head are considered at corresponding dredge levels and the releasing of the sediment through overflow is considered at the water surface. 5 continuous dredging cycles were considered for a simulation to represent the cumulative impact if any. Sediment loss rate during overflow is taken as 1% and then total sediments in overflow are estimated as 375m³. Percentage of very fine particles in the overflow is considered as 5% and those are mentioned as “Floaters” in the simulations. The rest of the overflow sediment is considered as coarse particles, and these coarse particles will settle down on the seabed within relatively short distance from the point of discharge. As such, they are not counted as suspended sediment. Overflow starts after 55 min of dredging operation and the total overflow volume is 37500m³ of mixture. Further 0.2% of sediment loss rate is taken into account at the suction head while dredging.

Total dredging time is estimated as 200min (dredging speed of 1 knots) and approximately 28km is assumed as travelling distance to the dumping site. With the speed of 10 knots, the dredger will take 90 min to travel from the dredging site to the dumping site. The total duration of each dredging cycle is 415 min (approximately 7 hrs). Sediment loss rate at the suction head and the overflow is estimated and used in the model along with the following data:

Table 7.4 Details of Sediment Source for Dredging Operations

Area of operation	A, B, C and D
Percentage of fine sediment loss during dredging	0.2% from suction head & 1% during overflow
Sediment loss rate at bottom (suction head)	14.6 kg/s
Sediment loss rate due to overflow (floaters)	4.4 kg/s
Total dredging time	200 min
Total dredging cycle	415 min

Continuous operation of 5 dredging cycles was considered in the model to capture the cumulative impact. Model simulation was carried out for the one-week period in each selected month by allowing extra time for complete sedimentation of dispersion material and also to incorporate the effect of both spring and neap tide.

Available water quality data was collected over recent years (1995-2014) in the study area from different studies was used to assess the reasonable suspended sediment concentration in the ambient condition to use as a guideline for the results comparison. Based on the results of those previous investigations, ambient suspended sediment concentration is ranging from 5mg/l to 20mg/l.

Generally, longer plumes are associated with fine-grained sediments such as silts and clays. Although the initial concentration in the hopper overflow is high, it will decrease rapidly to a low figure within few

meters. For this reason, the impact of the turbidity plume is expected to be minimal beyond the immediate zone of dredging.

Results from all model simulations were analyzed based on available standards and ambient values. Spreading plume concentration of suspended sediments were checked at critical locations under each monsoon to represent the continuous operation throughout the year.

The results of spreading plume concentration are obtained as spatial distribution of suspended floaters. Suspended sediment concentration for model simulation 1 (at location D2 during SW monsoon for a selected time step is given in **Figure 7.4**. Further suspended sediment concentration for dredging at location D during inter monsoon 1 is given in **Figure 7.3**.

Figure 7-3 2D Plots for spreading Sediment Concentration at Dredging Location D

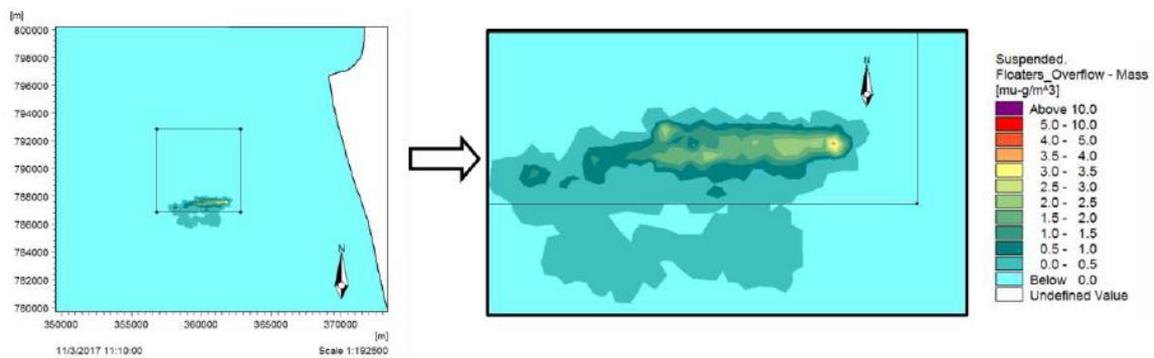
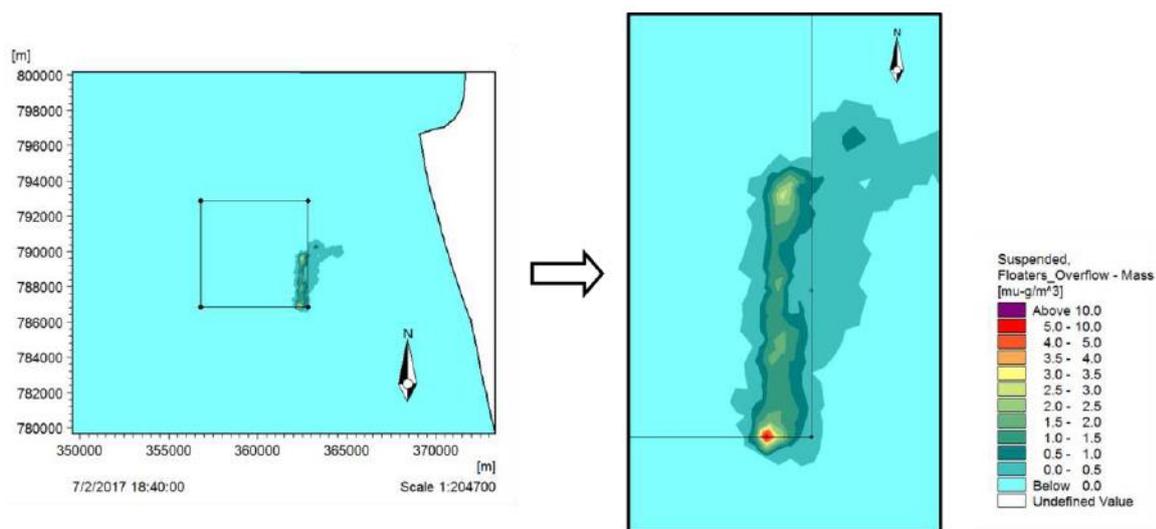


Figure 7-4 2D Plots for spreading Sediment Concentration at Dredging Location A



According to the colour legend concentration higher than 3.0mg/l shows in colours yellow to red while green shows the value less than 3.0mg/l. From the results it was observed that, suspended sediment concentration beyond the site area is less than $4 \times 10^6 \mu\text{g/m}^3$ (4mg/l) for all simulated conditions.

Measurements of suspended sediments of the study area show the TSS range of 2-20mg/l for different locations and different periods. Although spreading is occurring up to certain extent,

concentration of the suspended sediment is less than 3mg/l which is almost equal to ambient concentration. Further, the sediment settling will also occur within the dredging site itself. Therefore, dispersion of fine sediment due to dredging operations doesn't show any impact to the surrounding environment.

Dredging and disposal of soft (unusable sediment) at land reclamation area: Dredging and discharge of soft (unusable sediment) at land reclamation site and construction of other offshore structures will generate fine sediments and will also result in resuspension of sediments in water in localized area. This is expected to increase the turbidity of water and will have an adverse impact on surface water quality in the area surrounding the proposed WCT-1 area and offshore disposal area. The turbid waters impact on aquatic ecology will temporally affect primary productivity.

Accidental spillage of oil & grease from dredger & vessels: The potential water quality impacts consist of oil spills from dredgers or tug vessels during dredging or transportation or accidents. The amount of light penetrating into the water will be reduced if oil is spill from the dredgers in the mining area thus affecting the photosynthetic efficiency of the marine phytoplankton which are the only primary producers in the area. The impact on aquatic ecology and benthos has been discussed in the ecological impact assessment section.

Surface runoff from construction site: Potential surface runoff from bare earth during rainfall can result in a large amount of total suspended solids (TSS) levels at receiving waterbody. Rapid flow of rainwater on bare earth at the construction area could result in erosion; whereas, the eroded materials in the form of total suspended solids have the potential increase the turbidity of the receiving surface waterbody. The increased turbidity may have impact of aquatic ecology and benthos has been discussed in the ecological impact assessment section.

Surface runoff from accidental spillage area: Hazardous materials like fuels and lubricant, etc. will be stored in designated area having secondary containment. Surface water contamination during construction stage may occur from accidental events such as leaks and spills of oil and lubricants from storage area and during handling. The accidental spillage of fuel may occur at diesel driven vehicles and machineries and equipment operation areas. The accidental spillage can also occur at the hazardous waste storage area. WCT-1 Project has a spill response procedure and associated spill kits to contain any accidental spillage of fuel, chemicals and hazardous waste. If the spills are not properly contained, the surface runoff generated during rainfall has the potential to become impacted.

Generation and disposal of sewage: During construction phase, the project proponent will provide basic amenities sand sanitation facilities for workers at the construction site. The domestic wastewater will be treated through septic tank and soak pit or by using any sewage treatment facility available within the port premises. The accidental release of untreated sewage can happen only in case of malfunctioning septic tank and soak pit or STP. Untreated sewage, if directly discharged into nearby marine area will increase the organic load and the bacteriological load. This can lead to degradation of water quality (increase the BOD and E-coli and decrease the DO levels).

Discharge of untreated bilge and ballast water: The modern vessels typically containing on-board sewage treatment plants. All solid wastes will be either retained on-board, or collected by Contractors. The requirement for ballast is also very limited. Adequate draft and buoyancy is maintained as container vessels unload and load containers at each port they visited. The bilge water will be handled by the shipping agent or terminal operator. The discharge of untreated bilge water may impact on surface water quality.

Significance of Potential Impact

The significance of potential impacts to surface water due to discharge of sewage and untreated runoff during Project Stage 1 is assessed in following table.

Table 7.5 Assessment of Potential Impact to Surface water quality during Project Stage 1 activities

Criteria	Rating	Comment
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Potential Impact Sources		
<ul style="list-style-type: none"> ■ Dredging of sand at borrow area and discharge in the reclamation area; ■ Dredging and disposal of soft (unusable sediment) at land reclamation area; ■ Accidental spillage of oil & grease from dredger and vessels; ■ Contaminated Surface runoff from land based construction area; ■ Discharge of untreated sewage from construction site; ■ Discharge of untreated bilge and ballast water. 		
Nature	Negative	Potential impacts to surface water quality would be considered to be negative
Type	Direct	Potential impacts to surface water quality would likely be direct.
Duration	Short term	The surface water can be impacted due to dredging and discharge activity, which is expected to be completed within 8 months. The surface water also can only be impacted, if untreated sewage is discharged into local waterbody or due to surface runoff from accidental spillage area. If the surface water is impacted by accidental release of untreated sewage or accidental spillage, it is likely to be diluted and will be naturally assimilated in the receiving waters.
Extent	Regional	Potential impacts due to dredging operation and discharge likely to be limited within 3-4 km from the site. potential impact due to discharge of waste water and runoff are likely be limited to the discharge point and its surround area, depending upon quantity of untreated sewage and impacted runoff and sea current & wave situation.
Scale	Low	The impacts are likely to occur during dredging operation and accidental discharge of untreated sewage and surface runoff from construction site and accidental spillage area. The surface water quality may not be significantly altered due to above mentioned sources. The scale of change in water quality is expected to be low.
Frequency	The dredging and discharge activity will be completed within 8 months from the start of the activity. Any releases would be accidental, and therefore are expected to be infrequent, if any. The frequency can be categorised and likely.	
Magnitude	Small	Considering the duration, extent and scale of potential impact, the magnitude of the potential impact is assessed to be small.
Receptor/Resource Sensitivity	Medium	The water quality of Indian ocean in the ZOI is suitable for fisheries and regular fishing activities occurs at the ZOI by the local fisherman.
Potential Impact Significance	Moderate	As per the impact assessment methodology defined in Section 4, the combination of a low resource sensitivity and small potential impact magnitude will result in an overall moderate potential impact significance.
Proposed Mitigation Measures	<ul style="list-style-type: none"> ■ Minimise the suspended sediments release through use of modern sand extraction method; ■ The sand extraction can be limited to short-term as much as possible to avoid spawning or migration seasons and other biological critical time period; ■ Maintain proper extraction methods and technology to prevent or minimise and potential damage and contractor should strictly adhere to sand dredging guidelines and strictly follow mitigation measures put forward to minimise sedimentation; ■ Channelize all surface runoff from the construction site through storm water drainage system and provide adequate size double chambered sedimentation tank; ■ Compact site (proposed terminal area) to reduce the amount and rate of infiltration; ■ WCT-1 has a Site Specific Emergency Response Plan (SSERP) for soil clean-up remediation, in case of any accidental spills ■ Implement the standard operating procedures for the transfer and use of fuel to prevent accidental releases; ■ Once a spill incident has occurred, the contractor will identify the chemical involved and check hazardous property of the chemical from the Safety Datasheet (SDS); 	

	<ul style="list-style-type: none"> ■ The substance will be properly collected and stored in a separate labelled container and disposed in accordance with Waste Management Practice of WCT-1. ■ Periodic monitoring, verification and check for implementation of waste management plan (<i>Refer to Annex 8.1</i>).
Potential Residual Impact Significance	<p>Minor</p> <p>Implementation of the above mentioned mitigation measures would significantly reduce the potential extent and scale of the potential impact on surface water quality, which would reduce the potential impact magnitude to be negligible. If the recommended control measures are implemented, potential residual impact significance would be Minor.</p>

7.3.4 Potential Impact on Ambient Air Quality

Potential Impact Sources

Potential sources of impacts on ambient air quality due to activities during construction stage include:

- Fugitive dust emissions from site development activities like grading and levelling;
- Fugitive dust emissions from construction activities like earth work for foundation of buildings and civil construction;
- Emissions during transport of boulders, construction material, equipment and manpower;
- Fugitive dust emissions from handling of construction materials like sand, cement and aggregate;
- Emissions from operation of heavy machineries and equipment (excavators and pay-loaders, light and heavy-duty trucks and trailers, concrete mixers; lifting equipment, including crane and forklifts);
- Operation of potable DG sets.

Embedded control measures

Project mitigation measures are as follows:

- All vehicles utilized in transportation of raw material and personnel will have fitness certified vehicle;
- Vehicular speed limit of 10 km/hr. will be maintained within the project site;
- Dust suppression measures will be adopted through periodic water sprinkling during dry period in working area;
- Construction materials would be stored in designated storage area;
- DG set with adequate stack will be used for sourcing of power for construction activities.

Impact Assessment

As discussed in **Section 5.3.8**, the concentrations of PM₁₀, PM_{2.5}, SO₂, NO₂ and CO in all the primary monitoring locations in the ZOI, were well within the ambient air quality standards specified in the CEA.

Site development and earth work for foundation and civil work: Site development activity includes land grading, compaction and levelling. The construction activities includes earth work for foundation and handling of construction materials (sand, cement and aggregates). All such site development and construction activities have the potential to generate fugitive dust. The extent of potential impacts from dust will depend on the exact location of these activities and on the weather conditions; stronger winds and dry conditions will enhance the transfer of dust, while damp or wet conditions will reduce this potential impact. The fugitive dust generated during construction activities are generally of larger particle size. It is expected that larger particle size dust will be deposited in and around project site. The predominant wind direction is from the SW and WSW. Therefore, fugitive emission are likely to

disperse towards NE and NSE. The nearby human settlements, is located 2.5 km from the site. So the potential impact of fugitive emissions from the construction has not been envisaged.

Transport of boulder, construction material, equipment & manpower: During the construction stage, the traffic in the existing roads will increase due to transportation of boulders, construction material, equipment and workforce to the site. Exhaust emissions from the vehicles are likely to contribute to the air pollutant load (primarily particulate matter, NO₂, SO₂ and CO) in the ambient air within the ZOI. The site access roads are all paved road and condition of the roads are good. The vehicular movement on roads may generate re-entrained dust; however, this is not likely to be significant as the roads are paved and in good condition. The generated re-entrained dust from vehicular movement is expected to be localised, along the stretches of the site access road. The fill materials (sand) and other construction materials (cement, sand and aggregate) will also be transported through road ways. Fugitive dust may be generated, if these fill materials and construction material are transported in uncovered trucks. This fugitive emission could be dispersed locally along the transport route.

Fugitive emissions from construction material storage and handling area: Construction materials will be stored at the site at a designated area during the construction activity. Cement will be stored in covered area. Fugitive dust may be generated from the storage area of sand and cement. Fugitive dust may also be generated during handing (unloading from transport vehicle to storage area and handing during construction activity) of construction materials (sand, aggregate, cement). The extent of potential impacts from dust will depend on the exact location of such activities and on the weather conditions.

Operation of heavy machineries and equipment: During construction activity, heavy machineries and equipment will be used. Heavy equipment such as DG sets, excavators, pay-loaders, trucks & trailers, concrete mixers, lifting equipment, etc. will be deployed onsite. Emissions from these equipment can affect the ambient air quality of the surrounding areas. Exhaust emissions from operation of machinery and equipment are likely to contribute to the air pollutant load, including but not limited to pollutants such as PM, NO₂, SO₂ and CO. The pollutants, especially particulate matter, will settle in areas surrounding the site, and is expected for the entire duration of the site development stage.

Significance of Potential Impact

The significance of potential impacts to ambient air quality due to emissions from site development and construction activities during Project Stage 1 is assessed in following table.

Table 7.6 Assessment of Potential Impact to Ambient Air quality during Project Stage 1 activities

Criteria	Rating	Comment
Potential Impact Sources		
<ul style="list-style-type: none"> ■ Fugitive dust emission from site development and construction activities; ■ Emissions during transport of boulders, construction material, equipment and manpower; ■ Emission from operation of heavy machineries and equipment; ■ Operation of potable DG set. 		
Nature	Negative	Potential impacts to ambient air quality would be considered to be negative.
Type	Direct	Potential impacts to ambient air quality from Project activities is likely to be direct.
Duration	Short term	The air emissions from the construction stage of the project will be dispersed in the air environment
Extent	Local	Potential impacts would be limited to the immediate surrounding areas of the WCT-1 site, and hence is considered to be local, however winds may potentially carry emission into surrounding settlements.

Scale	Low	The emission from construction activity may not result in any perceptible changes in existing ambient air quality. The scale of change in ambient air quality is expected to be Low.
Frequency	Emissions will be released for the duration of Project Stage 1.	
Magnitude	Small	Considering the duration, extent and scale, the magnitude is assessed to be small.
Receptor/Resource Sensitivity	Low	Existing air quality in the Project area is good. There is no receptor (settlements) within 2.5 km of the proposed project site.
Potential Impact Significance	Minor	As per the impact assessment methodology defined in Section 4, the combination of a medium receptor sensitivity and small potential impact magnitude, will result in an overall minor potential impact significance.
Proposed Mitigation Measures	<p>The aforementioned mitigation measures will be implemented. Additionally following mitigation measures will also be implemented.</p> <ul style="list-style-type: none"> ■ Site development area will be compacted to reduce the fugitive dust emissions; ■ During construction, the approach road will be kept clean and free from mud and slurry; ■ All construction material will be transported in covered trucks to reduce the potential for emission of dust; ■ Construction material will not be loaded above the freeboard of the truck to avoid spillage; ■ All diesel-powered equipment will be regularly maintained and idling time reduced to minimize emissions; ■ Personal Protective Equipment (PPE) – mask will be provided to the construction workforce 	
Potential Residual Impact Significance	Incidental	Implementation of the above mentioned mitigation measures would significantly reduce the extent and scale of the potential impact, which in turn would reduce the potential impact magnitude to be negligible and potential residual impact significance would be incidental.

7.3.5 Potential Impact on Ambient Noise Quality

Potential Impact Sources

Potential sources of impacts to ambient noise quality due to activities during site development and construction stage include:

- Dredging and reclamation work;
- Operation of machineries and equipment (excavators and pay-loaders; light and heavy-duty trucks and trailers; concrete mixers; lifting equipment, including cranes and forklifts);
- Piling activity;
- Transport of boulders, equipment and machineries.

Embedded control measures

The following measures will be implemented:

- Vehicle, equipment, and machinery used for construction activities would conform to applicable National Environmental (Noise Control) Regulations No. 1 of 1996 noise standards;
- PPE will be provided to the construction workers.

Impact Assessment

Dredging and reclamation work: The operation of dredger at sand dredging area will also generate the noise. The proposed dredging site is approximately 7.5 km from the nearest settlement at the coast.

The generated noise will be attenuated with distance. Therefore, the construction noise due to dredging and reclamation works is unlikely results in significant impacts on noise sensitive receptors.

Operation of heavy machineries & equipment: During construction activity heavy machineries and equipment will be used. Heavy equipment such as excavators and pay-loaders; light and heavy-duty trucks and trailers; concrete mixers; lifting equipment, including cranes and forklifts will be used onsite. Noise generated from the operation of these machineries has the potential to result in an increase in ambient noise levels. The incremental noise level due to operation of heavy machineries & equipment is unlikely results in significant impacts on noise sensitive receptors.

Piling activity: The sound pressure levels from piling are high (up to 128 dB(A) depending on the piling method) and impulsive nature of piling noise can cause a nuisance. Notwithstanding this, the potential impact from piling and other construction activities such as dredging, reclamation are site works are likely to be limited. Developments immediately surrounding the existing port are primarily non-sensitive, such as warehouses. In addition to which, the attenuating distance between proposed noise source and receptors is more than 2.5 km. Finally the existing building within the situated within the existing port would act the noise barrier. The incremental noise level due to piling activity is unlikely results in significant impacts on noise sensitive receptors.

Outdoor noise propagation from construction area

A noise modelling exercise was undertaken based on sound pressure level propagation equations to evaluate potential noise levels generated during site establishment stage from the proposed project. The results will help in ascertaining if the sound propagated due to the proposed activities at receptor level and to assess the potential impact.

As per principle of sound pressure level propagation, in a free field condition, the sound pressure level decreases as the distance from the source increases, and the following equation holds:

$$SPL_{(R2)} = SPL_{(R1)} - 20 \log R2/R1;$$

Where,

SPL_(R2) = Sound Pressure Level at distance R2; and

SPL_(R1) = Sound Pressure Level at distance R1.

In addition, the sound pressure level reduces during propagation due to atmospheric attenuation caused by geometrical divergence, atmospheric absorption (frictional loss of sound energy for moving through air medium), due to absorption with solid obstacles such as concrete walls, berms, vegetation, etc. interaction with ground and other factors.

Based on the methodology proposed in ISO-9613, attenuation of sound which originates from a point sound source, or an assembly of point sources was calculated. The sources could be mobile or stationary. This method is applicable directly or indirectly to construction activities and many other ground based noise sources.

Hence, the refined equation for sound propagation around a noise source can be expressed as:

$$SPL_{(R2)} = SPL_{(R1)} - 20 \log R2/R1 - Ae;$$

Where,

Ae = Excess attenuation is a combination of all below-mentioned effects:

$$Ae = A_{weather} + A_{ground} + A_{turbulence} + A_{barrier} + A_{vegetation}$$

For application to the specific noise sources that could contribute to ambient noise levels, the following conservative assumptions have been made:

- At any given point of time, all the equipment and vehicle listed in **Table 7.5** are being operated together;
- Considering the machineries and equipment were operating within a radius of 50 m and equivalent noise level from each equipment was cumulatively considered to be a single point source of 93 dB(A) sound pressure level;
- The nominal mid-band frequency of noise generated was 500 Hz;
- Meteorological parameters such as wind speed and wind direction were not taken into consideration;
- Excess attenuation due to weather (30°C and 70% humidity) and barrier⁵⁸ (concrete fencing above the line of sight level) was considered.

Table 7.7 Typical Noise Emission from Construction Machinery

S. No.	Equipment	Sound Pressure Level dB at 10 m
1	Excavator (22t)	78
2	Grader/ Dozer (28t)	79
3	Truck & Trailers (29t)	79
4	Compactor- vibratory roller (4 t)	74
5	Hydraulic hammer rig (4t hammer)	87
6	Mobile lifting crane (400 t)	78

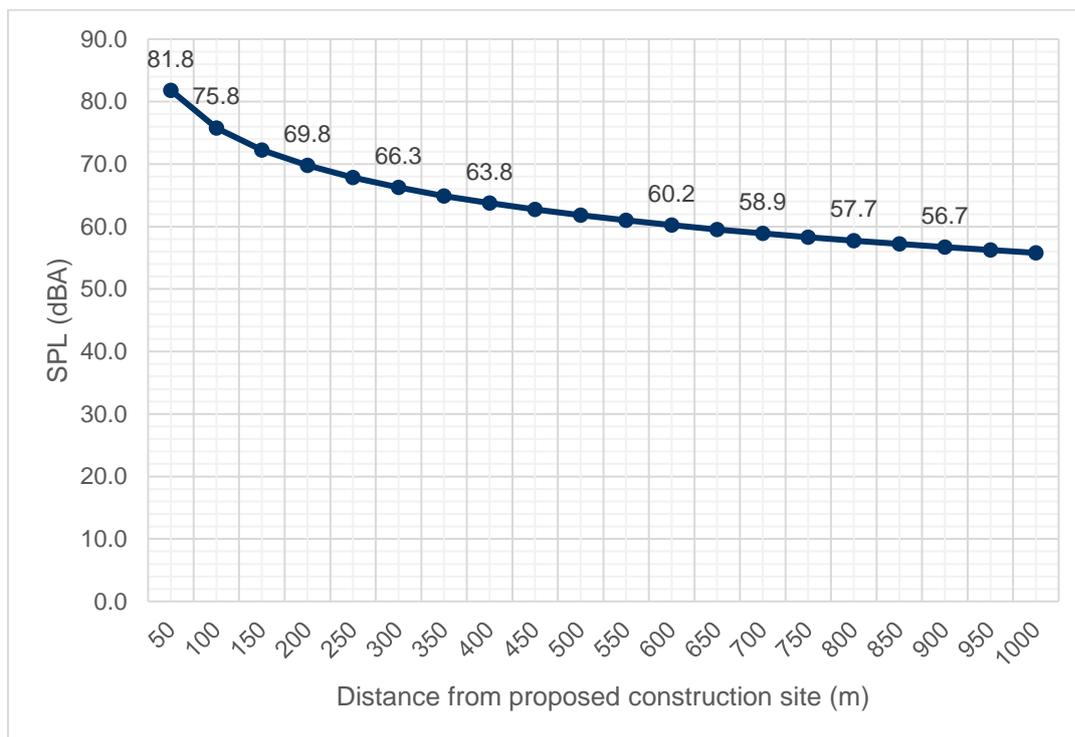
Source: BS 5228⁵⁹

The results of the modelled propagation of noise from the proposed project is as provided in **Figure 7.5**. The noise propagation figure reveals that incremental noise from construction activity will be attenuated to urban residential area day time noise standard 60.0 dB(A) within 600 meters from the construction area in any direction. The incremental noise standard will be attenuated to maximum noise level of 62.62 dB(A) at a distance of 525 m from the construction at any direction. There are no settlements within 2500 m from the proposed WCT-1 site.

⁵⁸ Per ISO 9613-2 (1996), for thin barriers, a maximum attenuation of 20 dB must be considered

⁵⁹ British Standard BS:5228: 2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites – Part 1, 2019

Figure 7.5 Propagation of noise from the Project during site establishment stage



Conclusions

Based on the noise modelling exercise, the following are the conclusions and recommendations:

- Noise propagation exercise was carried out to compare the predicted and baseline noise levels that will change due to the proposed Project during construction stage;
- Only proposed noise sources were considered for prediction assuming that noise from the existing noise sources is captured as a part of baseline noise monitoring;
- The resultant noise levels suggest that the proposed project is not going to create any impacts on the local community, as there is settlement within 2.5 km from the project site and predicted noise level will be attenuated to existing baseline noise level within 525 m from the construction site.
- The incremental noise from the construction activity may have potential impact on workers working in the construction site; same will be discussed in occupational health and safety impact section.
- No potential significant construction effects have been identified as there is no sensitive receptors located within the distances specified above. However, construction noise monitoring stations will be deployed at site boundaries to monitor construction noise levels in order to fulfil the requirements from the local authorities

Transport of fill material and construction materials: Transport of quarry material (boulder) and construction materials will increase the vehicular load on the existing roads. Noise generated from vehicular movement will only be experienced by people living in close vicinity of the roads, and only for a brief period of time.

Noise due to vehicular movement outside the site near residential area

The road A2 (Galle Face Center Road), A1 (Olotte Mawatta) is the main excess road to Colombo port, same will be utilised for transport of boulders from quarry area and construction materials and manpower.

The following conservative assumptions have been made:

- Assuming that in an hour a maximum of 25 Tippers/ Trailers would be transporting material to the site and return travelling;
- 10 number of other vehicles for transportation of manpower;
- The average speed of the vehicles is 40 km/hr.

The predicted traffic levels associated with the development of WCT-1 were calculated using the expected traffic due to peak construction phase traffic movement. Current traffic flow of trucks represents the traffic from the existing port of Colombo. The future traffic flow of trucks includes the additional contribution from WCT-1,

Noise level arising from existing and future traffic flows have also been predicted using the methodology developed by Ontario Ministry of Transportation and Communication Canada. Noise levels are calculated on the assumption that maximum speed within the port is 40 km/hr, using the following formula:

$$\text{Predicted sound level} = 52 + 10.2 \log (V_c + 6 V_t) - 13.9 \log D + 0.13 S$$

Where:

Leq = equivalent noise level during a hour dB(A)

Vc = volume of automobiles other than trucks, veh/hr

Vt = volume of trucks, veh/hr

D = Distance from the source to receiver, m

S= Average speed of traffic flow, km/h

The present and future predicted traffic flow and corresponding noise levels are shown in following table

Table 7.8 Predicted noise due to Construction stage traffic movement

Road Link	Current flow 2022 (hr. average)		During peak construction stage (2023)		Location of Noise predicted	Predicted noise level Leq dB(A)	
	Trucks	Others	Trucks	Others		2022	2023
Gate No. 3	14	138	39	148	Road side	53.31	55.74
Gate No. 6	182	142	207	152	Road side	60.93	61.47
Gate No. 8	50	88	75	91	Road side	55.79	57.27

Conclusions

Based on the noise modelling exercise, the following are the conclusions and recommendations:

- Noise propagation exercise was carried out to compare the predicted and baseline noise levels that will change due to traffic movement for construction phase;
- The results show that the existing noise level in 2022 due to traffic will range from 53.31 dB(A) to 60.93 dB(A). The predicted noise level due to traffic during peak construction stage (2023) is 55.74 dB(A) to 61.47 dB(A), which is within the CEA noise standard for urban residential areas of 60 dB(A) for Gate 3 and 9 location, however, exceeded in Gate 6 area.
- As per Schedule V of the National Noise Regulation, noise levels will be allowed to exceed the background noise level + 3 dB(A) in places where the background noise levels exceed or are

marginal to the given levels in Schedule I. Therefore, the predicted incremental noise level will be 0.44 to 2.04 dB(A), which is not considered to be a significant increase.

- The maximum baseline noise level (NQ-3) for roads and traffic was 62.62 dB(A), the predicted road traffic noise level is 60.9; therefore, total noise levels is estimated to be 64.8 dB(A) (62.6 + 60.9), which is within the Schedule III (for construction activity) daytime noise standard of 75 dB(A) but higher than the night-time noise standard of 50 dB(A). If traffic movement occurred at night, this may have an impact on the nearby community.
- However, if the road is passing through rural settlements and the baseline noise level is lower than the predicted noise level, the incremental noise level may have an impact on the baseline noise quality; but this is not considered to be significant.

Significance of Potential Impact

The significance of potential impacts to ambient noise due to construction activities during Project Stage 1 is assessed in following table.

Table 7.9 Assessment of Potential Impact to Ambient noise during Project Stage 1

Criteria	Rating	Comment
Potential Impact Sources		
<ul style="list-style-type: none"> ■ Dredging and reclamation work; ■ Operation of heavy machineries & equipment; ■ Piling activity; ■ Transport of boulders, equipment and machineries 		
Nature	Negative	Potential impacts to ambient noise would be considered to be negative.
Type	Direct	Potential impacts to ambient noise is likely to be direct from Project activities.
Duration	Short term	The emission of noise from proposed above mentioned sources will last for construction stage
Extent	Local	Potential impacts would be limited to the immediate surrounding of the Site, and hence would be considered to be local.
Scale	Low	The incremental noise generated from the construction activities will be attenuated to baseline noise level within 525 m from construction site and incremental noise from transport of construction stage traffic will be attenuated within 100m. The scale of change in ambient noise is expected to be Low.
Frequency	Noise will be generated for the duration of Project Stage 1.	
Magnitude	Small	Considering, the duration, extent and scale, the magnitude is assessed to be small.
Receptor/Resource Sensitivity	Low	There is no settlement of sensitive receptor within 2.5 km from the proposed site.
Potential Impact Significance	Minor	As per the impact assessment methodology defined in Section 4, the combination of a low receptor sensitivity and small potential impact magnitude will result in an overall minor potential impact significance.
Proposed Mitigation Measures	The aforementioned mitigation measures will be implemented. Additionally following mitigation measures will also be implemented. <ul style="list-style-type: none"> ■ Only well-maintained equipment will be operated on-site; ■ Regular maintenance of equipment such as lubricating moving parts, tightening loose parts and replacing worn-out components would be undertaken; 	

	<ul style="list-style-type: none"> ■ Machinery and construction equipment that may be in intermittent use, e.g. trucks, shall be shut down or throttled down during non-work periods; ■ Low-noise equipment shall be used where practicable; ■ The number of equipment operating simultaneously shall be reduced where practicable; ■ Equipment known to emit noise strongly in one direction should be orientated so that the noise is directed away from nearby noise-sensitive receptors where practicable; ■ The construction vehicular movement will be restricted in day time. 		
Potential Residual Impact Significance	<table border="1"> <tr> <td style="background-color: #008080; color: white;">Incidental</td> <td>Implementation of the above mentioned mitigation measures would significantly reduce the extent and scale of the potential impact, and in turn reduce the potential impact magnitude to negligible. If the recommended mitigation measures are implemented, potential residual impact significance would be incidental.</td> </tr> </table>	Incidental	Implementation of the above mentioned mitigation measures would significantly reduce the extent and scale of the potential impact, and in turn reduce the potential impact magnitude to negligible. If the recommended mitigation measures are implemented, potential residual impact significance would be incidental.
Incidental	Implementation of the above mentioned mitigation measures would significantly reduce the extent and scale of the potential impact, and in turn reduce the potential impact magnitude to negligible. If the recommended mitigation measures are implemented, potential residual impact significance would be incidental.		

7.3.6 Potential Impacts due to Underwater Noise and Vibration

Potential Impact Sources

Potential sources of impacts to under-water noise and vibration due to activities during site development and construction stage include:

- Piling operation;
- Operation of TSHD

Impact Assessment

Piling Operation: The potential impacts on underwater noise generation on marine fauna will be due to piles driving for development of foundation of terminal- towards offshore side. The sound pressure level (SPL) and sound exposure levels (SEL) expected during piles driving will be impulsive type that are likely to prevail for ~90 milliseconds with single strike per second in the shallow water of ~15 m depth. The underwater impulsive noise is expected to be SPL peak of 225 decibel reference 1 micro pascal at 1 m (dB re 1µPa at 1m); SPLrms of 210 dB ref 1µPa at 1m and SEL of 200 dB re 1µPa2s.

During construction phase, there will be potential impact on marine fauna due to underwater noise generation mainly during pile driving activities for jetty construction near the western breakwater of Colombo Port. The sound energy generated from source of pile driving due to hammering of piles into seabed propagates compression and transverse waves along the length of the piles into seabed through marine water column. Noise produced is typically broadband noise, with some low tonal peaks. The underwater noise levels expected to be generated from significant sources during the construction phase are described in following table.

Table 7.10 Underwater Noise Levels Considered

Underwater Noise Sources	Noise Source	Frequency (Range)Hz##	Assumptions
Pile Driving for jetty construction	SPL _{peak} : 225 dB re 1µPa at 1m SPL _{rms} : 210 dB ref 1µPa at 1m SEL: 200 dB re 1µPa ² s*	25 to 4,000 (62 to 10,000)	<ul style="list-style-type: none"> ■ Pulse signal - impulsive noise of ~90 milliseconds with 1 strikes per second ■ Prevailing shallow water depth of ~15 m

Note# =Sound Pressure Level (SPL) Peak and Root Mean Square (RMS) are expressed on a decibel scale (dB) and referenced to 1 micro Pascal at 1 m from the source [dB re 1 µPa @ 1m]; The Sound Exposure Level (SEL) measured over a period of time SEL = SPLrms + 10 Log(T) where T is time in seconds.

= Sound frequency is expressed in Hertz. Only the approximate range of peak frequencies is presented, frequencies outside this range are likely to exist but be lower in sound level.

* = Pile driving data is sourced from Compendium of Pile Driving Sound Data prepared for The California Department of Transportation by Illingworth and Rodkin, September 2007. The data chosen is of Impact Hammer Pile Type of 0.6 meter (24-inch) AZ Steel Sheet Pile Type measured values of SPL peak of 205 dB re 1 μ Pa, SPL rms of 190 dB re 1 μ Pa and SEL of 180 dB re 1 μ Pa² s at 10 m from source in relative water depth of ~15 m.

Criteria of Underwater Noise Levels

Noise sources, if sufficiently loud, may be detrimental to certain marine species under some circumstances and may result in physical harm or behavioural changes as defined

Table 7.11 Criteria Underwater Noise Levels applicable to Marine mammals

Marine Fauna	Criterion Underwater Noise Level	Possible Impacts	Reference
Marine mammals (Cetaceans)	SPL _{peak} : 224 dB re 1 μ Pa SEL: 183 dB re 1 μ Pa ² . S	Instantaneous exposure Permanent Threshold Shift (PTS)	Southall et al (2007 pg. 443)

Note: It is to be noted that marine mammals are unlikely to intentionally approach operations producing continuous or semi-continuous sounds that are powerful enough to lead to auditory damage. At lower sound levels there may be behavioural changes such as changes in diving patterns and avoidance behaviour, particularly when the noise source is intermittent. Continued exposure often results in habituation to the sound, followed by a recommencement of normal behaviour.

No marine mammals were observed during the present survey as part of this IEE Study or most recent surveys. However, there is some sighting of small groups of dolphin in offshore areas from Colombo Port. Several species of stranded whales (blue whale, humpback whale, short finned pilot whale) close to Colombo Port have been reported. However it is understood that marine mammals in the Project area are generally known to occur in water depths of 50 m and more, which is available beyond 50 km from FSRU location, however, sighting of cetaceans in shallow marine water cannot be ruled out.

Underwater Noise Modelled Results

The transverse waves and some of the ambient noise propagate through seabed into the sea water. Transmission loss of sound energy takes place spherically when it propagates uniformly in all directions in deeper regions whereas in shallow water, it propagates cylindrically. The sea water depth in the areas of pile driving for raising foundation of the proposed jetty is ~15-19 m. The intermediate noise propagation model has been considered to assess impact of underwater noise levels on prevailing marine fauna due to pile driving for terminal construction at the shallow water depth (<20m). It is also important to note that absorption of sound energy increases with the increase of frequency of the sound waves. Considering underwater noise source from pile driving as input to the noise model, the results obtained are presented in **Table 7.12**.

Table 7.12 Underwater Noise Propagation – Pile Operation

Distance from Source, m	SPL dB re 1 μ Pa		SEL dB re 1 μ Pa ² s				Safe Range Observed
	Peak	RMS	Single Strike	10-min	1-hour	3-hour	
1 (source)	225	210	200	-	-	-	Cetaceans: SPL _{peak} 224 dB re 1 μ Pa safe range is observed within 50 m.
50	199.5	184.5	174.5	201.5	209.5	214.5	
100	195.0	180.0	170.0	197.0	205.0	210.0	
200	190.5	175.5	165.5	192.5	200.5	205.5	
500	184.5	169.5	159.5	186.5	194.5	199.5	

Distance from Source, m	SPL dB re 1µPa		SEL dB re 1 µPa ² s				Safe Range Observed
	Peak	RMS	Single Strike	10-min	1-hour	3-hour	
1000	180.0	165.0	155.0	182.0	190.0	195.0	SEL 198 dB re 1 µPa ² .s is observed within 1 km from source. The SEL 183 dB re 1 µPa ² .s for behavioural changes is observed within 6.5 km from source.
2000	175.5	160.5	150.5	177.5	185.5	190.5	
5000	169.5	154.5	144.5	171.5	179.5	184.5	
6500	167.8	152.8	142.8	169.8	177.8	182.8	
10000	165.0	150.0	140.0	167.0	175.0	180.0	
25000	159.0	144.0	134.0	161.0	169.0	174.0	
50000	154.5	139.5	129.5	156.5	164.5	169.5	

From the table, the criterion injury threshold (applicable to cetaceans) of SPL peak of 224 dB re 1 µPa will remain within 50 m from source of pile driving activities. The criterion injury threshold of SEL of 198 dB re 1 µPa²s will remain within 1 km from source. While the criterion threshold for behavioural changes of SEL of 183 dB re 1 µPa²s will be observed within 6.5 km from source.

Cetaceans in general are observed in water column of 50 m and more and possibility of cetaceans venturing close to the proposed FSRU location near the western breakwater of the Colombo Port is not actually foreseen, however, since there is some sighting of small groups of dolphin and several species of stranded whales (blue whale, humpback whale, short finned pilot whale) in offshore areas from Colombo Port, sighting of cetacean in the shallow marine water cannot be ruled out.

It is also to be noted that input of worst case noise levels were considered in the EIA. Once the project design is finalized, the Project Owner will develop necessary revision in the action plan prior to start of construction activities for its implementation during pile driving activities. It is further recommended that the project uses 'high frequency - low energy piling technology' with a view to minimise under water noise generation.

With the medium receptor sensitivity and small magnitude of impact, the impact significance without mitigation is assessed as **Minor**.

Movement of dredger and other vessels: The underwater noise generation will be mainly from movement of dredgers and other vessels carrying cargo (particularly during arrival at and departure from the jetty). The expected underwater noise levels will be SPL_{peak} of 203 dB re 1µPa at 1m or SPL_{rms} of 185 dB ref 1µPa.

Underwater Noise Modelled Results

Considering the above mentioned underwater noise levels during movement of dredgers and other vessels as input to the model, the results obtained are presented in Table 7.8 considering the criteria threshold levels as defined in **Table 7.13**.

Table 7.13 Underwater Noise Propagation due to Cargo & Support Vessels Movement

Distance from Source, m	SPL dB re 1µPa		SEL dB re 1 µPa ² s				Safe Range Observed
	Peak	RMS	10-min	1-hour	3-hour	24-hours	
1	203.0	185.0	-	-	-	-	Cetaceans: SPL peak of are not at all impacted at any distance from source. SEL 198 dB re 1 µPa ² .s is observed within 100 m from source.
50	177.5	159.5	183.5	186.5	191.5	199.0	
100	173.0	155.0	179.0	182.0	187.0	196.0	
200	168.5	150.5	174.5	177.5	182.5	193.0	
500	162.5	144.5	168.5	171.5	176.5	189.0	
1000	158.0	140.0	164.0	167.0	172.0	186.0	
2000	153.5	135.5	159.5	162.5	167.5	183.0	
5000	149.8	131.8	155.8	158.8	163.8	180.6	

Distance from Source, m	SPL dB re 1 µPa		SEL dB re 1 µPa ² s				Safe Range Observed
	Peak	RMS	10-min	1-hour	3-hour	24-hours	
6500	145.8	127.8	151.8	154.8	159.8	177.9	SEL 183 dB re 1 µPa ² s for behavioural changes is observed within 2 km from source.
10000	143.0	125.0	149.0	152.0	157.0	176.0	
25000	137.0	119.0	143.0	146.0	151.0	172.0	
50000	132.5	114.5	138.5	141.5	146.5	169.0	

From the above table, the criterion SEL of 198 dB re 1 µPa².s (threshold of permanent injury to turtles) is expected to remain within 100 m from source, while criterion SEL of 183 dB re 1 µPa² s (threshold for behaviour changes in turtles or permanent threshold shift in cetaceans) is expected to remain within 2.0 km from source. The underwater noise due to TSHD and support vessel movement in the area with no sensitive habitats prevailing within the impact zone, and cetaceans generally prevail in 50 m and above water depth. However, their presence in shallow water cannot be ruled out, the impact of underwater noise generation from the TSHD and support vessel movement along the jetty location is assessed as **Minor**.

Significance of Potential Impact

The significance of potential impacts to underwater noise generation due to piling activities during construction stage is assessed in following table.

Table 7.14 Assessment of Potential Impact to marine fauna due to underwater noise generation during Phase 1 activities

Criteria	Rating	Comment
Potential Impact Sources		
■ Piling activities.		
Nature	Negative	Potential impacts to marine fauna would be considered to be negative
Type	Direct	Potential impacts to marine fauna is likely to be direct.
Duration	Short term	The piling activities in the proposed land reclamation area and sand dredging area will be completed within eight months. The movement of dredgers from sand borrow areas to terminal areas will be continued for eight months
Extent	Local	Potential impacts would be limited to the Project site and its immediate vicinity
Scale	Medium	Impact of underwater noise to marine mammals can cause disturbance and injury hence, the scale is considered as medium
Magnitude	Small	Considering the duration, extent and scale of potential impact, magnitude of impact is assessed to be small.
Receptor/Resource Sensitivity	Medium	Presence of cetaceans in shallow marine water cannot be ruled out, hence resource sensitivity is considered as medium.
Potential Impact Significance	Moderate	As per the impact assessment methodology defined in Section 4, the combination of a medium resource sensitivity and small potential impact magnitude will result in an overall moderate potential impact significance.
Proposed Mitigation Measures		<ul style="list-style-type: none"> ■ Generate low intensity impulsive noise prior to start of pile driving activities and ensure that any visible marine fauna moves away from the underwater noise source; ■ Periodic monitoring of underwater noise during pile driving activity; ■ Using High frequency - low energy piling technology. ■ Implementation of on Board Monitoring for marine mammals – as per Construction Stage Cetacean Mitigation Plan (that will be developed)
Potential Residual Impact Significance	Minor	Implementation of the above mentioned mitigation measures would significantly reduce the potential extent and scale of the potential impact on underwater noise, which would reduce the potential impact magnitude

to be negligible. If the recommended control measures are implemented, potential residual impact significance would still be Minor.

7.3.7 Potential Impact on Road Traffic and Transport

Potential Impact Sources

Potential sources of impacts to traffic and transport due to activities during construction stage include:

- Transport of boulders;
- Transportation of construction material, equipment and machineries, and workforce.

Embedded control measures

The following mitigation measures will be implemented:

- Contractors/CWIT will provide induction/training to all drivers for safe driving;
- Contractors/ CWIT will avoid transport of construction and boulders during rush hours by road;

Impact Assessment

As discussed in **Section 5.4.13**, traffic monitoring was conducted at Gate No. 3, Gate No 6 and Gate No 8. A total of passenger car unit (PCU) of these monitoring location were 4114, 06943 and 4987 respectively. The hourly average of PCU in the main port access roads were 171, 587 and 207 respectively.

The fill materials (sand) will be sourced from Indian Ocean. The dredged material will be directed transported to land reclamation area (WCT-1 site) through TSHD. It estimated the TSHD will movement in the designated sea route five (5) in a day. This will have no impact on road traffic and transport. Movement TSHD, in five times/ day for transport of fill material may not significant increase of sea traffic.

Transport of boulder & construction material: The boulder and civil construction materials will be transported through existing road. The estimated traffic load will be 250 tippers/ trailers per day for a period of 2-3 months. The estimated hourly peak incremental traffic load during construction stage is 750 PCU, which is 10-12% of the existing traffic load. The incremental traffic volume is not significant.

Transport of Manpower: The project will require workforce during construction activity. The workforce will be transported to the project site every day by small buses or cars. Workforce transportation will occur once during arrival at project site and once during departure from the project site. This regular activity of transporting workforce to and from the project site is not expected to result in a significant increase in existing traffic loads on the roads.

Significance of Potential Impact

The significance of potential impacts to traffic and transport due to transport of filling, construction materials and rig and equipment during Project Stage 1 is assessed in following table.

Table 7.15 Assessment of Potential Impact to Traffic & Transport during Project Stage 1 Activities

Criteria	Rating	Comment
Potential Impact Sources		
<ul style="list-style-type: none"> ■ Transport of boulder for site development; ■ Transport of construction materials, equipment and machineries, and workforce. 		
Nature	Negative	Potential impacts to road and traffic would be considered to be negative.
Type	Direct	Potential impacts to road and traffic is likely to be direct
Duration	Short term	Transport of boulders, construction materials and equipment and construction workforce only during the construction stage.

Extent	Local	Potential impacts would be limited to site access road, and hence would be considered to be local.
Scale	Low	The hourly average of PCU in three main port access roads were 171, 587 and 207 respectively. The increase of peak traffic volume during site development stage represent only 18, 11 and 15% respectively of existing traffic load. The scale of change in traffic load is expected to be Low.
Frequency		Stage wise transportation would be required during construction stage and is hence categorised as infrequent.
Magnitude	Small	Considering the duration, extent and scale, the magnitude is assessed to be small.
Receptor/Resource Sensitivity	Medium	The port access roads are passing through the urban as well as peri-urban area. Along these roads, there are commercial area, residential area, sensitive receptors like educational institute, health care facilities, religious structures, etc.
Potential Impact Significance	Moderate	As per the impact assessment methodology defined in Section 4, the combination of a medium resource/receptor sensitivity and small potential impact magnitude will result in an overall moderate potential impact significance.
Proposed Mitigation Measures		<p>The aforementioned mitigation measures will be implemented. Additionally following mitigation measures will also be implemented.</p> <ul style="list-style-type: none"> ■ The Master Contractors will prepared a traffic management plan and same will be reviewed by both HSE. The Contractors will undertake consultations with key stakeholders in order to finalise the plan and accordingly implement the plan provisions; ■ Contractors/ CWIT will require drivers to follow all legal and project related safety requirements applicable to road safety; ■ Traffic movement will be restricted during religious festival, school entry and dispersal hours, market times in proximity to mosque, schools and markets along site access road; ■ Contractors will provide instructions to drivers to maintain the speed limit at congested area as per traffic management plan; ■ Road conditions will be monitored and any damage of road or structures shall be remedied immediately to reduce the potential for significant impacts to the local communities. ■ Traffic management has been prepared for the project, same will be implemented by the CWIT and its contractor (<i>refer to Appendix 9.2</i>)
Potential Residual Impact Significance	Minor	Implementation of the above mentioned mitigation measures and additional mitigation measures would significantly reduce the potential scale of impact, which in turn will reduce the potential impact magnitude to negligible. If the recommended control measures are implemented, potential residual impact significance would be minor.

7.3.8 Potential impact to Marine Ecology

Potential sources of impacts to marine ecology due to activities during site development and construction stage include:

- Dredging of sand at borrow area and discharge in the reclamation area;
- Dredging and disposal of soft (unusable sediment) at land reclamation area;

Impact Assessment

Effect of Turbidity Plumes on Aquatic Species during Dredging: The bed sediments to be dredged in the borrow area comprise fine materials, predominantly fine silty sands, silts and silty-clays. It is the finer material which tends to remain in suspension for relatively long periods of time, thereby causing significant impacts on transparency of sea water. The dredged material also comprises of a large inorganic particulate load and also contains significant quantities of organic matter. Such material has a lower specific gravity than inorganic components and detectable in several kilometres downstream of a dredger. Sediment plume modelling conducted for the current project (*Section 7.3.3* indicate that sediment plume may extend to 4 km from the borrow area.

Material derived from the dredging process may also be carried as a benthic plume for significant distances along the sea bed. Dredging will re-suspend sediments, but the level of re-suspension and associated impacts depend on the physical and chemical characteristics of the sediment, as well as type of equipment and dredging method. The impacts of dredging may strongly influence by the local factors like water depth, rate of flow, tidal currents, wave action, amount of sediment, etc. If suspended at sufficient concentrations for long periods of time, then the penetration of sunlight through the water column may be reduced. Light is fundamental to photosynthesizing aquatic life such as algae and species and other organisms.

Most studies on the impact of dredging on marine benthos show that dredging can result in significance reduction in species variety, reduction in the number of individuals, reduction in biomass and species composition in dredged areas. In addition, increase in turbidity can cause the clogging of gills and feeding structures of certain species (e.g. Shellfish and filter feeding species including worms and molluscs). Similarly, young fish can be damaged if suspended sediments become trapped in their gills and increased fatalities of young fish have been observed in heavily turbid water. Adult fish are likely to move away from or avoid areas of high suspended solids, such as dredging sites, unless food supplies are increased as a result of increases in organic material. Hence, turbidity can promote reduced productivity and in extreme cases can be fatal.

The other environmental impacts may be:

- Physical disturbance of nesting and spawning, destruction of habitats, especially disturbance of spawning habitats or marine organisms;
- Physical removal of benthic communities;
- Disturbance of fish ,shrimps and benthic faunal feeding habits and habitats and larval stages
- Detrimental effects of suspended sediments, turbidity and sedimentation, especially effects on the behaviour of organisms;
- Burial of benthic communities;
- Disturbance of benthic fauna development ;
- Production of planktonic algae;
- Degradation of water quality, especially in zones with low energy and in waters with sediments with high organic content;
- Bioaccumulation of toxic materials;
- Enhancement of algal growth;

The process of recolonization and recovery after a disturbance is a complex involving initial colonization by fast growing animals (opportunistic) species. In stable environments these are replaced and supplemented by a wider species diversity of slow-growing (equilibrium) species after

cessation of dredging. In more disturbed habitats the community is dominated by opportunistic species, which do not move towards an equilibrium community of repeated environmental disturbance.

For dredging, the extent of these environmental affects is near-field and temporary generally only lasting few days to week. Impact of dredging for the proposed borrow area will have very localized impact on the macrofauna near the site. Moreover, recolonization of most species would occur after dredging activities.

No IUCN threatened species are reported to exist in the seabed area of the borrow areas. The impact of dredging on the marine ecology will therefore be local, small and temporary in nature.

As indicated in the IEE report that the identified sand extraction site has been extracted in the recent past the original habitats have modified in the area. Hence, the area is also considered as a modified habitat.

Sediment flow simulations were superimposed to the natural and modified habitat map (presented in Figure 5.27). The superimposed simulation maps indicate that the propagation of the plume is not expected to reach the natural habitats in the area viz. rocky reefs and Negumbo lagoon area. The maps are presented in **Figure 7.6** and **Figure 7.7**.

The transportation route from borrow area to the terminal areas are crossing one rocky reef structure (Thamba Gala), however, the depth of the reef is about 25-45 m and movement of vessels is not envisaged to cause any habitat loss or habitat degradation. The reclamation area within the breakwater of the Colombo port area is also not a natural habitat. Hence, the project activities viz. dredging, transportation and reclamation is not expected to cause any impact to any natural habitats.

Figure 7-6 Sediment Plume Simulations superimposed (SW Monsoon) on Habitat Areas

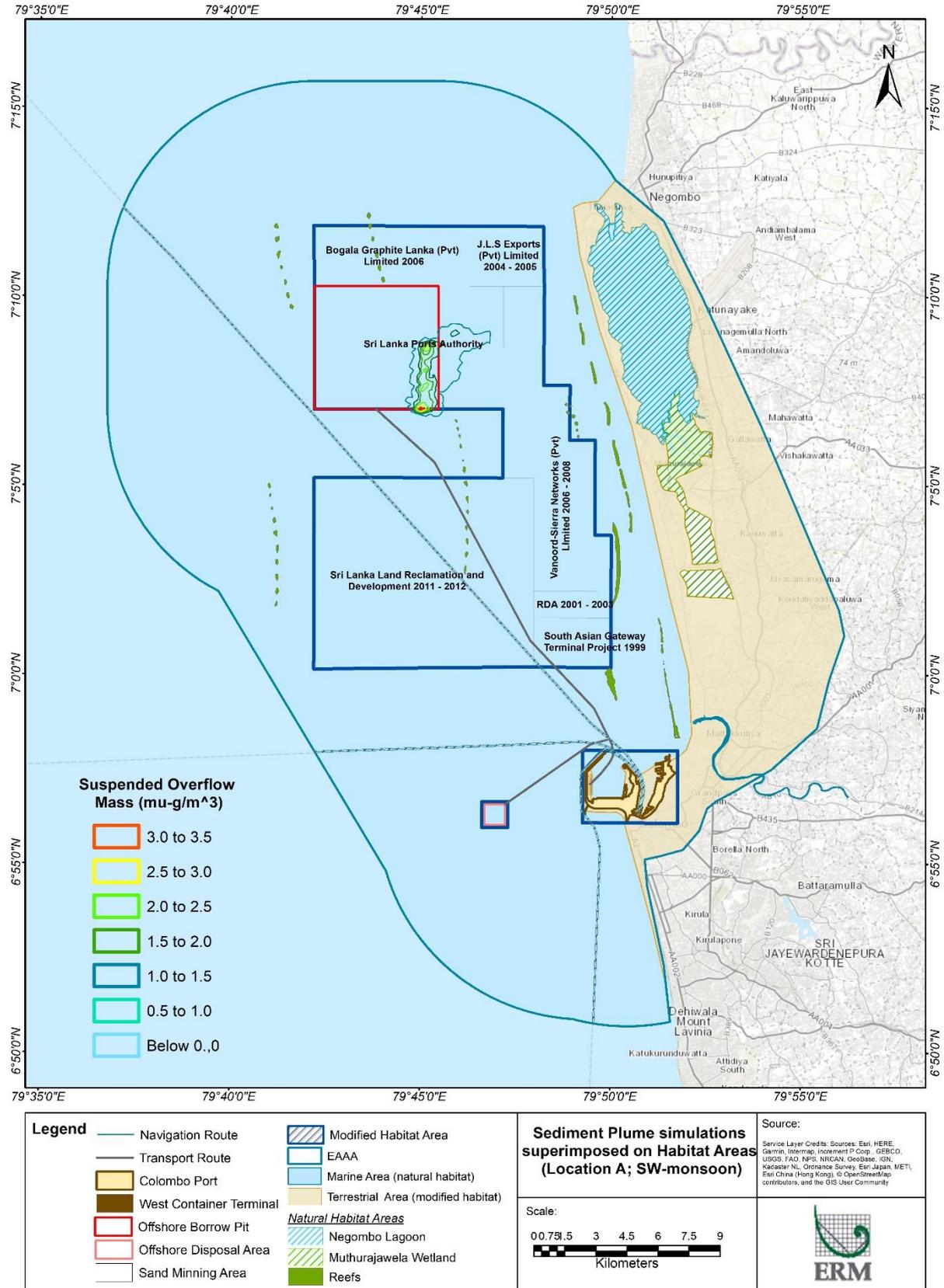
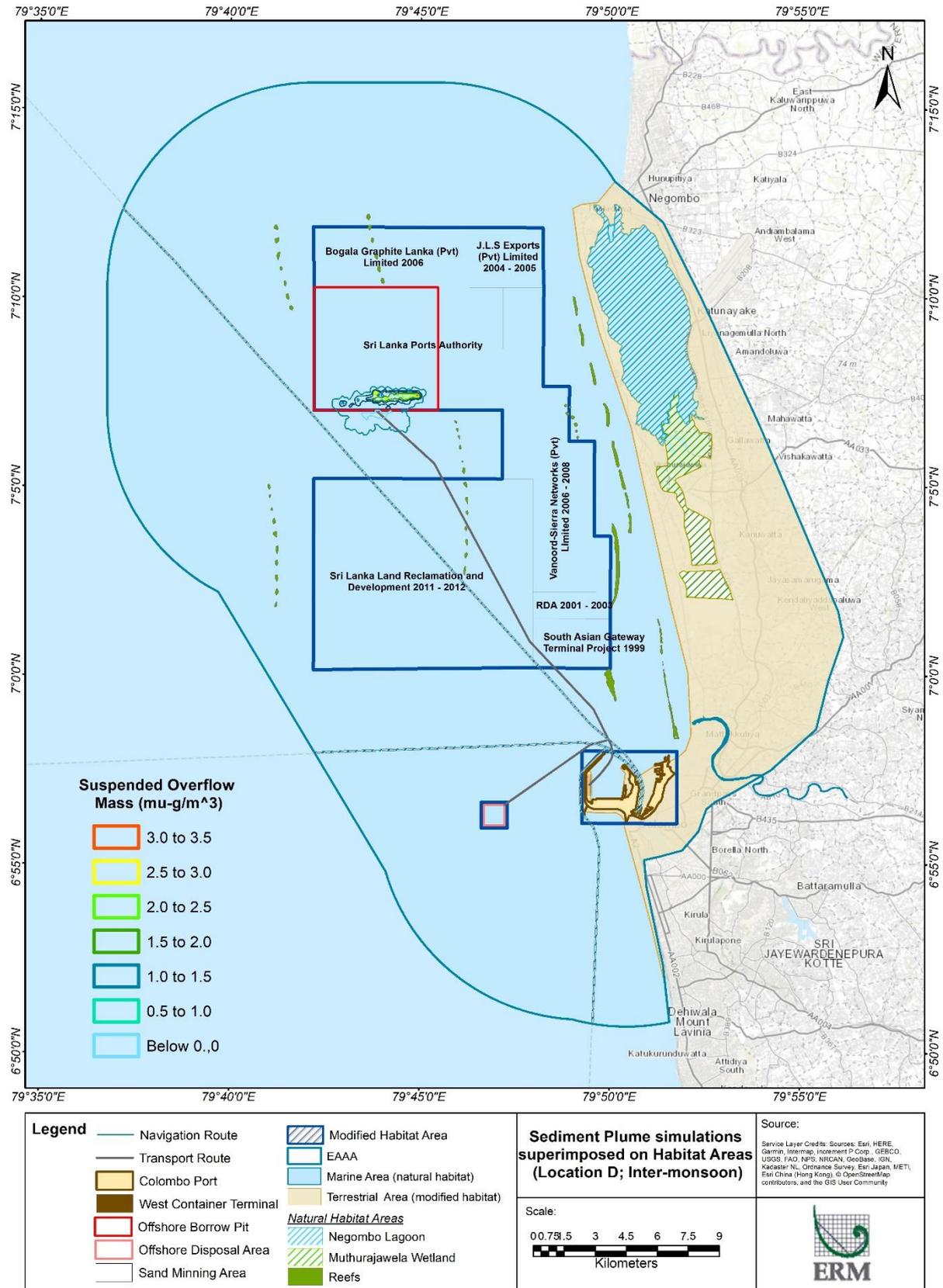


Figure 7-7 Sediment Plume Simulations superimposed (Inter-monsoon) on Habitat Areas



Permanent Removal of Benthos by Dredging: During the dredging process, there will be an inevitable removal and direct impacts on some benthic species. Assessment of benthic data during primary surveys conducted at the sand borrow areas reveal that the benthos primarily consists of molluscan fauna. It is likely that the species from adjacent areas will re-colonize the dredged area following dredging. The exact composition of species, in terms of abundance and distribution, may not re-colonize the area initially as the area will first be colonized by opportunistic species which are short-lived and reproduce rapidly. Moreover, the designated extraction area has been extracted in recent past hence the community structure in the area has been modified from the original condition.

Smothering of Benthos and Other Organisms due to Elevated Levels of Suspended Solids (SS): Sediments dispersed during dredging and disposal may resettle over the seabed and the animals and plants that live on and within it. This blanketing of benthic organisms may cause stress, reduced rates of growth or reproduction and in the worst case the effects may be fatal. The most susceptible species will be the sessile species such as sedentary worms and the slow moving species such as molluscs. Assessment of benthic data for sand borrow area and terminal area during primary surveys reveal that the benthos primarily consists of molluscan fauna. The sensitivity of marine animals and plants to siltation varies greatly. In areas with high natural loads of suspended sediments, like in Colombo port with close by mega development and river discharges, the relatively small increases in siltation away from the immediate dredging area are generally considered unlikely to have adverse impacts on benthic populations.

Effects of SS on marine organisms could be lethal or sub-lethal through reduction in survivorship, growth rate and reproductive potential due to stress incurred by the need to constantly flush out deposited material. High SS level will negatively impact sensitive receptors such as developing corals in the ZOI. In other marine biota which may clog gills and respiratory organs and hinder transfer of oxygen. Fish egg and larval fish (fry) are more susceptible to deleterious impacts from sedimentation through smothering and clogging of their respiratory systems.

Adult organisms are more likely to move away when they detect certain SS level and therefore less sensitive to the effects from SS and some have evolved adaptation to tolerate changes in SS, i.e. flushing water through their gills or simply moving to less turbid waters. If SS levels exceed tolerance thresholds of aquatic fauna unable to move away from the area, corals for example, may become stressed or even die.

The impact due to SS elevation is considered to be low to moderate and they are mostly localized and temporary in nature.

No important spawning or nursery grounds of commercial fish species were identified within and in the vicinity of the proposed sand borrow area and terminal areas. In view of the temporary nature of such impact, only minor impact on capture fisheries is anticipated.

Release of Contaminants during Dredging and Disposal: Dredging and disposal activities can potentially cause the remobilization of contaminated sediment. Contaminated sediment may not be necessarily harmful to aquatic organisms living in the sediment due to contaminant's adsorption behaviours. However, if sediment conditions are changed such that contaminants become released into the water column (either dissolved or as particulate matter), then they may become bioavailable and can cause toxic effects. Results of sediment analyses from the sand borrow area and terminal areas indicate that no contamination in the quality of sediments collected from the study area was reported.

Potential impacts on marine biota include the accumulation of contaminants in the tissues, resulting in sub-lethal effects which may alter behaviour, reproduction and increase susceptibility to

disease. Eggs, larvae and juveniles are particularly susceptible to the sub-lethal effects of contaminants, and elevated levels may lead to increased mortality.

In the view that mobile fauna like fish and crab is likely to avoid the dredging area and recolonize after construction works and refuge habitats would be available in nearby coastal waters for the affected resources, adverse impact due to the release of contaminant on fisheries resources would be minimal.

Release of Nutrients from Marine Sediment: High nutrient levels in marine water can trigger rapid increase in phytoplankton, resulting in algal bloom. However, elevated nutrients would be very harmful for coral reefs. Therefore, impacts from release of nutrient would be significant.

Impact to Marine Mammals:

As mentioned in Section 5.4.8.10, the area in proximity to dredging, dredger movement path and reclamation areas reveal presence of two cetacean species viz. Common Dolphin and Spinner Dolphin. Both the species are Least Concern as per the IUCN Threatened list. Impact to cetaceans may happen due to collision with moving dredgers in the area. Underwater noise generated as a result of dredging and dredger movement may also impact the cetaceans and move them away from the project site. Impact on cetaceans due to underwater noise generation has been added in Section 7.3.7.

Significance of Potential Impact

The significance of potential impacts to surface water to marine ecology during construction phase of the project is presented at the following table.

Table 7.16 Assessment of Potential Impact on marine ecology during construction phase

Criteria	Rating	Comment
Potential Impact Sources		
<ul style="list-style-type: none"> ■ Dredging of sand at borrow area and discharge in the reclamation area; ■ Dredging and disposal of soft (unusable sediment) at land reclamation area; 		
Nature	Negative	Potential impacts to marine ecology would be considered to be negative
Type	Direct and indirect	Potential impacts to marine ecology would likely be direct and indirect
Duration	Short term	Impacts due to dredging and discharge activity, is expected to be completed within 8 months.
Extent	Regional	Potential impacts to aquatic ecology due to dredging operation and discharge likely to be limited within 3-4 km from the site.
Scale	Low	The impacts are likely to occur during dredging operation and reclamation at the terminal area. The surface water quality may not be significantly altered due to above mentioned sources. The scale of change in water quality is expected to be low.
Magnitude	Small	Considering the duration, extent and scale of potential impact, the magnitude of the potential impact is assessed to be small.
Receptor/Resource Sensitivity	Medium	The water quality of Indian ocean in proximity to the sand borrow area terminal area are important for fishery. Moreover, some cetaceans area also reported in the area. Hence receptor sensitivity is considered as medium.
Potential Impact Significance	Moderate	As per the impact assessment methodology defined in Section 4, the combination of a medium resource sensitivity and small potential impact magnitude will result in an overall moderate potential impact significance.
Proposed Mitigation Measures	Impacts from Sediments	

		<ul style="list-style-type: none"> ■ Timing of the dredging to be carefully planned to avoid rainy season and least impact on small-scale fishing operations; ■ Construction site runoff and drainage should be prevented or minimized in accordance with international best practices and standards. Sand/silt retaining facilities such as traps and sediment basins should be provided to limit the runoff; ■ Exposed slope/soil surface, dredged material in particular should be covered to reduce the potential runoff. Arrangements should always be in place to ensure that adequate surface protection measures can be safely carried out well before the arrival of a rain; ■ Proactive and informed management of the dredging programme as it is executed can often significantly reduce the risk of or minimize the negative impacts. Through modelling and monitoring during execution, impacts may be predicted before being realized, and the dredging programme may be optimized to achieve the environmental objectives. A combination of monitoring, both of the dredge plume and at receptor sites, and dredge plume modeling to guide the dredging works need to be conducted before the beginning of dredging operations; ■ Potential impacts on sensitive receptors would also be minimized by conducting dredging works in phases in order to minimize the long term smothering. ■ Use an efficient trailing suction hopper dredger, wherever possible; ■ Contractors should take special care in selecting dredging equipment to be environmental friendly as possible, and training and guidelines to be given for operators; ■ Overflow shall be avoided during dredger sailing including sailing from the sand borrow area to the reclamation area ■ A Construction Stage Cetacean Mitigation Plan will be prepared and implemented to reduce the potential impact upon marine mammals ■ Monitoring should be conducted in the sensitive receptors such as developing corals for turbidity and possible impacts, rather than the site of the plume or hopper; ■ It is recommend that, as a minimum standard, the World Bank guidelines are adhered to, in terms of the acceptable limit of suspended sediment concentration allowed. This equates to 2,000 mg /l. (World Bank Technical Paper 140) and is derived in order to prevent covering valuable benthic species (e.g. shellfish) which are particularly sensitive to increased suspended sediment concentration. ■ Biodiversity management has been prepared for the project, same will be implemented by the CWIT and its contractor (<i>refer to Appendix 9.3</i>)
<p>Potential Residual Impact Significance</p>	<p>Minor</p>	<p>Implementation of the above mentioned mitigation measures would significantly reduce the potential extent and scale of the potential impact on marine ecology, which would reduce the potential impact magnitude to be negligible. If the recommended control measures are implemented, potential residual impact significance would be Minor.</p>

7.3.9 Potential Impact on Ecosystem Services

There are four categories of Ecosystem Services defined in Millennium Ecosystem Assessment as outlined in IFC PS 6:

- **Provisioning Services:** These services that can be extracted from ecosystem to support human needs etc.;
- **Regulating Services:** Benefits obtained from an ecosystem’s control of the natural environment, including the regulation of surface water purification, carbon storage & sequestration, climate regulation, protection from natural hazard, air quality, erosion and pests etc.;
- **Cultural Services:** Non-material benefits including diverse aspects of aesthetic, spiritual, recreational, and others cultural value; and

- **Supporting Services:** The natural process essential to the maintenance of the integrity, resilience, and functioning of ecosystems, thereby supporting the delivery of all other benefits, including nutrient cycling, and primary production.

Impact Assessment

Impact on Provisioning services

- Dredging may temporarily reduce fish harvests as a result of an increase in the turbidity of the water or disturbance of the sea floor.
- Wastewater discharge from ships may cause pollution of the marine water and render them unsuitable for the local community.

Impact on Regulating services

- Contaminated discharge from project sites can reach surface water bodies and cause marine water pollution.

Impact on Regulating services

- Sediment plume generated during dredging and reclamation works may reduce aesthetics of the area in proximity to operation etc.

Impact on Support services

- Marine water pollution from dredging activities can cause adverse effects on the functioning of marine ecosystems.
- Dredging may decrease local biodiversity (especially at the sea floor) and thereby reduce the bequest value.
- Water pollution from project operation have the potential to reduce/increase primary production of water bodies.

Significance of Potential Impact

The significance of potential impacts on ecosystem services during construction phase of the project is presented at the following table.

Table 7.17 Assessment of Potential Impact on Ecosystem Services

Criteria	Rating	Comment
Potential Impact Sources		
<ul style="list-style-type: none"> ■ Dredging of sand at borrow area and discharge in the reclamation area; ■ Discharge of waste water into marine environment 		
Nature	Negative	Potential impacts ecosystem services would be considered to be negative
Type	Direct and indirect	Potential impacts to ecosystem services would likely be direct and indirect
Duration	Short term	Impacts due to dredging and discharge activity, is expected to be completed within 8 months.
Extent	Regional	Potential impacts to aquatic ecology due to dredging operation and discharge likely to be limited within 3-4 km from the site.
Scale	Low	The impacts are likely to occur during dredging operation and reclamation at the terminal area. The surface water quality may not be significantly altered due to above mentioned sources. The scale of change in water quality is expected to be low.
Magnitude	Small	Considering the duration, extent and scale of potential impact, the magnitude of the potential impact is assessed to be small.

Receptor/Resource Sensitivity	Medium	The water quality of Indian ocean in proximity to the sand borrow area terminal area are important for fishery. Moreover, some cetaceans area also reported in the area. Hence receptor sensitivity is considered as medium.
Potential Impact Significance	Minor	As per the impact assessment methodology defined in Section 4, the combination of a medium resource sensitivity and small potential impact magnitude will result in an overall minor potential impact significance.
Proposed Mitigation Measures	<p>Provisioning Services</p> <ul style="list-style-type: none"> ■ No wastewater discharge from dredger or ships coming to the project areas ■ Trailer suction hopper dredgers (TSHD) will used for dredging activity to minimise the plume generation; ■ Periodical monitoring will be conducted for plume dispersion; ■ Spillage of dredge materials during transportation will be ensures ■ CWIT has prepared a plan for an insurance program to safeguard the fishermen. The insurance program will be effective/confined for the period of the project implementation for all registered fishermen falling under the dredging area during the entire dredging period. <p>Regulating services</p> <ul style="list-style-type: none"> ■ No wastewater streams to be released untreated from the site. ■ Trailer suction hopper dredgers (TSHD) will used for dredging activity to minimise the plume generation; ■ Periodical monitoring will be conducted for plume dispersion; ■ Spillage of dredge materials during transportation will be ensures <p>Cultural Services</p> <ul style="list-style-type: none"> ■ Trailer suction hopper dredgers (TSHD) will used for dredging activity to minimise the plume generation; ■ Periodical monitoring will be conducted for plume dispersion; ■ Spillage of dredge materials during transportation will be ensures <p>Support Services</p> <ul style="list-style-type: none"> ■ Similar as mentioned for “provisioning services”. 	
Potential Residual Impact Significance	Incidental	Implementation of the above mentioned mitigation measures would significantly reduce the potential extent and scale of the potential impact on ecosystem services, which would reduce the potential impact magnitude to be negligible. If the recommended control measures are implemented, potential residual impact significance would be incidental..

7.3.10 Potential Impact of Marine Invasive Species

Species that have been moved, intentionally or unintentionally, as a result of human activity, into areas where they do not occur naturally are called ‘introduced species’ or ‘alien species’⁶⁰.

Impact Assessment

Marine invasive species can have impact on biodiversity, ecosystems, fisheries and mariculture of an area. Alien species can be transported by various means through the ship’s ballast water or by attaching to hulls, or a result of dredging or transfer of dredged material.

The impacts may cause loss of native biodiversity due to:

- Invasive species preying upon native species
- Decreased habitat availability for native species
- Additional competition with native species for resource utilization

⁶⁰ <https://www.cbd.int/invasive/doc/marine-menace-iucn-en.pdf>

- Parasites and disease
- Smothering and overgrowth
- Hybridisation, causing genetic dilution

Other impacts of invasive species may include changes to ecosystem function, impacting nutrient cycle etc.

Significance of Potential Impact

The significance of potential impacts on ecosystem services during construction phase of the project is presented at the following table.

Table 7.18 Assessment of Potential Impact on Marine Invasive Species

Criteria	Rating	Comment
Potential Impact Sources		
■ Discharge of ballast water and introduction of invasive species from reclamation area to disposal site		
Nature	Negative	Potential impacts on invasive species would be considered to be negative
Type	Direct and indirect	Potential impacts to invasive species would likely be direct and indirect
Duration	Long term	Dredging and transportation of dredge material to reclamation site through TSHD. No additional dredger and barge will be required for site reclamation. During construction as ships will come port, but Colombo is signatory to the MARPOL convention, and discharge from vessels will be controlled under these international regulations. Therefore, discharge of ballast water in the ZOI has not been envisaged. However, accidental discharge in the ZOI with invasive species may have long term impact.
Extent	Local/ Regional	Potential impacts on invasive species due to above mentioned project activities likely to be localised/ regional based on nature of species and its habitat.
Scale	Low	Considering the existing practices in the Colombo Port, the scale of change impact is assessed to be low.
Magnitude	Small	Considering the duration, extent and scale of potential impact, the magnitude of the potential impact is assessed to be small.
Receptor/Resource Sensitivity	Medium	There are sensitive habitats like reef and marine fishing habitat. The proposed sites like sand borrow area and basin area are categorised as modified habitats. Hence receptor sensitivity is considered as medium.
Potential Impact Significance	Minor	As per the impact assessment methodology defined in Section 4, the combination of a medium resource sensitivity and small potential impact magnitude will result in an overall moderate potential impact significance.
Proposed Mitigation Measures		<ul style="list-style-type: none"> ■ Unintentional introductions of alien species should be minimised. Ballast water transfer, hull fouling etc. need to be identified, assessed and addressed (e.g. through ballast water exchange, treatment etc). Disposal of sediments to disposal site from reclamation site will be undertaken. The disposal site is a port designated site where disposal from other facilities may also happen. Care should be taken to follow any management plan of SLPA for control of marine invasive species. ■ Moreover, in all cases provisions should be in place for early detection and rapid response so that a new incursion can be eradicated before it spreads. Baseline surveys, surveillance, monitoring and contingency planning are all important at the port area and disposal site areas. ■ Biodiversity management has been prepared for the project, same will be implemented by the CWIT and its contractor (refer to Appendix 9.3)
Potential Residual Impact Significance	Incidental	Implementation of the above mentioned mitigation measures would significantly reduce the potential extent and scale of the potential impact

on ecosystem services, which would reduce the potential impact magnitude to be negligible. If the recommended control measures are implemented, potential residual impact significance would be incidentatl.

7.3.11 Potential Impact on Fishing Activities

Direct employment loss is not anticipated as there will not be any restrictions on the areas for fishing. However, there will be some disturbances for the fishery activities for the fisherman who will fish within the area allocated for the dredging (6km*6km) due to the dredger operations.

Potential Impact Sources

Potential sources of impacts on fishing activities during construction stage include:

- Reduction of fish catch due to dredging operation;
- Damage of fishing gear due to movement of dredger;
- Increase operational cost of fishing crafts;
- Cumulative impact due to dredging for other projects.

Embedded control measures

- CWIT has prepared a plan for an insurance program to safeguard the fishermen. The insurance program will be effective/confined for the period of the project implementation for all registered fishermen falling under the dredging area during the entire dredging period;

Impact Assessment

Curtailment of fisheries industry: Direct employment loss is not anticipated as there will not be any restrictions on the areas for fishing. However, there will be some disturbances for the fishery activities for the fisherman who will fish within the area allocated for the dredging (6km*6km) due to the dredger operations. Aquaculture is not practiced at the site or associated waters and there is no impact.

There are 8704 active Fishermen from Negombo Division and 591 active fishermen from Wattala Divisions that are closest to the project area. Stakeholder consultations revealed that fishermen from these two divisions mostly are engaged into daily and nearshore fishing activities. The prominent craft operated in the area is OFRP. The OFRP boats launch their fishing operation up to 20 km from the shore. OFRPs normally operate at the sea throughout the year and they could operate in a relatively wider sea area targeting a wide range of species. The IDAY boats and MTRB boats are operated 2 to 5 km from the shore, when they operate trawl fishery and small meshed gill net fishery respectively. The beach seine operation (NBSB) reaches about 1-2 km from the shore for daily fishing and nearshore fishing (*refer to Figure 5.34: Areas of Different Fishing Activities*). It has been reported that the fishermen use beach seine nets, drift or float nets and trawling nets (legally banned) for fishing in this region and these methods are used almost throughout the year. According to the fisheries statistics in 2022 total number of operating fishing craft/boats is 4187. Majority of marine fishing craft/boats were OFRP (1770) and NTRB (1456). Further, the OFRB will operate 20km from the coastal waters and they have to avoid a small area where the dredger is in operation. It has been reported by the fishermen that there is no fixed fishing ground, and it keeps on changing depending on the fish-catch availability (*refer to Figure 5.33: Fishing Ground Map*). Only the OFRP boat will have some disturbances due to the dredging operations. The small fish varieties will have some impact due to excessive sand mining. The sand mining activity may have impact on water quality due sediment plume and loss of benthic habitat and under-water noise. Therefore, there can be a reduction of small fish varieties in the area.

Fishermen perceive that there can be influence for reduction of fishery activities in the area demarcated for sand mining and also in the immediate vicinity. They also perceive that fish population may go down due to significant and continuous disturbances in the sea. The local stakeholders

interviewed mentioned that there can be some negative impacts to the fishery activities due to barge transportation of sand from Negombo to Colombo.

The natural behaviour of high and low tide of the sea help to enrich Negombo lagoon with fishery resources. If there is any change occur on this natural behaviour of the sea wave, the Negombo lagoon will get negatively affected. Since the dredging activities take place in deep-sea area will not lead to wave climate, accordingly the lagoon physical environment will not be affected.

Damage to fishing gear: According to the fisheries statistics in 2022 total number of operating fishing craft/boats is 4187. Majority of marine fishing craft/boats were small boats like OFRP (1770) and NTRB (1456). Fishing is done mainly in the morning before dawn or taking advantage of the moon light to extend their work day. Those boats can easily be involved in incidents as they lack in displaying the proper lighting or brightly lit boat. During calm weather, extra vigilance is required as this is the time when many small fishing vessels will go to sea. Small motorized boats especially OFRP boats are more likely to be fishing in or around the proposed sand extraction area. Generally, they use passive gears, especially gillnets. The gear used extends over very long distances from the boat, sometimes more than one kilometer. The movements of dredging ship may over run fishing gears making partial or total damage for fishing gears deployed. This may incur an additional cost for fishers. The fishermen may have difficulties to repay their loans taken for fishing vessels due to reduction of fishery activities.

Increase operational cost of fishing crafts: Disturbances to normal sailing paths of fishing crafts. The NARA highlights in its IEE that the usual sailing paths of fishing crafts may be interrupted by the movements and operation of the dredging ship. This may cause find alternative paths as well as increase operational cost of fishing operations. The project developer will use intensive barge transportation to transport extracted sand to the Colombo port. The distance of the transport route is about 20km and therefore, fairly long distance across the sea will be intensively used by the project developer for transport activities. The sea area identified for navigation is used by fishing community for fishing activities and also reaching other places in the deep sea for their operations. Therefore, transport related navigation activities for the project will create some disturbance to the fishing communities.

Cumulative Impact: Colombo Port region has been witness to several projects in the recent past that required heavy dredging and access restrictions that have impacted the nearshore fishing (Refer to **Figure 7.9**). GSMB has been issued licenses for sand mining of the adjacent areas of the project site for artificial nourishment and reclamation of marshy land as follows;

- i. South Asian Gateway Terminal Project in 1999
- ii. Bogala Graphite Lanka (Pvt) Limited from 1999 to 2001
- iii. Road Development Authority from 2001 to 2003
- iv. J.L.S Exports (Pvt) Limited from 2004 to 2005
- v. Vanoord- Sierra Networks (Pvt) Limited from 2006 to 2008
- vi. Asia Dredging Limited from 2004 to 2005
- vii. Sri Lanka Land Reclamation and Development authority from 2005 to 2008 and 2011-2012.
- viii. Sri Lanka Ports Authority, 2011-2013
- ix. Sri Lanka Ports Authority for Colombo Port City Development Project, 2016-2017

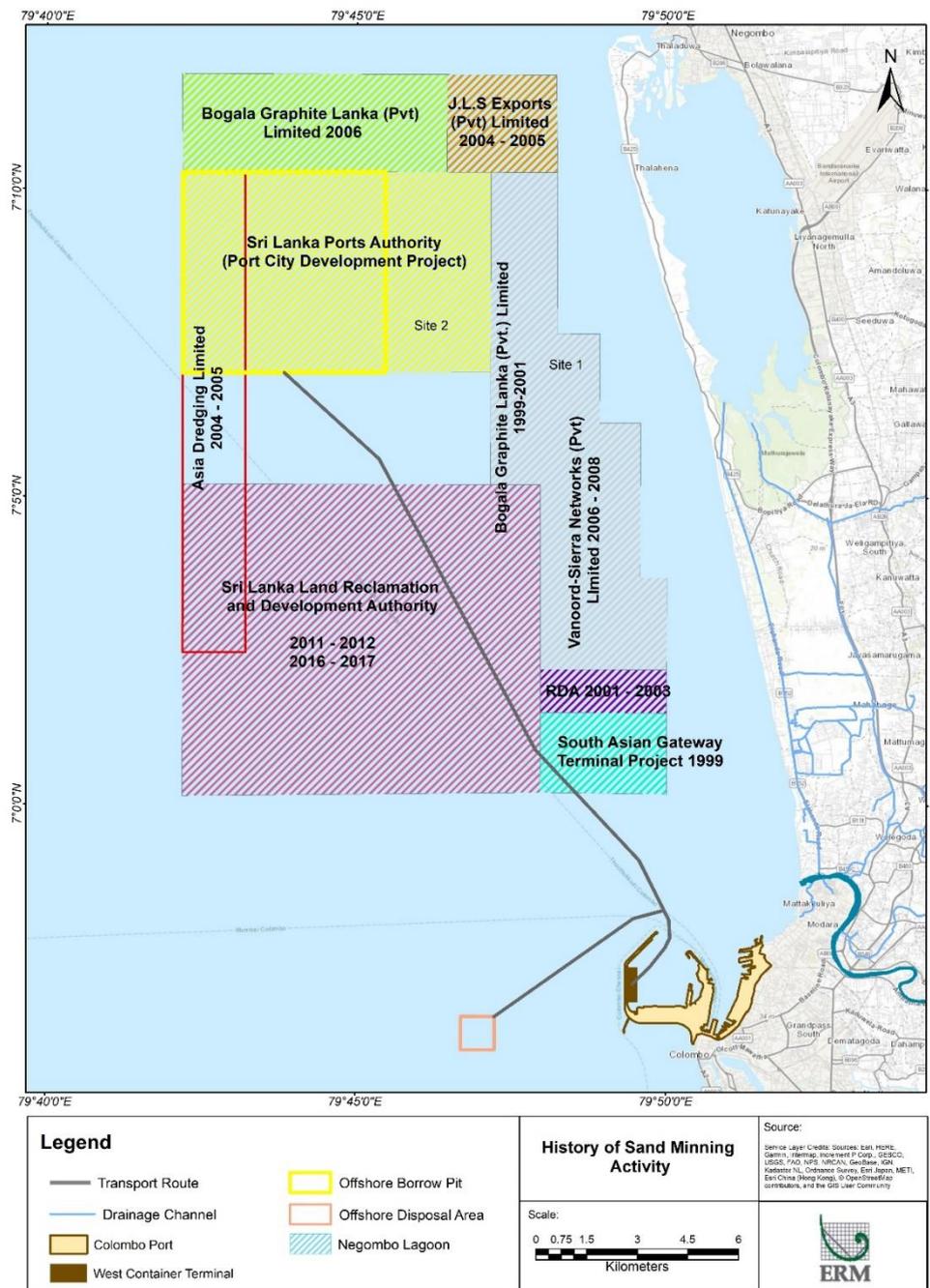
Sand mining in the western part of the study area is carried out by Sri Lanka Land Reclamation and Development Corporation. The quantity of sand extracted by the SLLRDC in 2008 and 2011 are 2.8m³ million and 30m³ million respectively

SLPA had obtained exploration license EL/281 from GSMB in 2013 (from 2013 to 2015) for the port city development project. An amount of 65 million m³ of sand is mentioned under the SEIA, December 2015, and the approval is granted by the CC&CRMD to extract sand from site 2 (9km*6km) only. Further, it was recommended to obtain the balance requirement from the site allocated to the Sri

Lanka Land Reclamation and Development Corporation (SLDC, previous SLLRDC). Accordingly, SEIA, December 2016 was conducted to obtain the balance amount of 40 million m³ of sand from the SLLRDC site. Accordingly, a volume of 25 million m³ of sand was extracted from this site (SLPA site) for the Port City Development project.

As the proposed sand borrow area is located historical sand mining area; proposed dredging activity may not have significant impact on fishing activities. With another new project in the region, the fishermen of the Negombo Division and Wattala Divisions expressed discontentment. Restrictions and security zones prevents the fishermen from carrying out their activities and use drift nets, beach seine nets, etc. Cumulative impact due to all the projects in the region on access disruption would eventually have impact on the income of the fishermen.

Figure 7.8 Sand Mining Map-showing historical dredging operation



Significance of Potential Impact

The significance of potential impacts on fishing activities during construction period is assessed in following table.

Table 7.19 Assessment of Potential Impact to Fishing Activities

Criteria	Rating	Comment
Potential Impact Sources		
<ul style="list-style-type: none"> ■ Dredging of sand at borrow area and discharge in the reclamation area; ■ Dredging and disposal of soft (unusable sediment) at land reclamation area; ■ Accidental spillage of oil & grease from dredger and vessels; ■ Contaminated Surface runoff from land based construction area; ■ Discharge of untreated sewage from construction site; ■ Discharge of untreated bilge and ballast water. 		
Nature	Negative	Potential impacts to fishing activity would be considered to be negative.
Type	Direct	Potential impacts to fishing activity is likely to be direct
Duration	Short term	The fishing activity can be impacted due to dredging and discharge activity, which is expected to be completed within 8 months.
Extent	Regional	Potential impacts due to dredging operation and discharge likely to be limited within 3-4 km from the site. potential damage of fishing gear along the dredge material transport route of 18 km.
Scale	Medium	There are 8704 active Fishermen from Negombo Division and 591 active fishermen from Wattala Divisions that are closest to the project area. Stakeholder consultations revealed that fishermen from these two divisions mostly are engaged into daily and nearshore fishing activities.
Frequency	The dredging and discharge activity will be completed within 8 months from the start of the activity. Any releases would be accidental, and therefore are expected to be infrequent, if any. The frequency can be categorised and likely.	
Magnitude	Medium	Considering the duration, extent and scale of potential impact, the magnitude of the potential impact is assessed to be small.
Receptor/Resource Sensitivity	Medium	The fishing community only dependent on fishing activity on marine area
Potential Impact Significance	Major	As per the impact assessment methodology defined in Section 4, the combination of a medium resource sensitivity and medium potential impact magnitude will result in an overall major potential impact significance.
Proposed Mitigation Measures	<ul style="list-style-type: none"> ■ A proper warning signal system must be established to inform locations of the vessels operation; ■ Awareness must be done for fishers on vessel operation before commencing the work and during the work. Communication with fishermen will be carried out in different ways (Digital media); ■ Communication with Fisheries Inspectors (FIs), Leaders of fishery associations and if possible with individual fishermen through mobile phone applications; ■ The project developer should make all the possible attempts at minimizing the disturbances to the fishermen carrying out fishing activities in the area demarcated for sand mining. ■ Regular awareness programmes will be conducted for fishing community, government officials etc. in the area in order to enhance their knowledge on the project activities. ■ Formal mechanism to be set up with the consultation of the DFAR to address any damages to fishing boats and other related equipment due to dredging operations. Based on the evaluation and approval of this committee, the Project Proponent/ Project Developer will compensate damages arising due to dredging activity. 	

	<ul style="list-style-type: none"> Stakeholder management plan (SEP) has been prepared for the project, same will be implemented by the CWIT and its contractor (<i>refer to Appendix 9.4</i>) 	
Potential Residual Impact Significance	Minor	Implementation of the above mentioned mitigation measures would significantly reduce the potential extent and scale of the potential impact to fishing activity, which would reduce the potential impact magnitude to be negligible. If the recommended control measures are implemented, potential residual impact significance would be Minor.

7.3.12 Potential Impacts on Socio-economic Opportunity

Potential Impact Sources

The proposed project will be constructed within the Colombo Port, no additional land will be required for proposed site establishment. The proposed project is unlikely to have an adverse impact on land based livelihoods of people in the area. The potential positive impacts on socio-economic opportunity during site establishment stage may occur due to:

- Sourcing of workforce for construction activity
- Sourcing of civil construction material from local vendors
- Opportunity for local enterprises.

Impact Assessment

Sourcing of workforce for construction activity: The work force requirement during peak construction stage will be approximately 1000 person. Contractors will be involved for construction activities under supervision of the CWIT project team. Unskilled workers will be sourced locally. Some skilled and semi-skilled workers will be sourced by the Contractors. It is estimated that about 70% man power requirement will be sourced from the local area. CWIT will encourage Contractors to hire appropriate positions from the local community.

Sourcing of construction materials: The civil construction materials (like cement, sand and aggregate) would be required for construction stage. CWIT/ Contractors has decided to source these materials from selected local suppliers. The selected local vendor will be benefited by supplying such materials.

Opportunities for local enterprises: The Colombo port project is already stimulating the local economy. The demand of basic food products (agriculture produces, meat, poultry products, fish, etc.) will be increased during the construction stage of the present project. The local enterprises, particularly those involved in the production and sale of the items have the potential to benefit from this demand.

Significance of Potential Impact

The significance of potential impacts to socio-economic opportunity due to construction activity of WCT-1 project during Project Stage 1 is assessed in following table.

Table 7.20 Assessment of Socio-economic Opportunity during Project Stage 1 Activities

Criteria	Rating	Comment
Potential Impact Sources		
<ul style="list-style-type: none"> Sourcing of workforce for construction activity Sourcing of civil construction material from local vendors Opportunity for local enterprises 		
Nature	Positive	Potential impacts to job and economic opportunity would be considered to be positive impact.
Type	Direct	The potential impacts would likely be direct potential impacts due to Project activities.

Criteria	Rating	Comment
Duration	Short term	The potential impact on the job and economic opportunity would be short term; i.e. site establishment stage.
Extent	Local	The potential impacts to employment are likely to affect mostly the local population.
Scale	Medium	The total number of workforce requirement for construction stage is around 950; non-technical job will be around 70%. However, some economic opportunity is likely to be generated in the form of supply of civil construction materials, etc. There is also possibility of local business opportunities by way of supply of various consumable products for the workforce.
Frequency	Potential impacts to employment would be continuous throughout the Project, on as-needed basis.	
Magnitude	Medium	Considering the number of workers required for the site development stage of the Project and potential business and economic opportunity potential, impact magnitude is assessed as medium.
Receptor/Resource Sensitivity	Medium	As there is a substantial interest for being engaged with the project within the local community, resource sensitivity is considered medium.
Potential Impact Significance	Beneficial	Potential impacts to employment and business opportunities are beneficial.
Proposed Mitigation Measures	CWIT will encourage Contractors to hire appropriate positions from the local community.	
Potential Residual Impact Significance	Beneficial	Potential impacts to employment and business opportunities are beneficial.

7.3.13 Potential Impact on Community Health and Safety

Potential Impact Sources

The sources of impact on community health and safety are listed below:

- Air emission from construction activities;
- Noise emission from construction activities;
- Traffic movement for transport of boulder, manpower, equipment and materials;
- Influx of non-resident workers to the area.

Embedded control measures

The following mitigation measures will be implemented:

- Dust suppression measures, described in section on air quality impacts (Section 7.3.4);
- Noise control measures, described in section on noise quality impacts (Section 7.3.5);
- Road and traffic control measures, described in section on road and traffic impacts (Section 7.3.6);
- CWIT has the Protocol for COVID – 19 management and same will be implemented for this project.

Impact Assessment

Air emission: Fugitive dust emission due to site development and construction activity have the potential to increase the particulate matter in the ambient air quality. The potential impact is assessed to be localised, i.e. project site and its immediate vicinity. As the nearest receptor, settlements are located more than 25 km from the site; potential impact due to air emission has not been envisaged.

Noise emission: Noise due to operation of machineries and equipment used for construction activity and operation of transport vehicles have the potential to increase the ambient noise level. The potential impact is assessed to be localised. Based on noise quality modelling results, the incremental noise generated from the construction activity will be attenuated to the noise standard within 300m from construction site. As the nearest receptor, settlements are located more than 2.5 km from the site; potential impact due to noise emission has not been envisaged.

Traffic movement: Construction materials and heavy equipment used during the construction phase will be brought into the site through existing road network as well as using the water ways. Though it will not cause any traffic congestions on roads and possible disruption to the community usage of roads – however, it will increase inconvenience to community in terms of air and noise pollution caused by due to pipeline laying during construction phase.

Influx of non-resident workers: The influx of workers may cause impacts to public health, especially in an increase in prevalence of diseases. Influx of migrant labourers during construction can cause mixing of the migrant workforce with the local people. This mixing of the groups may cause some adverse impacts to public health in the neighbouring villages with the potential for spread of infectious and communicable diseases.

Additionally, the pandemic situation in light of the spread of COVID19 requires special provisions of safety and sanitisation for engagement and management of migrant labourers for the period that this threat is considered active. All government prescribed safety measures, updated to the most recent and relevant ones, will have to be ensured by the Contractors.

Significance of Potential Impact

The significance of potential impacts to community health and safety (CHS) during Project Stage 1 is assessed in following table.

Table 7.21 Assessment of Potential Impact to CHS during Project Stage 1

Criteria	Rating	Comment
Potential Impact Sources		
<ul style="list-style-type: none"> ■ Air emission from construction activities; ■ Noise emission from construction activities; ■ Traffic movement for transport of boulder, manpower, equipment and materials; ■ Influx of non-resident workers to the area. 		
Nature	Negative	Potential impacts to air quality, risk of accidents, increased noise levels and influx of non-residential workforce are negative potential impacts.
Type	Indirect and Direct	<ul style="list-style-type: none"> ■ The potential for health-related impacts is indirectly linked to changes in the environment components. ■ Potential traffic-related accidents and increased noise levels would likely be direct potential impacts. ■ Migrant worker interaction with local population in common places such as market, public transport or local restaurants has the potential for indirect impacts.
Duration	Short term	The potential impact is expected to last during construction stage
Extent	Local	The potential impact will be limited at immediate vicinity of the project site and along the site access road
Scale	Low	<ul style="list-style-type: none"> ■ The fugitive dust emission and incremental noise level from construction activity may not result in any perceptible changes in existing ambient air quality and noise quality. ■ Peak traffic volume during construction stage is low compared to existing traffic volume. ■ The migrant workforce will stay in the hired accommodation facility in the nearby area. There is a possibility of interaction with local people during visit to nearby marketplaces.

Criteria	Rating	Comment
Frequency		<ul style="list-style-type: none"> ■ Dust dispersion, air pollution, and noise will be frequent throughout the construction process. ■ Road accidents, being unplanned events, can occur at any time. However, the frequency is expected to be low. The potential for accidents is likely to be higher on bad weather days with poor road conditions. ■ The interaction with migrant workforce will be regular during working hours
Magnitude	Small	Considering, the duration, extent and scale, the magnitude is assessed to be small.
Receptor/Resource Sensitivity	Medium	The occurrence of seasonal sickness and other diseases among local working population is higher during monsoon months. Population may be infected with COVID-19, in case, they came in contact with infected workforce.
Potential Impact Significance	Moderate	As per the impact assessment methodology defined in Section 4, the combination of a medium receptor sensitivity and low potential impact magnitude will result in an overall moderate potential impact significance.
Proposed Mitigation Measures		<ul style="list-style-type: none"> ■ Compulsory medical examinations for Project workers to ensure they are fit for work and to monitor the prevalence of communicable diseases detected through periodical medical check-up; ■ Conduct an induction and training to the construction workforce on the Project's Code of Conduct regarding do's and don'ts in relation with interaction with locals; ■ Regular engagement with local authorities relevant to crime (local police) or other social problems (e.g. local administrative authority) for prevention of issues and for mitigations when issues arise; ■ Accessible the grievance mechanism for all community groups to report concerns associated with potential Project health impacts. Where complaints are submitted the Project will undertake an immediate investigation. ■ Community health and safety management plan (CH& SMP) has been developed for the project. Periodic monitoring, verification and check for implementation of CH&SMP will be carried out as per plan (<i>Refer to Appendix 9.5</i>)
Potential Residual Impact Significance	Minor	The adoption of the recommended mitigation measures will reduce the residual potential impact significance to minor.

7.3.14 Potential Impact on Occupational Health and Safety

Potential Impact Sources

The sources of impact to the health and safety of the Project's construction workforce are listed below:

- Accidents and injuries associated with the operation of heavy machinery and other construction activities; and
- Health impacts associated with environmental conditions and changes in environmental quality, arising from emissions to air, water, land and noise emissions from construction activities as well as from storage and handling of waste, particularly hazardous waste.

Embedded control measures

The control measures are as follows:

- The Contractors will prepare and implement a Health and Safety Plan prior to commencing work. This plan will include method statements for working methods, plant utilization, construction sequence and safety arrangements;
- A Permit to Enter system will be established to ensure that only authorized persons gain entry to the site;

- Personal Protective Equipment (PPE) shall be worn at all times on the Site. This shall include appropriate safety shoes, safety eyewear, and hard hats. Non-slip or studded boots will be worn to minimize the risk of slips.

Impact Assessment

Accidents and injuries associated with the operation of heavy machinery and other construction activities: Over-exertion, ergonomic injuries and illnesses, such as repetitive motion, over-exertion, and manual handling, are among the most common causes of injuries on construction sites. Loose construction materials, liquid spills, and uncontrolled use of electrical cords and ropes on the ground, are also among the most frequent causes of lost time accidents at construction sites. Falls from elevation associated with working with ladders, scaffolding, and partially built structures are also among the most common causes of fatal or permanent disabling injury at construction sites.

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

Vehicle traffic, use of lifting equipment and the movement of machinery and materials on a construction site may pose temporary hazards, such as physical contact, spills, dust, emissions, and noise. Heavy equipment operators have limited fields of view close to their equipment and may not see pedestrians close to the vehicle. Center-articulated vehicles create a significant impact or crush hazard zone on the outboard side of a turn while moving.

Health impacts associated with environmental conditions and changes in environmental quality: Construction sites may pose a risk of exposure to dust, chemicals, hazardous or flammable materials, and wastes in a combination of liquid, solid, or gaseous forms. Access to construction areas, including the pipeline corridor and the access road, will be restricted to reduce risks to public health and safety. These risks could create long-terms impacts to the health and safety of the construction workforce and therefore the impact severity is assessed to be medium. Measures will be implemented to ensure that these risks are considered prior to the commencement of construction, and that all risks are communicated to the workforce.

Significance of Potential Impact

The significance of potential impacts to occupational health and safety (OHS) during Project Stage 1 is assessed in following table.

Table 7.22 Assessment of Potential Impact to OHS during Project Stage 1

Criteria	Rating	Comment
Potential Impact Sources		
<ul style="list-style-type: none"> ■ Accidents and injuries associated with the operation of heavy machinery and other construction activities; ■ Health impacts associated with environmental conditions and changes in environmental quality. 		
Nature	Negative	Potential impacts to occupational health and safety due to changes in environment quality and risk of accident on workforce are negative potential impacts.
Type	Indirect and Direct	<ul style="list-style-type: none"> ■ The potential for health-related impacts is indirectly linked to changes in the environment components. ■ Potential impact due to change of environmental quality is indirect.
Duration	Short term	The potential impact is expected to last during construction stage
Extent	Local	The potential impact will be limited at workplace
Scale	Medium	<ul style="list-style-type: none"> ■ The fugitive dust emission at construction area and high noise level (81.5 dB at 50 m from the construction activity) from construction activity may cause significant impact on workers working at site. ■ Considering health and safety provision potential impacts due to injuries/accident will be medium.

Criteria	Rating	Comment
Frequency		<ul style="list-style-type: none"> ■ Dust dispersion, air pollution, and noise will be frequent throughout the construction process. ■ Accident/ incidence, being unplanned events, can occur at any time. However, the frequency is expected to be low.
Magnitude	Small	Considering, the duration, extent and scale, the magnitude is assessed to be small.
Receptor/Resource Sensitivity	Medium	Approximately 950 workers will be employed during the peak construction stage, exposing the majority of the workers to occupational health and safety risks..
Potential Impact Significance	Moderate	As per the impact assessment methodology defined in Section 4, the combination of a medium receptor sensitivity and low potential impact magnitude will result in an overall moderate potential impact significance.
Proposed Mitigation Measures		<ul style="list-style-type: none"> ■ Providing the standard operating procedure (SOP) for handling of chemicals and periodical training; ■ Providing adequate and healthy living conditions in the Contractors worker camp as per National Policy on Safety, Health & Environment at Work Place; ■ Reducing exposure of workers operating near high noise generating sources to the extent possible; ■ Conducting health surveillance of the Contractors workforce; ■ Ensuring occupational health and safety of Contractors workforce through the formulation of an "Occupational Health & Safety Management Plan". ■ Occupational health and safety management plan (OH& SMP) has been developed for the project. Periodic monitoring, verification and check for implementation of CH&SMP will be carried out as per plan (<i>Refer to Appendix 9.6</i>)
Potential Residual Impact Significance	Minor	The adoption of the recommended mitigation measures will reduce the residual potential impact significance to minor.

7.3.15 Potential Impact on Tourism

Potential Impact Sources

Potential sources of impacts on tourism is due to shore line changes or instability of beaches.

Impact Assessment

Any active tourism activity is not identified at the offshore region in the proposed sand dredging area. The only possible impact on tourism is the instability of beaches. Since this proposed sand dredging will be performed beyond 8 km offshore to the shoreline and about 25m depth, it is very unlikely to impact beach stabilization. Therefore impact on tourism due to the proposed sand dredging is incidental.

Significance of Potential Impact

The significance of potential impacts on tourism due to Project Stage 1 activities is assessed in following table.

Table 7.23 Assessment of Potential Impact on Tourism during Project Stage 1

Criteria	Rating	Comment
Potential Impact Sources		
■ Shore line changes or instability of beaches		
Nature	Negative	Potential impacts on tourism due to shore line changes or instability of beaches are negative potential impacts.

Criteria	Rating	Comment
Type	Indirect	The impact is assessed to be indirect, if there any tourism activities in the impacted area
Duration	Long term	The potential shore line changes and instability of beaches may have long term effect if no preventive measures implemented.
Extent	Local/ Regional	The potential impact will be impacted to affected area of shore
Scale	Low	Since this proposed sand dredging will be performed beyond 8 km offshore to the shoreline and about 25m depth, it is very unlikely to impact beach stabilization.
Frequency	Remote, as the proposed project is 8 km away from the shore line.	
Magnitude	Negligible	Considering, the duration, extent and scale, the magnitude is assessed to be negligible.
Receptor/Resource Sensitivity	Low	There is no tourism activity in the beach area of the proposed sand borrow area.
Potential Impact Significance	Incidental	As per the impact assessment methodology defined in Section 4, the combination of a low receptor sensitivity and negligible potential impact magnitude will result in an overall incidental potential impact significance.
Proposed Mitigation Measures	<ul style="list-style-type: none"> ■ Measurement of beach profile should be carried out covering from the beach area of Sarakkuwa to Negombo mentioned in the CEA approval. 	
Potential Residual Impact Significance	Incidental	Residual impact is assessed to be incidental

7.3.16 Potential Impact on Archaeological and Cultural Sites

Impact Assessment

The proposed terminal will be constructed within the Colombo port area. There, is archaeological or cultural site in the proposed project site. Therefore, no direct impact is anticipated from the construction terminal.

The nearest identified archeologically and cultural & religious significant building area (Refer to Section 5.5) like located 1.8 km from proposed WCT-1 construction site. The vibration ground borne vibration during piling activity and other construction activity may not have any impact on these building.

The existing vehicular traffic for the port currently passes along the former Commissariat street situated between three building of recognised heritage interest, namely the Harbour Master's Building, the Gate House and SLPA Maritime Museum. During construction of WCT-1 terminal, this route will be used for transportation of boulder and construction materials. The additional ground vibration due to addition traffic for construction stage may not any significantly increase the existing vibration level of the road (Refer to **Figure 7.9**).

As per IEE report for sand borrow area, there is no underwater archaeological features in the sand borrow area and its ZOI, project also obtained NOC from Department of Archology. Therefore, no direct impact is anticipated from the offshore dredging.

Significance of Potential Impact

The significance of potential impacts on tourism due to Project Stage 1 activities is assessed in following table.

Table 7.24 Assessment of Potential Impact on Archaeological and Cultural Sites during Project Stage 1

Criteria	Rating	Comment
Potential Impact Sources		
<ul style="list-style-type: none"> ■ Ground vibration due to construction activities; ■ Ground vibration due to traffic movement; ■ Dredging from sand borrow area 		
Nature	Negative	Potential impacts on archaeological and cultural sites are negative potential impacts.
Type	Indirect	The impact is assessed to be indirect, may impacted due to ground vibration from construction and transport activities
Duration	Short term	The potential impact will short term –only during construction stage
Extent	Local	The potential impact will be local –only to particular structure
Scale	Low	Additional ground vibration may not be significant to cross the recommended threshold level of 1.0 mm/sec PPV for above mention heritage interest structures.
Frequency	Unlikely	
Magnitude	Negligible	Considering, the duration, extent and scale, the magnitude is assessed to be negligible.
Receptor/Resource Sensitivity	Medium	These structures are heritage buildings.
Potential Impact Significance	Minor	As per the impact assessment methodology defined in Section 4, the combination of a medium receptor sensitivity and negligible potential impact magnitude will result in an overall minor potential impact significance.
Proposed Mitigation Measures		<ul style="list-style-type: none"> ■ Vibration monitoring of the project site; ■ An additional safeguard measures has been recommended that a Watching Brief of dredging operations be carried out during the works, in case of archaeological chance finds.
Potential Residual Impact Significance	Minor	Residual impact is assessed to be minor

7.3.17 Potential Impact on Socio-economic Conflict

Potential Impact Sources

Potential sources of impacts of the Project on socio-economic conflict within the ZOI include:

- Engagement of local and outside workers;
- Socio-cultural differences with outside workers;
- Environmental pollution and impact on fishing.

Impact Assessment

Background: The Sri Lanka Labour Force Survey Annual Report for 2021 indicates that from the available labour force in Sri Lanka 8.1 million are employed whilst 439 thousand are unemployed. The employed workforce and unemployed from Colombo attributes to 920 thousand and 42.3 thousand (4.4%) respectively. Further, in 2021 there was a year-on-year increase of ~114 thousand in the total labour force, whilst 27 thousand was from Colombo alone.

The sector wise employment in industrial activities data showed that 0.69 million (9%) in construction activities and 0.48 million (6%) in transportation and storage activities. Indicating that there is a high labour participation in the industries relevant to the development and operation of CWIT. The high literacy rate of 93% means that majority of the individuals can be trained to perform specific tasks which augurs well for CWIT. Both SAGT and CICT as understood based on discussions, have not experienced any challenges in recruiting individuals with the required skill sets for the terminal operations.

Engagement of local and outside workers: The work force requirement during peak construction stage will be approximately 1000 person. It is estimated that about 70% man power requirement will be sourced from the local area. During operational stage, work force requirement will be approximately 350-400 employees out of which ~40-50% will be for the yard operations. Yard operations are very specialized in nature and are unique to a terminal operation.

CWIT will encourage contractors to hire appropriate positions depending on availability of required skill sets from the local community. CWIT has plans to provide the necessary training to ensure that recruits are developed to the required standards to sustain operations. Hence, prior experience although preferred, is not a necessity to sustain operations of CWIT.

CWIT is mandated by the Agreement entered with the Board of Investments Sri Lanka (BOI) to employ locals to the extent possible. However, there is provision in the agreement for contractors to hire foreign nationals. In such an event, the contractors are required to seek prior approval from the BOI prior to mobilization indicating the designation and the number of expats to be deployed. Consequently, the BOI would do an internal assessment and give an approval to the contractor if the request is deemed reasonable and necessary considering the local circumstances.

Socio-cultural differences with outside workers: During the construction stage, around 100-150 external discipline specific contractors (e.g. Mechanical, Civil, etc) are likely to be engaged from outside. The outstation workers will be housed in the work accommodation facilities within the Project site. Potential for bringing people together socially and culturally, but difficulties and friction may occur if efforts are not made to properly inform them of the customs and traditions in the locality. Worker accommodation with sources for drinking water, solid waste management, pest control services, will be provided, improper arrangement may have potential impact of occupational health and safety of the workers, same has been discussed in Section 7.3.14.

Dredging activity and impact on fishing: As discussed, in Section 7.3.11, potential impact due to offshore dredging and transportation of dredge materials to reclamation site may some adverse impact on fishermen community. Appropriate mitigation measures, like (i) execution of insurance policy for fishermen, (ii) insurance for damages of boats, fishing gears and (iii) life insurance covers for fishermen in the identified area has been planned. The proposed project may not significantly impact on fisheries and this may not cause conflicts with local fisherman.

Significance of Potential Impact

The significance of potential impacts as a result of any socio-economic and/or political conflicts during Project Stage 1 is assessed in following table.

Table 7.25 Assessment of Potential Impact to Socio-economic Conflict during Project Stage 1

Criteria	Rating	Comment
Potential Impact Sources		
<ul style="list-style-type: none"> ■ Engagement of local and outside workers; ■ Socio-cultural differences with outside workers; ■ Environmental pollution and impact on fishing. 		
Nature	Negative	Potential impacts due to socio-economic conflict from above mentioned sources are negative impacts.

Type	Direct	The potential impacts would likely be direct impacts due to Project activities.
Duration	Short term	The potential impact is expected to last during construction stage
Extent	Local	The potential impact will be limited to the surrounding settlements of the Project Site.
Scale	Medium	The conflicts from the above mentioned sources, if not properly addressed may hamper the progress of the construction activity.
Frequency	These events/ activities, can occur at any time. However, the frequency is expected to be low.	
Magnitude	Small	Considering, the duration, extent and scale, the magnitude is assessed to be small.
Receptor/Resource Sensitivity	Medium	Considering this overall perception of the fishermen community, the receptor sensitivity can be categorised as medium.
Potential Impact Significance	Moderate	As per the impact assessment methodology defined in Section 4, the combination of a medium receptor sensitivity and low potential impact magnitude will result in an overall moderate potential impact significance.
Proposed Mitigation Measures	<ul style="list-style-type: none"> ■ Local engagement plan for jobs and economic engagement opportunities will be managed by project Master Contractors ; ■ Address grievances towards the project, if any, resulting from social conflicts in a time bound manner. 	
Potential Residual Impact Significance	Minor	The adoption of the recommended mitigation measures will reduce the residual potential impact significance to minor.

7.4 Stage 2: Potential Impacts during operational Stage

7.4.1 Potential Impact on Surface Water Quality

Potential Impact Sources

Potential sources of impacts to surface water quality due to activities during operational stage include:

- Discharge of operational wastewater and surface runoff;
- Maintenance dredging;
- Accidental spillage;
- Accidental sewage discharge.

Embedded control measures

The following mitigation measures are in place and will be implemented for the site establishment stage of the project:

- Treatment of operational waste water through ETP;
- Treatment of surface runoff through sedimentation tank and oil & water separator;
- Sewage will be treated through STP;
- Spill response plan for any accidental spillage of hazardous materials and hazardous waste with adequate availability of spill kits.

Impact Assessment

Discharge of operational wastewater: The operation of terminal would involve the transfer, handling and storage of containers. There would be no requirement for the receipt of waste oil from container vessels. Operational equipment used for handling of container (e.g. RTGs, trucks and maintenance

vehicles) would generally be maintained in a mechanical workshop on the terminal. This workshop would be provided with an oil interceptor and any oil water would be collected and taken away for treatment. Some fuel would be stored on site for fuelling of equipment. The storage tank for fuel would meet all safety standards including a retaining bund of 110% of the tank volume to contain any loss.

The vessels using for the WCT-1 will be modern container vessels and do not require the same level of management as other types of vessels, such as oil or chemical tankers, The opportunity of hazardous waste is limited, due to nature of the cargo; however, the delivery and movement of all such waste will be monitored and regulated by SLPA.

Modern container vessels typically containing on-board sewage treatment plants. All solid wastes will be either retained on-board, or collected by Contractors. The requirement for ballast is also very limited. Adequate draft and buoyancy is maintained as container vessels unload and load containers at each port they visited. The WCT-1 has no facility for ship repairs, and the well documented issues associated with TBTs and other persistent toxicants from anti-fouling paints are not anticipated to arise. Colombo is signatory to the MARPOL convention, and discharge from vessels will be controlled under these international regulations.

With these mitigation measures in place, negative impact on water quality associated with operational wastes is not expected to be significant.

Accidental spillage: The potential environmental impacts may occur due to spills of oil and other hazardous substances, resulting fires or other disasters. However, to minimise the such potential impacts the design process has been considered for the port and terminal. Any such incident can seriously affect port operations and the design includes for comprehensive, state-of-the-art vessel navigation systems to reduce the potential for incidents.

The wave disturbance within the harbour is a key consideration in the design process as it is a functional criteria for operations. The orientation of the overall harbour layout and that of harbour entrance are the two principal parameters, which govern wave disturbance within the basin. The wave environment at the entrance is influenced by its configuration and the hydraulics of wave/structure interaction of the breakwater and internal harbour structures in the vicinity.

The potential impacts arising from excessive wave activity within harbour are:

- Hazards to vessels manoeuvring through steep and unstable waves arising from reflection;
- Disruption to loading and unloading due to excessive vessel motion;
- Damage to vessels, moorings or fenders from increasing mooring forces.

Both wave climate (outside basin) and wave climate (into basin and the existing port) were modelled. Results of modelling indicate that the required levels of calmness will be achieved within basin and the calmness inside the existing harbour will be improved. The potential for environmental impacts arising from wave disturbance in proposed terminal is considered to be low, and the wave environment within the existing port of Colombo likely to be improve.

Measures to reduce collisions and hazards within the harbour basin of CSH and the existing Port of Colombo are discussed above; other potential incidents outside the harbour area include:

- Collisions of vessels in the approach channels;
- Collisions between a vessel in the approach channel and tanker at the SPBM (or other SPM);
- Spills of hazardous cargoes on the quayside.

Collisions of vessels in the approach channels: As a container port, WCT-1 will not routinely service ships that carry bulk quantities potentially hazardous substances such as oil or chemicals. However, oil tankers do visit the existing Port of Colombo and crude oil is delivered to the Port via SPBM located outside the harbour. Therefore, the primary risk of incident to increase in vessel movement in the approach channels that service the existing port of Colombo and WCT-1.

As part of design, vessel movements and the risk of collisions in the harbours and approach channels were modelled under different conditions⁶¹. The simulation suggests that by 2030 the number of accidents per 1000 movements will be 1.4. This will be reduced to 0.7 with introduction of Vessel Traffic Management Information System (VTMIS). This compares very well with norms around the world. The number of reported accidents per 1000 varies from 0.1 in the North Sea to 2.4 in UK and 2.7 in the USA. The average is 1.5.

An accident does not necessarily imply a collision, as it could be a ‘near-miss’. As a rule one collision will occur in every three accidents and these can vary from a contact of no consequence to major impact. The predicted collisions in 2030 are 0.2 per 1000 movements or a total of 3. Since all ships are under the control of a pilot, the potential for incident resulting in a sinking or major holing with loss of either cargo or engine oil is considered low.

Collisions of vessels at the SPM: Restricted area are in place to minimise the risk of ships colliding with other vessels moored at the SPBM and other SPM around the Port. To further reduce this risk the alignment of the new outer approach channel has been designed to maximise the distance separation between the centreline of the channel and the SPMs. The risk of incident has been further modelled, by looking at the minimum stopping distance of a vessel in the event of ship losing steerage. This has shown that even if a ship were veer from the channel, emergency measures to stop the vessel could prevent a collision at the SPMs.

Spills of Hazardous Materials on the Quayside: Routine transshipment of hazardous materials is not anticipated at WCT-1. As a normal practice in modern container terminal will include a bunded area, specially for any damaged or leaking containers. Provisions are currently in place for managing the arrival and movement of any hazardous materials through the existing port. This includes classification of dangerous goods and requirements for notification of arrival, stowage, berthing and storage of dangerous good in the Port. These provisions will be maintained. It is considered that potential risks associated with hazardous cargo can be suitably managed, and the potential impacts are considered low.

Maintenance dredging: Maintenance dredging activities have the potential to cause water quality impacts as discussed above. However, given the low levels of maintenance dredging anticipated, significant negative impacts on water quality are not envisaged.

Significance of Potential Impact

The significance of potential impacts to surface water quality due to Project Stage 2 activities is assessed in following table.

Table 7.26 Assessment of Potential Impact to Surface water quality during Project Stage 2

Criteria	Rating	Comment
Potential Impact Sources		
<ul style="list-style-type: none"> ■ Discharge of operational wastewater and surface runoff; ■ Maintenance dredging; ■ Accidental spillage; ■ Accidental sewage discharge. 		
Nature	Negative	Potential impacts to surface water quality would be considered to be negative
Type	Direct	Potential impacts to surface water quality is likely be direct in event of accidental discharge of untreated waste water, surface runoff from accidental spillage during high rainfall period and sewage into basin.
Duration	Short term	The generation waste water and sewage will likely last the entire operational period of WCT-1. The effluent and sewage will be treated

⁶¹ MSR Rotterdam (2004) Marine Traffic Study, Port of Colombo

Criteria	Rating	Comment
		through the ETP and STP respectively. The surface water only can be impacted, if untreated effluent and sewage is discharged into local stream. In case of any minor accidental release of untreated waste water and sewage, it is expected to be dispersed in the sea and naturally assimilated in the ecosystem. However, in case of major accidental release of untreated waste water and spillage, the receiving surface waterbody can experience significant local deterioration of water quality at the discharge location and its AOI.
Extent	Local	Potential impacts would be limited to the discharge point and limited downstream area, depending upon quantity of untreated effluent/sewage.
Scale	Low	The potential impacts are likely to occur during accidental discharge of untreated waste water/ sewage/ spillage. The scale of change in water quality is expected to be Low.
Frequency	Generation of waste water and sewage will occur repeatedly throughout the operation of terminal. However, any releases of untreated waste water/ sewage/ spillage would be accidental events, and are expected to be infrequent.	
Magnitude	Small	Change in surface water quality is possible in the event of an accidental release of untreated effluent/ sewage, depending on the nature and volume of spill / release. However, this is an unlikely and unplanned event.
Receptor/Resource Sensitivity	Medium	The water quality of Indian ocean in the ZOI is suitable for fisheries and regular fishing activities occurs at the ZOI by the local fisherman.
Potential Impact Significance	Moderate	As per the impact assessment methodology defined in Section 4, the combination of a high receptor sensitivity and small potential impact magnitude will result in an overall moderate potential impact significance.
Proposed Mitigation Measures	<ul style="list-style-type: none"> ■ Develop and implement controls and standard operating procedures for the use of hazardous substances to prevent any accidental releases and accidents. ■ Potentially impacted runoff should be treated prior to any discharge to surroundings; ■ Appropriate spill kits to be made available on site. ■ Waste management plan has been developed for the project. Periodic monitoring, verification and check for implementation of waste management plan will be carried out as per plan (<i>Refer to Appendix 9.1</i>) 	
Potential Residual Impact Significance	Minor	Implementation of the above mentioned mitigation measures would significantly reduce the potential extent and scale of surface water quality impacts, which would reduce the potential impact magnitude to negligible. If the recommended control measures are implemented, potential residual impact significance would be minor.

7.4.2 Potential Impact on Air Quality

Potential Impact Sources and Pollutants

Potential impacts on air quality from the proposed WCT-1 project will involve emissions from operation of backup DG sets- 4 x 1.5 MVA capacity (3 in operational & 1 as standby) and three container ships, which may be docking at the berth during full capacity operations. The emissions from the backup DG sets and ships will be primarily nitrogen di oxide (NO₂), particulate matter (PM), sulphur di-oxide (SO₂) and carbon monoxide (CO).

Embedded control measures

The following measures will be implemented:

- The proposed DG sets will have to be maintained / operated properly per manufacturer's specifications.

Existing Air Quality

The existing ambient air quality condition (otherwise known as the baseline or background) in the immediate vicinity of the WCT1 terminal presents the current baseline to which the incremental ground level concentration caused by the emissions from the operation of the WCT1 terminal will be added. Ambient air quality monitoring would continue to be undertaken to evaluate background levels of key pollutants, during the construction and operations phase of the project. The existing ambient air quality data has been collected at three (3) points, details is provided in following table and the with the locations presented in Figure 7.10.

Table 7.27 Discrete Cartesian Receptor Locations

S. N.	Location ID	Location Name	UTM Co-ordinates*		Distance from Site Boundary (km)	Direction from Site
			Easting (m E)	Northing (m N)		
1	AQ1	Near CWIT office area	370968.10	767749.43	0.2	S
2	AQ2	Near Breakwater Bend	372234.88	766564.28	0.2	N
3	AQ3	Main Port access road	369991.14	767792.60	2.1	SE

* UTM Zone – 46 R

As discussed in **Section 5.4.11**, the concentrations of PM₁₀, SO₂, NO₂ and CO in all the primary monitoring locations in the ZOI, were well within the ambient air quality standards specified in the CEA.

Assessment Scenarios

The assessment scenarios considered for modelling include 24-hourly/ 8-hourly average Ground Level Concentrations (GLCs) for:

- Scenario 1 – Projected GLC for operation of 3 backup DG sets and container ships;
- Scenario 2 – Projected GLC (Baseline + Proposed Sources (DG Sets and Container ship) for.

Meteorological Data

Surface and upper air meteorological data of project location generated by Weather Research and Forecasting (WRF) model and USEPA's Mesoscale Model Interface Program (MMIF) for year 2022, downscaled to the Colombo area, have been used for the modelling exercise. Annual wind rose and wind class frequency distribution for the project site are presented in **Figure 7.11** and **Figure 7.12** Annual Wind Class Frequency Distribution, respectively. In order to develop the meteorological data for the model, AERMET pre-processor of AERMOD has been

Figure 7.10 Emission Sources and Monitoring Network

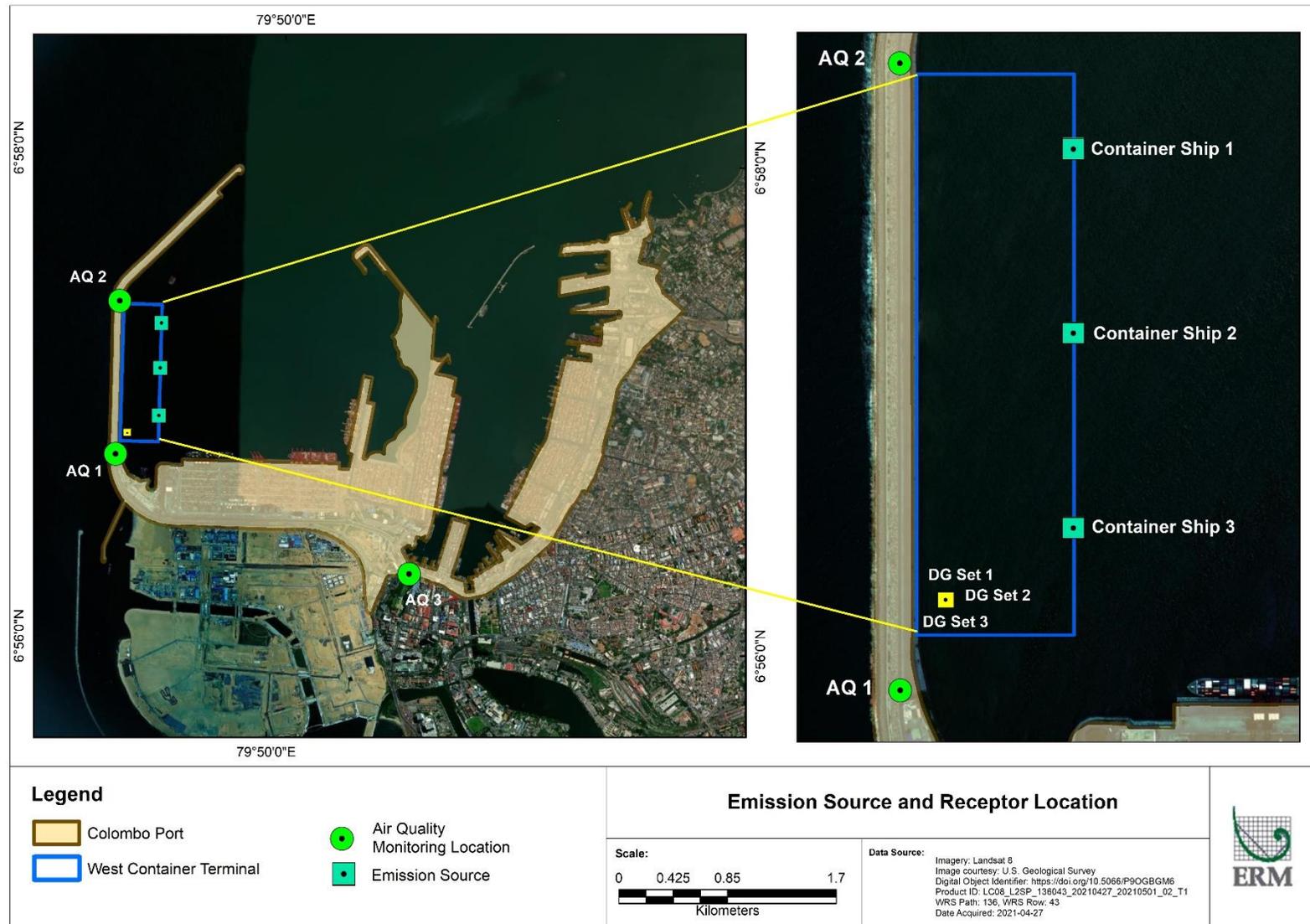
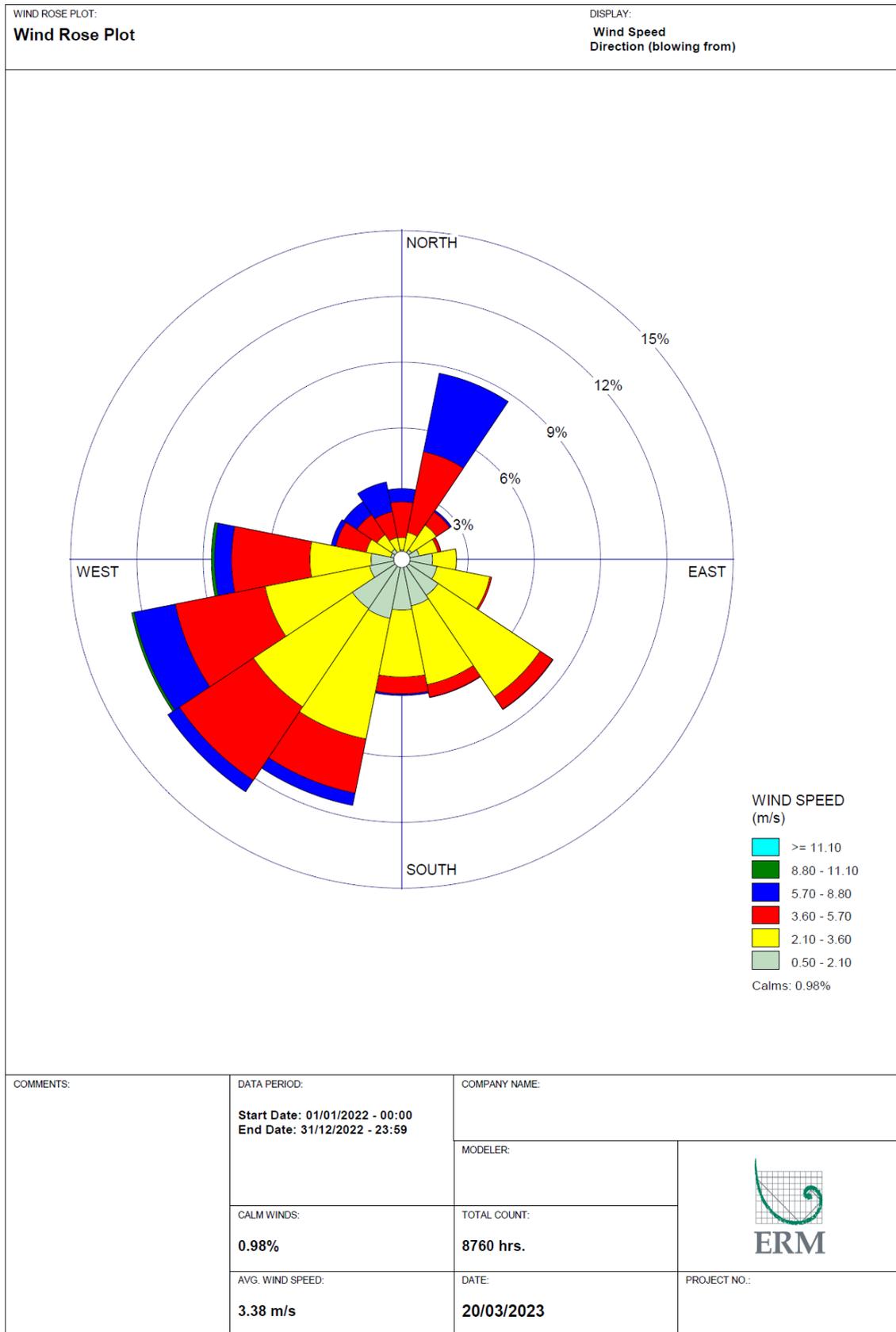
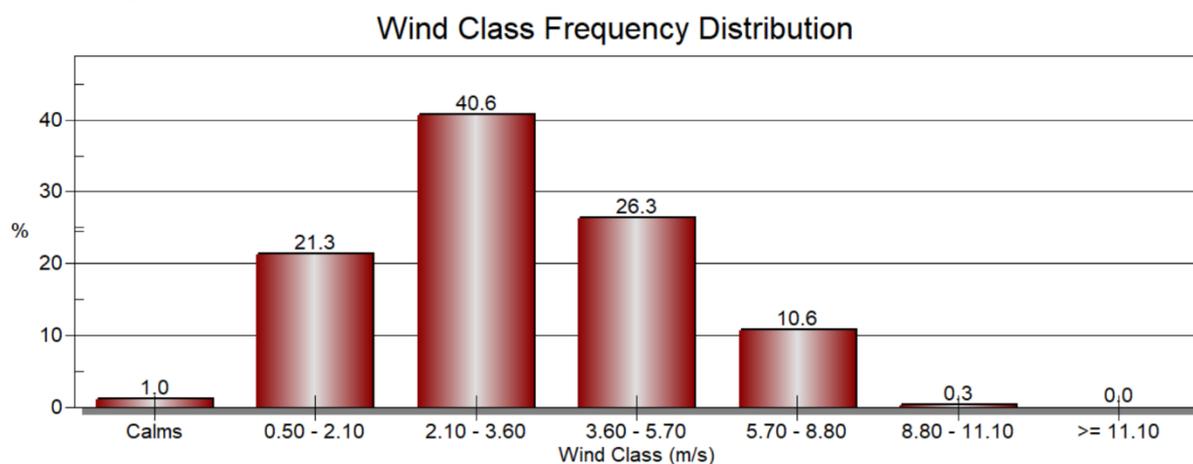


Figure 7.11 Annual Windrose



WRPLOT View - Lakes Environmental Software

Figure 7.12 Annual Wind Class Frequency Distribution



Emission Inventory

Potential impact on ambient air quality from these sources have been assessed through air quality modelling. The stack details and emission rate of the pollutants from the back-up DG sets have been presented in **Table 7.28** and emission from the container ships has been presented in **Table 7.29**.

Table 7.28 Emissions from the Proposed DG Stacks

Parameter	Unit	Stack 1	Stack 2	Stack 3
Stack Coordinates		370053.00 mE 768058.00 mN	370052.68 mE 768051.42 mN	370052.77 mE 768045.41 mN
Stack Height	m	30	30	30
Stack diameter	m	0.38	0.38	0.38
Stack temp	C	490	490	490
Stack velocity	m/s	20	20	20
Flow	Nm ³ /hr	3190.17	3190.17	3190.17
Emission Factors				
PM	lb/hp-hr	0.0007	0.0007	0.0007
SO ₂	lb/hp-hr	8.09E-03	8.09E-03	8.09E-03
NO ₂	lb/hp-hr	0.024	0.024	0.024
CO	lb/hp-hr	5.50E-03	5.50E-03	5.50E-03
Emission Factors				
PM	kg/kw-hr	4.26E-04	4.26E-04	4.26E-04
SO ₂	kg/kw-hr	4.92E-03	4.92E-03	4.92E-03
NO ₂	kg/kw-hr	1.46E-02	1.46E-02	1.46E-02
CO	kg/kw-hr	3.34E-03	3.34E-03	3.34E-03
Emissions				
PM	g/s	0.142	0.142	0.142
SO ₂	g/s	1.640	1.640	1.640
NO ₂	g/s	4.864	4.864	4.864
CO	g/s	1.115	1.115	1.115

Source: AP-42, Vol. I, 3.4: Large Stationary Diesel and all Stationary dual fuel engines

Table 7.29 Emissions from the Container Ship

Parameter	Unit	Ship-1	Ship-2	Ship-3
Phase of Trip (Cruise, Manoeuvring, Hotelling)		Manoeuvring	Manoeuvring	Manoeuvring
Ship Coordinates		370313.21 mE 768969.32 mN	370317.27 mE 768592.96 mN	370298.93 m E 768145.29 mN
Release height	m	35	35	35
Stack Inner Diameter	m	2	2	2
Stack Exit Temperature	C	264	264	264
Stack Exit Velocity	m/s	5.16	5.16	5.16
Emissions		Considered 100% emissions	Considering auxiliary emissions (25% emissions)	Considering auxiliary emissions (25% emissions)
PM ₁₀	g/s	1.33	0.33	0.33
PM _{2.5}	g/s	1.20	0.30	0.30
SO ₂	g/s	12.15	3.04	3.04
NO ₂	g/s	29.23	12.15	12.15

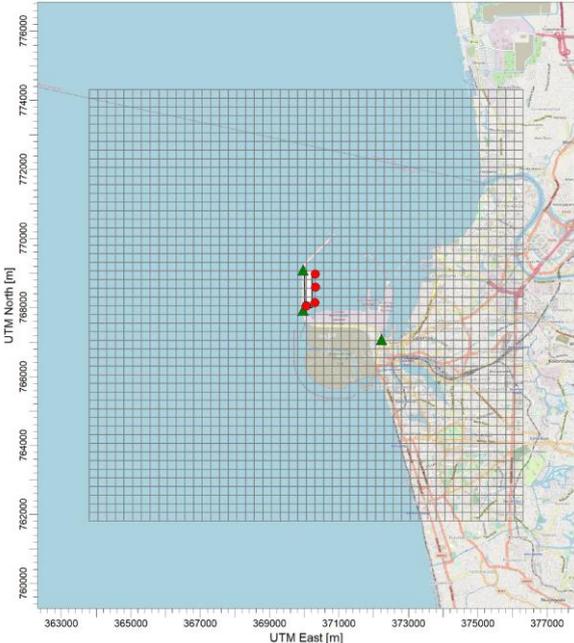
Source: Energy demand and exhaust gas emissions of marine engines by Hans Otto Kristenen, The Technical University of Denmark Harilaos Psaraffis, 2015

Modelling Methodology

The impact of the air emissions for pollutants like PM, SO₂, NO₂ and CO from the proposed Project have been evaluated using AMS/EPA approved air dispersion model – AERMOD View (version 10.2.1). AERMOD is a modelling system consisting of three separate modules: AERMET, AERMAP and AERMOD. AERMET is a meteorological pre-processor and uses hourly surface observations, cloud cover, and upper air parameters from twice-daily vertical sampling of the atmosphere to create two output files consisting of surface and vertical profile data, respectively. The terrain pre-processor AERMAP uses DEM maps as well as user generated receptor grids. AERMAP's output file consists of the x, y locations of each receptor, mean sea level (MSL) elevation and hill profile parameters. The hill profile parameter is used in determining plume flow around elevated terrain. The input details for the proposed Project is given in following table.

Table 7.30 Inputs for Air Dispersion Modelling Using AERMOD

S. No.	Input	Description
1	Modelling Software Used	AERMOD View ver. 10.2.1
2	Control Pathway	
	Dispersion option	Non-Default Options
	Dispersion Coefficient	Rural
	Flagpole Receptors	No
	Terrain	Flat & Elevated
	NO ₂ Options	Conversion Method Ambient Ratio Method (ARM)
3	Meteorology Pathway	
	Met Input Data	One season meteorological data (from 01 April 2019 to 30 June 2019) using Lakes Environmental Default AERMET Format
	Wind Speed Categories	■ A: 1.54 m/s

S. No.	Input	Description
		<ul style="list-style-type: none"> ■ B: 3.09 m/s ■ C: 5.14 m/s ■ D: 8.23 m/s ■ E: 10.8 m/s ■ F: no upper bound
	Datum	Universal Transverse Mercator (UTM)
	Anemometer Height	10 m above mean sea level
4	Receptor Pathways	<p>Nested Grid Grid 1 extending to 1 km with 50 m spacing; Grid 2 extending to 2.5 km with 100 m spacing; and Grid 3 extending to 5 km with 250 m spacing.</p>  <p>5-km Nested Grid (Red dot- source; green triangle – AQ monitoring stations)</p>
	No. of X and Y axis Receptors	4,689
5	Source Pathway (emission sources)	Point sources
6	Terrain Pathways	The terrain pre-processor AERMAP using the Shuttle Radar Topographic Mission (SRTM) 30 x 30m imagery was run to provide information on a) the base elevation of each receptor defined in the model; and b) the terrain height that has the greatest influence on dispersion for each individual receptor, otherwise known as the hill height scale. Both the base elevation and hill height scale were incorporated into AERMOD.
7	Modelling Scenarios	<ul style="list-style-type: none"> ■ The modelling scenarios comprises of following: ■ Scenario 1 – Period Ground Level Concentrations (GLCs) using model predictions of only proposed sources (back up DG and

S. No.	Input	Description
		<p>container ships) with input parameters as mentioned in Table 7.27 and Table 7.28.</p> <ul style="list-style-type: none"> ■ <i>Scenario 2</i> – As emissions from the existing sources will be captured in the baseline monitoring. Therefore, this scenario includes sum of model predicted Period GLCs and baseline GLCs.

Air Modelling Results

Scenario 1 - Predicted GLC - Operation of 3 backup DG sets and 3 ships

The model predicted results at the discrete receptors are provided for Period GLC in **Table 7.31**.

Table 7.31 Predicted GLC from the Proposed Project (Scenario 1)

Pollutant	GLC ($\mu\text{g}/\text{m}^3$)		
	PM ₁₀	SO ₂	NO ₂
AQ1	0.002	0.015	0.033
AQ2	0.005	0.052	0.139
AQ3	0.050	0.050	1.160
24 hrs average GLC	1.38	0.512	3.045
24 hrs average GLC UTM	371303 mE, 771308 mN	372221 mE, 767080 mN	371303 mE, 771308 mN
AAQS (24 hrs)	100	80	100

The predicted GLC of all pollutants was found to be within the prescribed ambient air quality standard (AAQS) limits.

Scenario 2 - Projected GLC (Baseline + Proposed Sources)

The Projected results are provided below in **Table 7.32**.

Table 7.32 Projected Period GLC from the Proposed Project (Scenario 4)

Sampling Location ID	Baseline 24 hourly average Conc. ($\mu\text{g}/\text{m}^3$)			Scenario 1 - Model predicted Period Conc. ($\mu\text{g}/\text{m}^3$)			Scenario 4 - Projected (Model Predicted + Baseline) 24 hourly Period Conc. ($\mu\text{g}/\text{m}^3$)		
	PM ₁₀	SO ₂	NO ₂	PM ₁₀	SO ₂	NO ₂	PM ₁₀	SO ₂	NO ₂
AQ1	86.67	69.75	144.01	0.002	0.016	0.033	86.672	69.766	144.043
AQ2	86.67	61.03	175.48	0.005	0.054	0.139	86.675	61.084	175.619
AQ3	120.00	61.03	181.75	0.050	0.513	1.160	120.05	61.543	182.91
CEA standard							100*	200**	250**

* 24-hourly; ** - 1 hourly

Conclusion

Based on the air modelling exercise, the following are the conclusions and recommendations:

- The dispersion modelling have been carried out to ascertain whether the emissions post commissioning of the proposed Project would meet the ambient air quality standards prescribed in Sri Lanka;
- The predicted GLC for PM₁₀, SO₂, NO₂ was found to be within the prescribed CEA standard at all the monitored locations, except PM₁₀ for AQ3. The baseline concentration of PM₁₀ was above the CEA standard.
- The predicted contribution from the project (during the operational stage) in all the parameters is less than 1 percent of the baseline value.

Significance of Potential Impact

The significance of potential impacts to ambient air quality due to emission from WCT-1 project is assessed in following table.

Table 7.33 Assessment of Potential Impact to Ambient Air quality during operational Stage 2

Criteria	Rating	Comment
Potential Impact Sources		
■ Emission from DG sets		
Nature	Negative	Potential impacts to ambient air quality would be considered to be adverse (negative).
Type	Direct	Potential impacts to ambient air quality from Project activities is likely to be direct.
Duration	Long term	The emission from DG sets will last the life of the Project
Extent	Local	Potential impacts would be limited to the immediate surrounding of the drill site, and hence would be considered to be local, however winds may potentially carry emission into surrounding communities.
Scale	Low	The modelled concentration of pollutants like PM ₁₀ , NO ₂ , SO ₂ will remain within the ambient air quality standard. The scale of change in ambient air quality is expected to be Low.
Frequency	Emissions will be released repeatedly for the duration of Project Stage 2.	
Magnitude	Small	Considering, the duration, extent and scale, the magnitude is assessed to be small.
Receptor/Resource Sensitivity	Medium	Existing air quality in the ZOI is moderate.
Potential Impact Significance	Moderate	As per the impact assessment methodology defined in Section 4, the combination of a medium receptor sensitivity and small potential impact magnitude will result in an overall moderate potential impact significance.
Proposed Mitigation Measures	<ul style="list-style-type: none"> ■ Periodic ambient air quality monitoring as per Environmental Monitoring Plan; ■ Explore minimizing the usage of diesel-based generators and avoid any idling; ■ Explore usage of cleaner fuels – such as natural gas for large engines and equipment; 	
Potential Residual Impact Significance	Minor	Implementation of the above mentioned mitigation measures would significantly reduce the potential extent and scale of air quality impact and the potential impact magnitude will be small. If the recommended control measures are implemented, potential residual impact significance would be minor.

Figure 7.13 Predicted GLC for PM₁₀

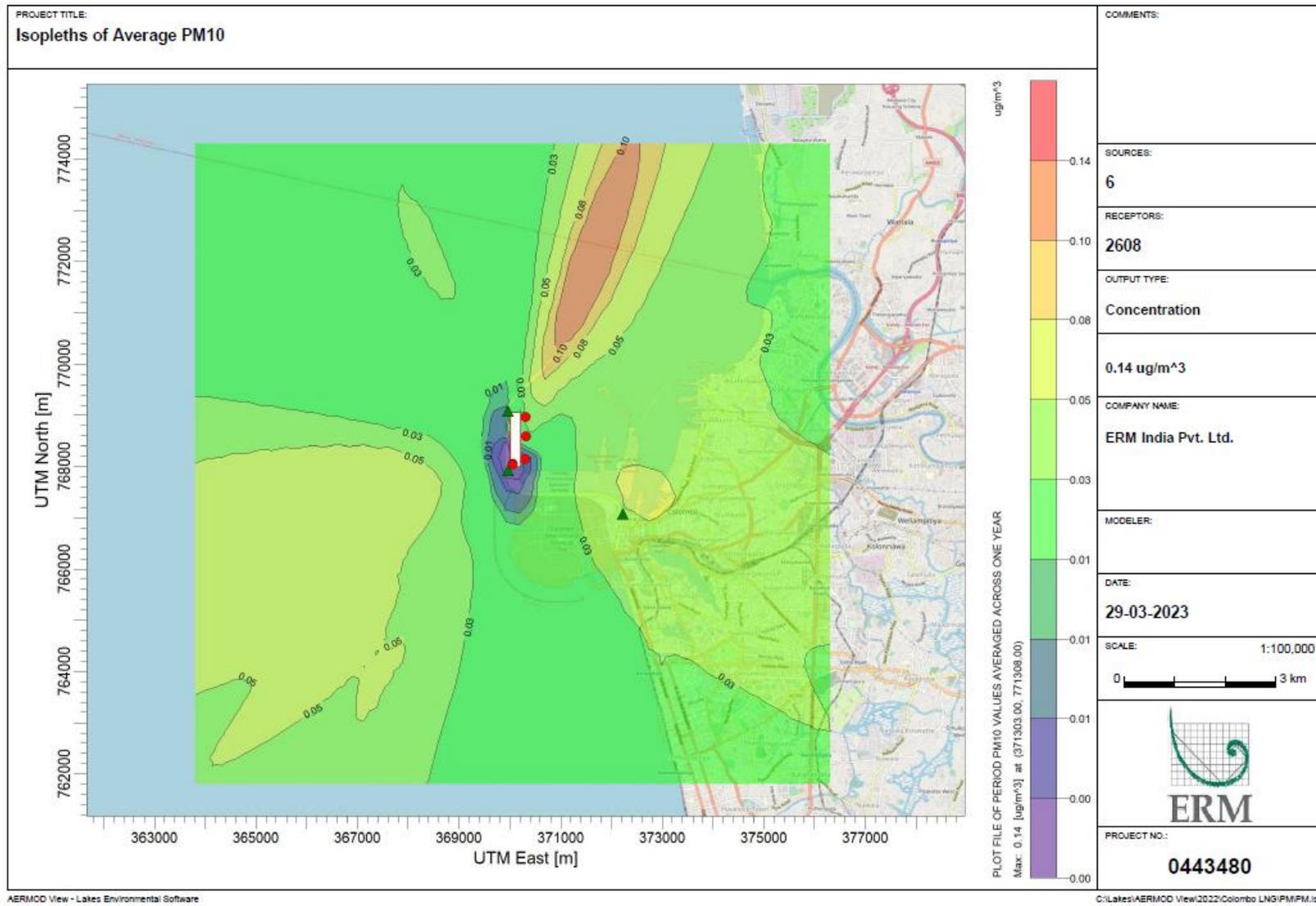


Figure 7.14 Predicted GLC for NO₂

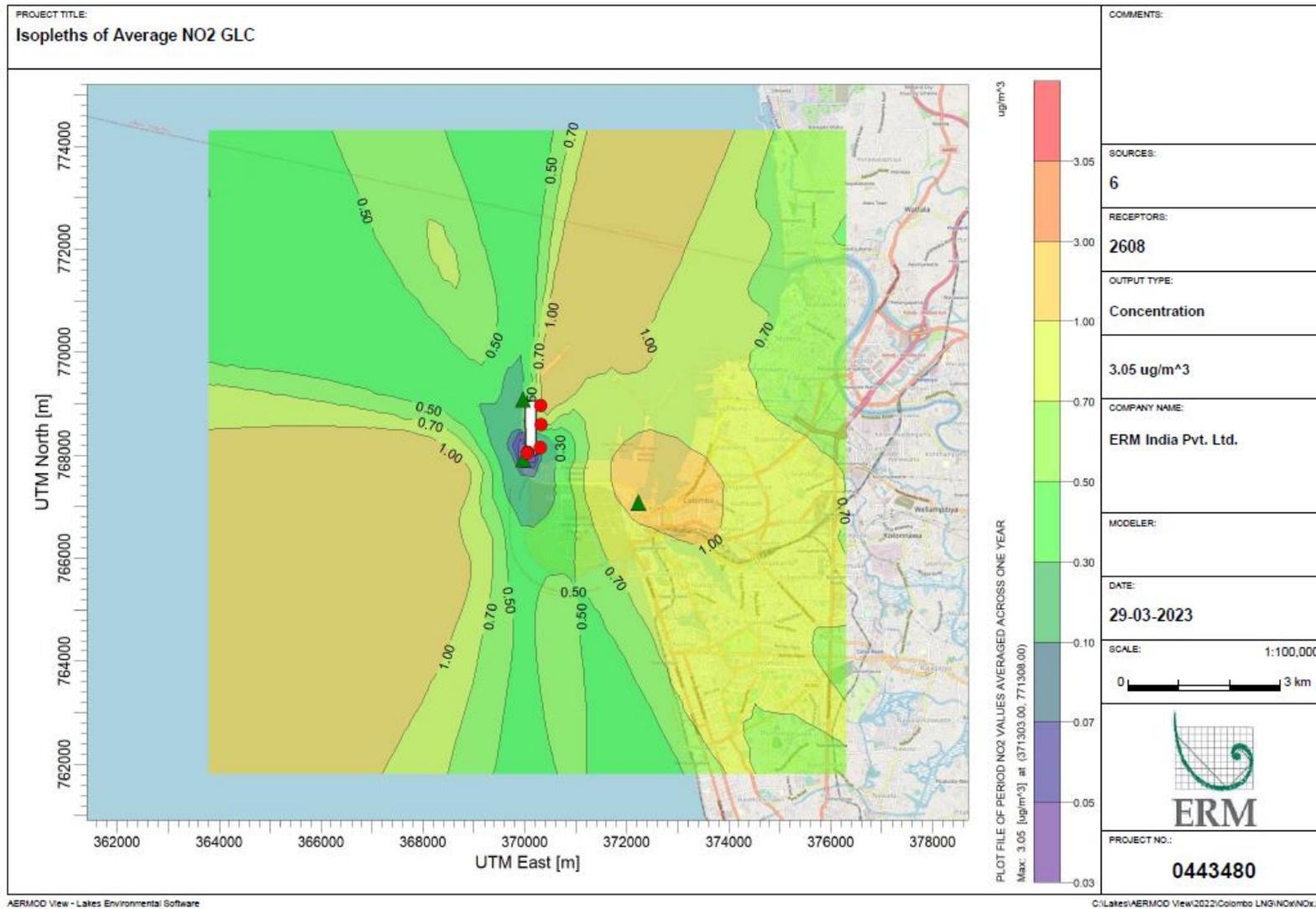
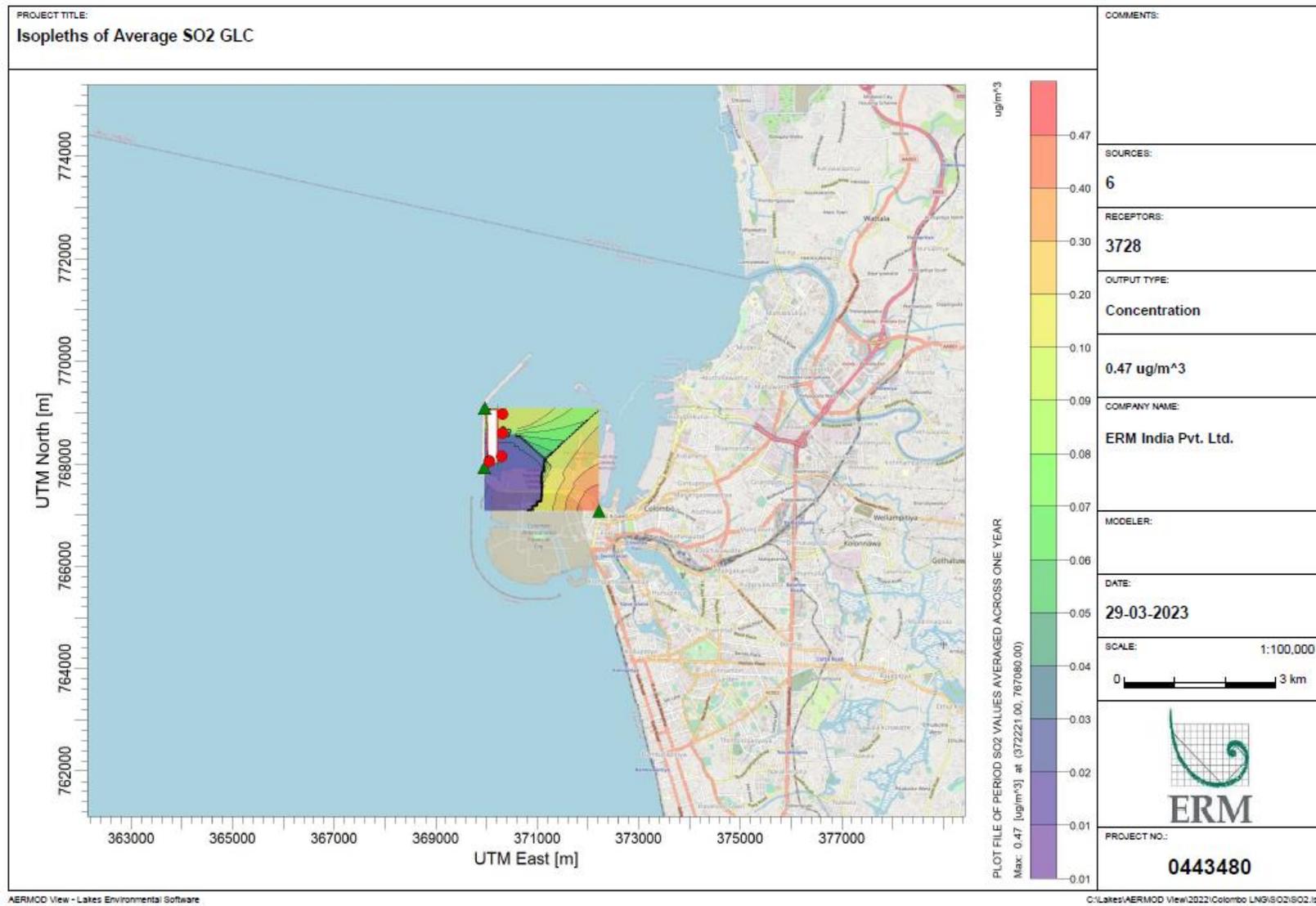


Figure 7.15 Predicted GLC for SO₂



7.4.3 GHG Emission

This section seeks to comply with the requirements established by the International Finance Corporation (IFC) that are based on the Environmental and Social Performance Standards. Specifically, Performance Standard 3 on Resource Efficiency and Pollution Prevention will be taken into account. It is recognized that increased economic activity, in this case commercial activities related to the fluvial transportation of products in a maritime terminal, generate increased levels of pollution to air, water and land, consuming resources and increasing the risks for people and the environment at the local, regional and global levels. Therefore, it is necessary to measure GHG emissions and promote reduction strategies.

Quantification / Estimation of GHG

The greenhouse gas emissions generated within the physical and operational boundaries of WCT -1 Terminal are considered for this estimation. In accordance with the reference standards (GHG Protocol and ISO 14064-1), emissions may be classified into three categories (Scope 1, 2 and 3).

Scope I: Direct greenhouse gas (GHG) emissions and removals	GHG emissions from sources owned and controlled by the organization.	Consider emissions	100%	of	GHG
Scope II: Indirect greenhouse gas emissions from energy	GHG emissions from the generation of electricity, heat or steam of external origin consumed by the organization.	Consider emissions	100%	of	GHG
Scope III: Other indirect GHG emissions	GHG emissions resulting from an organization's activities, but arising from GHG sources owned or controlled by other organizations.	Optional. Sources of emissions that must be included in the inventory can be selected.			

As can be seen from the above scope of estimation criteria, it is a mandatory requirement to consider all the “direct emissions and removals” (scope 1) and the “indirect emissions from energy” (scope 2). However, the inclusion of sources of emissions in the “other indirect GHG emissions” category (scope 3) is optional, and this is the primary focus in defining operational limits. Thus, as a part of this estimation study Scope 1 and 2 emissions of CO₂ have been considered.

Assumptions considered for Scope 1 & 2 estimation

WCT-1 Project would be developed through reclamation. The construction for the project commenced in October 2022, with Dredging and Reclamation. Thus, there is no baseline data that is available for the project, having started the construction. Even though the life of the project is for 35 years from 2022, the estimation of GHG emissions for CWIT was done with an objective to calculate the tonnes of CO₂ that would be emitted due till the maximum cargo handling capacity is obtained by the project in 2032-33. After which the electricity and fuel consumption is likely to plateau even though the project has a longer life. The estimation is also done for the initial 3 years when its only construction after that construction and operation will be done in tandem. The following are the key assumptions that has been considered.

Table 7.34 Key Assumption for GHG Estimations

Assumptions	Factors												
Average ITV (KM/day)	100												
Average Fuel per day (Lt/Day)	57												
Year	FY2026	FY2027	FY2028	FY2029	FY2030	FY2031	FY2032	FY2033					
Containers (TEUs) - As per Business Plan ('000TEUs)	1,360	2,011	2,609	2,875	3,050	3,240	3,250	3,230					
ITV (nos.) - As per Business Plan	28	58	78	78	78	92	92	92					
	2022-23	2023-14	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33		
	Construction Stage			Operational Stage									
VLSFO (KL)	7375	3000											
MGO (KL)	50	100	1400	1000									
HSD (KL)		1000	2500	1582.54	1707	1,623	1,623	1,623					
Electricity (GWH)	0.11	0.11	0.11	12.24	18.10	23.48	25.87	27.45	29.16	29.25	29.07		

Note:

Assumptions considered for Fuel estimation

- VLISO – It is used for Dredging and as it stands in the current year the dredging is likely to be completed thus no more need for VLISO is needed.
- MGO and HSD – These fuels will be used by multiple contractors during the construction stage. For the operation stage, HSD will be used by the Internal Transport Vehicles (ITV), based on the usage by SAGT, it is estimated that each truck will move approximately 100 km per day and use 57 Lt of fuel per day. The number of ITV is added as per the financial model.

Assumptions considered for electricity estimation

Following are the assumptions for the electricity consumption for WCT – 1.

- WCT -1 will source its electricity from Ceylon Electricity Board. There are plans to install rooftop solar panels however generation for the same is not calculated for electricity consumption. This is to ensure that a worst case scenario for CO2 emissions is considered.
- During construction stage only the office that is currently used will be using the electricity. Thereby the average annual KWH of the existing office is used for electricity consumption.
- All the equipment during operation stage would be electrified thereby the consumption of electricity during operation time is jumps significantly.
- For the consumption of the electricity at the terminal, benchmark of Mundra Container Terminal is taken the equipment at Mundra Port is of the same make and design. In the same, the electricity consumption is 7 KWH/ TEU.
- WCT -1 has assumed a higher level of electricity usage at 9 KWH/TEU. The number of TEUs that are based on the financial model of CWIT. This is due to the fact that, while the equipment is of same design, but has greater capacity. Thus, it is assumed that the equipment will utilize a little higher electricity.

Estimated GHG Emissions from the Project

Estimated GHG emission from the Project during first five years has been presented in following table

Table 7.35 Estimated GHG Emission from the Project

	2022-23	2023-14	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33
	Construction Stage			Operational Stage							
VLSFO (tCO ₂)	21,977.50	8,940	-	-	-						
MGO (tCO ₂)	147.51	298.00	4,172.00	2980.00	-						
HSD (tCO ₂)	-	1660.00	6650.00	6870.00	4540	4,317	4,317	4,317	5,091	5,091	5,091
Electricity (tCO ₂)	60.48	60.48	60.48	9845.76	11494	13,149.62	14,488.30	15,369.98	16,327.27	16,381.33	16,279.20
Total (tCO₂)	22,185	11,958	10,882	16,703	14,675	17,466	18,805	19,687	21,419	21,473	21,371

Note. Factor VLSFO (KL)- 2.98; MGO (KL)- 2.98; HSD (KL)-2.66; Electricity (KWH)- 0.00056

Significance of Potential Impact

The significance of potential impacts due to emission of GHG from WCT-1 project is assessed in following table.

Table 7.36 Assessment of Potential Impact due to GHG emission

Criteria	Rating	Comment
Potential Impact Sources		
<ul style="list-style-type: none"> ■ GHG emission due to fuel consumption ■ GHG emission due to consumption of electricity 		
Nature	Negative	GHG emission related impact is considered as negative
Type	Direct/ indirect	GHG emission- direct (fuel consumption for the project) as well indirect emission (use of electricity- grid supply).
Duration	Long term	Long term through the project cycle
Extent	National	GHG emission from the project and related potential impact on climate change will be national level impact
Frequency	Emissions will be released repeatedly for the duration of Project Stage 2.	
Magnitude	Medium	The estimated GH emission from the project is well within the threshold limit of 25,000 tCO ₂ during the period for which the estimation has been done.
Receptor/Resource Sensitivity	Medium	This considered as medium
Potential Impact Significance	Moderate	As per the impact assessment methodology defined in Section 4, the combination of a medium receptor sensitivity and small potential impact magnitude will result in an overall moderate potential impact significance.
Proposed Mitigation Measures	<ul style="list-style-type: none"> ■ Ensure that all equipment and machinery is maintained in accordance with manufacturer's specifications; ■ Project will have an active GHG emission monitoring protocol; ■ Project may involve investing in new equipment or technology, changing operational practices, or engaging employees to adopt sustainable behaviours. 	
Potential Residual Impact Significance	Minor	Implementation of the above mentioned mitigation measures would significantly reduce the potential extent and scale of air quality impact and the potential impact magnitude will be small. If the recommended control measures are implemented, potential residual impact significance would be minor.

7.4.4 Potential Impact on Noise & Vibration

Potential Impact Sources

Potential sources of impacts to noise and vibration due to activities during operational stage include:

- Container handling activities;
- Vehicular movement;
- Operation of back-up DG sets.

Impact Assessment

Container handling activities: Transshipment activities are not considered likely to cause a significant increment of noise level. The predominant noise sources during operation would be from the vehicular traffic on roads within the and outside the port premises.

The predicted traffic levels associated with the development of WCT-1 were calculated using the expected traffic due to operation of terminal. Current traffic flow of trucks represents the traffic from the existing port of Colombo. The future traffic flow of trucks includes the additional contribution from WCT-1,

Noise level arising from existing and future traffic flows have also been predicted using the methodology developed by Ontario Ministry of Transportation and Communication Canada. Noise levels are calculated on the assumption that maximum speed within the port is 40 km/hr, using the following formula:

$$\text{Predicted sound level} = 52 + 10.2 \log (V_c + 6 V_t) - 13.9 \log D + 0.13 S$$

Where:

Leq = equivalent noise level during a hour dB(A)

Vc = volume of automobiles other than trucks, veh/hr

Vt = volume of trucks, veh/hr

D = Distance from the source to receiver, m

S = Average speed of traffic flow, km/h

The present and future predicted traffic flow and corresponding noise levels are shown in following table

Table 7.37 Predicted noise due to Operational phase traffic movement

Road Link	Current flow 2022 (hr. average)		After commissioning of WCT-1 (2025)		Location of Noise predicted	Predicted noise level Leq dB(A)	
	Trucks	Others	Trucks	Others		2022	2025
Gate No. 3	14	138	35	143	Road side	53.31	55.35
Gate No. 6	182	142	203	146	Road side	60.93	61.37
Gate No. 8	50	88	71	93	Road side	55.79	57.1

The results show that the existing noise level in 2022 due to traffic will range from 53.31 dB(A) to 60.93 dB(A). The predicted noise level due to traffic in 2025 is 55.35 dB(A) to 61.37 dB(A), which is within the CEA noise standard for industrial and commercial areas of 70 dB(A) as well as the IFC guidelines value for industrial and commercial areas of 70 dB(A). The predicted incremental noise level will be 0.44 to 2.04 dB(A), which is not considered to be a significant increase.

Conclusions

Based on the noise modelling exercise, the following are the conclusions and recommendations:

- Noise propagation exercise was carried out to compare the predicted and baseline noise levels that will change due to traffic movement for operational stage;
- The results show that the existing noise level in 2022 due to traffic will range from 53.31 dB(A) to 60.93 dB(A). The predicted noise level due to traffic in 2025 is 55.35 dB(A) to 61.37 dB(A)., which is within the CEA noise standard for urban residential areas of 60 dB(A) for Gate 3 and 9 location, however, exceeded in Gate 6 area.
- As per Schedule V of the National Noise Regulation, noise levels will be allowed to exceed the background noise level + 3 dB(A) in places where the background noise levels exceed or are marginal to the given levels in Schedule I. Therefore, the predicted incremental noise level will be 0.44 to 2.04 dB(A), which is not considered to be a significant increase.
- The maximum baseline noise level (NQ-3) for roads and traffic was 62.62 dB(A), the predicted road traffic noise level is 60.9; therefore, total noise levels is estimated to be 64.8 dB(A) (62.6 +

60.9), which is within the Schedule IV (maximum permissible limit for industrial activity (daytime noise standard of 70 dB(A) but higher than the night-time noise standard of 60 dB(A)). If traffic movement occurred at night, this may have an impact on the nearby community.

- However, if the road is passing through rural settlements and the baseline noise level is lower than the predicted noise level, the incremental noise level may have an impact on the baseline noise quality; but this is not considered to be significant.

Operation of DG sets and other operational machineries and equipment: The other major noise generating sources will be from the DG sets. Acoustic DG sets will be used in the installations. Sound generated from the DG sets will be 85 dB(A). The other operational equipment and machineries are pay loader, truck & trailers, lifting equipment.

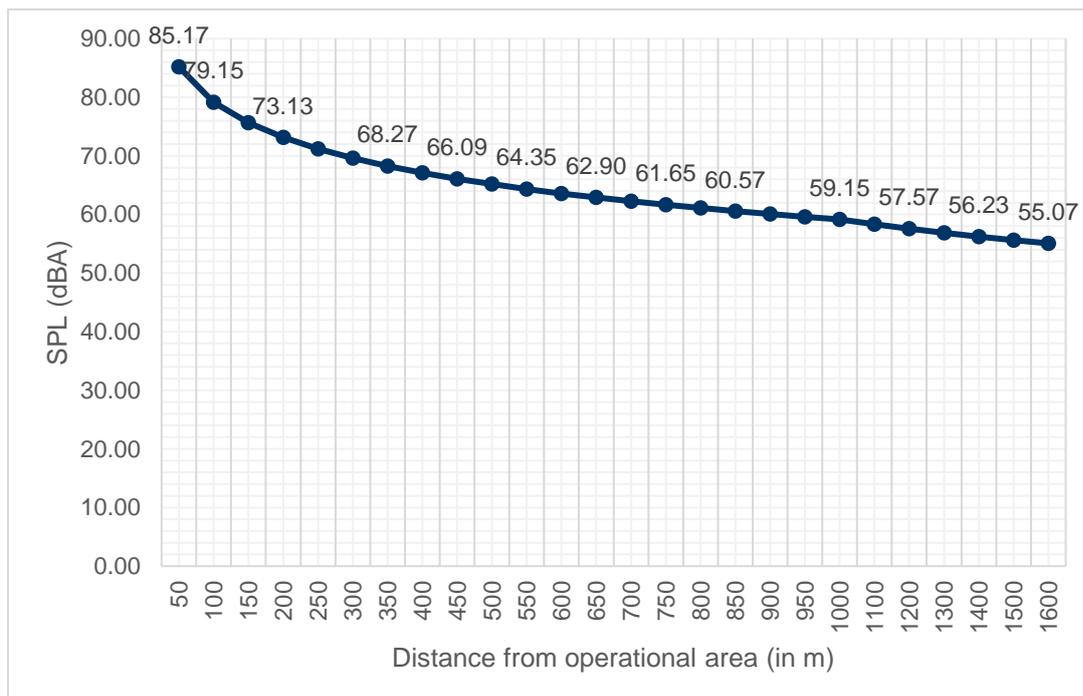
The cumulative noise generated from the three DG sets and other operational machineries (loading and unloading) equipment is calculated to be 85.17 dB(A). Noise attenuation equations (without any noise barrier) show that the normal attenuated noise to CEA standard for industrial and commercial area of 75 dB(A) within 175 from source and IFC noise guidance value for industrial and commercial area of 70 dB(A) within 275 m from operational area. Therefore noise will be attenuated within the proposed terminal facility.

Table 7.38 Typical Noise Emission from DG sets and Machinery

S. No.	Equipment	Sound Power Level At Operator (in decibels)
1	DG-1	85
2	DG-2	85
3.	DG-3	85
4	Pay loader	88
5	Truck & Trailers	79
6	Lifting equipment	85

Source: British Columbia, "Construction Noise," Workers Compensation Board of BC

Figure 7.16 Predicted Noise Pressure Levels from DG sets, Loading & Unloading Equipment



Conclusions

Based on the noise modelling exercise, the following are the conclusions and recommendations:

- Noise modelling exercise was carried out to compare the predicted and baseline noise levels that will change due to the proposed Project during operational stage;
- Only proposed noise sources were considered for prediction assuming that noise from the existing noise sources is captured as a part of baseline noise monitoring;
- The resultant noise levels suggest that the proposed project is not going to create any impacts on the local community, as there is settlement within 2.5 km from the project site and predicted noise level will be attenuated to existing baseline noise level within 700 m from the operational site.
- The incremental noise from the operation stage may have potential impact on workers working in the terminal; same will be discussed in occupational health and safety impact section.
- No potential significant operational stage noise effects have been identified as there is no sensitive receptors located within the distances specified above. However, operational noise monitoring stations will be deployed at site boundaries to monitor construction noise levels in order to fulfil the requirements from the local authorities

Significance of Potential Impact

The significance of potential impacts to noise quality due to operation of WCT-1 project is assessed in following table.

Table 7.39 Assessment of Potential Impact to Noise quality during Project Stage 2

Criteria	Rating	Comment
Potential Impact Sources		
<ul style="list-style-type: none"> ■ Container handling activities; ■ Vehicular movement; ■ Operation of back-up DG sets. 		
Nature	Negative	Potential impacts to ambient noise would be considered to be negative.
Type	Direct	Potential impacts to ambient noise from Project activities is likely to be direct
Duration	Long term	The noise from proposed operation will last till end of life of project.
Extent	Local	Potential impacts would be limited to the immediate surrounding of the drill site, and hence would be considered to be local.
Scale	Low/ Medium	The incremental noise generated from the operational activities will be attenuated to baseline noise level within 700 m from operational area and incremental noise from transport of construction stage traffic will be attenuated within 100m. If traffic movement occurred at night, this may have an impact on the nearby community The scale of change in ambient noise is expected to be Low-Medium.
Frequency	Noise will be generated repeatedly for the duration of Project Stage 2.	
Magnitude	Negligible	Considering, the duration, extent and scale, the magnitude is assessed to be negligible.
Receptor/Resource Sensitivity	Low	Existing air quality in the Project area is good. There is no receptor (settlements) within 2.5 km of the proposed project site.
Potential Impact Significance	Minor/ moderate	As per the impact assessment methodology defined in Section 4, the combination of a medium receptor sensitivity and negligible potential

		impact magnitude will result in an overall minor potential impact significance.
Proposed Mitigation Measures		The mitigation measures include: <ul style="list-style-type: none"> ■ The proposed unit will have to be maintained / operated at optimum efficiency; ■ Noise level will be monitored as per monitoring schedule.
Potential Residual Impact Significance	Minor/ Incidental	Implementation of the above mentioned mitigation measures would significantly reduce the potential extent and scale of noise impact, which would reduce the potential impact magnitude to be negligible. If the recommended control measures are implemented, potential residual impact significance would be incidental.

7.4.5 Potential Impact on Aquatic Ecology

Potential Impact Sources

Potential sources of impacts on aquatic ecology due to operation of WCT-1 project include:

- Discharge of operational wastewater, sewage and surface runoff;
- Accidental spillage;
- Increased vessel movement.

Embedded control measures

The mitigation measures are as follows:

- Waste water will be treated as per mitigation measures proposed in Section 7.4.1

Impact Assessment

Discharge of operational wastewater, sewage and surface runoff: As discussed in Section 7.4.1 discharge of waste water has potential to impact upon water quality, which in turn can affect aquatic ecology. However, these issues are readily managed, and assuming best practice measures are put in place, as for water quality, significant impact are not anticipated.

Leakage oil and spillage: The potential issues associated with spillage during construction discussed above also apply equally during operation. Unforeseen oil leakages and spillage can lead to secondary impacts on marine ecology, such as mortality of sessile organisms. Mobile animals such as fish may move away from polluted area with a corresponding reduction in abundance. Shorelines well away from the project area can also be polluted depending on the hydrodynamic conditions. Such incidents can increase the mortality of animals that live on nearby rocky shores and commercial organisms including fish, shrimps, crabs, cuttlefish and mussels can be contaminated with oil and unsuitable for consumption. Secondary impacts include the contamination of sandy shore preventing fisheries related activities such as landing of boats, net mending, etc. The likelihood of such incidents is considered low as discussed in Section 7.4.1. Given the low sensitivity of marine ecology in the project area, the potential impact on aquatic ecology is also assessed to be low.

Increased vessel movement: Potential impact on marine fauna due to increase of vessel movement will be underwater noise. The potential impacts on underwater noise generation on marine fauna during operation phase will be from movement of vessels. Assessment of underwater noise impacts to marine fauna due to movement of vessels has been presented in Section 7.3.8.

Common Dolphin and Spinner Dolphin species are reported from the area which are both IUCN Least Concern species. Impact to cetaceans may also happen due to collision with moving vessels during operation phase.

Significance of Potential Impact

The significance of potential impacts on aquatic ecology due to operation of WCT-1 project is assessed in following table.

Table 7.40 Assessment of Potential Impact on aquatic ecology during Project Stage 2

Criteria	Rating	Comment
Potential Impact Sources		
<ul style="list-style-type: none"> ■ Discharge of operational wastewater, sewage and surface runoff; ■ Accidental spillage; ■ Increased vessel movement. 		
Nature	Negative	Potential impacts to aquatic ecology would be considered to be negative.
Type	Direct	Potential impacts to aquatic ecology is likely be direct from Project activities.
Duration	Short term	Any discharge of untreated effluent, sewage and surface runoff would be an accidental event.
Extent	Local	Potential impacts would be limited to the discharge point and limited downstream area, depending upon quantity of untreated effluent/sewage. However, impact due to incremental vessel move will be regional
Scale	Low	The accidental discharge untreated effluent, sewage and surface runoff is not expected to result in significant changes to surface water quality and aquatic ecology. The scale of change in aquatic ecology is expected to be Low.
Frequency	The releases of untreated effluent/ sewage/ surface runoff would be accidental events, and are expected to be infrequent.	
Magnitude	Small	Considering that treating effluent through ETP is a standard procedure, the duration, extent and scale, the magnitude is assessed to be Small.
Receptor/Resource Sensitivity	Medium	The water quality of Indian ocean in proximity to the sand borrow area terminal area are important for fishery. Moreover, some cetaceans area also reported in the area. Hence receptor sensitivity is considered as medium.
Potential Impact Significance	Moderate	As per the impact assessment methodology defined in Section 4, the combination of a high receptor sensitivity and negligible potential impact magnitude will result in an overall “moderate” potential impact significance.
Proposed Mitigation Measures	The mitigation measures include: <ul style="list-style-type: none"> ■ Implement the surface water quality control measures suggested in Section 7.4.2. ■ A Operational Stage Cetacean Mitigation Plan will be prepared and implemented to reduce the potential impact upon marine mammals 	
Potential Residual Impact Significance	Minor	Implementation of the above mentioned mitigation measures and the additional mitigation measures would significantly reduce potential impact on aquatic ecology and sensitive receptors. If the recommended mitigation measures are implemented, potential residual potential impact significance would be Minor

7.4.6 Potential Impacts on Socio-economic Opportunity

Potential Impact Sources

The proposed project is unlikely to have an adverse impact on livelihoods of people in the area. The potential positive impacts on socio-economic opportunity during operational stage may occur due to:

- Sourcing of workforce for operation of WCT-1
- Opportunity for local enterprises.

Impact Assessment

Job opportunity due to sourcing of workforce for operational stage: The operation terminal would require skilled and semi-skilled man-power, there will be limited scope of unskilled and workforce. The estimated workforce required during operational stage is 350-400 workers, out of which ~40-50% will be for the yard operations. Yard operations are very specialized in nature and are unique to a terminal operation. Unskilled workers will be sourced locally. CWIT will encourage Contractors to hire appropriate positions from the local community.

Opportunities for local enterprises: The Colombo Port operations is already stimulating the local economy. The demand of basic food products (agriculture produces, meat, poultry products, fish, etc.) will be further increased during the operational stage. The local enterprises, particularly those involved in the production and sale of the items have the potential to benefit from this demand.

Significance of Potential Impact

The significance of potential impacts to socio-economic opportunity during Project Stage 2 is assessed in following table.

Table 7.41 Assessment of Socio-economic Opportunity during Project Stage 2 Activities

Criteria	Rating	Comment
Potential Impact Sources		
<ul style="list-style-type: none"> ■ Sourcing of workforce for operational stage ■ Opportunity for local enterprises. 		
Nature	Positive	Potential impacts to job and economic opportunity would be considered to be positive impact.
Type	Direct	The potential impacts would likely be direct potential impacts due to Project activities.
Duration	Long term	The potential impact on the job and economic opportunity would be entire operational stage..
Extent	Local	The potential impacts to employment are likely to affect mostly the local population.
Scale	Medium	The total number of workforce requirement for operational stage is around 500-600; non-technical job will be around 60-75%. There is also possibility of local business opportunity for supplying of various consumable products for construction workforce.
Frequency		Potential impacts to employment would be continuous throughout the Project, on as-needed basis.
Magnitude	Medium	Considering the number of workers required for during operational stage and potential business and economic opportunity potential impact magnitude is assessed as medium.
Receptor/Resource Sensitivity	Medium	As there is a substantial desire for employment within the local community, resource sensitivity is considered medium.
Potential Impact Significance	Beneficial	Potential impacts to employment and business opportunities are beneficial.
Proposed Mitigation Measures		CWIT will encourage Contractors to hire appropriate positions from the local community.
Potential Residual Impact Significance	Beneficial	Potential impacts to employment and business opportunities are beneficial.

7.4.7 Potential Impact on Community Health and Safety

Potential Impact Sources

Potential sources of impacts on community health and safety due to activities in the operational stage include:

- Noise emissions due to operation of machineries and equipment;
- Traffic movement due to transport of container;
- Influx of non-resident workers to the area.

Embedded control measures

The following mitigation measures will be implemented:

- Noise control measures, described in section on noise quality impacts (Section 7.4.3).

Impact Assessment

Noise emission: Noise due to operation of machineries and equipment used for loading and unloading operation in the terminal and operation of transport vehicles have the potential to increase the ambient noise level, as per Schedule IV of National Environmental (Noise Control) Regulations No. 1 of 1996. The potential impact is assessed to be localised.

Traffic Movement: During operational stage, container will be transported through existing road. The estimated traffic load will be 500 tippers/ trailers per day. The estimated hourly peak incremental traffic load during construction stage is 1500 PCU, which is 20-24% of the existing traffic load. The incremental traffic volume is not significant. The additional traffic may cause any traffic congestions on roads and possible disruption to the community usage of roads – however, it will increase inconvenience to community in terms of air and noise pollution caused by due to pipeline laying during construction phase.

Influx of non-resident workers: The influx of workers may cause impacts to public health, especially in an increase in prevalence of diseases. Influx of migrant labourers during construction can cause mixing of the migrant workforce with the local people. This mixing of the groups may cause some adverse impacts to public health in the neighbouring villages with the potential for spread of infectious and communicable diseases.

Significance of Potential Impact

The significance of potential impacts to community health and safety during Project Stage 2 is assessed in following table.

Table 7.42 Assessment of Potential Impact to community health and safety during Project Stage 2

Criteria	Rating	Comment
Potential Impact Sources		
<ul style="list-style-type: none"> ■ Noise emissions due to operation of machineries and equipment; ■ Traffic movement due to transport of container; ■ Influx of non-resident workers to the area. 		
Nature	Negative	Potential impacts to air quality, risk of accidents, increased noise levels and influx of non-residential workforce are negative potential impacts.
Type	Indirect and Direct	<ul style="list-style-type: none"> ■ The potential for health-related impacts is indirectly linked to changes in the environment components. ■ Potential traffic-related accidents and increased noise levels would likely be direct potential impacts. ■ Migrant worker interaction with local population in common places such as market, public transport or local restaurants has the potential for indirect impacts.

Criteria	Rating	Comment
Duration	Long term	The potential impact is expected to last for entire operational stage
Extent	Local	The potential impact will be limited at immediate vicinity of the project site and along the site access road
Scale	Low	<ul style="list-style-type: none"> The fugitive dust emission and incremental noise level from operational area may not result in any perceptible changes in existing ambient air quality and noise quality
Frequency		<ul style="list-style-type: none"> Dust dispersion, air pollution, and noise will be frequent throughout the site decommissioning stage. Dust and air quality related health impacts have the potential to increase in months when common seasonal sickness is high. Road accidents, being unplanned events, can occur at any time. However, the frequency is expected to be very low. The potential for accidents is likely to be higher on bad weather days with poor road conditions. The interaction with outside population will be regular during working hours
Magnitude	Small	Considering, the duration, extent and scale, the magnitude is assessed to be small.
Receptor/Resource Sensitivity	Medium	The occurrence of seasonal sickness and other diseases among local working population is higher during monsoon months. Population may be infected with COVID-19, in case, they came in contact with infected workforce.
Potential Impact Significance	Moderate	As per the impact assessment methodology defined in Section 4, the combination of a medium receptor sensitivity and low potential impact magnitude will result in an overall moderate potential impact significance.
Proposed Mitigation Measures		<ul style="list-style-type: none"> Compulsory medical examinations for Project workers to ensure they are fit for work and to monitor the prevalence of communicable diseases detected through periodical medical check-up; Conduct an induction and training on the Project's Code of Conduct regarding do's and don'ts in relation with interaction with locals; Regular engagement with local authorities relevant to crime (local police) or other social problems (e.g. local administrative authority) for prevention of issues and for mitigations when issues arise; Accessible the grievance mechanism for all community groups to report concerns associated with potential Project health impacts. Where complaints are submitted the Project will undertake an immediate investigation.
Potential Residual Impact Significance	Minor	The adoption of the recommended mitigation measures will reduce the residual potential impact significance to minor.

7.5 Potential Impact from Unplanned Event

The unplanned events, like natural disasters (storm-surge/ tsunami) and accidental release of oil may result in significant impact on surface water quality and aquatic ecology. Potential impact from unplanned event has been discussed in the following section.

7.5.1 Potential Impact due to Flood

Mitigation measures

- The proposed WCT-1 will be developed existing BY-NP was above the highest flood level (HFL) and proposed drill site will be within the existing site.

Impact Assessment

Tsunami: Tsunamis are extremely infrequent in Sri Lanka. Sri Lanka is not located near any of the twelve or thirteen main plate boundaries that are prone to earthquakes, but it is close enough to the

highly active seismic zone near Sumatra and other regions to its southeast. Earthquakes generated in these regions may lead to a Tsunami hazard in Sri Lanka.

The tsunami wave height measured at Colombo was approximately 3 m. Looking to the protection of berth with breakwater, there are very less chances of Tsunami wave to come inside harbour so, the same may not be considered however, Advisory team to provide their assessment regarding the same before any finalization

Cyclone: In Sri Lanka devastating cyclones are rare. Major storms usually affect sparsely populated coastal areas of the east and northwest parts. The cyclone season of Sri Lanka is from November to December, which has 83% of cyclone occurrences during this period. Out of the 28 cyclones that crossed Sri Lanka during the past years, only two have been formed in Arabian Sea and made landfall in either western or north-western coastlines of Sri Lanka; the rest have all been formed in Bay of Bengal and made landfall on the north and east coasts.

The terminal area may not inundate due to storm surge; therefore, it is envisaged that hazardous materials or waste will not be mixed with flood water and affect surface water quality used for fishing by local people. Therefore, impact on surface water quality due to flooding is considered unlikely.

Significance of Potential Impact

The significance of potential impacts due to storm surge during multiple Project Stages is assessed in following table.

Table 7.43 Assessment of Potential Impact due to Storm surge during Multiple Project Stages

Criteria	Rating	Comment
Natural disaster- flood		
<ul style="list-style-type: none"> ■ Flood may impact surface water by mixing of hazardous materials or waste from the Site. ■ The potential impact may occur during following Project stages: <ul style="list-style-type: none"> – Release of hazardous materials (oil, lubricant and chemical) – Release of hazardous wastes 		
Nature	Negative	The natural disaster (storm surge) potential to trigger or accentuate the impact of the unplanned events such as impacts to surface water resources.
Type	Indirect	The Potential impacts on surface water quality and fishing due to flooding would likely be indirect impact.
Duration	Short term	In the event of natural disaster the accidental release of waste would likely be stopped within a short amount of time (i.e. days).
Extent	Regional	The extent of potential impact would be much larger than during normal operations.
Scale	Low	The hazardous materials and wastes will be stored in designated area and respective containers. Therefore major release of these materials and mixing with surface water has not been envisaged,
Frequency	The frequency over the course of the Project is likely to be rare as the site is above the HFL	
Likelihood	Remote	The site has not faced any storm surge related risk; as the site was constructed above the HFL.
Magnitude	Small	Considering, the duration, extent scale and likelihood, the magnitude is assessed to be medium.
Receptor/Resource Sensitivity	Medium	Human, flora and fauna receptors are sensitive to the potential impact, but only a small number of resources will be within the impact range of an accidental release of waste due to flood.

Potential Impact Significance	Moderate	As per the impact assessment methodology defined in Section 4, the combination of a medium resource sensitivity, small potential impact magnitude will result in an overall moderate potential impact significance.
Proposed Mitigation Measures	<ul style="list-style-type: none"> ■ Implement the Site Specific Emergency Response Plan (SSERP) for an accidental release. 	
Potential Residual Impact Significance	Minor	Implementation of the above mitigation measures would reduce the likelihood of potential impacts on environment due to flood which would likely reduce the potential impact magnitude to be Negligible. If the recommended mitigation measures are implemented, potential residual impact significance would be Minor.

8 RISK ASSESSMENT AND EMERGENCY RESPONSE PLAN

8.1 Introduction

This section on Risk Assessment (RA) aims to provide a systematic analysis of the major risks that may arise as a result of the construction of proposed West Container Terminal within existing Colombo Port facility. The RA process outlines rational evaluations of the identified risks based on their significance and provides the outline for appropriate preventive and risk mitigation measures. The output of the RA will contribute towards strengthening of the Emergency Response Plan (ERP) in order to prevent damage to personnel, infrastructure and receptors in the immediate vicinity of the plant.

The following section describes the objectives, methodology of the risk assessment of the potential risk separately. This includes identification of major hazards, and consequence analysis for major hazards. The risk has been quantitatively evaluated through a criteria base risk evaluation matrix. Risk mitigation measures to reduce significant risks to acceptable levels have also been recommended as a part of the risk assessment study

8.2 RA Study Objective

The overall objective of this RA with respect to the proposed project involves identification and evaluation of major risks, prioritizing risks identified based on their hazard consequences and using the outcome to guide and strengthen both onsite and offsite ERP. Hence, in order to ensure effective management of any emergency situations that may arise from the spillage of oil.

In the following section, oil spill contingency plan, as undertaken by Colombo West International Terminal (Pvt) Ltd (CWIT) is described. This Oil Spill Response plan has been developed to conform the regulation made by the Minister of Environment under paragraph (d) of subsection (2) of Section 51 read with paragraph (g) of Section 6 and Section 39 of Marine Pollution Prevention Act, No. 35 of 2008.

8.3 Oil Spill contingency plan

Oil Spill Contingency Plan, undertaken by Colombo West International Terminal (Pvt) Ltd (CWIT), aim to provide a systematic analysis to ensure that there is a timely, measured, and effective response to pollution incidents that may arise as a result of construction of the WCT-1. This Oil Spill Response plan has been developed to conform the regulation made by the Minister of Environment under paragraph (d) of subsection (2) of Section 51 read with paragraph (g) of Section 6 and Section 39 of Marine Pollution Prevention Act, No. 35 of 2008. The plan is designed to meet the statutory responsibilities placed on the development of West Container Terminal-1 for responding to oil pollution within the site. The response strategy has been developed taking into account the spill risks and possible sources of spillage associated with dredging and reclaiming operation.

8.4 Scope of the Plan

The plan details the contingency arrangements for responding to actual or threatened oil pollution incidents within the West Container Terminal-1 area in Colombo Port and proposed sand borrow area. This contingency plan applies to oil spills, which cause or could cause environmental damages and financial damages due to the development activities caused by movements of vessels related to Dredging, Reclamation, Surveying and Construction of the project. The map of geographical area covered by this plan is given below:

Figure 8.1 WCT-1 Terminal Area and Sand Borrow Area



8.5 Risk Assessment

8.5.1 Tidal Movement of Oil in the Dredging Area and Reclaiming Area

Movement of oil in the Port is likely to be paralleled to the shoreline in either direction in line with the flood or tidal flows dependent on the wind force and direction. Tidal flows in the surrounding water

body are complex. If spillage occurs in the dredging area or in Outer Port Limits (OPL), tidal flows depending on the wind force.

8.5.2 Hazards during Dredging and Reclamation and Operations of WCT-1

Following are the major hazards during dredging, reclamation, and operation of WCT-1:

- Pilotage
- Vessel Traffic Management
- Collision between Vessels Underway
- Oil Transfer Operations (i.e., tank to tank transfer onboard)
- Bunkering Operations
- Leakages of Machineries on deck

8.5.3 Risk Assessment

Based on ranking of likelihood and severity, each identified hazard has been evaluated based on the likelihood of occurrence and the magnitude of severity. Therefore, level of risk is expressed as the product of likelihood and the severity of the risk event, expressed as follows:

Risk level = Likelihood X Consequence

Table below illustrates all possible product results for the five likelihood and consequence categories.

Table 8.1 Risk Level

Consequence	Risk Level (Severity x Likelihood)	Credible Spill Quantity (Tonnes)
Grounding / collision in adjacent	Low Risk	10-15
Collision underway	Low Risk	10-50
Oil transfer operation (on board tank to tank)	Low Risk	0-05
Bunkering operations, Overflow / Hose failure	Low Risk	5-10
Leakages from Machineries	Low Risk	01-04

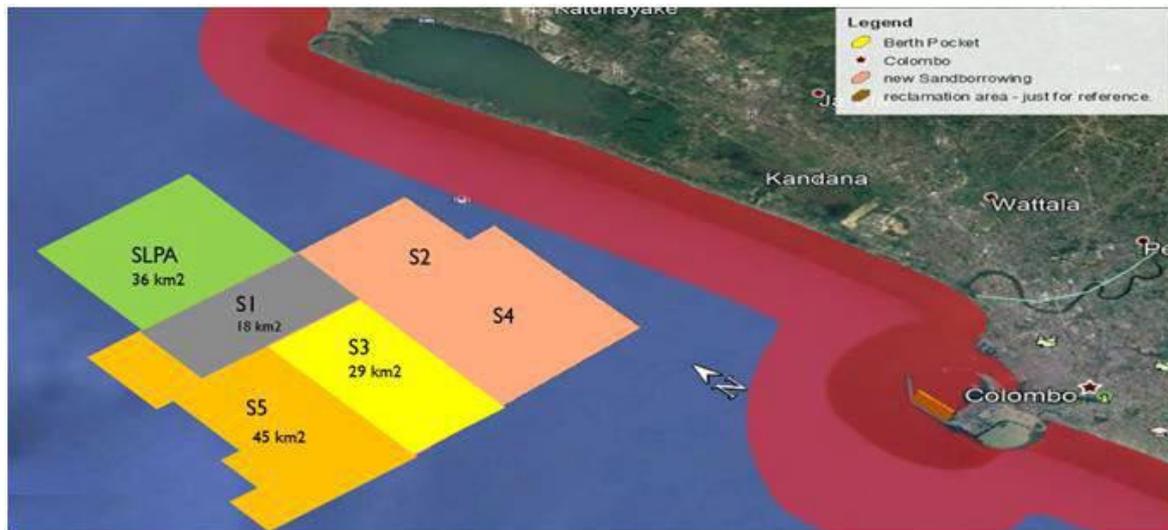
- As the assessed risk of a spill is deemed low in all cases except bunkering (small craft) as per the table above, the risk of any two spillages occurring simultaneously is assessed as very low.

8.5.4 Environmental Sensitivities

The priorities of any marine oil pollution response due to oil spill event inside our responsible area are the protection of:

- Human Health and Safety
- Protection of General operation
- Environment sensitive areas -Inside port and shoreline (refer Figure 1-3)

Figure 8.2 Environmental Sensitive Areas (marked in red)



8.5.5 Oil Spill Committee

Oil spill Committee (OSC) of CWIT, comprising of trained and qualified personnel, are in charge for time-to-time review and maintenance of Oil Spill Contingency Plan (OSCP) and act if an incident take place within the responsible area. The Members of the OSC also responsible to evaluate the Oil Spill Management Team (OSMT) functions and roles during the oil spill response.

8.5.6 Response Phases

For the purpose of this Plan, pollution response operations divided into five distinct phases:

Phase I – Notification

Phase II – Evaluation of the status, formulation, and activation of Action Plan

Phase III – Joint response operation at harbour area

Phase IV – Joint response operation on shoreline

Phase V – Demobilization

8.5.7 The Threats

The risk for oil spill could be due to two main reasons. During Bunkering operations and collision of vessels during transit of the dredger(s) to/from sand borrow area and reclamation area (WCT-1 site). As per risk assessment, only possible way for an oil spill is due to bunkering operation, collision, any spillage of traces of hydraulic oil, natural disasters or external threats.

8.6 Incident Response Organization

The Incident Response Organization (IRO) comprised of the Polluter, Incident Manager, Oil Spill Management team, and necessary noiresources to combat with emergency oil spills. The Polluter is responsible, for necessary oil spill combating efforts and economically liable for all costs incurred by

the oil spill. The Incident Manager (IM) has the overall responsibility for the conduct of any oil spill response operation and for the management of casualty/salvage operations in area of jurisdiction due to incidents related to current project phase. The Oil Spill Management Team (OSMT) for the implementation of the National Contingency Plan, established at Project Office of CWIT, under the Chairmanship of the Project Manager for Tier 1. In the event of a Tier 2 or 3 incidents, Incident Manager of CWIT require to transfer of responsibility for managing the incident.

The resources necessary to combat emergency oil spills will be deployed by SLPA on behalf of CWIT. Incident Manager is responsible for the equipment to be ready at any given notice with SLPA assistance. As a part of the IRO, a pollution alert report including detailed information on source and cause of pollution, estimate and type of oil spilled and likelihood of further spillage, description of oil slicks, weather, and sea condition, etc., should be prepaid by the IM before informing the other agencies.

At the onset there are no rules or procedure for determination of response tier. Main consideration should be given to whether the oil spill response is manageable or additional resources needed.

The Incident Manger to decide in consultation with the Harbour Master or Assistant Director – MEPA whether the available resources of authorized agency can manage the oil spill incident if the tier 1 plan will be implemented.

Upon receiving the notification, the Incident Commander needs to evaluate the situation based on information about source of the spill, type of oil (specific gravity, viscosity, pour pt: wax content, etc.), expected track of the slick at regular intervals from data on currents, tide, winds, weather forecast, identify threatened resources and their sensitivity.

8.7 Activation of OSMT

The Oil Spill Committee of CWIT Management will nominate Incident Commander as per the situation and availability. The Incident Manger (IM) is responsible for overall planning and management of incident response and control. The IM is also responsible for activation OSMT and allocating functions to each OSMT members. The Incident action plan needs to be prepared during the planning meeting. After preparing of incident action plan, briefing should be done to aware all members of OSMT regarding incident action plan and their roles and responsibilities. For the purpose, information related to environment sensitivity, waste storage and disposal could be gathered from Marine Environment protection Authority (MEPA).

An effective health and safety management plan should be mentioned at all levels throughout oil spill clean-up operations under the responsibility of HSE officer of CWIT. To achieve oil spill clearing as a safe operation, IM should follow procedures laid down in oil spill contingency plan. The safety assessment is intended to prevent uncontrolled incidents occurring which may cause further damage to the environment or loss due to damage, injury or illness.

For the monitoring of oil spill movement and behaviour, aerial monitoring is likely to be most effective although any other suitable means (Boats, Ship) and transmission of relevant reports to other Organizations, Such as MEPA, SLPA & Other Organizations. Activation of the NOSCOP, is the responsibility of the Incident Manager and MEPA. As per the behavior of oil spill. IM may request the assistance from Sri Lanka Air Force, SL Navy, SLPA, SLCG and other agencies to monitor the oil spill in order to determine volume of oil spill, weathering states of spilt oil and potential impact to sensitive resources and to estimate slick of volume by its appearance at sea and area covered.

8.8 Response Method

Oil spill can be occurred due to bunkering operation, collision, and any spillage of traces of hydraulic oil due to machinery leakages, natural disasters or external threats. When the oil spill occurred, - poisoning of water or food sources and or supply, damage to personnel property, injury or loss of

animal or plant species, impact of recreational areas, interference of ship transit etc. are evident or liable to occur

In such incident, following methods like can be used

- Oil Containment and Recovery,
- Marine Response Method like application of dispersant, shoreline protection or shoreline clean-up,
- Manual or Mechanical Removal of Oil and Oily Debris,
- Vacuum Recovery or Flushing,
- Sand Blasting and Team Cleaning.

8.9 Waste Management

The temporary storage, transport, treatment, and disposal of waste materials must be managed so as not to inhibit clean-up activities or pose any threat to the environment. For small scale responses the incident commander will deal with waste management. Any oil spill likely to produce significant amounts of waste, the IC should develop a waste management plan.

8.10 Terminating the response

The decision to terminate clean-up is made by the Incident Commander in consultation with the OST Committee members and MEPA when efforts are not returning significant benefit. Marine response also may terminate when all oil has been recovered or the oil slick has dissipated, or all oil has impacted shoreline is unlikely to be re-floated. The oil slick is beyond the range of response options.

8.11 Stand Down Procedure

Stand down procedure includes cleaning and retuning of the equipment, replacing the equipment and reimbursing the requirements for other owners, debriefing on oil spill by the IM, preparation of an incident report by the IM after termination of oil spill response and designing of cost recovery mechanism based on “polluter pay principle”.

9 ENVIRONMENT AND SOCIAL MANAGEMENT PLAN

9.1 Introduction

The Environment Management Plan (EMP) for the Project has been developed with an aim to avoid, abate on site, abate at receptor, repair/remedy and compensate/offset for potential adverse environmental, ecological and social impacts and to propose enhancement measures.

The EMP focuses on potential significant impacts, which have been identified in this EIA as part of the Impact Assessment (refer to **Sections 7**). The EMP also sets out a monitoring programme for key parameters to monitor environmental performance.

9.2 Purpose and Objectives of the ESMP

9.2.1 Purpose of ESMP

The purpose of the EMP is to:

- Integrate management and mitigation measures into the Project activities in order to reduce or mitigate potentially significant negative impacts on natural and socio-economic environments;
- To consider and – if appropriate – address the concerns and interests of stakeholders who will potentially be engaged or impacted during the various stages of the Project; and
- To establish systems and processes for delivery and implementation of the environmental project requirements in order to meet (or exceed) statutory and compliance standards.

9.2.2 Objectives of EMP

The objectives of this EMP are:

- Planning: This includes identification of environmental impacts, legal requirements, commitments and policies, setting environmental objectives and Health, Safety and Environment (HSE) compliance;
- Implementation: This comprises of resources available for the project, accountability of CWIT, contractors, documentation of measures to be taken;
- Checking - Measurement & Evaluation: This includes monitoring, corrective actions and record keeping and
- Management Review: Actions are taken to continually improve the HSE performance.

9.3 Environmental Management System

9.3.1 Legislative Framework

The key legislative instrument informing the development of the Project ESMP is the National Environmental Act No. 47 of 1980, as amended by Act No. 56 of 1988 and Act No. 53 of 2000 as well as international standards (IFC PS and WB ESS), as good international industry practice.

9.3.2 Corporate Environmental Responsibility

PP recognises that a safe, healthy & environment friendly workplace along with environment, safety and health conscious personnel are core of driving the business sustainability. PP is committed to ensuring environmentally sustainable and responsible operations to achieve the highest standards of excellence.

9.3.3 Organisational Structure and Responsibility

PP will have ultimate responsibility for implementing the provisions of the ESMP. This role will include the management of environmental impacts, monitoring of Contractors performance as well as development of mechanisms for dealing with environmental problems.

PP will also ensure that the activities of its Contractors during construction phase are conducted in accordance with 'good practice' measures, implementation of which will be required through contractual documentation. In order to facilitate this, and to demonstrate commitment to the ESMP, PP /Contractors will conduct regular internal site inspections, the results of which will be documented. The organisation structure of the CWT-1 project has been presented in **Figure 9.1**. The proposed structure will be suitably modified based on the on ground scenario requirements

Figure 9.1 CWT-1 EHS Organisation Structure



9.3.3.1.1 Role of CWIT

- Obtaining statutory clearances required during pre-construction stage of the Project
- Overall project co-ordination and management through EPC Contractors and supported by the third party environmental consultant/s
- Interaction and reporting to the respective department of GoSL
- Interaction and reporting to lenders
- Effective implementation of EMP and monitoring of EMP implementation
- Carryout verification/ supervision exercises during the construction phase of the Project for implementation of EMP
- Keeping records of all permits obtained by EPC Contractors
- Overall supervision of EMP implementation
- Approval of plans prepared by EPC Contractors
- Addressing grievances of local community and information dissemination
- Environmental monitoring through laboratory

9.3.3.1.2 Role of Contractors

- Inclusion of environmental mitigation measures in construction activities and budgets as specified in project EMP.
- Responsible for ensuring the project adheres to national law and the policy of the lender, including social and environmental safeguards.
- Day-to-day project management and coordination: project administration; technical oversight (engineering and environmental); review, supervise and approval of the work of the sub-Contractors.

- Environmental supervision to ensure that all mitigation is provided as specified in the project EMP by their own staff, sub-Contractors, and other service providers. Monitor the environmental compliance of the project according to the EMP.

9.3.4 Implementation

9.3.4.1 Management Control

Prior to start of proposed WCT-1 project activities, equipment and procedures will be designed to achieve the levels of HSE and social performance by all personnel and Contractor.

Implementation of the ESMP will involve CWIT staff and its Contractors. This will involve the implementation of the commitments contained in the ESMP, including relevant mitigation and control measures, working practices and overall management procedures as appropriate.

9.3.4.2 Environmental Awareness and Training

Environmental awareness training will be developed by the HSE, the objective of which will be to provide all personnel working on the Project with:

- A broad understanding of the local environment and the potential impacts of the project, in particular information about environmentally or socially-sensitive areas;
- An understanding of what each Contractors responsibilities are, as outlined in the ESMP;
- A means of developing a culture of compliance with the Project environmental requirements; and
- A means to improve the environmental awareness of the workforce through the education of Project field personnel;
- The HSE team will arrange to provide the required training during project initiation.

Project Induction

A site-specific environmental induction training module will be developed by the WCT-1 Project EHS team. EHS induction records will be kept and used to verify that all personnel working onsite have duly completed the process of environmental induction.

- The content of the site induction training is to include, at a minimum:
- Roles and responsibilities of all personnel in achieving environmental performance;
- management of environmental incidents and operation of accidental spill control equipment;
- management of waste; and
- Response to environmental incidents.

EHS Toolbox Talks and Training

A toolbox talk involves the dissemination of information to project personnel at the field level. Generally, toolbox talks focus on safety aspects with reference to certain Project jobs or tasks. They can, however, also be used to disseminate environmental management information. Toolbox talks are to be held regularly and will cover environmental aspects, such as:

- Explanation of any new project requirements (if any);
- Explanation of the key environmental risks associated with an activity or specific procedure(s) which could have potential environmental impacts;
- Explanation of mitigation strategies with reference to an activity or specific procedure(s), which could have potential environmental impacts;

- Reinforcing the importance of specific or generic environmental commitments;
- Obtaining feedback related to environmental issues; and
- Any other relevant purpose related to the implementation or review of the EMP.

Toolbox talks will allow relevant information to be communicated to the workforce and will also provide a forum for providing feedback on issues of interest or concern. Toolbox talks will generally be organized by the WCT-1 Project EHS Team but may also be delivered by the Project Leadership team. Possible Toolbox Talk topics will include:

- Management of works in port premises;
- Air emission suppression measures during project activities;
- Noise and vibration reduction;
- Waste management, reduction and recycling;
- Waste-water management, treatment facility operation and monitoring
- Fire safety at site;
- Spill management;
- Unloading and lifting of heavy machineries and equipment;
- Occupational health and safety, especially COVID-19 protocols.

9.3.4.3 *Grievance Mechanism*

CWIT's existing Community Grievance Management Process (CGMP) provides a systematic means to capture and resolve to all valid community grievances that are related to both base business and development projects. The steps used in the CGMP are:

- Record
- Investigate
- Communicate
- Resolve
- Close

Grievances are regularly discussed at the periodic grievance resolution committee (GRC) meetings which is chaired by EHS Team and Project Team, as required to promote uniform awareness and to properly investigate and resolve grievances by the Stakeholder Management Committee (SMC), with the overview of the GRC.

9.3.4.4 *Record Keeping*

A record keeping system will be developed and implemented to support accurate and timely maintenance of Project records. Systems to be established, which are directly relevant to the environmental management aspects of the Project, include:

- Induction register;
- Environmental incidents, non-conformances and complaint records;
- Inspection reports, checklists;
- Environmental monitoring results;
- Meeting minutes;
- Formal letters and correspondence;

- Waste measurement and tracking records;

9.3.4.5 Inspections and Verification & Validation (V&V)

The EHS Team will undertake and document regular site inspections for the purpose of verifying compliance with the EMP, licenses, permits and approvals, and the other environmental requirements. Where inspections determine that environmental management measures are not effective, corrective and preventative measures will be implemented.

9.3.4.6 Monitoring

The inspections and V&V will be further supported by monitoring i.e. documenting practical achievement of implementation of required actions. Sampling and analysis as per the identified monitoring plan will be implemented to check level of compliance of discharges, emissions and required environmental conditions. The environmental monitoring program has been provided in **Section 9.5**.

9.3.4.7 Preventative and Corrective Actions

The EHS Director will be responsible for directing monitoring of the following aspects, to determine trends and recommend actions to be taken to reduce the potential for environmental incidents:

- Project, activity, or area-specific environmental risks;
- Any exceedance of environmental standards;
- Legislative changes; and
- Inspection and V&V outcomes.

Deficiencies identified on the Project will, if possible, be rectified immediately by the person identifying the deficiency, and reported to the EHS Team. This includes submission of a corrective action request at the earliest on any of the following:

- A major deviation from agreed upon or approved procedure, approval conditions or Project environmental management objectives;
- A major non-compliance with the EMP performance criteria; and/or
- Any perceived breach of the legislative requirements.

The corrective action request will include details of the environmental impact, action taken to correct the problem and proposed measures to prevent the occurrence of a similar incident. The identification, reporting and rectification of environmental deficiencies should be encouraged at Project induction and in toolbox discussions.

9.3.4.8 Reporting

CWT-1 Project EHS Team will prepare a quarterly environmental report summarizing monitoring, inspection and V&V outcomes as well as details of any environmental non-compliances and actions taken/recommended as required.

9.3.4.9 Management Review

CWIT management will review the performance against the required actions of the proposed WCT-1 Project.

9.4 Action Plans under EMP

Environmental and Social Management Plans have been prepared based on the outcome of Environmental Impact Assessment study. These ESMPs apply to project activities of PP. The commitments made in these plans are applicable to PP and its Contractor personnel. The principal purpose of formulating this EMP is to ensure commitments made in the ESIA report are translated into ongoing actions.

Specifically this ESMP pulls together the mitigation and management measures identified within this ESIA as being necessary for the construction stage and operational stage of the Project. The stage wise management plan has been provided in the following section

9.4.1 Stage 1: Construction of Terminal

Environmental and Social Management Plans have been prepared based on the outcome of Environmental Impact Assessment study. The commitments made in these plans are applicable to CWIT and its Contractor personnel. The principal purpose of formulating this EMP is to translate commitments made in the EIA report into ongoing actions.

Table 9.1 Project Stage 1: EMP Sub Plan- (Construction of Terminal)

Construction Phase	
Key Activities	<ul style="list-style-type: none"> ■ Dredging and transportation of dredging material ■ Site reclamation for terminal; ■ Civil construction ■ Installation of plant and machineries ■ Storage and handling of fuel, lubricant, paints ■ Handling and disposal of construction waste and hazardous waste ■ Generation of MSW & disposal, ■ Generation of sewage and treatment ■ Construction of gas pipeline, transmission line and site access road
Objective	<ul style="list-style-type: none"> ■ To manage the activities undertaken during site development & construction phase of the Project in a manner which reduces potential negative impacts on both the local environmental and the local community ■ To comply with all statutory and approvals requirements pertinent to site development & construction phase of the Project
Performance criteria	<ul style="list-style-type: none"> ■ Worksites prepared in accordance with designs providing for the management and mitigation of potential project impacts ■ All site development and construction works are managed to avoid, mitigate, and/or manage potential impacts on the social and environmental conditions within the study area ■ All community complaints are recorded and investigated and, if appropriate, actioned
Target	<ul style="list-style-type: none"> ■ Zero accidental releases ■ Compliance with relevant regulatory requirements ■ All appropriate project related community concerns are appropriately actioned and recorded
Monitoring	<ul style="list-style-type: none"> ■ Review the EMP if any significant changes are made to the Project scope or methodology ■ Verify and validate the implementation of the EMP on an ongoing basis
Reporting	<ul style="list-style-type: none"> ■ EHS to report as required by statutory authorities with respect to environmental management performance ■ Community complaints register should be filed for each complaint

Table 9.2 provides recommended management and mitigation measures for the Project, along with information regarding responsibility of personnel, and timing/scheduling for implementation of the relevant measure.

Table 9.2 Environment Management Plan for Stage 1: Site Establishment

	Project Activity	Potential Impact / Aspect	Mitigation measure	Specific Actions	Location for Intervention	Responsible Project Team Member	Schedule	Monitoring	Training / Resources	Reporting	Comment / Reference
A. Soil & Sediment Quality											
A.1	Land filling for site development	Change of soil characteristics; Soil erosion	<ul style="list-style-type: none"> Sand will be sourced from selected dredging area for site development Compact the Site to reduce the amount and rate of infiltration; Construction area will be channelized to storm water drainage system; 	<ul style="list-style-type: none"> Implementation of soil erosion; measures-regular compaction of soil with compactor; Periodically check the implementation of soil erosion measures; Implementation of storm water drainage plan prepared by the CWIT 	Construction area	EPC Contractors	Site development period	Ste inspection, and visual assessment.	Training: None Resource: EPC Contractors will be responsible for EMP implementation	Monthly inspection report to EHS Team	-
A.2	Storage of construction material (sand and cement) in non-designated area	Change of soil characteristics	<ul style="list-style-type: none"> All the construction material will be stored in raw material storage area; A designated machineries and equipment storage area will be developed for the Project; 	<ul style="list-style-type: none"> Provision of demarcated storage area for different types of construction materials within the existing storage area. 	Construction material storage area	EPC Contractors	Construction stage	Ste inspection, and visual assessment.	Training: None Resource: EPC Contractors will be responsible for EMP implementation	Monthly inspection report to EHS Team	-
A.3	Storage and disposal of construction debris) in non-designated area	Change of soil characteristics	<ul style="list-style-type: none"> On completion of work all temporary structures, surplus materials and wastes will be completely removed from site; Construction waste (inert materials) will be utilised for filling of site as applicable, stored in designated area and finally disposed through third party vendor. Implement a construction materials inventory management system to minimise over-supply of the construction materials, which may lead to disposal of the surplus materials at the end of the construction period; Segregate hazardous and non-hazardous waste and provide appropriate containers for the waste types generated (e.g. enclosed bins for putrescible materials to avoid attracting pests and vermin and to minimise odour nuisance); 	<ul style="list-style-type: none"> Specific instruction to the construction workforce to store the C&D waste at designated area; Identify the third party vendor for disposal of C&D waste from site final disposal or reuse. 	Construction material storage area	EPC Contractors	Construction stage	Ste inspection, and visual assessment.	Training: None Resource: EPC Contractors will be responsible for EMP implementation	Monthly inspection report to EHS Team	Refer to Appendix 9.1 Waste Management Plan
A.4	Storage and disposal municipal solid waste (MSW)	Change of soil characteristics	<ul style="list-style-type: none"> Separate bins will be provided at construction area for collection of segregated as per waste management procedure; 	<ul style="list-style-type: none"> Assess the number of bins required for storage collection of segregated MSW and provide the 	MSW storage area	EPC Contractors	Construction stage	Ste inspection, and visual assessment.	Training: None Resource: EPC Contractors will be responsible	Monthly inspection report to EHS Team	Refer to Appendix 9.1 Waste Management Plan

	Project Activity	Potential Impact / Aspect	Mitigation measure	Specific Actions	Location for Intervention	Responsible Project Team Member	Schedule	Monitoring	Training / Resources	Reporting	Comment / Reference
	in non-designated area		<ul style="list-style-type: none"> Segregated MSW will be temporarily stored in different bins within the existing facility temporary collection area; MSW will be disposed through third party vendor. 	<ul style="list-style-type: none"> required number of bins before ignition of construction activity; Provide instruction in local language use of bins, and dispose in the segregated manners in the bins as and when required; Assess the existing capacity of bins in the existing temporary storage facility; if not sufficient provide additional bins; Arrangement with third party vendor to handle the additional MSW for disposal 					for EMP implementation		
A.5	Accidental spillage of hazardous waste from storage area	Soil contamination	<ul style="list-style-type: none"> Different types of hazardous waste collection bins will be provided for oily substances and non-oily hazardous waste at construction area; Hazardous wastes generated from the construction activity will be stored in the hazardous waste storage area, having secondary containment Provide enough space to allow for inspection between waste containers so as to identify any leaks or spills; Ensure storage areas have impermeable floor and containment, of capacity to accommodate 110% of the volume of the largest waste container. Hazardous waste will be finally disposed through third-party vendors. 	<ul style="list-style-type: none"> Specific instruction to the construction workforce to store the hazardous waste in the designated hazardous waste storage area; Implement the spill control measures as per procedure; Implement the report of spills and maintain the record; Provide training for implementation of spill control measures as applicable. 	Hazardous waste storage area	EPC Contractors	Construction stage	Ste inspection, and visual assessment.	Training; Spill prevention. Resource: EPC Contractors will be responsible for EMP implementation	Monthly inspection report to EHS Team	Refer to Appendix 9.1 Waste Management Plan
A.6	Accidental spillage of fuel, lubricant and paints from storage site and handling area. Accidental spillage of fuel from vehicles (cars, vans, trucks, tractors, cranes, etc.) and	Impacts from chemical, toxic metal, hydro-carbon.	<ul style="list-style-type: none"> Fuels, paint, chemicals and lubricants will be stored in the dedicated storage areas having secondary containment; Implement the standard operating procedures for the transfer and use of fuel and chemicals to prevent accidental releases; As per spill response procedure and associated spill kit to contain any incidental spillage of fuel, chemicals and hazardous waste; 	<ul style="list-style-type: none"> Fuels, paint, chemicals and lubricants should be stored in the dedicated storage areas; Unloading, loading and refuelling protocols are required for transfer of diesel, oil and used oil respectively and workers trained to prevent/ contains spills and leaks; 	Fuel, lubricant storage area and spillage area	EPC Contractors	Construction stage	Ste inspection, and visual assessment.	Training; Spill prevention. Resource: EPC Contractors will be responsible for EMP implementation	Monthly inspection report to EHS Team	Refer to Appendix 9.1 Waste Management Plan

	Project Activity	Potential Impact / Aspect	Mitigation measure	Specific Actions	Location for Intervention	Responsible Project Team Member	Schedule	Monitoring	Training / Resources	Reporting	Comment / Reference
	diesel generator (DG).		<ul style="list-style-type: none"> Once a spill incident has occurred, the Contractors will identify the chemical involved and check hazardous property of the chemical from the Safety Datasheet (SDS); The substance will be properly collected and stored in a separate labelled container and disposed through third party vendor. 	<ul style="list-style-type: none"> Implement the spill control measures as per procedure; Implement the report of spills and maintain the record; Provide training for implementation of spill control measures as applicable. 							
B	Coastal Morphology										
B.1	Dredging at reclamation area for unsuitable soil	Costal morphology -	<ul style="list-style-type: none"> Trailer suction hopper dredgers (TSHD) will used for dredging activity; 		Proposed land reclamation area	EPC Contractors	Land reclamation period under construction stage	Supervision of Contractors work as per plan	Training: None Resource: EPC Contractors will be responsible for EMP implementation	Monthly inspection report to EHS Team	EC compliance report CEA
B.2	Disposal of unsuitable soil at offshore disposal site		<ul style="list-style-type: none"> Unsuitable soil from reclamation area will be disposed in the SLPA designated disposal site; 	<ul style="list-style-type: none"> Tracked by using data obtained from the Marine Traffic Software on dredger movement 	Offshore disposal site						
B.3	Dredging of sand from sand extraction area		<ul style="list-style-type: none"> Trailer suction hopper dredgers (TSHD) will used for dredging activity; Sand extraction is limited to a maximum of 3m at a location to avoid creation of scattered deep holes in the area; Sand extraction would be initially restricted to the grid area specified in the SLPA letter No. PD/WCT/02- D&R dated 25.01.2022. Sand extraction should be limited to the prescribed area only; Use suction method to extract the sand; Measurement of beach profile should be carried out covering from the beach area of Sarakkuwa to Negombo mentioned in the CEA approval. 	<ul style="list-style-type: none"> Tracked by using data obtained from the Marine Traffic Software on dredger movement and same has been shared with CEA and GSMB. Dredging depth has been maintained by the Dredge Track Presentation System (DTPS) on the dredger. 	Sand dredging area						
C.	Surface water quality										
C.1	Dredging of sand at borrow area and discharge in the reclamation area	Increased sediment load in the receiving surface water body and potential to result in increase of suspended solid,	<ul style="list-style-type: none"> Trailer suction hopper dredgers (TSHD) will used for dredging activity; Unsuitable soil from reclamation area will be disposed in the SLPA designated disposal site; Minimise the suspended sediments release through use of modern sand extraction method; 	<ul style="list-style-type: none"> Turbidity levels are monitored as part of the monitoring plan. 	Sand dredging and discharge area	EPC Contractors	Land reclamation period under construction stage	Surface water quality monitoring as per monitoring schedule	Training: None Resource: EPC Contractors will be responsible for EMP implementation	Monthly inspection report to EHS Team	EC compliance report CEA
C.2	Dredging and disposal of soft (unusable	decreased DO and increased BOD									

	Project Activity	Potential Impact / Aspect	Mitigation measure	Specific Actions	Location for Intervention	Responsible Project Team Member	Schedule	Monitoring	Training / Resources	Reporting	Comment / Reference
	sediment) at land reclamation area		<ul style="list-style-type: none"> The sand extraction can be limited to short-term as much as possible to avoid spawning or migration seasons and other biological critical time period; Maintain proper extraction methods and technology to prevent or minimise and potential damage and Contractors should strictly adhere to sand dredging guidelines and strictly follow mitigation measures put forward to minimise sedimentation; 								
C.3	Accidental spillage of oil & grease from dredger and vessels used for transportation of dredge and construction materials	Impacts to surface water body due to mixing of hydro-carbon and chemicals; potential impact on water quality and aquatic ecology	<ul style="list-style-type: none"> WCT-1 has a well defined spill response procedure and associated spill kits to contain any incidental spillage of fuel, chemicals and hazardous waste; 	<ul style="list-style-type: none"> Implement the spill prevention measures, in case of any spillage of fuels, paint, chemicals and lubricants at storage area of handling area 	Onshore construction site	EPC Contractors	Construction stage	Ste inspection, and visual assessment.	Training; Spill prevention. Resource: EPC Contractors will be responsible for EMP implementation	Monthly inspection report to EHS Team	Refer to Appendix 9.1 Waste Management Plan
C.4	Contaminated Surface runoff from land based construction area	Impacts to surface water body due to mixing of hydro-carbon and chemicals; potential impact on water quality and aquatic ecology	<ul style="list-style-type: none"> A designated machinery and equipment storage area will be developed for the Project; Fuels, lubricants will be stored in dedicated storage area having secondary containment; Different types of hazardous waste collection bins will be provided for oily substances and non-oily hazardous waste at construction area; Hazardous wastes generated from the site establishment stage will be stored in designated waste storage area, having secondary containment; Hazardous waste will be finally disposed through third-party vendors; Channelize all surface runoff from the construction site through storm water drainage system and provide adequate size double chambered sedimentation tank; Compact site (proposed terminal area) to reduce the amount and rate of infiltration; WCT-1 has a Site Specific Emergency Response Plan (SSERP) for soil clean-up remediation, in case of any accidental spills 	<ul style="list-style-type: none"> Refer to C.3 	Onshore construction site	EPC Contractors	Construction stage	Ste inspection, and visual assessment.	Training; Spill prevention. Resource: EPC Contractors will be responsible for EMP implementation	Monthly inspection report to EHS Team	Refer to Appendix 9.1 Waste Management Plan

	Project Activity	Potential Impact / Aspect	Mitigation measure	Specific Actions	Location for Intervention	Responsible Project Team Member	Schedule	Monitoring	Training / Resources	Reporting	Comment / Reference
			<ul style="list-style-type: none"> Implement the standard operating procedures for the transfer and use of fuel to prevent accidental releases; Once a spill incident has occurred, the Contractors will identify the chemical involved and check hazardous property of the chemical from the Safety Datasheet (SDS); The substance will be properly collected and stored in a separate labelled container and disposed in accordance with Waste Management Practice of WCT-1. Periodic monitoring, verification and check for implementation of waste management plan. 								
C.5	Discharge of untreated sewage from construction site	Increased sediment load in the receiving surface water body and potential to result in decreased DO and increased BOD;	<ul style="list-style-type: none"> Offshore: All sewage generated will be treated and disinfected on-board and disposed offshore beyond 3 nautical miles (nm) complying with the MARPOL requirements. Onshore: Provision of 100 KLD STP to treat wastewater from construction sites / labour camp proposed to be located within the Port Premises 	<ul style="list-style-type: none"> Install the STP as per design; Channelize the all sewage water to STP; Periodically test the treated water quality 	Onshore construction site	EPC Contractors	Construction stage	Ste inspection, and visual assessment. Monitoring of treated water	Training; Spill prevention. Resource: EPC Contractors will be responsible for EMP implementation	Monthly inspection report to EHS Team	EC compliance report CEA Refer to Appendix 9.1 Waste Management Plan
C.6	Discharge of untreated bilge and ballast water	Impacts to surface water body due to mixing of hydro-carbon and chemicals; potential impact on water quality and aquatic ecology	<ul style="list-style-type: none"> The bilge water will be handled by the shipping agent or terminal operator 	<ul style="list-style-type: none"> Ensure that bilge water discharged through shipping agent or terminal operator 	Vessels used for construction phase	EPC Contractors	Construction stage	Ste inspection, and visual assessment.	Training; Spill prevention. Resource: EPC Contractors will be responsible for EMP implementation	Monthly inspection report to EHS Team	Refer to Appendix 9.1 Waste Management Plan
D. Ambient Air Quality											
D.1	Fugitive dust emissions from site development activities like grading and levelling	Fugitive emission of dust and potential to degrade the ambient air quality.	<ul style="list-style-type: none"> Site filling area will be compacted to reduce the fugitive dust emission; During construction, the approach road will be kept clean and free from mud and slurry; The vehicular speed limit of 10 km/hr will be maintained within the project site; Dust suppression measures will be adopted through periodical water sprinkling during dry periods at working areas; 	<ul style="list-style-type: none"> Minimise the stockpiling of fill materials, by coordinating spreading, re-grading and compaction activities. If moisture level is low in the fill materials; sprinkling of water to reduce the fugitive dust emission; Mud, slurry need to be removed from the site access road and removed 	Onshore construction area	EPC Contractors	Construction stage	Ste inspection, and visual assessment. Ambient air quality monitoring as per monitoring schedule	Training; Spill prevention. Resource: EPC Contractors will be responsible for EMP implementation	Monthly inspection report to EHS Team	EC compliance report CEA

	Project Activity	Potential Impact / Aspect	Mitigation measure	Specific Actions	Location for Intervention	Responsible Project Team Member	Schedule	Monitoring	Training / Resources	Reporting	Comment / Reference
			<ul style="list-style-type: none"> No solid waste can be burnt in the project area. Personal Protective Equipment (PPEs) will be provided to the construction workforce 	<ul style="list-style-type: none"> materials will be used in site development; Cleaning the trucks' tyres prior to leaving the project site to avoid mud slurry in the public road; Limiting the speed limit with appropriate signage of maximum speed limit at the internal road and aware the drivers to obey the traffic rules; Water sprinkling arrangement at least 2-3 times depending upon the moisture condition in the road and visible dust generation from the site assess road; Cease or phase down work if excess fugitive dust is observed. Investigate the source of dust and ensure suppress the dust through water sprinkling; Provide PPEs to the workforce and make aware to use the PPE during working hour. 							
D.2	Fugitive dust emissions from construction activities like earth work for foundation of buildings and civil construction	Fugitive emission of dust and potential to degrade the ambient air quality.	<ul style="list-style-type: none"> Dust suppression measures will be adopted through periodical water sprinkling during dry periods at working areas; Personal Protective Equipment (PPEs) will be provided to the construction workforce 	<ul style="list-style-type: none"> Create the demarcated storage area for construction materials within the construction materials storage yard. Potential dust generating materials like cement should be stored in covered area; Limiting the speed limit with appropriate signage of maximum speed limit at the internal road and aware the drivers to obey the traffic rules; Water sprinkling arrangement at least 2-3 	Onshore construction area	EPC Contractors	Construction stage	Ste inspection, and visual assessment. Ambient air quality monitoring as per monitoring schedule	Training; Spill prevention. Resource: EPC Contractors will be responsible for EMP implementation	Monthly inspection report to EHS Team	EC compliance report CEA

	Project Activity	Potential Impact / Aspect	Mitigation measure	Specific Actions	Location for Intervention	Responsible Project Team Member	Schedule	Monitoring	Training / Resources	Reporting	Comment / Reference
				<p>times depending upon the moisture condition in the road and visible dust generation from the site access road;</p> <ul style="list-style-type: none"> Provide PPEs to the workforce and make aware to use the PPE during working hour. 							
D.3	Emissions during transport of boulders, construction material, equipment and manpower	Fugitive emission of dust and potential to degrade the ambient air quality.	<ul style="list-style-type: none"> Construction material will not be loaded above the freeboard of the truck to avoid spillage; All vehicles utilized in transportation of raw material and personnel will be fitness certified vehicles; Vehicles and equipment observed emitting significant black smoke through their exhausts will be serviced or replaced 	<ul style="list-style-type: none"> Provide instruction to the transport constructor for covering of construction materials fill materials, sand and cement, and loading of materials below the freeboard limit during transportation will be undertaken; The security staff at the plant entry gate will make sure that construction materials trucks having proper cover and not overloaded; The security staff at the plant entry gate will make sure vehicles have the Fitness certified; The polluting vehicles (emitting significant black smoke in their exhausts) shall be noted and inform the contractor for servicing and maintenance. 	Onshore construction area	EPC Contractors	Construction stage	Ste inspection, and visual assessment. Ambient air quality monitoring as per monitoring schedule	Training; Spill prevention. Resource: EPC Contractors will be responsible for EMP implementation	Monthly inspection report to EHS Team	EC compliance report CEA
D.4	Fugitive dust emissions from handling of construction materials like sand, cement and aggregate	Fugitive emission of dust and potential to degrade the ambient air quality.	<ul style="list-style-type: none"> Construction materials would be stored in designated storage area; The vehicular speed limit of 20 km/hr will be maintained within the project site; 	<ul style="list-style-type: none"> Provision of dedicated construction material storage area 	Onshore construction area	EPC Contractors	Construction stage	Ste inspection, and visual assessment. Ambient air quality monitoring as per monitoring schedule	Training; Spill prevention. Resource: EPC Contractors will be responsible for EMP implementation	Monthly inspection report to EHS Team	EC compliance report CEA
D.5	Emissions from operation of heavy	Fugitive emission of dust and potential to degrade the ambient air quality.	<ul style="list-style-type: none"> All diesel-powered equipment will be regularly maintained and idling time reduced to reduce emissions; 	<ul style="list-style-type: none"> The emission from the DG set and other stationary machines will be controlled by ensuring the 	Onshore construction area	EPC Contractors	Construction stage	Ste inspection, and visual assessment.	Training; Spill prevention. Resource: EPC Contractors will	Monthly inspection report to EHS Team	EC compliance report CEA

	Project Activity	Potential Impact / Aspect	Mitigation measure	Specific Actions	Location for Intervention	Responsible Project Team Member	Schedule	Monitoring	Training / Resources	Reporting	Comment / Reference
	machineries and equipment		<ul style="list-style-type: none"> ■ DG set with adequate stack will be used for sourcing of power for construction activities. ■ Contractors will develop and follow vehicle inspection & maintenance procedure for project. ■ Fitness certified vehicle, equipment and machinery will be used for construction activity 	<ul style="list-style-type: none"> ■ engines are always properly tuned and maintained; ■ The construction manager will conduct periodic inspection DG set and other stationary machines having the Fitness Certificate; ■ Stack height of DG set shall be designed as per Good International Industry Practice (GIIP) Stack Height. <p>HG = H + 1.5L; where HG = GEP stack height measured from the ground level elevation at the base of the stack H = Height of nearby structure(s) above the base of the stack. L = Lesser dimension, height (h) or width (w), of nearby structures “Nearby structures” = Structures within/ touching a radius of 5L but less than 800 m.</p>				Ambient air quality monitoring as per monitoring schedule	be responsible for EMP implementation		
E.	Ambient Noise quality										
E.1	Dredging and reclamation work	Increase in ambient noise levels and potential to impact site workers	<ul style="list-style-type: none"> ■ The night time job intensity will be reduced. 	<ul style="list-style-type: none"> ■ Instruction shall be provided to the dredging contractor 	Offshore dredging area	EPC Contractors	Land reclamation period under construction stage	Supervision of Contractors work as per plan	Training: None Resource: EPC Contractors will be responsible for EMP implementation	Monthly inspection report to EHS Team	
E.2	Operation of machineries and equipment	Increase in ambient noise levels and potential to impact site workers, nearby community and fauna	<ul style="list-style-type: none"> ■ Low-noise equipment shall be used where practical; ■ Vehicle, equipment, and machinery used for construction activities would conform to applicable noise standards; ■ Only well-maintained equipment will be operated on-site; 	<ul style="list-style-type: none"> ■ Prior to initiation of construction activities, instruction shall be provided to the Master Service Contractor to select low-noise equipment and to confirm applicable noise standard (Excavator -87 dB, Pay- 	Onshore construction area	EPC Contractors	Construction stage	Ste inspection, and visual assessment. Ambient noise quality monitoring as per monitoring schedule	Training: Spill prevention. Resource: EPC Contractors will be responsible for EMP implementation	Monthly inspection report to EHS Team	EC compliance report to CEA

	Project Activity	Potential Impact / Aspect	Mitigation measure	Specific Actions	Location for Intervention	Responsible Project Team Member	Schedule	Monitoring	Training / Resources	Reporting	Comment / Reference
			<ul style="list-style-type: none"> Regular maintenance of equipment such as lubricating moving parts, tightening loose parts and replacing worn-out components would be undertaken; Machinery and construction equipment that may be in intermittent use, e.g. trucks, shall be shut down or throttled down during non-work periods; The number of equipment operating simultaneously shall be reduced where practical; Equipment known to emit noise strongly in one direction will be orientated so that the noise is directed away from nearby noise-sensitive receptors where practicable. Contractors will provide PPEs to the construction workers 	<ul style="list-style-type: none"> loaders- 88 dB, Piling Rig -98 dB, Truck & Trailers- 96.0 dB, Concrete Mixer - 85.0 dB and Lifting Equipment -85.0 dB) Technology approach shall be used through implementation of standard operating procedure (SOP) on every equipment utilized during construction phase; Managing the increase of noise to maintain the noise level in accordance to CEA norms; Socio Culture approach shall be used through training, Tool-box talk to promote awareness on health and safety to the workers during construction stage, 							
E.3	Piling activity	Increase in ambient noise levels and potential to impact site workers, nearby community and fauna	<ul style="list-style-type: none"> The night time job intensity will be reduced. 	<ul style="list-style-type: none"> Instruction shall be provided to the contractor 							
E.4	Transport of boulders, equipment and machineries	Increase in ambient noise levels and potential to impact nearby community and fauna	<ul style="list-style-type: none"> Vehicle used for transportation of fill materials and construction materials would conform to applicable noise standards; 	<ul style="list-style-type: none"> Technology approach shall be used through implementation of standard operating procedure (SOP) for maintenance of transport vehicles. 							
F.	Road Traffic and Transport										
F.1	Transport of boulders; Transportation of construction material, equipment and machineries, and workforce.	Increase of traffic and disturbance of daily traffic movement;	<p>The Master Contractors will prepare the traffic management plan and same will be reviewed by both HSE and CA. Consultation with key stakeholders will be conducted prior to plan finalization. The Contractors will ensure implementation of this plan;</p> <p>The traffic management plan shall:</p> <ul style="list-style-type: none"> Identify the sensitive location (religious facility, educational facility, health 	Implement the traffic management plan	Site Access Road	EPC Contractors	Construction stage	Weekly inspection program	Training: Road safety training for the drivers Resource: EPC Contractors will be responsible for EMP implementation	Monthly inspection report to EHS Team	Refer to Appendix 9.2: Traffic Management Plan

	Project Activity	Potential Impact / Aspect	Mitigation measure	Specific Actions	Location for Intervention	Responsible Project Team Member	Schedule	Monitoring	Training / Resources	Reporting	Comment / Reference
			facility, commercial areas) along the site access road ; <ul style="list-style-type: none"> ■ Identify the road condition, traffic congestion areas and peak traffic load period; ■ Identify the traffic hotspots like road junctions, market areas, school areas; ■ Provision of traffic marshal (signalman) in identified traffic sensitive locations; ■ Identify any major road repairing requirement along the site access road; ■ Prepare traffic movement plan based on local sensitivity (religious gathering, school timing, market timing and peak traffic timings); ■ Implement procedure to follow road safety requirements by the drivers & helpers; ■ Implement procedure to check fit certificates of the vehicles to minimise the emission of air and noise. 								
F.2		Potential to damage the road	<ul style="list-style-type: none"> ■ Road conditions will be monitored and any damage of road or structures shall be remedied immediately to reduce the potential for significant impacts to the local communities. 	Ref. to F1							
F.3		Potential for a community accident	<ul style="list-style-type: none"> ■ Contractors/CWIT will provide instructions to drivers to maintain the speed as per traffic management plan. ■ Contractors/CWIT will provide induction/training to all drivers for safe driving; ■ Contractors/ CWIT will require drivers to follow all legal and project related safety requirements applicable in respect of road safety; 	Ref. to F1							
G.	Underwater Noise and Vibration										
G.1	Piling operation; Operation of TSHD	Potential increase of underwater noise and impact on aquatic fauna	<ul style="list-style-type: none"> ■ Generate low intensity impulsive noise prior to start of pile driving activities and ensure that any visible marine fauna moves away from the underwater noise source; ■ Periodic monitoring of underwater noise during pile driving activity; ■ Using High frequency - low energy piling technology. 	<ul style="list-style-type: none"> ■ Technology approach shall be used through implementation of standard operating procedure (SOP) for piling activity 	Offshore dredging area and land reclamation area	EPC Contractors	Construction stage	Weekly inspection program	Training: None Resource: EPC Contractors will be responsible for EMP implementation	Monthly inspection report to EHS Team	-

	Project Activity	Potential Impact / Aspect	Mitigation measure	Specific Actions	Location for Intervention	Responsible Project Team Member	Schedule	Monitoring	Training / Resources	Reporting	Comment / Reference
H.	Marine Ecology										
H.	Dredging of sand at borrow area and discharge in the reclamation area; Dredging and disposal of soft (unusable sediment) at land reclamation area;	<ul style="list-style-type: none"> ■ Physical disturbance of nesting and spawning, destruction of habitats, especially disturbance of spawning habitats or marine organisms; ■ Physical removal of benthic communities; ■ Disturbance of fish ,shrimps and benthic faunal feeding habits and habitats and larval stages ■ Detrimental effects of suspended sediments, turbidity and sedimentation, especially effects on the behaviour of organisms; ■ Burial of benthic communities; ■ Disturbance of benthic fauna development ; ■ Production of planktonic algae; ■ Degradation of water quality, especially in zones with low energy and in waters with sediments with high organic content; 	<ul style="list-style-type: none"> ■ Timing of the dredging to be carefully planned to avoid rainy season and least impact on small-scale fishing operations; ■ Construction site runoff and drainage should be prevented or minimized in accordance with international best practices and standards. Sand/silt retaining facilities such as traps and sediment basins should be provided to limit the runoff; ■ Exposed slope/soil surface, dredged material in particular should be covered to reduce the potential runoff. Arrangements should always be in place to ensure that adequate surface protection measures can be safely carried out well before the arrival of a rain; ■ Proactive and informed management of the dredging programme as it is executed can often significantly reduce the risk of or minimize the negative impacts. Through modelling and monitoring during execution, impacts may be predicted before being realized, and the dredging programme may be optimized to achieve the environmental objectives. A combination of monitoring, both of the dredge plume and at receptor sites, and dredge plume modeling to guide the dredging works need to be conducted before the beginning of dredging operations; ■ Potential impacts on sensitive receptors would also be minimized by conducting dredging works in phases in order to minimize the long term smothering. ■ Use an efficient trailing suction hopper dredger, wherever possible; ■ The loading should be made precautionary by reducing the pumping flow during the final stages of the loading process or by reducing the total loading time ■ Use an efficient trailing suction hopper dredger, wherever possible; 	Biodiversity management plan has been prepared for this project, same should be implemented.	Offshore dredging area and land reclamation area	EPC Contractors	Construction stage	Weekly inspection program	Training: None Resource: EPC Contractors will be responsible for EMP implementation	Monthly inspection report to EHS Team	Refer to Appendix 9.3: Biodiversity Management Plan

	Project Activity	Potential Impact / Aspect	Mitigation measure	Specific Actions	Location for Intervention	Responsible Project Team Member	Schedule	Monitoring	Training / Resources	Reporting	Comment / Reference
		<ul style="list-style-type: none"> ■ Bioaccumulation of toxic materials; ■ Enhancement of algal growth; ■ Impact to marine mammals due to collision with dredger, underwater noise 	<ul style="list-style-type: none"> ■ Extraction should be completed within a shorter period of time ■ Use of silt curtains wherever possible, i.e., along the boundaries of the dredge pocket and the reclamation area within the port basin and/or maintain turbidity level of the site to the standard level with other appropriate methods ■ A Construction Stage Cetacean Mitigation Plan will be prepared and implemented to reduce the potential impact upon marine mammals ■ Contractors should take special care in selecting dredging equipment to be environmental friendly as possible, and training and guidelines to be given for operators; ■ Overflow shall be avoided during dredger sailing including sailing from the sand borrow area to the reclamation area ■ Monitoring should be conducted in the sensitive receptors such as developing corals for turbidity and possible impacts, rather than the site of the plume or hopper; ■ It is recommend that, as a minimum standard, the World Bank guidelines are adhered to, in terms of the acceptable limit of suspended sediment concentration allowed. This equates to 2,000 mg /l. (World Bank Technical Paper 140) and is derived in order to prevent covering valuable benthic species (e.g. shellfish) which are particularly sensitive to increased suspended sediment concentration. ■ A Construction Stage Cetacean Mitigation Plan will be prepared and implemented to reduce the potential impact upon marine mammals; 								
I	Ecosystem Services										
I.1		<ul style="list-style-type: none"> ● Provisioning Services 	<ul style="list-style-type: none"> ■ No wastewater discharge from dredger or ships coming to the project areas ■ Trailer suction hopper dredgers (TSHD) will used for dredging activity to minimise the plume generation; ■ Periodical monitoring will be conducted for plume dispersion; 	Biodiversity management plan has been prepared for this project, same should be implemented.	Offshore dredging area and land reclamation area	EPC Contractors	Construction stage	Weekly inspection program	Training: None Resource: EPC Contractors will be responsible for EMP implementation	Monthly inspection report to EHS Team	Refer to Appendix 9.3: Biodiversity Management Plan

	Project Activity	Potential Impact / Aspect	Mitigation measure	Specific Actions	Location for Intervention	Responsible Project Team Member	Schedule	Monitoring	Training / Resources	Reporting	Comment / Reference
			<ul style="list-style-type: none"> Spillage of dredge materials during transportation will be ensures CWIT has prepared a plan for an insurance program to safeguard the fishermen. The insurance program will be effective/confined for the period of the project implementation for all registered fishermen falling under the dredging area during the entire dredging period. 								
I.2		Regulating services	<ul style="list-style-type: none"> No wastewater streams to be released untreated from the site. Trailer suction hopper dredgers (TSHD) will used for dredging activity to minimise the plume generation; Periodical monitoring will be conducted for plume dispersion; Spillage of dredge materials during transportation will be ensures 	Ref. to I.1	Ref. to I.1	Ref. to I.1	Ref. to I.1	Ref. to I.1	Ref. to I.1	Ref. to I.1	Ref. to I.1
I.3		Cultural Services	<ul style="list-style-type: none"> Trailer suction hopper dredgers (TSHD) will used for dredging activity to minimise the plume generation; Periodical monitoring will be conducted for plume dispersion; Spillage of dredge materials during transportation will be ensures 	Ref. to I.1	Ref. to I.1	Ref. to I.1	Ref. to I.1	Ref. to I.1	Ref. to I.1	Ref. to I.1	Ref. to I.1
I.4		Support services	<ul style="list-style-type: none"> Refer to I.3 	Ref. to I.1	Ref. to I.1	Ref. to I.1	Ref. to I.1	Ref. to I.1	Ref. to I.1	Ref. to I.1	Ref. to I.1
J.	Marine Invasive Species										
J.1	<p>Discharge of ballast water in sea;</p> <p>Disposal of sediments to disposal site from reclamation site will be undertaken. The disposal site is a port designated site where disposal from other facilities may also happen.</p>	<ul style="list-style-type: none"> Invasive species preying upon native species Decreased habitat availability for native species Additional competition with native species for resource utilization Parasites and disease Smothering and overgrowth Hybridisation, causing genetic dilution Other impacts of invasive species may include 	<ul style="list-style-type: none"> Unintentional introductions of alien species should be minimised. Ballast water transfer, hull fouling etc. need to be identified, assessed and addressed (e.g. through ballast water exchange, treatment etc). Care should be taken to follow any management plan of SLPA for control of marine invasive species. Moreover, in all cases provisions should be in place for early detection and rapid response so that a new incursion can be eradicated before it spreads. Baseline surveys, surveillance, monitoring and contingency planning are all important at the port area and disposal site areas. 	Biodiversity management plan has been prepared for this project, same should be implemented.	Offshore dredging area and land reclamation area	EPC Contractors	Construction stage	Weekly inspection program	Training: None Resource: EPC Contractors will be responsible for EMP implementation	Monthly inspection report to EHS Team	Refer to Appendix 9.3: Biodiversity Management Plan

	Project Activity	Potential Impact / Aspect	Mitigation measure	Specific Actions	Location for Intervention	Responsible Project Team Member	Schedule	Monitoring	Training / Resources	Reporting	Comment / Reference
		changes to ecosystem function, impacting nutrient cycle etc.									
K	Fishing Activity										
K.1	Dredging operation	Reduction of fish catch due to dredging operation; Damage of fishing gear due to movement of dredger; Increase operational cost of fishing crafts; Cumulative impact due to dredging for other projects.	<ul style="list-style-type: none"> ■ CWIT has prepared a plan for an insurance program to safeguard the fishermen. The insurance program will be effective/confined for the period of the project implementation for all registered fishermen falling under the dredging area during the entire dredging period; ■ A proper warning signal system must be established to inform locations of the vessels operation; ■ Awareness must be done for fishermen on vessel operation before commencing the work and during the work. Communication with fishermen will be carried out in different ways (Digital media); ■ Communication with Fisheries Inspectors (FIs), Leaders of fishery associations and if possible with individual fishermen through mobile phone applications; ■ The project developer should make all the possible attempts at minimizing the disturbances to the fishermen carrying out fishing activities in the area demarcated for sand mining. ■ Regular awareness programmes will be conducted for fishing community, government officials etc. in the area in order to enhance their knowledge on the project activities. ■ Formal mechanism to be set up with the consultation of the DFAR to address any damages to fishing boats and other related equipment due to dredging operations. Based on the evaluation and approval of this committee, the Project Proponent/ Project Developer will compensate damages arising due to dredging activity 	CWIT has prepared a livelihood restoration measures as per Environmental clearance condition for offshore sand dredging site. Same has been implemented	Offshore dredging area and land reclamation area	EPC Contractors	Construction stage	Weekly inspection program	Training: None Resource: EPC Contractors will be responsible for EMP implementation	Monthly inspection report to EHS Team	Refer to Appendix 9.4: Stakeholder Engagement Plan (SEP)
L.	Socio-economic Opportunity										

	Project Activity	Potential Impact / Aspect	Mitigation measure	Specific Actions	Location for Intervention	Responsible Project Team Member	Schedule	Monitoring	Training / Resources	Reporting	Comment / Reference
L.1	Sourcing of workforce for construction activity Sourcing of civil construction material from local vendors Opportunity for local enterprises	Positive impact - job and economic opportunity	<ul style="list-style-type: none"> Some skilled and semi-skilled workers will be sourced by the Contractors. CWIT will encourage Contractors to hire appropriate positions from the local community Construction materials (fill material, sand, cement, aggregate, etc.) will be sourced from selected local vendor/supplier Community Grievance Management Process for addressing any valid complaints from the community within the ZOI 	<ul style="list-style-type: none"> Provide and communicate clear information about the Project's requirement related to employment and business opportunities and provide priority to locals where feasible; Prioritising use of local workforce, especially the unskilled and semi-skilled workforce to be employed subject to meeting the qualification/experience requirements; Supervise the recruitment process by the contractor in accordance with Stakeholder Engagement Procedure; Conduct due diligence of the local suppliers to identify and evaluate the quality of services and products provided by local suppliers in line with the required standards; The grievance mechanism should be accessible for all villagers to report concerns associated with job and business opportunities as well as other concerns (if any). An immediate investigation will be undertaken. The submitted grievances. 	Onshore construction area	EPC Contractors	Construction stage	Periodic monitoring through inspection and verification of Contractors;	Training: None Resource: EPC Contractors will be responsible for EMP implementation	Monthly inspection report to EHS Team	Refer to Appendix 9.4: Stakeholder Engagement Plan (SEP)
M.	Community Health and Safety										
M.1	Air emission from construction activities; Noise emission from construction activities; Traffic movement for	Community health and safety	<ul style="list-style-type: none"> Dust suppression measures, described in section on air quality impacts (Section 7.3.4); Noise control measures, described in section on noise quality impacts (Section 7.3.5); 	Community health and safety management plan has been prepared for the project. CWIT and its contractor will implement the plan	Onshore construction area	EPC Contractors	Construction stage	Periodic monitoring through inspection and verification of Contractors;	Training: None Resource: EPC Contractors will be responsible for EMP implementation	Monthly inspection report to EHS Team	Refer to Appendix 9.5: Community Health and Safety Management Plan

	Project Activity	Potential Impact / Aspect	Mitigation measure	Specific Actions	Location for Intervention	Responsible Project Team Member	Schedule	Monitoring	Training / Resources	Reporting	Comment / Reference
	transport of boulder, manpower, equipment and materials; Influx of non-resident workers to the area.		<ul style="list-style-type: none"> ■ Road and traffic control measures, described in section on road and traffic impacts (Section 7.3.6); ■ CWIT has the Protocol for COVID - 19 management and same will be implemented for this project. ■ Conduct an induction and training to the construction workforce on the Project's Code of Conduct regarding do's and don'ts in relation with interaction with locals; ■ Regular engagement with local authorities relevant to crime (local police) or other social problems (e.g. local administrative authority) for prevention of issues and for mitigations when issues arise; ■ Accessible grievance mechanism for all community groups to report concerns associated with potential Project health impacts. Where complaints are submitted the Project will undertake an immediate investigation. 								
N. Occupational Health & safety											
N.1	Accidents and injuries associated with the operation of heavy machinery and other construction activities; Health impacts associated with environmental conditions and changes in environmental quality	Occupational health and safety	<ul style="list-style-type: none"> ■ The Contractors will prepare and implement a Health and Safety Plan prior to commencing work. This plan will include method statements for working methods, activity sequence and safety arrangements; ■ Measures will be implemented to reduce the likelihood and consequences of the following hazards: <ul style="list-style-type: none"> - Falling from height; - Entanglement with machinery; - Tripping over permanent obstacles or temporary obstructions; - Slipping on greasy or oily walkways; - Falling objects; - Contact with dangerous substances; - Electric shock; - Variable weather conditions; - Lifting excessive weights; and - Welding, grinding and cutting work. 	Occupational health and safety management plan has been prepared for the project. CWIT and its contractor will implement the plan	Onshore construction area	EPC Contractors	Construction stage	Periodic monitoring through inspection and verification of Contractors;	Training: None Resource: EPC Contractors will be responsible for EMP implementation	Monthly inspection report to EHS Team	Refer to Appendix 9.6: Occupational Health and Safety Management Plan Refer to Appendix 9.7: Labour Management Plan

	Project Activity	Potential Impact / Aspect	Mitigation measure	Specific Actions	Location for Intervention	Responsible Project Team Member	Schedule	Monitoring	Training / Resources	Reporting	Comment / Reference
			<ul style="list-style-type: none"> ■ A Permit to Enter system will be established to ensure that only authorised persons gain entry to the working area; ■ All persons working on project will be provided information about risks on area and arrangements will be made for workers to discuss health and safety with the Contractors; ■ All workers will be properly informed, consulted and trained on health and safety issues; ■ Personal Protective Equipment (PPE) shall be worn at all times on the Site. ■ Before starting work all the appropriate safety equipment and the first-aid kit will be assembled and checked as being in working order; ■ All lifting equipment and cranes will be tested and inspected regularly. All hoist ways will be guarded; ■ Safety hoops or cages will be provided for ladders with a height in excess of two metres; ■ The Contractors shall provide appropriate safety barriers with hazard warning signs attached around all exposed openings and excavations when the work is in progress. ■ SOPs need to be developed for construction and related activities of the Plant; ■ No employee will be exposed to a noise level greater than 85 dB (A) for a duration of more than 8 hours per day. Provision of earplugs, earmuffs etc. and rotation of workers operating near high noise generating areas. ■ Hazardous and risky areas, installations, materials, safety measures, emergency exits, etc. will be appropriately marked. ■ Adequate sanitation facilities will be provided onsite for the construction workers. ■ Training programmes will be conducted for the workforce regarding proper 								

	Project Activity	Potential Impact / Aspect	Mitigation measure	Specific Actions	Location for Intervention	Responsible Project Team Member	Schedule	Monitoring	Training / Resources	Reporting	Comment / Reference
			usage of Personal Protection Equipment (PPE), handling and storage of fuels and chemicals, etc. ■ Periodical medical check-up will be carried out all the construction workers.								
O	Tourism										
O.1	Dredging activity	Shore line changes or instability of beaches and related impact on tourism	■ Measurement of beach profile should be carried out covering from the beach area of Sarakkuwa to Negombo mentioned in the CEA approval.	Monitoring of beach profile	Beach area of Sarakkuwa to Negombo	CWIT	During dredging period	Monitoring as per EC condition	-	Monitoring report	EC compliance report to CEA
P	Archaeological and Cultural Sites										
P.1	Construction at site; Road transport; Offshore dredging	Potential impact heritage building due to ground vibration from construction activity and transport activity	■ Vibration monitoring of the project site; ■ An additional safeguard measures has been recommended that a Watching Brief of dredging operations be carried out during the works, in case of archaeological chance finds.	Vibration monitoring of the project site	Construction site	CWIT	During construction period	Periodically monitoring as per EC condition	Training: None Resource: CWIT will be responsible for EMP implementation	Monitoring report	EC compliance report to CEA
Q.	Socio-economic Conflict										
Q.1	Engagement of local and outside workers; Socio-cultural differences with outside workers Environmental pollution and impact on fishing.	Socio-economic conflict with local people	■ Local engagement plan for jobs and economic engagement opportunities will be managed by project Master Contractors ; ■ Address grievances towards the project, if any, resulting from social conflicts in a time bound manner.	Labour management plan has been prepared for the project, same will be implemented.	Construction site	EPC contractor	During construction period	Periodic monitoring through inspection and verification of Contractors;	Training: None Resource: EPC Contractors will be responsible for EMP implementation	Monthly inspection report to EHS Team	Refer to Appendix 9.7: Labour Management Plan

9.4.2 Stage 2: Operation of Terminal

Table 9.3 Stage-2- EMP Sub Plan (Operation of Terminal)

Operation & Maintenance Phase	
Key Activities	<ul style="list-style-type: none"> ■ Cargo movement ■ Container handling; ■ Waste water treatment and discharge, ■ Waste handling and Disposal. ■ Transport of container
Objective	<ul style="list-style-type: none"> ■ To manage the activities undertaken during operation stage of the Project in a manner which reduces potential negative impacts on both the local environmental and the local community ■ To comply with all statutory and approvals requirements pertinent to operation and maintenance phase of the Project
Performance criteria	<ul style="list-style-type: none"> ■ Worksites prepared in accordance with designs providing for the management and mitigation of potential project impacts ■ All the terminal operation and maintenance works are managed to avoid, mitigate, and/or manage potential impacts on the social and environmental conditions within the ZOI ■ All community complaints are recorded and investigated and, if appropriate, actioned
Target	<ul style="list-style-type: none"> ■ Zero accidental releases ■ Compliance with relevant regulatory requirements ■ All community concerns appropriately actioned and recorded
Monitoring	<ul style="list-style-type: none"> ■ Review the EMP if any significant changes are made to the Project scope or methodology ■ Audit the implementation of the EMP on an ongoing basis (six monthly audit)
Reporting	<ul style="list-style-type: none"> ■ EHS to report as required by DoE with respect to environmental management performance ■ Community complaints register should be filed for each complaint

Table 9.4 Environment Management Plan for Stage 2: Operation of Terminal

	Project Activity	Potential Impact / Aspect	Mitigation measure	Specific Actions	Location for Intervention	Responsible Project Team Member	Schedule	Monitoring	Training / Resources	Reporting	Comment / Reference
A. Surface Water Quality											
A.1	Discharge of operational wastewater and surface runoff	Surface water body impacts due to increase of organic load potential impact on water quality and aquatic ecology	<ul style="list-style-type: none"> ■ Treatment of operational waste water through ETP; ■ Sewage will be treated through STP; ■ The periphery drainage structure will be provided with sedimentation tank; ■ The drainage facility will be provided around the fuel storage area, waste storage area, chemical storage area with oil –water separator, ■ Periodic cleaning will be undertaken of storm water drainage structures to maintain uninterrupted storm water flow; ■ Sediment control measures in the form of silt traps and sedimentation tank will be provided to treat surface run-off before disposal 	<p>Comply the discharge standard from the ETP and STP;</p> <p>Periodically motored the treated water quality and submit the monitoring results to the regulators.</p> <p>Maintain the storm water drainage channel- desludging, etc.</p>	Terminal area	CWIT	Operation stage	Monitoring of ETP, STP and treated storm water quality as per monitoring plan	Training: None Resource: CWIT will be responsible for EMP implementation	Quarterly inspection and audit report	Submit the monitoring report to CEA Refer to Appendix 9.1: Waste Management Plan
A.2	Maintenance dredging		<ul style="list-style-type: none"> ■ Maintenance dredging will be conducted as per plan in coordination SLPA 								
A.3	Accidental spillage		<ul style="list-style-type: none"> ■ Wastes shall be stored in a manner that will prevent contact between incompatible wastes i.e. post compatibility checks, ■ Proper labelling of hazardous wastes; ■ Special care shall be taken in the storage areas to prevent any spillage of hazardous wastes and restrict access (except for trained staff) to such areas; ■ Periodic audits shall be carried out for such areas and containers; also on the segregation and collection systems and the findings will be documented and appropriate action taken against irregularities; and ■ A spill response plan and emergency plan shall be prepared to address accidental spillages or release of hazardous wastes. 	<ul style="list-style-type: none"> ■ Provide spill kits at the hazardous waste storage area; ■ Operation team to ensure spill control immediately as per SOP; 							
B Ambient air quality											
B.1	Operation of DG sets	Emission of gases with potential to degrade the ambient air quality; potential to impact nearby community.	<ul style="list-style-type: none"> ■ Periodic ambient air quality monitoring as per Environmental Monitoring Plan; ■ Explore minimizing the usage of diesel-based generators and avoid any idling; Explore usage of cleaner fuels - such as natural gas for large engines and equipment 	Meet the emission standard as per design specification.	Terminal area	CWIT	Operation stage	Ambient air quality monitoring as per monitoring plan	Training: None Resource: CWIT will be responsible for EMP implementation	Quarterly inspection and audit report	Submit the monitoring report to CEA
C. GHG Emission											

	Project Activity	Potential Impact / Aspect	Mitigation measure	Specific Actions	Location for Intervention	Responsible Project Team Member	Schedule	Monitoring	Training / Resources	Reporting	Comment / Reference
	GHG Emission	GHG emission and potential impact on climate change	<ul style="list-style-type: none"> Ensure that all equipment and machinery is maintained in accordance with manufacturer's specifications; Project will have an active GHG emission monitoring protocol; Project may involve investing in new equipment or technology, changing operational practices, or engaging employees to adopt sustainable behaviours. 	GHG emission monitoring and reporting	Terminal area	CWIT	Operation stage	GHG emission monitoring	Training: None Resource: CWIT will be responsible for EMP implementation	Six monthly	-
D. Noise and Vibration											
D.1	Container handling activities; Operation of back-up DG sets	Increase in ambient noise levels with potential impacts on site workers, nearby community and wildlife	<ul style="list-style-type: none"> Implementation of noise reduction measures, such as use of vibration dampers; Well maintained equipment and vehicles will be used; All DG sets would be provided with acoustic enclosures; Appropriate PPEs (e.g. ear plugs) will be used by workers while working near high noise generating equipment. 	Meet the emission standard as per design specification.	Terminal area	CWIT	Operation stage	Ambient noise quality monitoring as per monitoring plan	Training: None Resource: CWIT will be responsible for EMP implementation	Quarterly inspection and audit report	Submit the monitoring report to CEA
D.2	Vehicular movement;	Increase in ambient noise levels potential to impact site workers, nearby community and fauna	<ul style="list-style-type: none"> Only those vehicles meeting the standards as specified by regulation will be used; Vehicles should be regularly maintained. 	Ensure that only fit certified vehicle can be used for project							
E. Aquatic Ecology											
E.1	Discharge of operational wastewater, sewage and surface runoff; <ul style="list-style-type: none"> Impact to cetaceans due to underwater noise generated from movement of vessels and collision with vessels Accidental spillage 	Impact on aquatic ecology Impact to marine mammals	<ul style="list-style-type: none"> Surface water quality management (Refer to A) A Operational Stage Cetacean Mitigation Plan will be prepared and implemented to reduce the potential impact upon marine mammals. Underwater noise management plan (Refer to S, No. H 9.3) 	Refer to A	Terminal area	CWIT	Operation stage	Ref. to B1	Ref. to B1	Ref. to B1	Ref. to B1
F Socio-economic Opportunity											
F.1	Sourcing of workforce for construction activity	Positive impact - job and economic opportunity	<ul style="list-style-type: none"> Some skilled and semi-skilled workers will be sourced by the Contractors. 	Stakeholder management plan has been prepared and same will be	Terminal area	CWIT	Operation stage	Periodic monitoring through	Training: None	Quarterly inspection	Stakeholder Engagement Plan (SEP),

	Project Activity	Potential Impact / Aspect	Mitigation measure	Specific Actions	Location for Intervention	Responsible Project Team Member	Schedule	Monitoring	Training / Resources	Reporting	Comment / Reference
	Opportunity for local enterprises		<ul style="list-style-type: none"> CWIT will encourage Contractors to hire appropriate positions from the local community Community Grievance Management Process for addressing any valid complaints from the community within the ZOI 	implemented for operational stage of the project				inspection and verification of Contractors;	Resource: CWIT will be responsible for EMP implementation	report to EHS Team	provided in Appendix 9.4
G. Community Health and Safety											
G.1	<ul style="list-style-type: none"> Noise emissions due to operation of machineries and equipment; Traffic movement due to transport of container; Influx of non-resident workers to the area. 	Community health and safety	<ul style="list-style-type: none"> Noise control measures, described in section on noise quality impacts (Section 7.3.5); CWIT has the Protocol for COVID - 19 management and same will be implemented for this project. Compulsory medical examinations for Project workers to ensure they are fit for work and to monitor the prevalence of communicable diseases detected through periodical medical check-up; Conduct an induction and training to the construction workforce on the Project's Code of Conduct regarding do's and don'ts in relation with interaction with locals; Regular engagement with local authorities relevant to crime (local police) or other social problems (e.g. local administrative authority) for prevention of issues and for mitigations when issues arise; Accessible the grievance mechanism for all community groups to report concerns associated with potential Project health impacts. Where complaints are submitted the Project will undertake an immediate investigation. 	Community health and safety management plan has been prepared for the project. CWIT and its contractor will implement the plan	Terminal area	CWIT	Operation stage	Periodic monitoring through inspection and verification of Contractors;	Training: None Resource: CWIT will be responsible for EMP implementation	Quarterly inspection report to EHS Team	

Table 9.5 Environment Management Plan for Unplanned Events – Multiple Project Stage

	Project Activity	Potential Impact / Aspect	Mitigation measure	Location for Intervention	Responsible Project Team Member	Schedule	Monitoring	Training / Resources	Reporting	Comment / Reference
A. Surface Water Quality										
A.1	Storm surge and inundation of terminal area mixing of waste and hazardous materials with water	Potential impact on surface water quality and ecology	<ul style="list-style-type: none"> In case of flood or heavy rain, the wastes including hazardous waste should be stored in the dedicated storage area in demarcated containers, so that, these are not mixed with water; Wastes shall be disposed through third party vendor prior to heavy rain/ flood like situation; Maintain the record of waste generation and disposal from the Site through third party vendors; In case of any emergency due to flood, the following information shall immediately be reported to Colombo Port, local administration and CEA: <ul style="list-style-type: none"> Personnel affected (injured, missing, fatalities etc.) 	Terminal area	CWIT	In case of natural disaster and accidental event	Incidence reporting	SSERP training to the workforce; Resources to manage the emergency situation, if any	CWIT will be responsible for notifying the CEA of incidents causing or threatening material harm' to the environment as soon as practicable	-

	Project Activity	Potential Impact / Aspect	Mitigation measure	Location for Intervention	Responsible Project Team Member	Schedule	Monitoring	Training / Resources	Reporting	Comment / Reference
			<ul style="list-style-type: none"> – Emergency support available and its location (standby transport, medical facilities, etc.) – Weather conditions – Current operations (abandoning the site, firefighting, etc.) 						after becoming aware of the incident.	

9.5 Environmental Monitoring

The environmental monitoring programme has been developed with the following objectives:

- To evaluate the effectiveness of the proposed mitigation measures and the protection of the ambient environment as per prescribed/ applicable standards for the Project;
- To identify the need for improvements in the management plans;
- To verify compliance with statutory and community obligations; and
- To allow comparison against baseline conditions and assess the changes in environmental quality in the Project ZOI.

9.5.1 Performance Indicators and Monitoring Schedule

Management of components linked with physical, biological and socioeconomic environment of particular significance have been identified as performance indicators. A comprehensive monitoring plan for each performance indicator has been prepared for all phases of the Project and is presented in **Table 9.6**. This includes parameters to be measured, methods to be used, sampling locations, frequency of measurements, and responsibilities.

9.5.2 Reporting Mechanism for Environmental Monitoring Programme

A robust reporting system will provide the Project with the necessary feedback mechanisms to verify quality and timely implementation of the works. The reporting system will provide a mechanism to verify that the measures proposed in the Project's ESMP are implemented.

CWIT has a reporting mechanism for its existing for the project and the same will be followed for the proposed project.

During dredging operation TSS and turbidity has been monitored in 28 location of undisturbed area of sand borrow area it immediate vicinity to understand the from degrading activity. The monitoring location map and results has been presented in following figure and table

Table 9.6 Environmental Monitoring Programme

S. No.	Aspect	Environmental quality/ Performance Indicator	Monitoring Parameter	Location	Period & Frequency	Responsibility
A. Stage 1: Construction of Terminal						
A.1	Fugitive emission from construction area	Ambient Air Quality	Measurement of PM ₁₀ , PM _{2.5} , NO ₂ , SO ₂ , CO using ambient air sampler	Within fence boundary, nearest habitations and site access road	Quarterly, 2 times in a week x 2 weeks during construction stage	EPC Contractors
A.2		Dust suppression measures	Visual observation of dust in air by haziness	Site and approach roads	As and when required during construction stage	EPC Contractors
A.4	Noise from construction machineries, equipment and vehicles	Ambient noise	Measurement of Noise Pressure Level in dB(A) as per Schedule III of National Noise Rules	Within fence boundary, nearest habitations and site access road	Quarterly once during construction stage	EPC Contractors
A.5	Generation of construction waste and disposal	Offsite disposal, if any	Inspection and Audit	Disposal site	As and when required	EPC Contractors
A.6	Accidental spillage of oil, lubricant & chemical from storage area and handling site; Accidental spillage of hazardous waste Accidental release of untreated sewage	Soil and ground water impacts	Analysis for suite of constituents (heavy metals, TPH, organic carbon, pH) for soil Analysis for suite of constituents (heavy metals, TPH, organic carbon, pH, oil & grease) for ground water	Site, adjacent areas	In event of spills	EPC Contractors
A.7		Spill prevention measures	Time taken to control the spill	Spill location	In event of spills	EPC Contractors
A.8	Surface Runoff	Surface water quality	pH, DO, BOD, COD, Total dissolved solids, oil & grease, total coliform, Chloride, Fluoride, heavy metals	Four locations in the basin	Quarterly once during construction stage	EPC Contractors

S. No.	Aspect	Environmental quality/ Performance Indicator	Monitoring Parameter	Location	Period & Frequency	Responsibility
			Turbidity and TSS	Towards break water area/ and undisturbed area during site reclamation activity	Bi-weekly	EPC Contractors
A.9	Dredging	Surface water quality	pH, DO, BOD, COD, Total dissolved solids, oil & grease, heavy metals	Four locations in the dredging site	Quarterly once during construction stage	EPC Contractors
			Turbidity and TSS	Undisturbed area of the dredging site during dredging operation	By-weekly	EPC Contractors
A.10	Impacts on fishing activity	Fish catch and fishing grounds		Selected fisheries in selected landing sites Pitipana – small mesh gillnet, bottom set gillnets, bottom longline Kapungodasmallmesh gillnets, beach seine Hedala-small mesh gill nets, , bottom longline	Monthly	CWIT
A.11	Impacts on the fishing community due to income loss	Statistics from Fisheries Department on fish catch and income Number of programs conducted and number of people attended		Negombo and Wattala fishing villages	Monthly	CWIT
A.12	Damages to fishing gear			Occurrences of damage to fishing gears	Required based on the complaint	CWIT

S. No.	Aspect	Environmental quality/ Performance Indicator	Monitoring Parameter	Location	Period & Frequency	Responsibility
A.13	Vibration	Ground vibration	ppv	Two location in around the construction site	Quarterly, once during construction stage	CWIT
B	Stage 2: Operation of Terminal					
B.1	Air emission	Ambient Air quality	PM ₁₀ , PM _{2.5} , NO ₂ , SO ₂ , CO,	Within fence boundary and nearest habitation	Quarterly, 2 times in a week x 2 weeks	CWIT
B.2	Noise generation	Ambient noise	Measurement of Noise Pressure Level in dB(A) as per Schedule IV of National Noise Rules	Within fence boundary, nearest habitations and site access road	Quarterly, once	CWIT
B.3	Treated ETP & STP water	Quality of water - untreated and treated	pH, EC, TDS, Chloride, Oil & Grease, BOD, COD, ICP metals	At the process tank and at system outlet	Quarterly, once	CWIT
B.4	Accidental spillage of oil & lubricant from storage area and handling site	Soil impacts	Analysis for suite of constituents (heavy metals, TPH, organic carbon, pH,).	Site, adjacent areas	In event of spills	CWIT
B.5	Surface Runoff	Surface water quality	pH, DO, BOD, COD, Total dissolved solids, oil & grease, total coliform, Chloride, Fluoride, heavy metals	Basin	As and when required during site decommissioning	CWIT

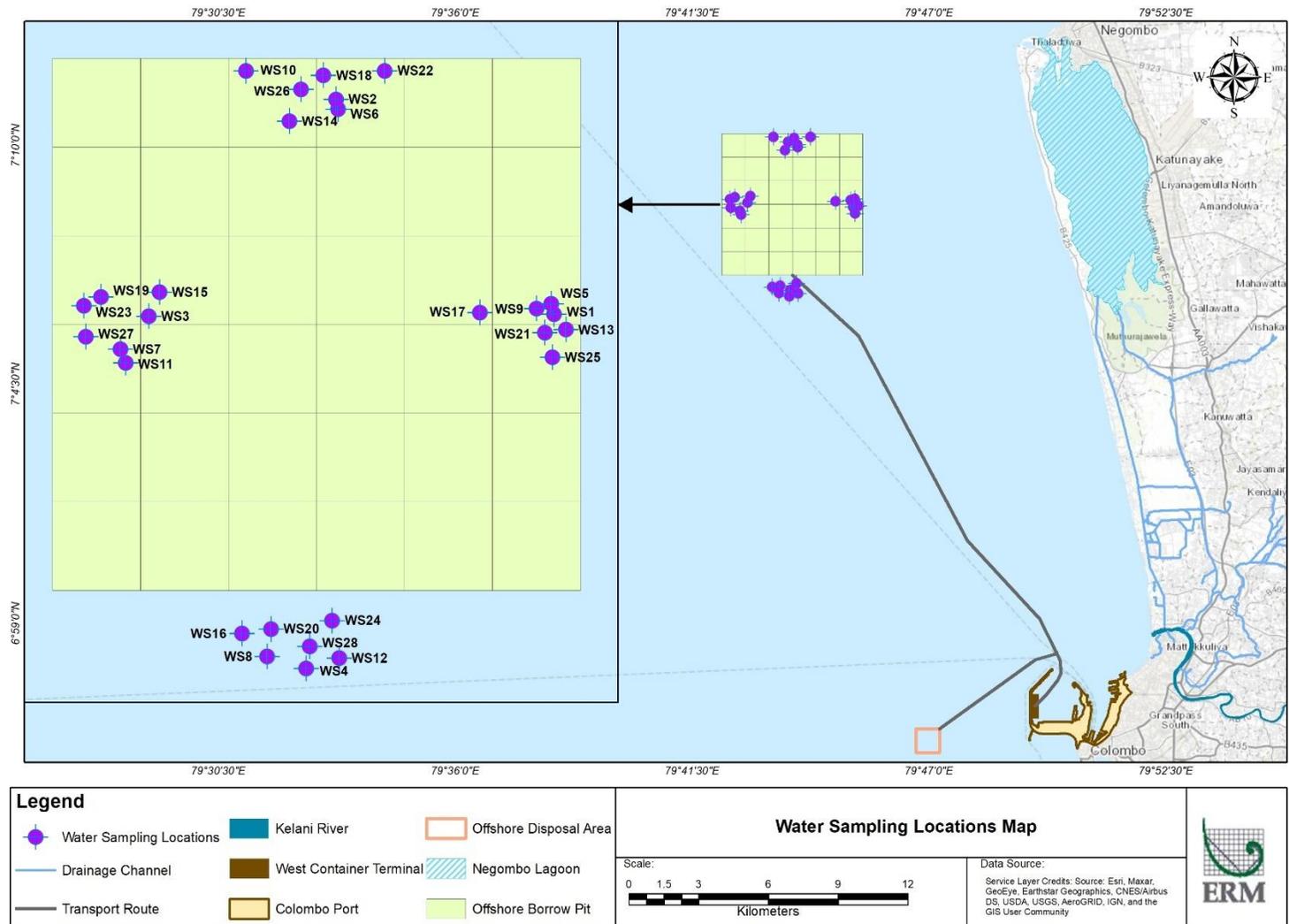
9.5.3 TSS and Turbidity Monitoring in Sand Borrow Area

During the dredging operation, TSS and turbidity have been monitored in 28 locations (March 2023) in the undisturbed area of the sand borrow area and its immediate vicinity to understand the effects of degrading activity. The monitoring location map and results have been presented in the following Figure 9.2 and Table 9.7. The monitoring results show that the turbidity levels in all the monitoring locations were less than 1 NTU. The suspended solids level ranged from 114 to 146 m/l, which is within the MEPA limit of 150 mg/l.

Table 9.7 TSS and Turbidity Monitoring Results at Sand Borrow Site

Sampling Location Code	Parameters	
	Turbidity (in NTU)	Suspended Solids (mg/l)
WS1	<1	146
WS2	<1	120
WS3	<1	132
WS4	<1	134
WS5	<1	142
WS6	<1	146
WS7	<1	146
WS8	<1	131
WS9	<1	130
WS10	<1	132
WS11	<1	148
WS12	<1	148
WS13	<1	146
WS14	<1	137
WS15	<1	148
WS16	<1	142
WS17	<1	141
WS18	<1	129
WS19	<1	144
WS20	<1	128
WS21	<1	133
WS22	<1	132
WS23	<1	138
WS24	<1	140
WS25	<1	136
WS26	<1	127
WS27	<1	131
WS28	<1	114
MEPA Limit	<1	150

Figure 9.2 TSS & Turbidity Monitoring Location Map



9.6 EMP Implementation Budget

The Contractors and CWIT will allocate a separate budget for WCT-1 project's environmental and social management plan implementation, training, environmental monitoring, analysis and reporting, verification monitoring and capacity building. It should be noted that costs for many in-built mitigation measures for air emission control and noise control and effluent treatment is included in the project budget. Any additional budget for implementation the EMP of the WCT-1 project will be borne by CWIT.

10 SUMMARY AND CONCLUSION

10.1 Introduction

Colombo Port is a rapidly growing maritime hub of the South Asia Region. The Sri Lanka Ports Authority (SLPA) executed the Colombo Port Expansion Project (CPEP) to build a deep-water harbour basin (Colombo South Harbour) with three container terminals on its three sides (south, east, and west) each with designed capacity of 2.4 million TEUs per year. The project was aimed at consolidating Colombo Port's position as a trans-shipment hub for the South Asia region by providing sufficient container handling capacity and sufficient depth for new-generation vessels.

10.2 Need for the Project

The West Container Terminal development and operation is part of the Colombo Port Expansion Project (CPEP) which Sri Lanka Ports Authority (SLPA) embarked in April 2008 with the assistance of Asian Development Bank (ADB). Colombo West International Terminal (Private) Limited (CWIT), the Project Proponent, expects to commence construction of the terminal in early CY2022 with phase 1 of the terminal, comprising of a quay length of 600 metres, slated to be operational within a period of approximately 24 months. The remainder of the terminal is expected to be completed within a further period of approximately 24 months. The total project cost is envisaged to be approximately USD 650 million. CWIT has signed BOT agreement with SLPA for complete terminal development in 60 months. The identified site for berthing the WCT-1 is falling within the premises of the Colombo Port which administratively is located within the Colombo Divisional Secretary's Division (DSD).

10.3 Environment and Social Baseline

A 5 km radial zone around the project site has been considered to ascertain the potential presence of sensitivities / sensitive receptors and has been delineated as the Zone of Influence (ZOI). The baseline environment study was conducted through primary monitoring and survey and collection of secondary information.

10.3.1 Physical Environment

The physical environmental baseline (air, noise, surface water, traffic) was studied through review of secondary information and supplemented with findings from site reconnaissance and through primary monitoring and surveys. It was found that the project area and its surrounding ZOI are not polluted. The analysis of primary and secondary monitoring data indicates that the environmental parameters are generally in compliance with respective standards given in ECA and its amendments.

10.3.2 Biological Environment

The terrestrial habitats within the ZOI are modified habitats and comprise of urban and rural settlements. The aquatic habitats include river, and sea and marshy land. A total of 270 species of the seven taxonomic groups – the vertebrates (fish, amphibians, reptiles, birds and mammals) and the two selected invertebrate groups (butterflies and dragonflies) are likely to occur here. Of these 234 are native / resident species whereas 17 species were exotic/ introduced species and 20 were endemic

10.3.3 Socio-economic Environment

There are three (3) DSD in the ZOI. Colombo is the most populated DS and Negombo is the least of all the ZOI DS. GNs within the Colombo DSD sharing only 3.15% of the total population and whereas GNs within Negombo shares 11.78% of total Negombo population.

The fisheries sector plays a major role in the social and economic life of the people of Sri Lanka. There is total 67 Fishery Inspectors Divisions (FI division) of which 52 FI divisions are at Negombo Assistant Director divisions (AD divisions), 9 FI division at Colombo AD and 6 at Wattala division. Information gathered from the Colombo Regional Office indicates the presence of 9 registered fishing societies along with 525 active fishermen who are registered under Fisheries Department in Colombo Division.

Negombo Regional Office indicates the presence of 52 registered fishing societies along with 8704 active fishermen who are registered under Fisheries Department in Negombo Division.

Wattala Regional Office indicates the presence of 6 registered fishing societies along with 591 active fishermen who are registered under Fisheries Department in Wattala Division

10.4 Stakeholder Consultations

A range of stakeholders were consulted in order to gather their views, opinions and concerns about the proposed project including Fishermen Community from Doowa, Pitapana Cental, SW, Thaladena, Dungalpitiya, Kepungoda, Settippaduwa GN of Negombo DS, Pamunugama, Paranambalama, Uswetakeiyawa, Dikovita, Palliyawatta N & S GN of Wattala DS, Mattakkuliya, Modara, Aluthmawatha, Lunopokuna, Pettah GN of Colombo DS. Other stakeholder are Women Households at different GNs of Negombo, Wattala and Colombo DS; Stakeholder Associated with Fishing Activities and Grama Niladhari/ village officer of respective Grama Niladhari division).

10.5 Potential Impacts and Mitigation

The potential environmental and social impacts associated with project activities have been assessed considered (a) Stage -1: construction of terminal (b) Stage-2: operation of terminal. The potential impacts associated with the project activities across the aforementioned stages have been analysed in details with modelling exercises being undertaken, wherever necessary, to understand the magnitude and significance of the potential impacts. Basis the impact analysis undertaken, it is assessed that the potential negative impacts associated with the Project can be effectively minimised, mitigated and managed through application of mitigation measures and management plans.

The Environment and Social Management Plan (ESMP) for the Project has been developed with an aim to avoid, abate on site, abate at receptor, repair/ remedy or compensate for potentially significant adverse environmental and social impacts and to propose enhancement measures.

10.6 Project Justification and Conclusion

Port of Colombo is the main container transshipment hub in South Asia due to its proximity to the major East-West trade route, which is the principal trade route in the global container trade. Colombo Port is the main port of the country and handles almost all the container throughput of the country. In 2020, Colombo port handled a throughput of 6.9 million TEU of which 84% is transshipment.

Colombo port's capacity utilization was 94% in 2020. Total volumes have grown by a CAGR (2010-2020) of 5.1%, transshipment traffic has increased by a CAGR of 6.4%, however, gateway traffic increased with a CAGR of only 0.4% during the same period.

CICT commenced operations in 2012 and its market share increased steadily due to its superior infrastructure along with its ability to handle 18,000 TEU vessels. On the other hand, the market share of SLPA has dropped mainly due to lesser draft and lower productivity.

Colombo is the main gateway port in Sri Lanka. Most of the export processing zones (EPZ) are concentrated in the Western and Central provinces of Sri Lanka, which are close to Colombo. Gateway volumes of SLPA have dropped by a CAGR of 16.9% between 2017-2020. Gateway volumes of CICT dropped by 1.4% during the same period, whereas the gateway volumes for all the terminals of Colombo together dropped by 7.7% during this period.

Transshipment volumes registered a CAGR of 6.1% for all the terminals of Colombo between 2017-2020. CICT registered the highest growth among the three terminals with a CAGR of 9.0% during the same period. Although the total transshipment volumes of Colombo dropped by 3.2% between 2019-2020, it dropped marginally by 0.2% at CICT during the same period.

The WCT-1 Project should therefore proceed, in due consideration of the following:

- This Project is in the national interest of Sri Lanka;
- Proper safety measurement is in place to prevent and mitigate any negative impact associated with the project;
- There are no potentially irreversible impacts on the surrounding environment, ecology and socio-economy;
- The Project will also have potential positive (beneficial) impacts.

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