ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) FOR COASTAL DEFENSE STRUCTURE AT WEST POINT

MONROVIA METROPOLITAN CLIMATE RESILIENCE PROJECT (MMCRP)

OCTOBER 2025

earthtime

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PROJECT DETAILS			
Client	**Monrovia Metropolitan Climate Resilience Project (MMCRP)**	**Document Type**	Environmental and Social Impact Assessment
Project Title	**Environmental And Social Impact Assessment (ESIA) for the Coastal Defense Structure at West Point**		
Project Code	EP2023044		
Version	4 Final	**Date**	October 2025
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ABBREVIATIONS AND ACRONYMS

%	Percent
°C	Degree Celsius
ANFO	Ammonium Nitrate Mixed with Fuel Oil
BNF	Bureau of National Fisheries
CCG	Community Consultation Group
CD	Chart Datum
CDC	Community Development Committee
CEDAW	Convention on the Elimination of All Forms of Discrimination against Women
C-ESMP	Contractor's Environmental and Social Management Plan
CH_4	Methane
CLO	Community Liaison Officer
CO	Carbon monoxide
CO_2	Carbon dioxide
DMP	Dredging Management Plan
eDNA	Environmental DNA
EHS	Environmental, Health and Safety
EIS	Environmental Impact Statements
EO	Environmental Officer
EPA	Environmental Protection Agency
EPH	Extractable Petroleum Hydrocarbons
EPML	Environment Protection and Management Law
EPRP	Emergency Preparedness and Response Plan
ESAR	Environmental and Social Assessment Report
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management System
ESS	Environmental and Social Safeguards
EVA	Extreme Value Analysis
FDA	Forestry Development Authority
FGD	Focus Group Discussion
FGM	Female Genital Mutilation
GCF	Green Climate Fund
GFDRR	Global Facility for Disaster Reduction and Recovery
GHG	Greenhouse Gases
GIIP	Good International Industry Practice
GRM	Grievance Redress Mechanism
GRO	Gasoline Range Organics
HESDD	Hydro Engineering Study and Detailed Design
HFC	Hydrofluorocarbons
HIES	Household Income and Expenditure Survey
HRM	Human Resources Manager's
HSO	Health and Safety Officer
Hz	Hertz
ICZM	Integrated Coastal Zone Management

IFC	International Finance Corporation
ITP	Independent Third Party
kHz	Kilohertz
KII	Key Informant Interview
km	kilometres
LCG	Liberian Coast Guard
LEC	Liberia Electricity Corporation
LHI	Lanka Hydraulic Institute Ltd
LIMA	Liberia Maritime Authority
LMA	Liberian Market Association
LMP	Labour Management Plan
LRP	Livelihood Restoration Plan
M	Moment Magnitude Scale
m/s	Meters per second
mbar	Millibar
MBI	Monrovia Breweries
MFDP	Ministry of Finance and Development Planning
MGCSP	Ministry of Gender, Children and Social Protection
mm	millimetres
MMA	Monrovia Metropolitan Area
MMCRP	Monrovia Metropolitan Climate Resilience Project
MME	Ministry of Mines and Energy
MOA	Ministry of Agriculture
MPW	Ministry of Public Works
MSL	Mean Sea Level
NAFAA	National Fisheries and Aquaculture Authority
NF_3	Nitrogen Trifluoride
NGO	Non-governmental Organization
NO_2	Nitrogen dioxide
NOI	Notice of Intent
O_3	Ozone
OHSP	Occupational Health and Safety Plan
PC	Project Coordinator
PCR	Polymerase Chain Reaction
PFC	Perfluorocarbons
PM	Particulate Matter
PMU	Project Management Unit
POCs	Parameters of Concern
PPE	Personal Protective Equipment
PPF	Project Preparatory Fund
PS	Performance Standards
s	Second
SAI	Social Area of Influence
SAMFU	Save My Future Foundation
SEP	Stakeholder Engagement Plan
SES	Social and Environmental Standards

SESP	Social and Environmental Screening Procedure
SF_6	Sulfur hexafluoride
SGBV	Sexual and Gender-based Violence
SGBVU	Sexual and Gender Based Violence Unit
SGO	Social and Gender Officer
SM	Site Manager
SO_2	Sulphur dioxide
STW	Sea Turtle Watch
TDS	Total dissolved solids
TMP	Traffic Management Plan
TSS	Total Suspended Solids
UNDP	United Nations Development Programme
UTM	Universal Tract Metractor
VOC	Volatile organic compound
WHO	World Health Organization
WMP	Waste Management Plan

0 EXECUTIVE SUMMARY

0.1 INTRODUCTION

0.1.1 Overview

This Environmental and Social Impact Assessment (ESIA) Report was prepared by Earthtime Inc. (Earthtime) for the Coastal Defence Structure at West Point is part of the Monrovia Metropolitan Climate Resilience Project (MMCRP), which aims to enhance climate resilience along Monrovia' coast. Funded by the Green Climate Fund (GCF), implemented by the Environmental Protection Agency (EPA) of Liberia through its Project Implementation Unit (PMU), and supervised by the United Nations Development Program (UNDP), the Project focuses on protecting the densely populated and vulnerable area of West Point in Monrovia from climate impacts like sea-level rise and intense storms. Key project outputs include building a 1,050-meter coastal revetment to reduce erosion, strengthening coastal management through policy support, and protecting mangroves while promoting climate-resilient livelihoods. The ESIA assesses the environmental and social risks of the project and proposes measures to mitigate these impacts in compliance with Liberian, UNDP, and GCF requirements. It includes a stand-alone Environmental and Social Management Plan (ESMP) designed to guide the project's phases, ensuring compliance with environmental and social safeguards.

0.1.2 Background

The historical background of the MMCRP outlines why West Point was chosen for coastal defence intervention. During the 2019 design phase, five coastal areas in Monrovia were evaluated for erosion control, and West Point was selected due to its dense population, vulnerability to sea-level rise, and urgent need for protection against coastal erosion and flooding. The area faced significant socio-economic and environmental challenges, making it a priority for action.

A conceptual design of the coastal defence structure (rock revetment) to be constructed at West Point was developed during the design stage of the MMCRP. Based on this conceptual design, an Environmental and Social Assessment Report (ESAR) was prepared to safeguard the environment and society through the implementation of the Project and beyond. In addition to the ESAR, the Social and Environmental Screening Procedure (SESP) was carried out to assess how the Project has integrated the overarching principles of UNDP's Social and Environmental Standards (SES). A detailed hydro-engineering study refined the design, incorporating best practices from similar projects to mitigate flooding risks and enhance the resilience of West Point against future climate impacts.

0.1.3 Scope of the ESIA

The ESIA primarily covers the construction, operation and decommissioning phases of the establishment of a coastal defence structure in West Point and its ancillary facilities. It also considers impacts associated with livelihood activities under outputs 2 and 3 pertaining to strengthening coastal management through policy support and protecting mangroves while promoting climate-resilient livelihoods.

0.1.4 ESIA Methodology and Approach

The preparation of the ESIA involved desktop and literature review, field surveys to collect data on the physical, biological, and socio-economic environments, laboratory analysis, and expert consultation. Public consultations were conducted with stakeholders, communities of the project area, and relevant Government agencies.

0.2 LEGAL AND INSTITUTIONAL FRAMEWORK

This ESIA has been prepared in accordance with the Liberian Environmental Protection and Management Law (EPML) of 2003, the Environmental Protection Agency's (EPA) ESIA Procedural Guidelines of 2022, and the EPA's approved Parameters of Concern (POCs). The proposed Project falls under the "Building and Civil Engineering Industries" category, Annex I, Number 13 of the EPML. All projects and activities identified in Annex I of the EPML are required to conduct an environmental impact assessment. This ESIA has been prepared in line with the laws and regulations of the Republic of Liberia and the international agreements to which Liberia is a signatory, while satisfying the requirements of the relevant GCF Revised Environmental and Social Policy (ESP) which adopts the IFC Performance Standards (PS) as its Interim Environmental and Social Standards (ESS), and the applicable UNDP Social and Environmental standards (SES), and good international industry practice (GIIP).

0.3 PROJECT DESCRIPTION

The Project seeks to address immediate and long-term impacts of climate change on the coast of Monrovia by enhancing coastal protection, fostering improved coastal management, and presenting local communities with diversified climate-resilient livelihoods through three outputs.

The Project location and design components are presented in Figure 0-1. A summary of the Project's main information, design components and activities are presented in Box 0-1.

Figure 0-1 Project location and components

Box 0-1 Summary of the Project's main information

Coastal Defense Structure at West Point - Monrovia Metropolitan Climate Resilience Project (MMCRP)

- **Project Location**: Monrovia, in communities and areas bordering the Mesurado Wetland.
- **Project Outputs**:
  - Output 1: Protection of coastal communities and infrastructure at West Point against erosion caused by sea level rise and increasingly frequent high-intensity storms.
  - Output 2: Institutional capacity building and policy support for the implementation of Integrated Coastal Zone Management (ICZM) across Liberia.
  - Output 3: Protecting mangroves and strengthening gender- and climate-sensitive livelihoods to build local climate resilience in Monrovia.
- **Design Components**:
  - Coastal protection structure, which includes a main rock revetment, a light rock revetement and a breakwater
  - A promenade
  - Beach access points for fishing community and the general public
  - Drainage and related infrastructure
  - Boat landing sites and related infrastructure
- **Project Activities**:
  - Mobilization phase that includes shipping and sourcing of primary materials and equipment, transport of equipment to site and setting up camps, offices, ramps, pads and facilities to support construction.
  - Site preparation phase including clearing, excavation and preparation of site, raising of ground and platforms and stockpiling of materials.
  - Construction phase including grading, excavation and filling works, stabilization of structures, Installation of drainage, fabrication and building the promenade, planting of trees and other vegetation on the promenade.
  - Dredging and filling works
- **Project timeline**: estimated to be 23 months
- **Project Lifetime**: 50 years
- **Equipment:** construction, excavation and backfilling equipment, transport equipment.
- **Main Materials:** rocks, sand and aggregates, geotextile, cement, diesel, oil, and lubricants, and seedlings and plants.
- **Employment**: figures not available yet but estimated 7 expatriates and 20 to 25 skilled local staff, plus a larger number of unskilled local workers, taking into account gender balance.
- **Expected waste**: quantities not estimated. Waste types include municipal waste, construction and demolition waste, hazardous waste, and to a lesser extent medical waste and liquid waste. Construction waste and dredged materials are expected to be reused where possible in filling activities and building of landing sites.
- **Main sources of greenhouse gas emissions:** Emissions from materials, machinery and equipment, project activities, electricity production, and transportation of materials.

0.4 ANALYSIS OF ALTERNATIVES

This analysis focuses on potential alternatives for addressing coastal erosion in West Point, and their associated environmental and social impacts. The goal is to identify a solution that minimizes harm to both the environment and the local communities.

0.4.1 "Do Nothing" Alternative

The "Do Nothing" alternative suggests leaving the environment to its natural progression without any project intervention. This approach acknowledges that coastal erosion will continue and worsen due to the effects of climate change.

Projections show that by 2050, the coastline could retreat by up to 252 meters during storms. This coastal retreat would severely disrupt the livelihoods of local communities, particularly the fishing industry, which relies on access to the beaches. Without intervention, the socio-economic consequences for the coastal residents, including forced displacement, loss of livelihoods, and reduced food security in Monrovia due to diminished fishing activities, would be significant. While this alternative avoids direct environmental impacts from construction, it is not considered a viable option due to its detrimental socio-economic effects.

0.4.2 Alternative Location

During the design phase of the MMCRP, five coastal sections were evaluated for erosion control in Monrovia. Compared to the other coastal hotspots assessed, West Point was ultimately chosen as the most suitable location due to its dense population, its low-lying land highly susceptible to sea-level rise, and the urgent need to protect its residents from the risks of property loss and damage.

0.4.3 Alternative Design

The construction of a long groyne combined with beach nourishment to protect the coast was considered. This alternative would involve extensive construction and the dredging of sand from offshore locations, which would result in high environmental impacts, particularly on marine life and ecosystems. Additionally, this option is expensive in both implementation and ongoing maintenance, and it was met with resistance during community consultations in 2019. For these reasons, the groyne and nourishment option was dismissed.

0.4.4 Preferred Alternative

After considering the alternatives, the "Do Nothing" approach is dismissed due to the severe socio-economic consequences, while the alternative design with a groyne was abandoned due to high environmental impact and implementation and maintenance cost. West Point was

selected as the focus area for intervention due to its vulnerability and the pressing need for protection.

0.5 PUBLIC PARTICIPATION

A stakeholder identification and analysis were conducted to inform this ESIA. Stakeholders were identified and a summary analysis of their expectations and concerns has been made. Stakeholders were classified into affected communities and interested parties as shown below:

- Affected parties:
    - Residents (men and women) of the Westpoint Township, communities and towns whose plots and livelihoods will be impacted by the project.
    - Vulnerable groups within the affected communities: lonely elderly people, families headed by women, families with many children, single-parent families, people with disabilities and other low-income groups.
    - Fishermen and fishmongers whose livelihood solely depend on their access to the beach and landing sites.
    - General public in Monrovia
- Interested parties:
    - State authorities.
    - Green Climate Fund (GCF).
    - UNDP
    - PMU
    - Community based organizations.
    - Local non-governmental organizations (NGOs).
    - Women's groups.
    - Local authorities.
    - Religious groups, including secret societies.
    - International community including experts and NGOs.

0.5.1 Stakeholder Engagement

Stakeholder engagement was carried out as follows.

- **High-level stakeholder consultation**

  A high-level stakeholder consultation was held on on 23 July 2024 at the West Point Town Hall. The meeting's aim was to brief key stakeholders (government entities and NGOs) on the Project's design, activities, and potential impacts, aiming to gather their feedback, address questions, and deliberate on their suggestions and concerns.

- **Community consultations**

  A Community Group Consultation (CGC) exercise was undertaken for the Project in August 2024. The location of the consultation was in the West Point Fanti area in ward 405.

- **Focus Group Discussions** (FGDs)

  Several FGDs were held as part of this ESIA with women, fishmongers and fishermen. In addition, FGDs that were conducted in 2019 were also incorporated in this report.

- **Key Informant Interviews**

  A key informant interview (KII) was conducted with the township commissioner to gain an understanding of the overall situation in the social area of influence (SAI). The interview provided valuable information about key services and structures in the area, as well as the community's fears and expectations regarding the project. Additionally, the interview offered insights into issues related to women in the community.

A summary of the key concerns raised by the stakeholders are listed in Box 0-2.

Box 0-2 Key concerns raised during stakeholder consultations

Key Concerns Articulated by Stakeholders

- **High-level stakeholder consultation**
  - The project's timeframe.
  - The funding of the project.
  - Access to the sea is needed for community survival: fishermen rely on it for their livelihood.
  - Possibility to revisit the design so that the long sandy beach is not lost.
  - Roles of both genders in the project, namely women.
  - Resettlement possibilities
  - Mitigation measures to be taken to mitigate impacts.

- **Community consultations**
    - Being compelled to stop fishing
    - Being relocated for construction
    - Being relocated once the land is protected
    - Loss of the beach as an entertainment area
    - Loss of access to the beaches
    - Increase in population at Westpoint
    - Increase in drug use
    - Increase in prostitution
    - Increase in theft incidents
    - Influx of workers

0.6 BASELINE CONDITIONS: THE PHYSICAL ENVIRONMENT

Understanding the baseline conditions of the physical environment will help assess the likely environmental impacts of developing the Project.

0.6.1 Climatological Conditions

The climate of Liberia is influenced by its equatorial location and proximity to the Atlantic Ocean, resulting in warm temperatures and high humidity year-round. The meteorological parameters—rain, temperature, humidity, barometric pressure, and wind—are critical for understanding environmental impacts on the Project and helps in guiding Project planning, particularly with aspects related to erosion control, drainage systems, and pollution dispersion. Meteorological Data was collected from the MBI weather station, situated about 5 km northeast of the project site, from May 2019 to August 2024. Key findings include:

- Rainfall: Liberia has distinct wet and dry seasons, with heavy rains from June to September. The MBI station recorded an annual average rainfall of 3,421.3 mm, with a decreasing trend over the years.
- Temperature: The country's temperature remains warm year-round with little seasonal variation. Monthly averages at the MBI station ranged between 25°C to 29°C, with peak temperatures from January to March and cooler periods from June to September.
- Humidity: High year-round, typically between 80% and 90%, with occasional peaks up to 100% during the wet season.
- Barometric Pressure: Varies between 1,007 and 1,016 mbar, with lower pressure observed during the dry season

- Wind: Wind speeds are moderate throughout the year averaging between 1.13 m/s and 1.95 m/s, with peaks up to 18.8 m/s. Winds predominantly blow west-south-west, with seasonal variations.

0.6.2 Geology, Topography and Bathymetry

The terrain of Liberia is predominantly underlain by Precambrian crystalline metamorphic rocks, part of the Guinea Shield. The region is characterized by granite, gneiss, and schist formations, with structural features exhibiting uniformity over large areas. Investigations revealed a coastal area primarily composed of Quaternary deposits, with notable Jurassic diabase formations at Cape Monrovia. Site investigations, including three boreholes drilled to a depth of 20 meters, showed a stratigraphy of loose silty sands with varying clay content, and bedrock (suspected gneiss) encountered at approximately 12 meters depth.

Liberia's topography consists of three main zones: a flat coastal plain, broken forested hills, and northern highland mountains. The project area, situated within the coastal plain, features a steep seabed off West Point, with water depths reaching 8 meters only 500 meters offshore. Bathymetric surveys indicated gentle slopes with sandy and silty seabed, alongside shallow areas and mudflats at the mouth of the Mesurado River, which can pose navigational hazards.

0.6.3 Currents, Waves and Tides

Liberian waters are situated between the Canary Current to the northwest and the Benguela Current to the east, with the Guinea Current significantly influencing offshore waters. Seasonal variations in the Guinea Current lead to minimum speeds from November to February and maximum speeds from May to September. The Guinea Current promotes high biological productivity, while the Guinea Undercurrent flows westerly beneath it.

Monrovia experiences a semi-diurnal tidal regime, characterized by two high and two low tides daily, extending about 10 kilometers inland in wetlands and rivers. A comprehensive tide data survey conducted from September to November 2023 revealed significant tidal parameters, including a highest astronomical tide (HAT) of 1.68 meters and a mean sea level (MSL) of 0.90 meters. The maximum tidal amplitude recorded was 1.54 meters, with an average rising tide duration of 6 hours and 19 minutes.

The wave regime along the coast is dominated by long-period swell waves generated by distant storms in the South Atlantic. Wave data collected in October 2023 showed that significant wave heights predominantly ranged from 0.6 to 1 meter, with maximum heights between 1 and 2 meters. Most waves originated from the southwest and south-southwest, with seasonal variations noted, particularly higher wave activity occurring from June to September during the rainy season.

Overall, the findings underscore the dynamic marine environment of Liberia, characterized by significant tidal movements and wave activity, which have important implications for coastal management and development projects.

0.6.4 Water Resources

Baseline water quality data for the project area was established during the Environmental and Social Assessment Report (ESAR) study in 2019, involving seven samples from the Mesurado River and estuary, and offshore ocean waters. To update this baseline, a new round of sampling was conducted in August 2024, collecting five water samples: two marine, two brackish, and one groundwater (Figure 0-2).

The water quality results are compared to relevant national and international standards for groundwater and marine/brackish water samples.

For groundwater, Nitrite and Phosphate levels exceeded the Liberia Ministry of Health standards. Metals traces were detected, all within acceptable limits and Extractable Petroleum Hydrocarbons (EPH) was detected, indicating potential hydrocarbon contamination.

For marine and brackish waters, comparisons with local standards showed that Total Dissolved Solids (TDS) exceeded acceptable levels in all samples, while Total Suspended Solids (TSS) exceeded the standards during the ESAR sampling round but were within limits in the recent assessment. Traces of metals were detected, within acceptable levels, and EPH and Gasoline Range Organics (GRO) were detected in some samples, suggesting hydrocarbon contamination.

Notably, concentrations of contaminants were generally lower in the recent samples compared to the 2019 data, potentially due to seasonal variations and dilution effects from the rainy season. Overall, while the water quality in the assessed areas shows compliance with most standards, the presence of certain contaminants indicates the need for ongoing monitoring and potential remediation efforts.

0.6.5 Sediment Budget and Quality

The coastal system around Monrovia features a complex interplay of coastal processes. The Monrovian coastline is characterized by a straight, sandy, wave-dominated beach with steep slopes and coarse sediment, typical of reflective coastlines. Sediment transport predominantly moves northwest, influenced by long-period swell waves. The area experiences significant erosion due to limited sediment input from the southern coast and active sand mining, where sand is harvested from nearby bars for construction purposes.

Two sediment samples, collected from the West Point coastline (Figure 0-2), were tested and compared to internation standards. In general, the results complied with the used standards. Metals such as iron, aluminium, and magnesium were detected, with concentrations within acceptable limits, reflecting the area's natural geology. Notably, no hydrocarbons were found in the tested samples.

0.6.6 Air Quality and Noise

Collection of baseline data for air quality was performed as part of this ESIA study. Data were collected at 2 locations, one on the coastline and another further inland (Figure 0-2). The results revealed high particulate matter concentrations (PM2.5 and PM10), especially near the coastline. Notably, levels of dust were high even during the rainy season, suggesting persistent air quality challenges.

Sources of air pollutants identified in the Project are include fuel combustion, vehicular traffic, motorized fishing vessels, domestic cooking using coal, waste burning, and dust from the road and the coastline.

Noise monitoring was conducted at the same 2 locations monitored for air quality. These locations fit within the Category D of the EPML Noise Pollution Control and Standards Regulations (2017), described as residential including industry or small-scale production and commerce. The noise levels exceeded the permissible limits for Category D at both locations. The monitoring revealed elevated noise levels at the coastline compared to inland locations, attributed to both human activities and natural sound amplification from waves.

Sources of noise in the Project area are significantly impacted by natural and anthropogenic activities including, waves crashing on the shoreline, vehicular traffic, residential and commercial activities at the West Point Township.

Figure 0-2 Sampling Location map

0.7 BASELINE CONDITIONS: THE BIOLOGICAL ENVIRONMENT

The beach in the project area is narrow and sandy and is home to a few species of crabs, molluscs, lizards and birds as elsewhere in the altered littoral fringe habitats close to Monrovia. The biological value is expected to be low as this is a beach which is constantly frequented by the fishermen and local community of West Point. It is polluted by solid waste and is widely used by the West Point community for defecation, due to the lack of toilets available in the township. Sea turtles do not nest on the West Point beach due to increased human traffic (day and night) and pollution. The coastal savannah that usually fringes beaches in Liberia is not present on the geomorphological formation underlying West Point, which is an unconsolidated sand spit: built structures start immediately above the active inter-tidal beach. Also, there is no mangrove development along the beach, because of the exposure to strong waves. However, a small patch of mangroves is found on the little island located behind the northern end of the beach at the outlet of the Mesurado River. Some mangrove trees, as well as some coastal savannah species, are also observed on the small beach created by the sand deposits south of the northern breakwater of the Monrovia port. On the northern end of West Point also, nested behind the beach, is a small lagoon that is surrounded by built structures and is being filled with solid waste and old tires to make space for new structures. It is heavily polluted by this waste and does not harbour any valuable biological life.

The Mesurado Wetland extends for about eight kilometres starting at about on kilometre from West Point. It is one of Liberia's five designated Wetlands of International Importance. Its ecological significance stems from its mangrove species (*Rhizophora harrisonii*, *R. mangle,* and *Avicennia africana*), which are under threat due to charcoal production and fuelwood harvesting. The wetland serves as a feeding and breeding ground for various bird species and hosts some species of national and/or international conservation concerns such as the African Sharp-Nosed Crocodile, the Water Chevrotain and the Red Colobus Monkey. The West African Manatee may also be present. Despite its ecological value, the Mesurado Wetland faces increasing threats from human activities, including the cutting of mangrove trees for fuel, construction materials, and medicinal uses, solid waste disposal, and urban encroachment.

Literature data on the continental shelf biodiversity in front of the West Point beach is not available. The shelf is dominated by sand and mud, with apparently few rocky areas. The nearshore zone presumably supports populations of crustaceans, polychaete worms, and molluscs, including commercially valuable species such as penaeid shrimps and crabs, as well as oysters. Limited seagrass and seaweed growth is due to factors like seasonal upwelling, turbid waters, and low habitat diversity. Data from 2019 suggests that the most commonly fished species in the nearshore waters of West Point are Barracuda (Pipe Fish), Cassava Croakers (Cassava Fish) and Snappers. The high proportion of Snappers in the landings

suggests that there are patches of rocky seabed offshore from West Point because these species are usually caught over rocky bottoms.

Some species of marine mammals and sea turtles previously recorded offshore of Liberia, including species of conservation concern, could be present offshore of West Point. However, they are not expected to come very close to shore or be affected by the project activities.

In order to get a better understanding of the fauna present in the project area, an environmental DNA (eDNA) survey was conducted in the coastal, riverine and estuarine waters in the project area. The survey identified a total of 949 Molecular Operational Taxonomic Units (MOTUs) and 241 distinct taxa. Among these, 52 taxa corresponded to vertebrates, including 37 fish species, eight mammals, four birds, and one reptile. The highest species diversity was observed in the estuarine habitat. Notably, the survey confirmed the presence of 13 species known to exist in Liberia and suggested potential presence for four additional species. Three species of conservation concern were identified in the estuarine samples: the Angola Dentex (*Dentex angolensis*), classified as Near Threatened; the Royal Threadfin (*Pentanemus quinquarius*), classified as Vulnerable; and the Shortfin Mako Shark (*Isurus oxyrinchus*), classified as Endangered.

0.8 BASELINE CONDITIONS: THE SOCIO-ECONOMIC ENVIRONMENT

To establish the socio-economic baseline along the coastline at Westpoint Township, the socio-economic characteristics of the social area of influence were assessed in terms of demographics, access to key resources and infrastructure, health, education, social capital, economic activities and food security. The data collected indicate several groups that may be vulnerable to the social, environmental, and economic changes that are likely as a result of the building of the revetment.

One of the most pressing problems in the SAI that was observed is the lack of sanitation facilities and the tendency for using beaches as a makeshift bathroom. People in the SAI have access to education, clinics, religious sites, water and different services. However, there are no hospitals in the SAI.

Residents of West Point and other coastal communities in Monrovia primarily rely on petty trade, fishing, and fish mongering for their livelihoods. A smaller percentage of residents engage in other occupations, such as security guard services, operating commercial motorbikes or vehicles, and undertaking small contracts for fellow community members. Unemployment and poverty rates are high in West Point, particularly among the over 90% of residents who depend on fishing and fish mongering, primarily those of Kru and Fanti descent.

Based on the fieldwork conducted in the SAI and to the West Point Women for Health and Development, the rate of sexual and gender-based violence (SGBV) and rape is moderate despite the congestion of the community.

0.9 ENVIRONMENTAL AND SOCIAL MITIGATION, MANAGEMENT, AND MONITORING

0.9.1 Summary of Environmental and Social Impacts

The Project will significantly benefit the local community, particularly fishermen and fish mongers affected by severe beach erosion and flooding. Key positive impacts include:

Reduced Beach Erosion and Flood Protection: The revetment will protect local infrastructure and homes from erosion and flooding, directly improving community livelihoods.

Job Creation and Economic Boost: The project will generate employment and stimulate the local economy through the purchase of supplies, with a focus on hiring local labor, including women, thereby enhancing community engagement and income.

Improved Fishermen's Landing Sites: Enhanced landing sites will facilitate fishing operations, potentially increasing income for local fishermen.

Recreational Spaces Creation: New recreational areas, such as a green promenade, will provide community spaces for leisure and social engagement.

Enhanced Livelihoods for Fish Mongers: The provision of cook-stoves and cold storage will help fish mongers, primarily women, adopt more sustainable and profitable practices.

Strengthened Climate Resilience Management: The project will enhance national climate resilience by building institutional capacity, promoting sustainable coastal management, and involving communities in climate adaptation efforts.

Mangrove Protection and Conservation: The project will protect mangroves in Monrovia's Mesurado Wetland, enhancing coastal defence, supporting biodiversity, and contributing to climate change mitigation through carbon sequestration.

Creation of Artificial Habitats: The revetment will provide new hard surfaces that support marine life, enhancing local biodiversity by creating habitats that mimic natural rocky shorelines.

Conversely, the project will result in a number of negative impacts affecting human the local socio-economy, public and occupational health and safety, water, air and soil quality, visual amenity among other impacts as follows:

Community Impacts:

- Increase of criminal activities due to the increase of foreign people in the area.
- Local communities are not engaged and consulted in a satisfactory and timely manner, or vulnerable groups are not included in community consultations.
- Incoming workers do not respect local communities, leading to social disruption.
- Local people's livelihoods are adversely affected by project activities.
- Cumulative losses are incurred by social groups unable to respond to change.
- Project-affected persons are unable to seek the redress of their grievances.
- Sexual exploitation and gender-based violence increase in local communities, particularly due to the influx of temporary labourers
- The disruption of the social relationship the communities share with the beach and their ability to access it at all points. The beach represents a social and an entertainment space for the communities.
- The possibility of economic displacement due to the disruption of fishermen and fishmongers' usual activities in the area.
- Spread of communicable diseases such as HIV in the communities due to the increase of population and the influx of workers.
- Fishermen would lose access to landing sites during construction.
- Disrupting fishing and leisure activities due to the installation of materials stores, workshops, machinery parking areas, laydown yards, vehicle movement, etc.
- Increased traffic on public roads leading to more accidents and generating nuisance levels of dust and noise, especially on the roads between the project area and the port of Monrovia and those between the project area and the quarry site(s).
- Public injuries during on-site work and material transportation, particularly affecting children.
- Increased risk of infectious diseases in local communities.

Occupational Health and Safety Risks:

- Injuries from improper tool use, exposure to hazards, and accidents.
- Risks of drowning and slipping in the ocean, as well as exposure to UV light and infectious diseases.

Labor and Working Conditions:

- Unfair employment practices, including inadequate opportunities for local workers and failure to respect women quotas.
- Poor worker accommodations and sanitation leading to health issues.
- Inability for workers to voice grievances.

Cultural Heritage Risks:

- Potential damage to undiscovered cultural or archaeological sites during construction.
- Waste Management Issues:
- Pollution from improper waste management affecting soil, air, and water resources.
- Contamination due to incorrect disposal of dredged materials.

Hazardous Materials Risks: Pollution and health risks from spills and mishandling of hazardous materials, including oil and lubricants.

Water Resource Pollution:

- Contamination of surface water and groundwater from waste, chemicals, and potentially contaminated sediments.
- Increased turbidity and potential release of contaminants during exaction and dredging.

Coastal Sediment Changes:

- Altered sediment dynamics leading to erosion and habitat loss, particularly in the Mesurado estuary.
- Risks from unexploded ordnance (UXO) at construction sites.
- Risk of illegal sand mining activities impacting the stability of the revetment wall.

Soil and Land Resource Issues: Potential soil contamination and damage to disposal sites due to project activities.

Air Quality and Climate Effects: Increased dust and emissions affecting local air quality.

Noise and Vibration Impacts: Disruption from construction noise and vibrations affecting local communities and marine fauna.

Fauna and Flora Disruption:

- Habitat destruction and direct damage to natural habitats and spawning grounds from excavation and dredging.
- Attraction of wildlife to nighttime lighting posing physical hazards.

Visual Amenity Degradation: Negative impacts on the visual landscape and recreational appeal of the area due to construction.

0.9.2 Mitigation Strategy

For each of the adverse environmental and social impacts identified, a mitigation strategy is defined, categorized as one or more of the standard practices of avoidance, reduction, mitigation /remediation and compensation / offset. For each impact, an approach to fulfil the appropriate strategy is then identified. This is translated into practical mitigation actions in the Environmental and Social Management Plan (ESMP, see Section 11.4.2).

The ESMP is the main reference that describes the mitigation measures, monitoring program, institutional arrangements, and budget required for the proposed project activities. Rather than have separate plans for managing health and safety, gender and social inclusion, biodiversity, hazardous materials, etc., the ESMP encompasses all of these aspects. The disadvantage of numerous sub-plans is the risk of contradiction, duplication and omission where topic areas overlap. The strength of a single, encompassing plan is that actions, standards to be achieved and responsibilities are clearly defined and can be easily monitored to ensure effectiveness.

In order to make it possible to manage the identified adverse environmental and social risks and impacts in a structured way, they are disaggregated within areas of risk. This led to the following categories and impact mitigation headings that are used as the basis of the overall ESMP.

Overall safeguards

1. General Environmental Protection

Protection of people

2. Community protection measures, including gender and social inclusion
3. Environmental Health and Safety
4. Occupational Health and Safety
5. Labour and Working Conditions
6. Cultural Heritage

Pollution control

7. Waste Management
8. Hazardous Material Management

Environmental safeguards

9. Water Resources Management
10. Coastal Sediment Resources Management
11. Soil and Land Resources Management
12. Air Quality Management, including GHG emissions
13. Noise and Vibration Management
14. Fauna and Flora Protection
15. Visual Amenity

Through these categories, the ESMP lays out the management system to ensure that all the environmental and social measures required by the Government of Liberia, GCF, and UNDP, are addressed to adequate, defined standards, and that this can be ascertained through monitoring. Most of the ESMP content is given over to practical actions in all project activities, and guidelines to support these actions in meeting national and international standards.

The ESMP allows the identified potential impacts to be reduced to acceptable residual levels. Mostly they are categorized as negligible. A few are classed as minor residual impacts, where it is impossible to remove risk or restore environmental conditions completely. Examples of these are traffic safety risks, increased turbidity in the coastal waters during excavation and dredging, and noise and vibration. Beyond issues of this nature, the ESMP, if implemented as proposed, will provide an effective mitigation system for the Project.

0.9.3 Responsibilities for ESMP Implementation

The EPA is responsible for the overall supervision and implementation of the ESMP through its PMU and contractor. The PMU and the Contractor must each have the following staff:

- An Environmental Officer
- An Occupational Health and Safety Officer.
- A Social and Gender Officer, supported by a Community Liaison Officer.

The PMU must require its contractors to implement the Project in accordance with this ESMP.

The EPA is the lead agency for environmental protection and management in Liberia. The EPA is mandated to enforce the EPML of 2003, under which the EPA will issue an environmental permit prior to commencement of the rehabilitation works. The EPA will monitor project activities from time to time through field visits and through review of quarterly environmental compliance reports prepared by an EPA-accredited independent third party (ITP) and submitted to it by the PMU.

0.9.4 Environmental and Social Monitoring

The main objectives of environmental and social monitoring are to assess the changes in environmental and social conditions, monitor the effective implementation of mitigation measures recommended in this ESIA, and indicate potential problems in order to allow prompt implementation of effective corrective measures, so as to minimize the negative impacts generated.

Therefore, the implementation of a monitoring program ensures that the legal obligations and the environmental and social safeguards identified as necessary are all satisfactorily complied with, so as to reduce the impact of the Project on the environment and people. The program covers monitoring of weather data, soil quality, groundwater quality, surface water quality, air quality, noise and vibration, waste management, biodiversity, society – including employees, handling of fuel and hazardous materials, and health and safety. See Section 11.5 for further details.

0.9.5 Environmental and Social Action Plan and Budget

The main environmental and social actions that must be implemented and documents that must be developed by the PMU and the Contractor are listed in Table 0-1, along with the responsible entity and the approximate cost. The PMU must ensure that all items listed in the Table are completed or in place before the related work can begin.

Table 0-1 Environmental and social action plan and budget

No.	Item	Responsibility	Approximate cost (USD)
Before activities begin			
1.	Project Environmental and Social Management System (ESMS)	PMU	30,000
2.	Contractor's Environmental and Social Management System (ESMS)	Contractor	30,000
3.	Contractor's Environmental and Social Management Plan (C-ESMP)	Contractor	60,000
4.	Emergency Preparedness and Response Plan (EPRP) (as per guidelines in Appendix K)	Contractor	45,000
5.	Waste Management Plan (WMP)	Contractor	40,000
6.	Waste Management Plan for vessels	Contractor	25,000
7.	Dredging Management Plan (DMP) (as per guidelines in Appendix N)	Contractor	150,000
8.	Occupational Health and Safety Plan (OHSP) (as per guidelines in Appendix M)	Contractor	40,000
9.	Project Grievance Redress Mechanism (GRM)	PMU	Under PMU operational cost
10.	Internal Grievance Redress Mechanism (GRM)	Contractor	Under Contractor operational cost
11.	Labour Management Plan (LMP)	Contractor	30,000
12.	Traffic Management Plan	Contractor	30,000

No.	Item	Responsibility	Approximate cost (USD)
13.	Stakeholder Engagement Plan (SEP)	PMU	Under PMU operational cost
14.	Livelihood Restoration Plan (LRP)	PMU	40,000
Throughout the Project			
15.	Monitoring Equipment Cost – initial set-up (*Includes 2 multiparameter water monitoring probes, 1 noise level meter, 1 handheld gas monitoring device, and 1 weather station. Does not include cost of calibration, sensor or equipment replacement*)	PMU	75,000
16.	Regular environmental sampling for soil and sediment and water quality (*Does not cover contingency cost in case of spill or complaint)*	ITP	25,000 / year
17.	Regular environmental surveys for water flows, sediment drift, erosion and deposition	ITP	*To be determined*
18.	Monthly environmental and social monitoring reports	Contractor	6,000 / report
19.	Quarterly monitoring reports	ITP	7,500 / report
20.	Yearly environmental, social, and health and safety audit	ITP	30,000 / report
21.	Bi-annual progress reports to UNDP	PMU	Under PMU operational cost
Before decommissioning			
22.	Restoration and Rehabilitation Plan	Contractor	50,000

1 INTRODUCTION

This report is the Environmental and Social Impact Assessment (ESIA) Report for the Coastal Defence Structure at West Point - Monrovia Metropolitan Climate Resilience Project (MMCRP) in the West Point area in Monrovia, Liberia. ("the Project"). This document has been prepared by Earthtime Inc. ("Earthtime") for the Project Implementation Unit (PMU) at the Environmental Protection Agency (EPA) of Liberia.

1.1 OVERVIEW

The MMCRP, financed by the Green Climate Fund (GCF), aims at building the long-term climate resilience of coastal communities in Liberia by both addressing immediate adaptation priorities and creating an enabling environment for up-scaling coastal adaptation initiatives to other parts of Monrovia and Liberia.

The Project seeks to address immediate and long-term impacts of climate change on the coast of Monrovia by enhancing coastal protection, fostering improved coastal management, and presenting local communities with diversified climate-resilient livelihoods. This will be accomplished through three outputs, as follows.

- Output 1: Protection of coastal communities and infrastructure at West Point against erosion caused by sea level rise and increasingly frequent high-intensity storms.

  This will be achieved by building a coastal revetment on 1,050 m of coastline at West Point, ensuring landings for fishing boats.

- Output 2: Institutional capacity building and policy support for the implementation of Integrated Coastal Zone Management (ICZM) across Liberia.
- Output 3: Protecting mangroves and strengthening gender- and climate-sensitive livelihoods to build local climate resilience in Monrovia.

The EPA of Liberia, in close collaboration with the Ministry of Mines and Energy (MME), the Ministry of Finance and Development Planning (MFDP), and the Ministry of Public Works (MPW), will implement the MMCRP through the PMU based at the EPA.

The United Nations Development Programme (UNDP), as an Accredited Entity to the GCF, will provide oversight and quality assurance services to the MMCRP. The PMU will be responsible for the implementation of the Project with support from the EPA and UNDP.

1.2 HISTORICAL BACKGROUND

In 2019, during the design phase of the MMCRP, five coastal sections were considered for

erosion control in Monrovia. West Point was ultimately chosen as the most suitable location for an intervention, due to its dense population, its low-lying land highly susceptible to sea-level rise, and the urgent need to protect its residents from the risks of property loss and damage. A conceptual design of the coastal defence structure (rock revetment) to be constructed at West Point was developed during the design stage of the MMCRP. Based on this conceptual design, an Environmental and Social Assessment Report (ESAR) was prepared to safeguard the environment and society through the implementation of the Project and beyond. In addition to the ESAR, the Social and Environmental Screening Procedure (SESP) was carried out to assess how the Project has integrated the overarching principles of UNDP's Social and Environmental Standards (SES).

A project site-specific Hydro Engineering Study and Detailed Design (HESDD) of West Point has been conducted to ensure that the risks of potential localized and broader flooding are incorporated in the detailed design of the defence structure that will be installed at West Point. The final detailed design report was submitted in April 2024 and was based on the existing conceptual design provided in the Engineering Sub-assessment funded by GCF's project preparatory fund (PPF) resources, and considered best practices and lessons learned from other coastal protection interventions in Monrovia.

1.3 OBJECTIVES OF THE ESIA

One of the first steps towards environmental and social compliance is the production of an ESIA and an Environmental and Social Management Plan (ESMP). The ESIA's main objective is to ensure that the potential environmental and social risks and impacts associated with project activities from the different phases of the Project are identified, their significance is assessed, and appropriate mitigation, management and monitoring measures are proposed to eliminate or minimize such impacts during a reasonable timeframe. This document includes an ESMP which is designed to be immediately usable as a self-standing safeguards manual for the Project. The ESIA Report has been prepared in accordance with the following regulations and guidelines (see Section 2 for further detail).

- The EPA of Liberia's regulations and standards, specifically:
    - Sections 13 and 14 of the Liberian Environmental Protection and Management Law (EPML) of 2003.
    - The ESIA Procedural Guidelines of 2022.
    - The Approved Parameters of Concern (POCs) for Different Environmental Projects.
- The GCF Revised Environmental and Social Policy (ESP), which serves as the overarching framework for GCF safeguards and reinforces the application of the

International Finance Corporation (IFC) Environmental and Social Performance Standards (PS), which are used as the interim Environmental and Social Safeguards (ESS) by the GCF.

- UNDP's Social and Environmental Standards (SES)
- Good International Industry Practice (GIIP).

1.4 SCOPE OF THE ESIA

The ESIA primarily covers the construction, operation and decommissioning phases of the establishment of a coastal defence structure in West Point and its ancillary facilities (see Section 3 for further detail). It also considers impacts associated with livelihood activities under outputs 2 and 3 pertaining to strengthening coastal management through policy support and protecting mangroves while promoting climate-resilient livelihoods.

1.5 STRUCTURE OF THE ESIA REPORT

The ESIA Report has been organized in 11 sections covering all the items listed in the Liberia ESIA Procedural Guidelines (EPA, 2022), as well as the various pertinent UNDP and GCF requirements. The ESIA Report structure is summarized in Table 1-1.

Table 1-1 ESIA Report structure

Section	Title	Contents
0	Executive Summary	Summarizes the ESIA Report.
1	Introduction	Presents a brief background of the Project, and the objective, scope, approach, and structure of the report.
2	Legal and Institutional Framework	Describes the legal and policy requirements as well as the administrative structure relevant to the Project.
3	Project Description	Describes the need and desirability of the Project, as well as project location, duration, design, and activities.
4	Project Alternatives	Analyses the various alternatives that were assessed for the Project.
5	Public Participation and Stakeholder Engagement	Summarizes stakeholder engagement activities and findings.
6	Baseline Conditions: The Physical Environment	Provides a detailed baseline assessment of the receiving physical environment.
7	Baseline Conditions: The Biological Environment	Provides a detailed baseline assessment of the receiving biological environment.
8	Baseline Conditions: The Socio-economic Environment	Provides a detailed baseline assessment of the receiving socio-economic environment.
9	Environmental and Social Assessment of Impacts	Presents i) the standardized approach to impact assessment in order to make the findings, conclusions, and recommendations more objective and transparent, and ii) the actual assessment of the Project's impacts to the physical, biological, and socio-economic environments.
10	Environmental and Social Mitigation	Describes the approach followed to set mitigation measures that must be put in place for each potential impact.

Section	Title	Contents
11	Environmental and Social Management Plan	Outlines i) the proposed management measures, costs, and responsibilities to implement the mitigation and enhancement measures, ii) procedures essential for effectively monitoring social and environmental mitigation and management measures, and iii) the action plan that must be implemented throughout the Project.

2 LEGAL AND INSTITUTIONAL FRAMEWORK

2.1 NATIONAL LEGISLATION, POLICIES AND REGULATIONS

The main categories of legislation in Liberia are described in Table 2-1. A summary of the Liberian legislation relevant to the Project is presented in Table 2-2, while a summary of the relevant national policies, strategies, guidelines, codes and plans is provided in Table 2-3. Details from selected relevant national legislation are described in sections 2.1.1 through 2.1.3.

Table 2-1 – Categories of legislation in Liberia

Category	Description
Law	Laws are passed by the National Legislature of Liberia, comprising the Senate and the House of Representatives. Any citizen or group of citizens, Cabinet Ministers, Managing Directors of public corporations or agencies can propose a bill to the National Legislature for enactment. The draft bill is first passed over to the appropriate Steering Committee of the Legislature. In the case of environmental bills, this committee is generally the Committee on Natural Resources, Energy and the Environment. The Committee reviews, assesses and presents the bill to the Legislative Plenary with appropriate amendments for debate, public hearing and subsequent enactment by the Legislature.
Executive order	The Executive Branch of government headed by the President, is charged with the duty to either approve those bills or reject them. If the President signs a bill into law; it goes immediately into effect unless there is another effective date noted. Equally, the President can issue Executive Orders without the approval of the National Legislature. The Executive orders have the power of a law provided that they do not contravene the existing law. The power of such orders has a limited time of existence.
Regulation	The national Legislature has empowered Cabinet Ministers and Managing Directors of public corporations and agencies to issue regulations for their respective functionaries without legislative approval or supervision, provided that such regulations are consistent with the statutory laws and the constitution of Liberia.

Table 2-2 – Relevant national laws

Category	Title	Year	Description
General	Constitution of the Republic of Liberia	1986	The 1986 Constitution is the main legal framework which provides for the rights, equal treatment, and protection of all Liberian citizens and those residing within the borders of Liberia. It ensures that no citizen is discriminated against on the basis of sex, age, ethnic background, religious belief, political affiliation, social and economic status.
Environment	The Environment Protection Agency (EPA) Act	2003	The Act provides the EPA with the authority of government for the protection and management of the environment in Liberia. It provides for an Environmental Administrative Court to hear from aggrieved parties and requires that an Environmental and Social Impact Assessment (ESIA) be carried out for all activities and projects likely to have an adverse impact on the environment.
	The Environment Protection and Management Law (EPML)	2003	The law enables the EPA to protect the environment through the implementation of the Law. It arranges the rules, regulations, and procedures for the conduct of ESIAs and establishes regulations for environmental quality standards, pollution control and licensing, among others.
	Asbestos Regulation of Liberia	2017	The regulation basically bans the production, importation, sale and distribution of asbestos or materials containing asbestos in Liberia and gives the responsibility to the EPA to locate and dispose of all asbestos material in the country.
Biodiversity conservation	The Natural Resources Law of Liberia	1979	This Law includes chapters on forests, fish, and wildlife, soil, water, and minerals.
	Wildlife and National Parks Act	1988	The Act identifies a number of protected areas and specifies policies and objectives regarding wildlife and conservation in the country.
	National Wildlife Conservation and Protected Areas Management Law	2016	The Law updates the 1988 law on wildlife and national parks. It includes a number of important provisions relating to biodiversity and protected areas.
Fisheries	New Fisheries Regulations	2010	These Regulations implement the Laws on Marine Fisheries, 1976. They provide rules for the marine fisheries sector, including fisheries conservation and management; fishing and operating of fishing vessels; requirements and procedures for licenses and authorizations, and conditions and requirements for fishing, transhipment and the use of ports.
	Fisheries and Aquaculture Management and Development Law	2019	This law provides a management framework for the fisheries and aquaculture sector. It aims at ensuring the long-term management, conservation, development and sustainable use of the fisheries and aquaculture resources and related ecosystems.

Category	Title	Year	Description
Water resources	Water Resources (Wetlands, Rivers, Lakes, Groundwater and Sea Shore) Management Regulations	2009	These Regulations are pursuant of the provisions of the EPML (2003) and apply to all water resources and water bodies in Liberia.
	Water Quality Regulations of Liberia (draft)	2018	These Regulations prohibit the pollution of water resources, including inland, coastal and marine waters. The regulations layout the maximum allowable concentrations for water quality for domestic use, effluent discharge to the environment, irrigation water and recreational waters. They also provide measures for compliance, enforcement and offences. Under these regulations, a license for water abstraction must be obtained prior to abstracting spring water, ground water or carrying out any activity near any water body that is likely to have adverse impact on the quantity and quality of the water; and an effluent discharge license must be obtained prior to discharging any effluent from sewage treatment works, industry or other point sources into the aquatic environment.
Occupational health and safety	Work Act of Liberia	2015	The Act repealed Title 18 of the Executive Law, Labour Practices of 1956. This is the most important piece of legislation on occupational health and safety in Liberia. Part VI of the Act provides the legal framework for occupational health and safety and outlines the general duties of employers and employees with respect to occupational health, safety and welfare in the workplace.
Public health and safety	Public Health Law	1976	This Law provides a framework for the management of public health and health systems in Liberia.
	Public Health Law, Revised	2017	This law is the revised version of the 1976 public health law. It provides to a wide array of matters concerning public health, including, among other things, animal diseases, communicable diseases, veterinary drugs, environmental sanitation, hygiene in food establishments, control of parasites and mosquitoes, placing on the market of food, freshwater pollution and drinking water.
Maritime	Maritime Law (Revised)	2013	This law makes provisions with respect to marine navigation and the registration of marine vessels in Liberia. The Act also provides for the taxation of fishing vessels.
	Maritime Regulations	2002	These Regulations implement provisions of the Maritime law with respect to a wide variety of matters such as the control of navigation, the prevention of marine pollution by ships, the documentation on board of vessels, the equipment of ships and radio installations, the inspections and the ship property rights. They regulate discharge from ships of oil, noxious substances and garbage.

Category	Title	Year	Description
	Maritime Authority Act	2010	The Act established the Liberia Maritime Authority and defined its functions and powers which, according to the act, include promoting the enactment of national legislation regarding the responsibilities of the Republic of Liberia under the United Nations Convention on the Law of the Sea of 1982 and other maritime-related international instruments, the development, coordination and implementation of the National Maritime Strategy, in addition to functions in coastal zone management.

Table 2-3 – Relevant national policies, strategies, guidelines, codes and plans

Category	Title	Year	Description
Environment	National Environmental Policy	2003	The policy provides a systematic and logical framework by which to address environmental issues. Section 4.7 of the policy calls for an ESIA on all major developmental, socioeconomic and land use activities in any form that may have adverse effects/impacts on the environment to one degree or another.
	National Environmental Action Plan (NEAP) (2019-2023)	2019	Based on the finding of the State of the Environment Report for Liberia (2007-1018) which identified the outstanding environmental challenges in Liberia, the Plan recommends the actions to be undertaken by the Liberian Government for the management of the environmental resources of the country between 2019 and 2023.
	Environmental & Social Impact Assessment (ESIA) Revised Procedural Guidelines	2022	The ESIA Revised Procedural Guidelines provides the lasted administrative procedures and requirements for the preparation of ESIAs to ensure effective environmental governance.
Biodiversity	National Biodiversity Strategy and Action Plan (2017-2025)	2017	The Plan implements the United Nations Convention on Biological Diversity, of which Liberia is a member, on the national level.
Water resources	National Integrated Water Resources Management Policy	2007	The Policy is intended to assist decision-makers and resource users in determining the roles in water resources management, "who does what and how", and in making priorities at the national level as well as at the private sector, local community, and individual levels.

Category	Title	Year	Description
Climate	National Strategy for Reducing Emissions from Deforestation and Forest Degradation (REDD+)	2016	The document indicates a number of Strategic Priorities, as follows (i) reduce forest loss from pit sawing, charcoal production and shifting agriculture, (ii) reduce impact of commercial logging, (iii) complete and manage a network of Protected Areas; (iv) prevent or offset clearance of high carbon stock and high conservation value forest in agricultural and mining concessions, and (v) fair and sustainable benefits from REDD+. For each of the priorities, there is a set of Strategy Options that define more specifically how the Strategy can be achieved.
	National Policy and Response Strategy on Climate Change	2018	The policy sets the basic analysis, mitigation and prevention issues and principles related to the adverse impacts and consequences of climate change on the Liberian territory. The policy recognized some sectors as the most impacted by climate change and the priority for adaptation. These prioritized sectors were forestry and wildlife, agriculture, coastal area, water, fishery, energy, mining, industry, transport and tourism, infrastructure, urbanization; and social sectors including health and settlement.
	Liberia's Revised Nationally Determined Contribution	2021	This revised Nationally Determined Contribution (NDC) is a 10-year nationwide sectoral document aiming at reducing the economy-wide greenhouse gas emissions by 64% below the projected business-as-usual level by 2030 though GHG mitigation and adaptation targets across various sectors including Agriculture, Forests, Coastal zones, Fisheries, Health, Transport, Industry, Energy, and Waste.
Health	National Environmental and Occupational Health Policy	2010	The Policy contains plans for improving the environmental and occupational health situation in Liberia. The Policy aims to reduce disease and socio-economic burdens due to poor environmental health conditions and practices, occupational fatalities and accidents, and work-related illnesses and to ensure healthier communities and workplaces within Liberia.
	National Health Policy and National Health Plan	2011	The document is a framework for health sector reforms in Liberia. The goal of the policy is to make health care delivery services throughout the country effective and efficient, thereby enhancing the quality of life of the population.
Chemicals and hazardous materials	Liberia National Contingency Plan for Pollution from Oil and Other Noxious and Hazardous Substances (Draft)	2012	Although still in its draft form, the Plan is currently being used by the Liberian Government. The Plan defines the national protocol for the national response to spills of oil and other hazardous or noxious substances into the marine environment. It sets out the responsibilities for the operational response to such incidents.

Category	Title	Year	Description
	Guidelines for the Importation, Handling, Transportation and Storage of Chemicals in Liberia	2020	The Guidelines prohibit the importation of chemicals restricted under international conventions to which Liberia is a state party. Under these Guidelines, all entities planning to import, store, handle or transport chemicals into the country must obtain a license from the EPA. The Guidelines provides for the "Pollutant Registry" which is a management system of chemicals and pollutants in the country and an information platform concerning the chemicals present in the country.
Fisheries	Fisheries and Aquaculture Policy and Strategy	2014	This document provides guidance for the management and development of the fisheries sector.
Human rights and gender	National Gender Policy	2009	The Policy is intended to eradicate and eliminate all gender related problems in Liberia.
	National Human Rights Action Plan	2013	The Plan seeks to strengthen Liberia's commitment to foster and guarantee the overall development of all persons and populations by respecting, defending, and promoting their human rights, ensuring the full exercise of civil, political, social, economic, cultural, and environmental rights.

2.1.1 Constitution of the Republic of Liberia

The 1986 Constitution is the main legal framework which provides for the rights, equal treatment, and protection of all Liberian citizens and those residing within the borders of Liberia. It ensures that no citizen is discriminated against on the basis of sex, age, ethnic background, religious belief, political affiliation, social and economic status.

Article 7 of the 1986 Constitution of the Republic of Liberia sets the fundamental basis for the constitutional, legislative, and institutional frameworks for the protection and management of the environment. It also encourages public participation in the protection and management of the environment and the natural resources in Liberia.

Article 8 of the Constitution states that the Republic shall direct its policy toward ensuring for all citizens, without discrimination, opportunities for employment and livelihood under just humane conditions, and towards promoting safety, health, and welfare facilities in employment.

2.1.2 The Environmental Protection Agency Act

The Environmental Protection Agency Act established the Environment Protection Agency of the Republic of Liberia, known as the Environment Protection Agency (EPA) as "a monitoring, coordinating and supervisory authority for the sustainable management of the environment in partnership with regulated Ministries and organizations and in a close and responsive relationship with the people of Liberia; and to provide high quality information and advice on the state of the environment and for matters connected therewith".

The Act was approved on November 26, 2002 and published on April 30, 2003. The establishment of the EPA marked a significant step forward in the protection and management of the environment of Liberia.

Section 5 of the Act designates the EPA as the principal Liberian authority for environmental management which shall co-ordinate, monitor, supervise, and consult with relevant stakeholders on all the activities for environmental protection and the sustainable use of natural resources. Section 6 (b) of the Act stipulates that the EPA should propose environmental policies and strategies to the Policy Council and ensure the integration of environmental concerns in the overall national planning. Moreover, the EPA is empowered to carry out, among other things, the following aspects of environmental protection and management in Liberia:

- Establish environmental criteria, guidelines, specifications, and standards for production processes and the sustainable use of natural resources for the health and

welfare of the present generation, and in order to prevent environmental degradation for the welfare of the future generations.

- Identify projects, activities, and programs for which environmental impact assessment must be conducted under this Law.
- Review and approve environmental impact statements (EIS) and environmental impact assessment (EIA) submitted in accordance with this Act.
- Monitor and assess projects, programs, and policies including activities being carried out by relevant ministries and bodies to ensure that the environment is not degraded by such activities and that environmental management objectives are adhered to and adequate early warning and monitoring on impending environmental emergencies is given.
- Review sectoral environmental laws and regulations and recommend for amendments and to initiate proposals for the enactment of environmental legislations in accordance with this Act or any other Act.
- Encourage the use of appropriate environmentally sound technologies and renewable sources of energy and natural resources.
- Function as the national clearinghouse for all activities relating to regional and international environment-related conventions, treaties and agreements, and as national liaison with the secretariat for all such regional and international instruments.

2.1.3 Act Adopting the Environment Protection and Management Law of the Republic of Liberia

The Environment Protection and Management Law (EPML) is the principal piece of legislation covering environmental protection and management in Liberia in parallel to the EPA Act. This Act provides the legal framework for the sustainable development, management and protection of the environment by the EPA in partnership with relevant ministries, autonomous agencies and organizations. It also stresses inter-sectoral coordination while allowing for sector specific statutes.

The EPML defines the specific requirements for performing an Environmental and Social Impact Assessment (ESIA) and other measures required to protect the environment in Liberia.

A summary of the key sections of the EPML are presented in Table 2-4.

Table 2-4 – Key sections of the Environment Protection Management Law

Section	Description
6	Requires an ESIA license or permit for the commencement of projects that have the potential to impact the environment. An ESIA is required for some specific types of projects (defined in Annex I of the EPML), while the need for an ESIA for other projects may be determined on a case-by-case basis.
12	Requires environmental review for projects or activities that may have significant impact on the environment. Project proponent shall submit to the EPA their plans for improving environmental performance, including: • Identification of the major environmental effects; and • A comprehensive mitigation plan in accordance with Section 15 of this law.
13	Requires the preparation of an environmental impact study.
15	Business investors should present an environmental mitigation plan to the EPA, which should include the following sections: • Objectives; • Description of activities to be carried out by the project to mitigate any adverse effects on the environment; • Period within which the mitigation measures shall be implemented; and • Proven effectiveness of the mitigation measures by indicating their experimental nature.
24	The EPA should ensure that projects comply with their environmental mitigation plans through monitoring of their operations. Where evidence of non-compliance occurs, the EPA shall impose remedial measures and may bring action before the Environmental Court or through the Ministry of Justice to enforce compliance.
25	The EPA is responsible for carrying out periodic environmental audits of activities or projects likely to have adverse effects on the environment.
58	An "Effluent Discharge License" must be obtained from the EPA for any type of discharge into the sewage system, also in case of operation of a sewage system. This license does not exceed one year.
64	Requires project proponents to acquire a "Solid and Hazardous Waste Disposal License" in case of generation, storage, handling, transport or disposal of hazardous waste, or else ownership or operation of a waste disposal site. The EPA provides this license for a period of not more than one year. This license obliges the party who is generating the waste to take up waste management measures such as treatment, determination or recycling and remediation.
71	Requires a "Pollution Emission License" for any project or activity which is likely to pollute the environment in excess of any standards or guidelines issued under this Law (the EPML). The EPA provides this license for a period of not more than one year.
74	The EPA may prescribe general or specific guidelines for the management of rivers, lakes or wetlands. Those of specific relevance to the project include: • Measures for the prevention or control of soil erosion; • The conservation of any vegetation growing in and around a river, lake or wetland; • The contingency plan for the prevention and control of any deliberate or accidental discharge which is likely to pollute the river, wetland or lake; and • The control measures to be taken in harvesting minerals including the strategies for the restoration of mining sites.

Section	Description
75	Prohibits the activities below in relation with any river, lake or wetland declared as protected areas by the EPA. These activities include: • Using, erecting, constructing, placing, altering, extending, removing or demolishing any structure in, on, under, or over the bed; • Excavating, drilling, tunnelling or disturbing the bed otherwise; • Introducing or planting any part of a plant, plant specimen or organism whether alien or indigenous, dead or alive in a river, lake or wetland; • Introducing any animal or microorganism whether alien or indigenous, dead or alive in a river, lake or wetland; • Depositing any substance in a river, lake, or wetland or in or under its bed, which is likely to have adverse environmental effects on the river, lake or wetland; • Directing or blocking a river, lake or wetland from its natural and normal course; and • Draining any river, lake or wetland.
80	Provides an outline framework for the Protection of Wild Animals and Birds and includes conservation areas. It differentiates wildlife protected areas in section 80 (4) – national park, wildlife reserve, and nature reserve – from wildlife management areas in section 80 (5) – wildlife sanctuary, and community wildlife area – while also stating that the Line Ministry can designate any other area as either as it sees fit.
83-85	Provide the enabling environment for the conservation of biodiversity, charging the EPA with responsibility for a wide range of measures from preparing national conservation strategies to selecting and managing buffer zones to protected areas, to issuing guidelines for botanical gardens.
91	The EPA may impose on the party that has caused or is likely to cause harm to the environment an "Environmental Restoration Order," requiring it to remedy/prevent the harm within 21 days of the service of the order.
92	Allows the party to request the Agency to reconsider that order (Section 91) by giving reasons in writing within the same period.
107	States that non-compliance with the restoration order convicts the responsible party to imprisonment and/or a fine.

2.2 NATIONAL ENVIRONMENTAL ADMINISTRATIVE FRAMEWORK

The main institutional framework through which citizens' rights, liberty, safety, and the right to own property are protected is the Government Administrative Structure – the Central and Local Government Administration.

2.2.1 The Administrative Sub-Divisions of Liberia

The governance structure of Liberia is divided into the following four administrative subdivisions:

- national level;
- county level;
- district level; and

- clan level.

2.2.1.1 Role of National Level Authorities

National level governance consists of three separate but equal branches - the Executive Branch which is headed by the President, the Legislative Branch which is headed by the Speaker, and the Judiciary Branch which is headed by the Chief Justice. The Legislative Branch makes and passes laws, acts, bills and budgets, and holds the Executive accountable for their implementation; the Executive plans and executes all projects and programs aimed at promoting the social, economic and political development of the country; and the Judiciary interprets the laws, conducts hearings into and adjudicates disputes.

As the head of the Government, the President ensures through close coordination with the other two branches that law and order prevail and the rights, liberty and safety of every citizen and resident is protected under the law. The President also ensures that socio-economic opportunities are created and made accessible to everyone without any form of discrimination.

2.2.1.2 Role of County Level Authorities

Liberia is divided into 15 counties. As the first tier of the local administration, the county level governance structure is headed by the Superintendent who is appointed by the President of the Republic to administer the social, economic, political, and cultural affairs of the county on behalf of the President. Supported by the Assistant Superintendent for Development and the County Inspector, the Superintendent oversees the day-to-day activities of the county including ensuring that everyone under his or her jurisdiction is treated fairly and humanely, and the amicable resolution of disputes or conflicts wherever and whenever they occur within the county.

2.2.1.3 Role of District Level Authorities

Counties are subdivided into a variable number of districts. As the second tier of the local administration, the district level governance structure is headed by the Commissioner. His or her team (including the Township Commissioner, the City Mayor, and the Paramount Chief) has the primary responsibility to ensure law and order in the district, as well as overseeing socio-economic development activities across the district. They also have the important responsibility of ensuring that the rights, freedom and safety of all citizens and residents within the district are protected and that no one is discriminated against based on gender, age, religious belief, etc. Like the national and county levels, the district authorities ensure that laws are enforced, and justice is served without discrimination.

2.2.1.4 Role of Clan Level Authorities

As the last tier in the governance structure, the clan level administration is headed by the Clan Chief. At this level, the Clan Chief, with support from the General Town Chief and the traditional council of elders, ensures peace, security, and the protection of the rights of each citizen and resident within the clan. The Clan and General Town Chief, with the guidance and advice of the traditional council, investigate and adjudicate dispute cases brought before them, foster peaceful co-existence and social cohesion through conflict mediation and resolution between and amongst citizens and residents in the clan.

2.2.2 Environmental and Social Institutional Framework

The environmental and social governance in Liberia is divided between the EPA and some other ministries and national authorities, at the national level, and the Environmental and Social Committees, at the local level.

2.2.2.1 National Level

The EPA is the main agency and principal authority in Liberia for environmental management. In addition to the EPA, other organizations involved in environmental protection and management include the Ministry Mines and Energy (MME), the Ministry of Agriculture (MOA), and the Forestry Development Authority (FDA). Waste management is under the Ministry of Public Works (MPW). Organizations involved in social protection and management include the Ministry of Gender, Children and Social Protection (MGCSP), the Ministry of Justice and the Ministry of Labor. Other organisations relative to the marine and maritime environment are the National Fisheries and Aquaculture Authority (NAFAA) (formerly the Bureau of National Fisheries (BNF)), the Liberia Maritime Authority (LIMA) and the Liberian Coast Guard (LCG).

Table 2-5 summarizes the key functions of the EPA and other institutions relevant to environmental and social governance in the country.

Table 2-5 – Key functions of the national institutions governing the environmental and social issues

Institution	Key functions
Environmental Protection Agency (EPA)	• To "coordinate, monitor, supervise and consult with relevant stakeholders on all activities in the protection of the environment and sustainable use of natural resources" (GoL, 2003a, s. 5); • Has executive authority for all environmental activities and programs relating to environmental management in Liberia (GoL, 2003a, s.5); • **Responsible for issuing environmental impact assessment licenses; and** • **Responsible for compliance monitoring relating to environmental regulations and standards**.
Liberia Maritime Authority (LIMA) - Department of Marine Environmental Protection	• Is responsible to develop and implement policies for the protection of the marine environment from pollution; • Coordinates with other relevant government agencies for the establishment of a national system for immediate response to marine pollution incidents; • Contribute to capacity building for marine emergency response; • Develops systems and technical procedures for the inspection of marine facilities; • Defines the rules and regulations for the effective compensation for damage caused to persons, property or the environment in the ocean; and • Implement and follows -up on the national contingency plan for dealing with oil pollution in the marine environment.
National Port Authority	• Is responsible to manage, plan, and build all public ports in Liberia. • Currently manages the four ports of Liberia: Freeport of Monrovia, Port of Buchanan, Port of Greenville, and Port of Harper.
Liberian Coast Guard (LCG)	• Is responsible to enforce the laws related to the Liberian coastline and Exclusive Economic Zone (EEZ); • Carries on inquiries, examinations, inspections, searches, seizures, and arrests upon the high seas as may be necessary; and • Provides assistance to distressed persons, vessels and aircrafts on the high seas and in Liberian waters.
National Fisheries and Aquaculture Authority (NAFAA)	• Manages and regulates all fisheries and aquaculture activities in the Liberian waters.
Ministry Mines and Energy (MME)	• Responsible for the development of mineral, water and energy resources in Liberia • Manages the energy provision through the National Energy Committee • Manages water resources through the Liberian Hydrological Services (LHS)

Institution	Key functions
Ministry of Public Works (MPW)	• Is responsible for the design, construction and maintenance of roads and highways, bridges, storm sewers, public buildings and other civil works in the country • Is responsible for the administration of urban and town planning, as well as provision of architectural and engineering services for all government ministries and agencies. • Is responsible for the installation and maintenance of the entire infrastructure required for waste management delivery services, including the construction of sanitary landfill facilities.
Ministry of Agriculture (MOA)	• Regulates forestry in relation to plant quarantine, agro-forestry and food crop related plantations, fishery and agriculture sectors; • Has specific responsibilities for soil conservation; and • Plans, executes, administers, manages and supervises agriculture programs and provides extension services, trains local farmers in improved cultural practices, and supplies farm inputs to enhance food security.
Forestry Development Authority (FDA)	• Is responsible for the protection, management and conservation of government-owned forests and wildlife on a sustainable basis; • Manages commercial, conservation and community use of Liberia's forest estate; • Provides long- and mid-range planning in the forestry sector; • Prepares forestry policy, law and administration; • Controls the commercial use of state-owned forests: grants the concessions, supervises the adherence to the forest legislation and the concession agreements, calculates and determines forestry fees, evaluates investment proposals, executes reforestation and forest research and training and monitors activities of timber companies; and • Is responsible for the development and management of protected areas and wildlife through the Department of Conservation which is made up of the Division of National Parks and the Division of Wildlife.
Ministry of Gender, Children and Social Protection (MGCSP)	• Serves as the main central government institution for promoting gender equality and the elimination of all forms of discrimination against women and girls; • Through its National Gender Policy and National Gender Action Plan, the Ministry seeks to ensure gender equality across the spectrum of the social, economic, political and cultural life of the nation; and • Has a Sexual and Gender Based Violence Unit mandated to monitor and report on cases of Sexual and Gender Based Violence (SGBV) throughout the country.

Institution	Key functions
Ministry of Justice, Sexual and Gender Based Violence Unit (SGBVU)	• Shares information with the Ministry of Justice to recommend cases for prosecution; • Serves as the secretariat for the Gender-Based Violence Inter-Agency Task Force, which brings together UN, government, and local and international NGOs to address pressing gender-based violence issues in the country; and • Oversees the prosecution of sexual offenses at Criminal Court "E" and at the regional justice and security hubs.
The Ministry of Labour	• Is the central government institution established to advance safe, fair and harmonious workplace practices that are essential to the social and economic wellbeing of citizens and residents; • Is responsible to set, communicate and enforce workplace standards; and • Develops, coordinate and implement strategies to prevent workplace injuries and illnesses through training and dissemination of health and safety information.

2.2.2.2 Local Level

To decentralize environmental management, the EPA Act authorizes the establishment of County and District Environmental Committees and directs the National Environmental Policy Council to provide guidelines for their establishment. Each County Committee is composed of county and district officials, traditional leaders, private citizens, and two local representatives to the national legislature. The Committee is staffed by a County Environment Officer, hired by the EPA, but responsible to the County Committee.

The District Environment Committees are to be established by and report to the relevant County Environment Committee. They are charged with promoting environmental awareness and mobilizing the public to manage and monitor activities within the district to ensure that they do not have any significant impact on the environment. The District Committees are composed of district officials, mayors, chiefs, and private citizens and are staffed by a District Environment Officer hired by the EPA.

In addition to assisting the County and District Committees in the fulfilment of their responsibilities, the County and District Environment Officers are responsible for compiling reports to the EPA, promoting environmental awareness, and conducting public hearings on environmental impact assessment in the County and the District.

At present, two County Environmental Committees have been established; one in Sinoe County and another in Nimba County. However, EPA has established outstation offices, staffed by Environmental Inspectors, in ten counties. As the County Environment Committees are established, some of the Inspectors may be reassigned as County Environment Officers.

2.2.3 Environmental Inspectors and Courts

For the enforcement of environmental requirements and standards, the Environment Protection Agency Act provides for the appointment of Environmental Inspectors and the establishment of an Environmental Court system.

2.2.3.1 Environmental Inspectors

The EPA Act authorizes the EPA to "designate its officers and duly qualified public officers/civil servants […] to be environmental inspectors within such Counties and District limits." Thus, Environmental Inspectors do not have to be EPA employees, but can also be designated officers or civil servants in other branches of the government. Environmental Inspectors are authorized to enter premises, inspect activities, take samples, and review records to ensure compliance with environmental rules and regulations. The exact nature of the inspector's enforcement authority is not defined in the Act, but the Act does state that the EPA is to "[…] establish the conditions, rules and regulations governing the qualifications, performance, powers and duties of the Environmental Inspectors." The EPML confirms that

Environmental Inspectors can write Restoration Orders to correct an activity deemed to be noncompliant with environmental rules and regulations. Currently, the EPA has inspectors deployed in all the counties and districts of Liberia.

2.2.3.2 Environmental Courts

The Environmental Protection Agency Act defines a two-tiered court system to hear and rule on compliance with environmental rules and regulations. The first tier is the Environmental Administrative Court. The complaints may concern the actions or decisions of the EPA or an Environmental Inspector or may be brought by a member of the public to stop activities they believe are damaging the environment. The second tier is an Environmental Appeals Court, established at the Judicial Circuit level. At present, the Environmental Court system has not been formally established.

2.3 HUMAN RIGHTS AND GENDER EQUALITY FRAMEWORK IN LIBERIA

Liberia has ratified or acceded to the core international human rights treaties. It is a party to the major regional human rights instrument which obliges states to respect, protect and fulfil human rights of all persons within the territory and subject to the jurisdiction of the state, without discrimination. As a state party to the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW) and the Protocol to the African Charter on Human and Peoples' Rights on the Rights of Women in Africa (the "Maputo Protocol"), Liberia has made legally binding commitments to exercise due diligence to combat gender-based violence and discrimination. Table 2-6 presents the legal and safeguard provisions that are in place to address this issue.

Table 2-6 – Provisions related to gender equality framework in Liberia

Category	Provisions
National provisions	• National Action Plan for the Implementation of United Nations Security Council Resolution 1325 (2009) • National Sexual and Reproductive Health Policy (2010), providing for access to quality health services for survivors of sexual violence and the establishment of a reporting mechanism to facilitate intra-governmental coordination in the management of SGBV cases (MOHSW, 2010) • National Plan of Action for the Prevention and Management of Gender Based Violence in Liberia (2011-2015) • Reconciliation Roadmap (2012), incorporating recommendations of the Truth and Reconciliation Commission to enhance women's psychosocial recovery and economic empowerment as a form of redress for sexual violence (Republic of Liberia, 2012) • Agenda for Transformation (2012), which includes provisions to address gender-based violence and empower women in multiple sectors and to enhance the protection of children from violence and abuse (MPEA, 2012) • National Human Rights Action Plan of Liberia (2013), which incorporates recommendations regarding SGBV received during the Universal Periodic Review (UPR) process • Third Joint Program of the Government of Liberia and the United Nations on SGBV and harmful traditional practices, launched in 2016 • Revised National Gender Policy (2018-2022), of the Ministry of Gender, Children and Social Protection providing is an update of the National gender policy of 2012 • Liberia's Second Phase of the National Action Plan on Women, Peace and Security (NAP WPS) (2019-2023).
Regional provisions	• African Charter on Human and Peoples' Rights (ACHPR) (1982) • African Charter on the Rights and Welfare of the Child (ACRWC) (2007) • Protocol to the ACHPR on the Rights of Women in Africa (the "Maputo Protocol") (2007)
International agreements	• International Covenant on Civil and Political Rights (ICCPR) (2004) • International Covenant on Economic, Social and Cultural Rights (ICESCR) (2004) • Convention against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment (CAT) (1993) • Convention on the Elimination of All Forms of Discrimination against Women (CEDAW) (1984) • Convention on the Rights of the Child (CRC) (1990) • Convention on the Rights of Persons with Disabilities (CRPD) (2012) • International Convention on the Elimination of All Forms of Racial Discrimination (1976)

2.4 MULTILATERAL AGREEMENTS AND BIODIVERSITY PROTOCOLS

Relevant international treaties, conventions and protocols to which Liberia is a signatory are presented in Table 2-7. The table includes all international maritime conventions ratified by Liberia because the Project involves the operation of vessels. In addition to complying with all the agreements listed in Table 2-7, the vessel activities must be conducted according to the following:

- International Maritime Organization's Manual on Oil Pollution (2011 Edition).
- International Maritime Organization's Field Guide for Oil Spill Response in Tropical Waters, 1997.

- International Chamber of Shipping (Oil Companies International Marine Forum) Ship to Ship Transfer Guide for Petroleum (4th Edition), 2005.
- International Ship and Port Facility Security Code, 2002 (ISPS).

Table 2-7 – Environmental multi-lateral agreements

Category	Convention	Liberia date of ratification	Relevance to the Project
Air quality	Convention for the Protection of the Ozone Layer (Vienna Convention) (UN, 1985)	15th January 1996	Project activities produce emissions that deplete the ozone layer.
	Montreal Protocol on Substances that Deplete the Ozone Layer	15th January 1996	
	Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer	30th November 2004	
Biodiversity conservation	Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (Switzerland, 1973)	9th June 1981	CITES species can occur in or around the project location.
	Convention on Biological Diversity (CBD) (UN, 1992)	8th November 2000	The Project takes place near areas with biodiversity importance.
	Cartagena Protocol on Biosafety (UN, 2000)	15th February 2002	
	Convention on the Conservation of Migratory Species of Wild Animals (CMS/Bonn Convention) (Germany, 1979)	2nd September 2004	Potential occurrence of avian, piscine and reptilian migratory species within the project area.
	Convention for Co-operation in the Protection and Development of the Marine and Coastal Environment of the West and Central African Region (Côte d'Ivoire, 1981)	22nd March 2005	Project activities will take place in the marine environment and coastal zones falling within the jurisdiction of Liberia.
	Protocol concerning Co-operation in combating Pollution in cases of Emergency (Côte d'Ivoire, 1981)	23rd March 2005	
	Memorandum of Understanding concerning Conservation Measures for Marine Turtles of the Atlantic Coast of Africa (CMS/UNEP, 2000)	24th November 2005	
	Memorandum of Understanding concerning the Conservation of the Manatee and small Cetaceans of Western Africa and Macaronesia (CMS, 2008)	3rd October 2008	
	Memorandum of Understanding on the Conservation of Migratory Sharks (CMS, 2010)	12th February 2010	
	International Convention for the Conservation of Atlantic Tunas (FAO, 1966)	14th February 2014	

Category	Convention	Liberia date of ratification	Relevance to the Project
	Revised African Convention on the Conservation of Nature and Natural Resources (Maputo Convention) (AU, 2003)	23rd February 2014	The Project will take place near parts of Liberia with conservation value.
Climate change	United Nations Framework Convention on Climate Change (UNFCCC) (UN, 1992)	5th November 2002	Project activities involve the use of vehicles, vessels and generators which will result in increased greenhouse gas emissions.
	Kyoto Protocol (UN, 1997)	5th November 2002	
	Doha Amendment to the Kyoto Protocol (UN, 2012)	17th August 2015	
	Paris Agreement (UN, 2018)	27th August 2018	
Socio-cultural	Convention Concerning the Protection of the World's Cultural and Natural Heritage (UNESCO, 1972)	23rd March 2002	Potential occurrence of culturally important resources on the seafloor.
	International Covenant on Economic, Social and Cultural Rights (ICESCR) (UN, 1976)	22nd September 2004	The Project is affecting local labour force and might affect the livelihoods of local fishing communities.
Waste transport	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (UN, 1989)	22nd September 2004	The conventions govern transboundary movement of hazardous wastes and apply if offshore activities include disposal of hazardous wastes in African countries outside of Liberia.
	Amendment to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (UN, 1995)	16th September 2005	
	Basel Protocol on Liability and Compensation for Damage Resulting from Transboundary Movements of Hazardous Wastes and their Disposal (UN, 1999)	16th September 2005	
	Bamako Convention on the Ban of the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa (AU, 1991)	16th December 2013	
Maritime	Agreement for the Implementation of the Provisions of the UN Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (UN, 1995)	16th September 2005	Some project activities will take place at sea and involve the operation and use of vessels.

Category	Convention	Liberia date of ratification	Relevance to the Project
	United Nations Convention on the Law of the Sea (UNCLOS) (UN, 1982)	25th September 2008	
	International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC) (IMO, 1990)	5th October 1995	
	Protocol on Preparedness, Response and Co-operation to Pollution Incidents by Hazardous and Noxious Substances	18th September 2008	
	International Convention for the Safety of Life at Sea (SOLAS) (IMO, 1974)	29th November 1983	
	Protocol of 1988 relating to the International Convention for the Safety of Life at Sea, 1974 (IMO, 1988)	26th February 1997	
	International Convention for the Prevention of Pollution from Ships (MARPOL), 1973, as modified by the Protocol of 1978 (MARPOL 73/78), including Annexes I-VI (IMO, 1978)	28 October 1980	
	Convention for Co-operation in the Protection and Development of the Marine and Coastal environment of the West and Central African Region	22 March 2005	

2.5 UNDP'S AND GCF'S REQUIREMENTS

In addition to its compliance with the national legislations and policies, and international agreements to which Liberia is a signatory, this ESMP is prepared in accordance with the UNDP's SES, and the GCF's Revised ESP and its interim ESS, the IFC PS.

2.5.1 UNDP's Social and Environmental Standards (SES)

UNDP's revised SES underpin UNDP's commitment to mainstream social and environmental sustainability in its programmes and projects to support sustainable development. The objectives of the SES are to:

- strengthen the quality of programming by ensuring a principled approach;
- maximize social and environmental opportunities and benefits;
- avoid adverse impacts to people and the environment;
- minimize, mitigate, and manage adverse impacts where avoidance is not possible;
- strengthen UNDP and partner capacities for managing social and environmental risks; and
- ensure full and effective stakeholder engagement, including through a mechanism to respond to complaints from project-affected people.

UNDP applies the following three principles to the development and implementation of country, regional and global programmes:

- Leave No One Behind
- Human Rights
- Gender Equality and Women's Empowerment
- Sustainability and Resilience
- Accountability

UNDP screens and reviews its activities to identify opportunities to advance these principles and to identify potential risks that may require measures to avoid, minimize, and/or mitigate potential impacts.

The SES are comprised of eight standards:

- Standard 1: Biodiversity Conservation and Sustainable Natural Resource Management
- Standard 2: Climate Change and Disaster Risks
- Standard 3: Community Health, Safety and Security
- Standard 4: Cultural Heritage
- Standard 5: Displacement and Resettlement
- Standard 6: Indigenous Peoples
- Standard 7: Labour and Working Conditions
- Standard 8: Pollution Prevention and Resource Efficiency

All of UNDP SES are initially evaluated to be relevant to the Project, except Standard 6, because there are no indigenous people in the project area. Applicable SES are, summarized in Table 2-8. The objectives of each standard and the rationale behind its relevance to the Project are given.

The UNDP has a Social and Environmental Management System (SEMS), which is a framework designed to ensure that all UNDP projects meet its social and environmental standards. It involves several key processes:

- **Screening and Categorization:** Projects are assessed early to categorize their level of social and environmental risk (low, moderate, high).
- **Social and Environmental Assessment:** Detailed assessments, such as Environmental and Social Impact Assessments (ESIA), are conducted for moderate and high-risk projects to evaluate potential risks.
- **Stakeholder Engagement:** Meaningful consultation with stakeholders, including local communities and indigenous peoples, is required throughout the project lifecycle.
- **Grievance Redress Mechanism (GRM):** Projects must establish accessible systems for stakeholders to raise concerns and address grievances related to social and environmental risks.
- **Risk Mitigation Plans:** Projects must develop and implement mitigation and management plans to address identified risks.
- **Monitoring and Reporting:** Ongoing monitoring of mitigation measures is required, with regular reporting to ensure accountability.
- **Capacity Building:** Training is provided to ensure project teams and partners understand how to manage social and environmental risks.

- **Strategic Risk Management:** Broader sustainability and risk strategies are integrated into country programs and project portfolios.
- **Continuous Improvement:** Lessons learned are shared, and the system is regularly updated to stay aligned with international best practices.
- **Compliance and Oversight:** Independent reviews and audits are conducted to ensure projects comply with the standards, with corrective actions taken as needed.

This system ensures that UNDP projects are socially and environmentally sustainable, promoting accountability and minimizing risks to people and ecosystems.

2.5.2 GCF's Environmental and Social Standards (ESS)

The GCF revised ESP serves as the overarching framework for GCF safeguards and has adopted the IFC PS (International Finance Corporation, 2012) as its interim ESS. Seven of the eight IFC Performance Standards (PS) are preliminary assessed to be relevant to the Project. These are Performance Standards 1, 2, 3, 4, 5, 6 and 8, summarized in Table 2-9. The objectives of each standard and the rationale behind its relevance to the Project are given. PS 7 Indigenous People is not triggered because no indigenous people are identified in the project area.

Table 2-8 Applicable UNDP Social and Environmental Standards

Standard	Objectives	Relevance rationale
Standard 1 **Biodiversity Conservation and Sustainable Natural Resource Management**	• To conserve biodiversity; • To maintain and enhance the benefits of ecosystem services; • To promote sustainable management and use of living natural resources; • To ensure the fair and equitable sharing of the benefits from the utilization of genetic resources; • To respect, preserve, maintain and encourage knowledge, innovations and practices of indigenous peoples and local communities relevant for the conservation and sustainable use of biodiversity and their customary use of biological resources.	The Project is expected to cause direct or indirect loss or degradation of local biodiversity and habitats.
Standard 2 **Climate Change and Disaster Risks**	• To ensure that UNDP projects are sensitive to climate change and disaster risks and strengthen resilience in order to achieve sustainable development outcomes; • To reduce project-related greenhouse gas (GHG) emissions and intensity.	The Project aims at enhancing resilience to climate change. The project will however contribute to the greenhouse gas emissions through the operation of vehicles, vessels, generators and fuel-powered machinery.
Standard 3 **Community Health, Safety, and Security**	• To anticipate and avoid adverse impacts on the health and safety of affected communities during the project life cycle from both routine and non-routine circumstances; • To ensure quality and safety in the design and construction of project-related infrastructure, preventing and minimizing potential safety risks and accidents; • To avoid or minimize community exposure to hazards, diseases and hazardous materials associated with project activities; • To ensure that the safeguarding of personnel and property minimizes risks to communities and is carried out in accordance with international human rights standards and principles; • To have in place effective measures to address emergency events, whether human-made or natural hazards.	The Project might affect the health and safety of the communities living in the project area.

Standard	Objectives	Relevance rationale
Standard 4 **Cultural Heritage**	• To protect Cultural Heritage from damage, inappropriate alteration, disruption, removal or misuse; • To preserve and safeguard Cultural Heritage; • To promote the equitable sharing of benefits from the use of Cultural Heritage; • To promote meaningful consultation with stakeholders regarding preservation, protection, utilization and management of Cultural Heritage.	Standard 4 is triggered on a precautionary base since the Project involves excavation and dredging activities where archaeological material can potentially be found.
Standard 5 **Displacement and Resettlement**	• To recognize and respect the prohibition on forced evictions • To anticipate and avoid, or, when avoidance is not possible, minimize adverse social and economic impacts from land or resource acquisition or restrictions on land or resource use • To enhance and restore the livelihoods of all displaced persons, and to improve the standards of living and overall socioeconomic status of displaced poor and other displaced groups and to support efforts to progressively realize the rights to adequate housing and adequate standards of living for displaced populations • To ensure that resettlement activities are planned and implemented collaboratively with the meaningful and informed participation of those affected.	The Project is expected to involve economic displacement and restrictions on land use.
Standard 7 **Labour and Working Condition**	• To promote, respect and realize fundamental principles and rights at work • To protect and promote the safety and health of workers; • To ensure applicable parties comply with employment and labour laws, applicable rules and regulations and international commitments; ; • To leave no one behind by protecting and supporting workers in disadvantaged and vulnerable situations, including a special focus, as appropriate, on women workers, young workers, migrant workers and workers with disabilities.	The Project is expected to engage a workforce through the contractor.

Standard	Objectives	Relevance rationale
Standard 8 **Pollution Prevention and Resource Effiiency**	• To avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities; • To promote more sustainable use of resources, including energy, land and water; • To avoid or minimize programming-related emissions of short and long-lived climate pollutants and ozone-depleting substances; • To avoid or minimize generation of hazardous and non-hazardous substances and wastes, • and promote a human rights-based approach to the management and disposal of hazardous substances and wastes; • To promote safe, effective, environmentally sound pest management.	The Project is expected to use water and energy. It is also projected to use fuel, oils and lubricants that may pollute the environment in the project area. The Project will produce hazardous and non-hazardous waste material.

Table 2-9 Applicable GCF Environmental and Social Standards (IFC Performance Standards)

Performance Standard	Objectives	Relevance rationale
Performance Standard 1 **Assessment and Management of Environmental and Social Risks and Impacts**	• Identify and assess social and environment impacts, both adverse and beneficial, in the Project's area of influence. • To avoid, or where avoidance is not possible, minimise, mitigate or compensate for adverse impacts on workers, affected communities, and the environment. • To ensure that affected communities are appropriately engaged on issues that could potentially affect them. • To promote improved social and environmental performance of companies through the effective use of management systems.	Applies to all projects that have environmental and social risks and impacts.
Performance Standard 2 **Labour and Working Conditions**	• Establish, maintain, and improve the worker-management relationship. • Promote the fair treatment, non-discrimination and equal opportunity of workers, and compliance with national labour and employment laws. • Protect the workforce by addressing child labour and forced labour • Promote safe and healthy working conditions. • Protect and promote the health of workers.	The Project is expected to engage a workforce through the contractor.

Performance Standard	Objectives	Relevance rationale
Performance Standard 3 **Resource Efficiency and Pollution Prevention**	• Avoid or minimise adverse impacts on human health and the environment by avoiding or minimising pollution from Project activities. • Promote the reduction of emissions that contribute to climate change.	The Project is expected to use water and energy. It is also projected to use fuel, oils and lubricants that may pollute the environment in the project area. The Project will produce hazardous and non-hazardous waste material.
Performance Standard 4 **Community Health, Safety, and Security**	• Avoid or minimise risks to and impacts on the health and safety of the local community during the Project lifecycle from both routine and non-routine circumstances. • Ensure that the safeguarding of personnel and property is carried out in in accordance with relevant human rights principles.	The Project might affect the health and safety of the communities living in the project area.
Performance Standard 5 **Land Acquisition and Involuntary Resettlement**	• Avoid/minimize adverse social and economic impacts from land acquisition or restrictions on land use. • Improve or restore livelihoods and standards of living. • Improve living conditions among displaced persons.	The Project is expected to involve economic displacement and restrictions on land use.
Performance Standard 6 **Biodiversity Conservation and Sustainable Management of Living Natural Resources**	• Protect and conserve biodiversity including following the mitigation hierarchy, identification of ecological zones and identification of important areas supporting threatened species. • To maintain the benefits from ecosystem services valued by people and businesses. • Promote the sustainable management and use of natural resources through the adoption of practices that integrate conservation needs and development priorities.	The Project is expected to cause direct or indirect loss or degradation of local biodiversity and habitats.
Performance Standard 8 **Cultural Heritage**	• Protect cultural heritage from adverse impacts of Project activities and support its preservation. • Promote the equitable sharing of benefits from the use of cultural heritage in business activities.	Performance Standard 6 is triggered on a precautionary base since the Project involves excavation and dredging activities where underwater archaeological material can potentially be found.

3 PROJECT DESCRIPTION

This section presents the Project Description for the Coastal Defence Structure at West Point, for which this ESIA Report applies. It includes details on the Project location, design and description of the Project activities and byproducts.

3.1 PROJECT LOCATION

The Project is located in Monrovia, the Capital City of Liberia, in communities and areas bordering the Mesurado Wetland.

The Mesurado wetland, a Ramsar site that extends over an area of around 6,760 ha, is a network of creeks that drain into the Atlantic Ocean through the Mesurado River and Estuary. The Mesurado river is connected to the St Paul River though a network of wetlands and the Stockton Creek.

The coastal revetment structure will be constructed on 1,050 m of the coastline at West Point in Monrovia, Montserrado County (Figure 3-1). The structure will be located on a large sand spit on the western fringe of the Mesurado Estuary, bordered by the Cape of Monrovia to the southwest. The location of the structure will ensure landings for fishing boats while having a green promenade.

3.2 PROJECT DESIGN

A revetment structure will be constructed along a major part of the West Point coastline to fix the coastline position and thereby protect against coastal retreat.

A detailed design report was developed by Brighten Development and Lanka Hydraulic Institute Ltd (LHI) in April 2024 as part of the HESDD. The description of the design components in the following subsections are based on the detailed design report by Brighten Development & LHI, 2024. The detailed design drawings are presented in Appendix A.

The structure is designed to ensure both sustainability and economic feasibility. A structural design life of 50 years has been adopted. The revetment is designed to be stable enough to withstand extreme scenarios as specified in the design requirements and as calculated by the Extreme Value Analysis (EVA) performed in the detailed design report (Brighten Development & LHI, 2024).

The design incorporates the following design elements, which are presented in Figure 3-1 and described in the subsections 3.2.1 to 3.2.5.

- Coastal protection structure, which includes a main rock revetment, a light rock revetement and a breakwater

- A promenade
- Beach access points for fishing community and the general public
- Drainage and related infrastructure
- Boat landing sites and related infrastructure

3.2.1 Coastal Protection Structure

A rubble mound revetment has been selected for the coastal protection structure. The structure is divided into different segments based on several design considerations assessed in the detailed design report (Brighten Development & LHI, 2024). Thus, the coastal protection structure includes a main rock revetement, a light rock revetement and a breakwater. The final design parameters for each segment are presented in Table 3-1.

Table 3-1 Final design parameters at each segment of the coastal protection structure (Brighten Development & LHI, 2024)

Chainage	Design Element	Significant wave height (Hs) (m)	Peak wave period (Tp) (s)
R 0 – 150 m	Light Revetment	1.39	8
R 150 - 1050 m	Revetment	2.55	8
B 0 – 180 m	Breakwater trunk	2.80	12
B 180 – 188 m	Breakwater head	2.91	12

The revetment structure is specifically designed not to encroach the existing dwellers nor to disturb their livelihoods. A cove breakwater is accommodated in the design with a prime focus on providing shelter for larger vessels. The light revetment in the north segment (0 – 200 m) is specifically designed to cater the estuarine environment taking into account worst-case scenario where the sand bar disappears, and the revetment is exposed to the sea wave attack.

3.2.2 Promenade

A 6 m wide and 1,050 m long promenade is included in the design of the 1,050 m long revetement to facilitate public access to the beach and create a recreational aspect for the public. The promenade deck is designed as a concrete paving with interlocking blocks. The deck of the promenade is sloped seawards at 2% to facilitate any overtopping discharge to seep back to the sea. In addition to beach access points described in Section 3.2.4, access to the promenade will be made available at the two ends facilitate construction-vehicle access.

The promenade design will include decorative plants to enhance the visual appeal of the area and blend with the nature greenery. The exact type of trees and vegetation to be used will be selected at a later stage and might include the tropical almond tree and desert rose plant.

Solar powered individual pole lights will be installed along the promenade.

Figure 3-1 Project location and components

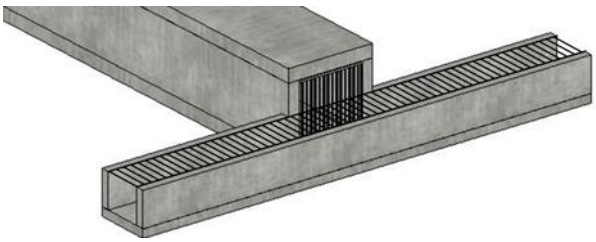
3.2.3 Drainages

The detailed design report identified six sub catchment areas for surface run-off that might affect the revetement structure. To ensure that surface water run-off drains out of the promenade area and revetement structure, the design include a main longitudinal drain along the revenant and 4 cross drains to route any collected discharge to the sea. The final design details of the drainages are presented in Table 3-2.

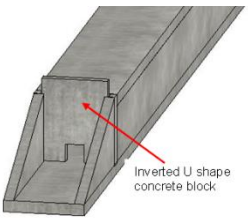
To ensure the safety of the public, a steel grating will be installed on the main channel and on the inlets of the cross drains. Inverted U-shape concrete blocks will be installed at the outlet of the cross drains to protect the drains from momentary wave run ups (Figure 3-2).

Table 3-2 Final design parameters at each segment of the coastal protection structure (Brighten Development & LHI, 2024)

Drain Name	Chainage	Drain Size (m)		Inlet invert level m MSL	Outlet invert level m MSL
		Width	Height		
Main Drain	R-Ch. 150.00m	0.6	0.4	1.1	N/A
	R-Ch. 350.00m	0.6	0.6	0.9	N/A
	R-Ch. 700.00m	0.6	0.6	1.6	N/A
	R-Ch. 800.00m	0.6	0.6	0.8	N/A
	R-Ch. 950.00m	0.6	0.6	1.0	N/A
	R-Ch. 1050.00m	0.6	0.6	1.4	N/A
Cross Drain 01	R-Ch. 25.00m	1.0	0.8	0.6	0.5
Cross Drain 02	R-Ch. 350.00m	1.5	1.5	0.9	0.6
Cross Drain 03	R-Ch. 800.00m	1.5	1.5	0.8	0.6
Cross Drain 04	R-Ch. 950.00m	1.5	1.5	1.0	0.7



Steel grating



Inverted U shape concrete blocks

Figure 3-2 Protection types for drainages (Brighten Development & LHI, 2024)

3.2.4 Beach Access Points

Four beach access points will be installed to allow the public to access the beach trough the revetement structure, and to allow access for the fishing community to pursue their livelihood activities. A description of the beach access points is provided in Table 3-3.

Table 3-3 Description of beach access points (Brighten Development & LHI, 2024)

No	Chainage	Main Uset	Access type	Comments
1	210 m	Public	Concrete steps defined by two wingwalls of height 0.6 m each	This access serves the public at the north section of the revetment. The sand bar at the estuary, as evident from sediment transport model studies, will remain intact and hence will provide direct access to the beach for those who take this access point.
2	487 m	Fishing community	Concrete steps defined by two wingwalls of height 0.6 m each	This access serves the operators/users of large fishing boats that would anchor in the sheltered area created by the breakwater.
3	608 m	Fishing community	Boat ramp Width: 8 m Slopes: 1:10 at seaside 1:6.5 at land side.	This access is a ramp to aid boat launching and repair work.
4	852 m	Public	Concrete steps defined by two wingwalls of height 0.6 m each	This access serves the public at the south section of the revetment.

3.2.5 Fish Landing Site

To accommodate for the fishing canoes and direct access to the ocean, two fish landing sites are included in the design. Description of these is presented in Table 3-4.

Landing site No. 1 will be strategically developed at the south side of proposed coved breakwater as the sediment transport model study revealed that the site will tend to retain sand in the future after its construction. The site's aim is to harbour medium to large fishing boats. Landing site No. 2 is an already existing site that will be improved and will be used by small to medium fishing boats (Brighten Development & LHI, 2024).

Table 3-4 Description of fish landing sites (Brighten Development & LHI, 2024)

Landing Site No.	Chainage	Finished Elevation, m MSL	Required Fill, m^3	Dimensions	Description
1	585 to 710	+0.5	16,940	Triangular shape Seaward distance: 80m Along revetment: 125m	south side of proposed coved breakwater sand nourishment program must be conducted once the breakwater is constructed
2	1050 to 1380	natural	-	Longitudinal irregular in shape. Max offshore distance:40m	existing facility, and currently used by small to medium fish crafts

3.3 MATERIALS AND EQUIPMENT

A preliminary list of materials needed for the revetement construction include:

- Rocks (for underlayer, scour protection, armour, rubble, quarry run)
- Sand and aggregates.
- Geotextile.
- Components for the construction of drainage culverts or open drains.
- Diesel fuel, oil, and lubricants.
- Seedlings and planting stocks of trees, shrubs, and grasses.

Most of these materials will be sourced locally if available.

An estimation of the type and number of equipment required for the construction of the revetement structure at West Point is presented in Table 3-5. Most of these will be hired from international companies and shipped to Liberia during the mobilization phase, along with spare parts, lubricants, and oil.

Table 3-5 Type and estimated number of equipment (adapted from Brighten Development FZE & UNDP, 2023)

Type of Machine	Estimated number of machines
Trailer	16
Loader	4
Truck	**5**
Bulldozer	1
Pontoon	**4**
Backhoe	14

3.4 PROJECT ACTIVITIES

3.4.1 Activities under Output 1

The project activities for the construction of a rock revetement structure at West Point include mobilization, site preparation, and construction stages.

3.4.1.1 Mobilization

The mobilization phase include:

- Shipment and arrival of primary equipment to Liberia through the Freeport of Monrovia.
- Transport of equipment to site. These include small and large excavators, large off-

road trucks, concrete batch plant and standard trucks.

- Setting up camps, ramps, pads and facilities to support the main mobilization and construction. This might include:
    - Water use (sanitation and concrete mixing).
    - Waste treatment (chemicals, solid waste, etc.).
    - Fuel storage and fuelling facilities.
    - Offices.
    - Concrete mixing.
    - Workshops for repair and maintenance.
    - Loading / unloading area. This area should be firm and flat to allow vehicles on site and should provide adequate and safe space for storage, manoeuvring lorries and the handling equipment.
    - Casting and construction of concrete elements.

3.4.1.2 Site preparation

Works are likely to commence within the foreshore corridor and seaward to prepare the area for the main construction ahead of the arrival of the main material. The site preparation might include:

- Cleaning of the site and removal of rubbish (steel and debris).
- Excavation and preparation of the wall area.
- Raising of the near shore ground to form a working platform.
- Arrival and stockpiling of needed material. The stockpile area should be on firm ground free from obstructions.

3.4.1.3 Construction

The construction stage will include:

- Clearing the bed of anything that may cause damage, such as stones and tree roots.
- Grading the area.
- Excavation and Backfilling

- Rolling and placing the geotextile by creating sufficient overlap for continuous coverage and considering the possible settlement and deformation of the soil. The geotextile layer can be temporarily stabilized with stones until the armour stone layers are placed on top.
- Stabilizing existing defence gabion structure by the intersection of steel piles into the ground in front of the gabions.
- Spreading the underlayer of imported quarry rockfill and compacting it to the required grade.
- Building the armour stone. The placing of rocks shall commence at the lower end (i.e. seaward side) and proceed inwards and upwards towards the crest. Rocks shall be lowered into place and not dropped.
- Installation of drainage.
- Fabrication and building the promenade.
- Planting of trees and other vegetation on the promenade

During construction, the large excavator will be elevated above the high tide water level and above significant wave action, which will allow it to construct the main wall through most operating conditions. At lower tide, the excavator will be supported by trucks that can bring more material or take excess material away as the seawall works progress. After the main portion of the rock wall has been constructed by the large excavator, a smaller excavator will be used at the top of the wall and behind it within the maintenance corridor to do final trimming of the revetment profile and placing of the general fill materials.

The excavated material shall be re-used where possible and placed back at the original level. Surplus sand material shall be spread along the beach in front of the rock armour revetment in an appropriate manner. Other surplus excavated material shall be used to reinstate areas where soil erosion has occurred. Upon completion of works, all temporary structures, plant and machinery shall be removed, and the beach shall be reinstated to its previous condition and level.

3.4.1.4 Dredging Works

A dredging plan was designed in the detailed design report to accommodate the construction of the revetement structure (Appendix A). The maximum dredging depth ranges between - 3.3 m MSL at the light revetement zone to - 5.6 m MSL for the main revetement and breakwater. The total estimated dredging quantities are displayed in Table 3-6.

To minimize the risk of siltation and ensure the stability of the working areas, dredging will be conducted in segments where rock placement will immediately follow the dredging activity in each completed section.

Table 3-6 Estimated dredging quantities (Brighten Development & LHI, 2024)

Design element	Seaside (m^3)	Rear side (m^3)	Total Volume (m^3)
Revetment	65,058	7,318	72,375
Breakwater	4,798	N/A	4,798
Total	69,856	7,318	77,173

3.4.1.5 Filling Works

The estimated quantities and location of the filling work is presented in Table 3-7. It is anticipated that excess dredged material to be used in the areas requiring backfilling where possible.

Table 3-7 Estimated filling locations and quantities (Brighten Development & LHI, 2024)

Location	Chainage (m)	Total Volume (m^3)
Light revetment backfill	R Ch 0- R Ch 150	2,475
Light revetment backfill	R Ch 150- R Ch 200	564
Main revetment backfill	R Ch 200- R Ch 350	455
Landing site no 1 reclamation	R Ch 595- R Ch 710 B Ch 0- B Ch 95	16,939
Total		20,433

3.4.2 Activities under Output 2 - Institutional capacity building and policy support for the implementation of Integrated Coastal Zone Management (ICZM) across Liberia.

Output 2 of the Project focuses on building the institutional capacity and policy support for the implementation of Integrated Coastal Zone Management (ICZM) across Liberia. Activities under this output include:

- Supporting the cross-sectoral coordination among the 10 government institutions responsible for climate-resilient coastal management.
- Land-use planning in relation to climate risks, the interconnectivity of coastal systems, stakeholder sectors, as well as the intrinsic dependence of communities on coastal resources for their livelihoods.
- Promoting evidence-based decision-making using scientifically defensible data.
- Development of a high resolution, multi-criteria vulnerability map of the Liberian coastline.

- Development of a national Integrated Coastal Zone Management Plan (ICZMP).
- Equipping and building capacity of relevant stakeholders to effectively implement the plan.

3.4.3 Activities under Output 3

Output 3 of the project focuses on protecting mangroves and strengthening gender- and climate-sensitive livelihoods to build local climate resilience in Monrovia. Activities under this output will include:

- Establishing a community-led co-management agreement to ease the human caused pressure on mangroves in the Monrovia Metropolitan Area (MMA). This will serve as a means to safeguard ecosystem services and livelihoods that depend on mangroves. The main areas covered by this output are communities bordering the Mesurado Wetland including West Point, Jacobtown, Topoe Village, Nippay Town, Fiamah, and Plonkor.
- Implementing awareness-raising activities and incentives for alternative livelihood practices; including:
    - Establishing small-scale manufacturing facilities
    - Developing training material to capacitate community members to manufacture and sell cookstoves to support alternative climate-resilient livelihoods.
    - Purchase and install low-maintenance eco-friendly cold storage facilities near fish processing sites to reduce pressure on mangroves and increase market efficiency.

3.5 TIMELINE

The exact timeline for the different components of the project is not yet set and will be finalized based on the final design. However, the preliminary timeline for the different construction activities is estimated to be 23 months. A construction timeline of 17 months can be achieved by splitting the work to two construction teams (Brighten Development FZE & UNDP, 2023).

The designs are planned with a lifetime of 50 years.

3.6 WORKFORCE AND EMPLOYMENT

Employment opportunities will be available in the short-term during project activities. Priority will be given to skilled and unskilled workers from the local communities, taking into

account gender balance. However, where the availability of skilled labor is low, there is potential for an influx of non-local labor.

Employment will include equal opportunities for both men and women. A written statement in all service providers' contracts will include commitment to equality, social inclusion, and adherence to the prohibition of child labor according to the ILO Minimum Age Convention, 1973 (no 138), which sets the general minimum age for admission to employment or work at 15 years (13 years for light work) and minimum age for hazardous work at 18 years (16 years under certain strict conditions).

It is expected that the Project will employ around 7 expatriates and 20 to 25 skilled local staff, plus a larger number of unskilled local workers. The minimum key staff will include managers, supervisors, surveyors, mechanics, machine operators, drivers, safety officers and security officers. Expatriate workers will be housed in one or two rented apartments, while local workers will find their own accommodation space in the urban areas close to the work sites.

3.7 WASTE MANAGEMENT

The types of waste expected to be generated during the construction of the revetment structure are:

- Municipal waste
- Construction and demolition waste
- Hazardous waste
- Medical waste
- Liquid waste from sanitation facilities related to camps.

Measures will be put in place to minimize waste generation through careful planning, reuse and recycling of materials where possible. Waste will be segregated by type on site, and stored in an enclosed area with hard standing, to ensure no leaching occurs and to prevent access to insects and rodents. Waste will be collected and disposed of by EPA-certified collectors. No open burning of waste will take place.

3.7.1 Handling of excessive dredged material

The design estimates an excess volume of around 56,000 m^3 of dredged materials and proposes the following options for handling these:

- Transport excess material to Landing Site No.2 where it can be naturally retained and either used to expand the site or stockpiled there for future use
- Fill in a portion of the swamp at the rear side of the light revetement between chainage 0 and 150 m, while being careful not to create a flooding risk

- Stockpile a portion of the dredged material at Landing Site No.1 for future use.

3.8 GREENHOUSE GAS EMISSIONS

Greenhouse gases (GHG) are natural and man-made gases occurring in the atmosphere which absorb and emit infrared radiation (heat), thus trapping the Sun's radiation in the atmosphere and creating the "greenhouse gas effect". The large increase in GHG concentrations in the atmosphere due to anthropogenic sources contributes to global warming and climate change.

GHGs include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), ozone (O_3), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), Sulfur hexafluoride (SF_6), and nitrogen trifluoride (NF_3).

Potential sources of GHGs for the Project phases include:

- Emissions due to machinery and equipment used (earthworks, transport, drainages, structures, etc.).
- Emissions from materials used (Cement, gravel, steel, geotextile, diesel, etc.).
- Emissions from project activities (Concrete batching, dredging, excavations, etc.).
- Emissions from electricity production and use of generators.

4 ANALYSIS OF ALTERNATIVES

This section discusses project alternatives that could promote the elimination of the negative environmental and social impacts identified. It is a critical consideration in determining the ideal project interventions with minimal environmental and social disturbance.

4.1 "DO NOTHING" ALTERNATIVE

This alternative allows nature to take its course and evaluates the state of the original environment without any project intervention.

In the event that the project was not to occur ("Do Nothing"), coastal retreat and coastal erosion will continue to take place and become significantly worse due to the impacts of climate change.

This can be clearly seen in the vulnerability map presented in Figure 4-1, which shows the impacts of the least conservative climate change scenario (IPCC RCP 8.5) on the project location. This map was generated by CDR International (2019) and used the fifth assessment report of International Panel on Climate Change (IPCC - AR5 2014) as a basis for assessing the climate change impact. In the vulnerability map, the hazard "lines" (blue, yellow, orange and red) show that the coastline position will shift to the east as a result of coastal retreat caused by sea level rise and increasingly intense storm erosion. Different scenarios are presented (shown by the various line colours), and the results are summarized in Table 4-1.

Table 4-1 Projected coastline retreat due to climate change impacts for RCP 8.5 with respect to its 2020 position (adapted from CDR International, 2019)

Year	Scenario	Projected coastline retreat with respect to the 2020 position
2020	Storm with 100 year return period	21 m
2050	No storm	229 m
2050	Storm with 100 year return period	252 m

The Do Nothing alternative does not have any foreseen direct impacts on the environment, although there may be localised marine pollution as structures are washed away. However, it will generate significant harmful socio-economic impacts on the communities living along the coast. If erosion control measures are not put in place, people will be forced to leave their homes, as well as their formal and informal workplaces and businesses. Most of these communities are fishermen, fishmongers or associated service providers, all of whose livelihoods depend on proximity to the beaches. Their physical displacement therefore also means loss of livelihood and trading income. With fisheries collapsing due to the lack of access by the fishermen, food security of the greater Monrovia area will deteriorate markedly because the source is no longer exploited.

The Do Nothing alternative is therefore not a justifiable proposition.

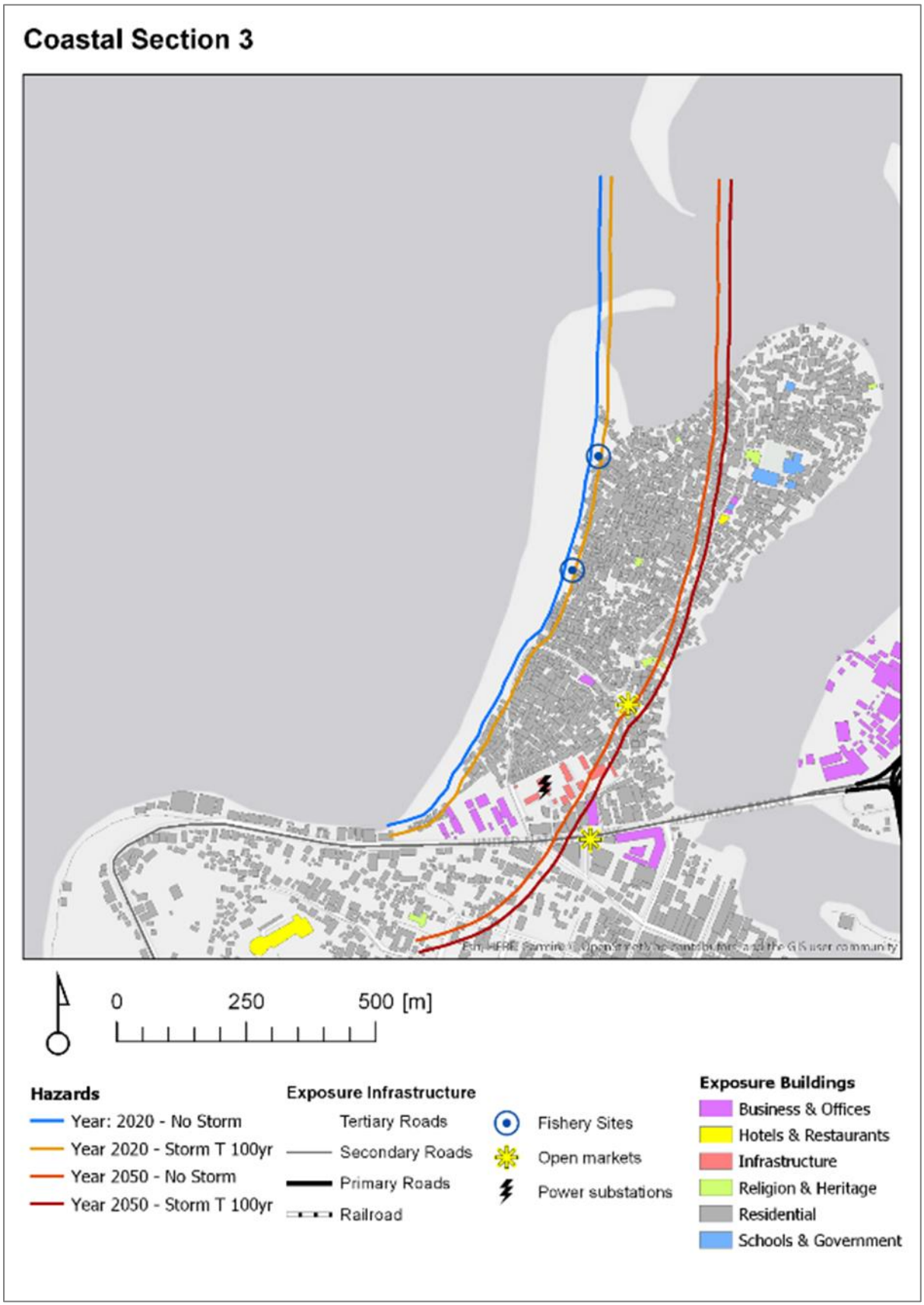


Figure 4-1 Vulnerability map for West Point (Source: Revised Interim Report (CDR International, 2019)

4.2 ALTERNATIVE LOCATION

In 2019, during the design phase of the MMCRP, five coastal sections where fishing activities are prominent were selected for potential coastal erosion interventions, as shown in Table 4-2. Their sandy beaches offer suitable locations for the safe landing of the wooden canoes used by the artisanal fishermen. These sections are all exposed to coastal retreat.

Table 4-2 Name and length of the five coastal sections considered during the design phase of the MMCRP

Coastal section	Common Name	Length (m)
Coastal section 1	Hotel Africa	2,200
Coastal section 2	New Kru Town to the Port	2,400
Coastal section 3	West Point	1,500
Coastal section 4	American Embassy to the Military Base	2,600
Coastal section 5	Military Base to Bernard Beach (JFK Hospital)	4,700
Total		13,400

The coastal section in West Point was eventually selected for the project because it is densely populated on very low-lying ground that is particularly susceptible to inundation as sea level rises, and it is seriously at risk of significant property loss and damage.

4.3 ALTERNATIVE DESIGN

In 2019, alternative designs were considered for the project, including the construction of a long groyne backed by beach nourishments as another option for physically protecting the West Point beach from coastal retreat. This option would require heavy construction works as well as the sourcing of sand for nourishments from offshore locations using dredgers. This could result in much higher environmental impacts on the coastal and offshore marine physical and biological environments, particularly due to the dredging activities. It is also a costlier option on both the implementation and maintenance levels and was not favoured by stakeholders during consultations. This design was therefore abandoned.

4.4 PREFERRED ALTERNATIVE

Following the analysis of all options, the preferred alternative selected is the implementation of the proposed coastal protection measures at West Point. The “Do Nothing” option was rejected due to projected severe coastal erosion under the IPCC RCP 8.5 scenario, which would lead to property loss, community displacement, and livelihood disruptions. The alternative design with a long groyne and offshore sand nourishment was also dismissed due to high costs, environmental impacts from dredging, and limited stakeholder support. Among the five coastal sections assessed, West Point was selected for its high population density, low elevation, and extreme vulnerability to sea-level rise and storm erosion, making it the most effective and socially justifiable alternative.

5 PUBLIC PARTICIPATION AND STAKEHOLDER ENGAGEMENT

Stakeholder engagement serves to keep project stakeholders informed about project activities, potential project impacts, and strategies to minimize these impacts during the ESIA stage. It enables stakeholders to express their concerns about project activities and offer feedback. This feedback is carefully considered when planning project activities and devising measures to address and alleviate any issues.

This section offers an outline of the stakeholder engagement efforts conducted for the Project. Additionally, it summarizes the key aspects of stakeholder engagement, and the procedures followed for addressing grievances.

5.1 NOTICE OF INTENT

In accordance with the ESIA Procedural Guidelines (Environment Protection Agency, 2022), a Notice of Intent (NOI) was published in three newspapers for three days (see Appendix B).

The NOI included a summarized description of the Project as well as contact email and phone numbers to allow the public to voice their comments and concerns. No input was received from the public following the publishing of the NOI.

5.2 ESIA STAKEHOLDER ENGAGEMENT AND PUBLIC PARTICIPATION

5.2.1 Stakeholder Identification and Mapping

During the undertaking of the ESIA, project stakeholders were identified and mapped as described in Table 5-1.

Table 5-1 Stakeholder identification and mapping

Stakeholder identified	Description	Influence	Engagement level
Communities in the project area	Affected party	High	Engage closely
Fishermen and fishmongers in the project area	Affected party	High	Engage closely
Community leaders (town chiefs, clan chiefs, district commissioners)	Affected party	Moderate	Engage closely
General public in Monrovia	Affected party	Low	Inform
Environment Protection Agency (EPA)	Interested party	High	Inform and consult
PMU	Interested party	High	Inform and consult
UNDP	Interested party	High	Inform and consult
Ministry of Gender, Children and Social Protection (MGCSP)	Interested party	Moderate	Inform and consult
Liberia Land Authority (LLA)	Interested party	Moderate	Inform and consult
Ministry of Labor	Interested party	Moderate	Inform and consult
National Fisheries and Aquaculture Authority (NaFAA)	Interested party	Moderate	Inform and consult
Liberia Maritime Authority (LIMA)	Interested party	Moderate	Inform and consult

Stakeholder identified	Description	Influence	Engagement level
National Port Authority (NPA)	Interested party	Moderate	Inform and consult
Ministry of Finance and Development Planning	Interested party	Moderate	Inform and consult
National Disaster Management Authority (NDMA)	Interested party	Moderate	Inform and consult
Ministry of Mines and Energy	Interested party	Moderate	Inform and consult
Ministry of Public Works	Interested party	Moderate	Inform and consult
Liberia Meteorological Service	Interested party	Moderate	Inform and consult
Green Climate Fund (GCF)	Interested party	Moderate	Inform and consult
Flora & Fauna International	Interested party	Low	Inform and consult

5.2.2 Stakeholder Engagement Methodology

For the sake of this ESIA, engaging stakeholders was done through various channels as follows:

- High-level stakeholder consultations, during which key stakeholders such as government entities, representatives, NGOs and community leaders were consulted. Details and findings of the key stakeholder consultations are presented in Section 5.2.3.
- Community Group Consultation, during which the communities in West Point expected to be directly affected by the Project were consulted. Details and findings of the community consultations are presented in Section 5.2.4.
- Focus Group Discussions (FGDs), including women groups and groups involving people relying on ecosystem services in the project area. Details and findings of FGDs are presented in Section 5.2.5.

Key informant interview and FGDs were also used to collect information for the social baseline. Data collected is presented in the relative sections. In addition, previous FGDs and community group consultations were conducted in 2019 for the development of the ESAR and continue to be relevant. Information from all interviews and consultations conducted were used to develop the social baseline, determine impacts and mitigation measures.

5.2.3 High-level Stakeholder Consultation

A stakeholder consultation for the Project was held on 23 July 2024 at the West Point Town Hall (Appendix C). Various stakeholders attended the consultation meetings including governmental entities and local communities:

1. Forestry Development Authority
2. Ministry of Public Works
3. National Disaster Management Agency

4. National Port Authority
5. Environmental Protection Agency
6. LIMA Liberia Maritime Authority
7. Community organizations
8. Community leaders, chiefs and elders
9. Local NGOs
10. Plumkor community
11. Ministry of Mines and Energy

The stakeholder consultation agenda was as follows:

1. Prayer
2. Welcome remarks
3. Introduction of Earthtime Inc.
4. Presentation by Earthtime Inc.
5. Closing remarks
6. Questions and concerns from community members

Figure 5-1 Photos from the stakeholder consultation

As part of the presentation, Earthtime gave an overview of the project, its location and activities, as well as the expected impacts on the environment and communities. The floor was then opened for attendees to ask their questions and raise any concerns they may have.

Issues of concern are presented in Table 5-2. The feedback from the stakeholder consulting meetings has been incorporated in this ESIA Report. The minutes of meetings are presented in Appendix C.3.

Table 5-2 Issues articulated during stakeholder consultations

No.	Issue
1.	When will the Project start? When will the community see change in West Point? The community has been hearing about this project for years but have not seen anything concrete yet. In the meantime, houses are being destroyed due to erosion.
2.	Access to the sea is needed for community survival: fishermen rely on it for their livelihood.
3.	Is funding for the project available?
4.	Will activities continue at Jacob Town and other towns where awareness sessions were conducted? It is important that these areas are not left out.
5.	Possibility to revisit the design so that the long sandy beach is not lost.
6.	Have other ministries and government entities been consulted?
7.	Roles of both genders in the project, namely women.
8.	How well has the community accepted this Project?
9.	Will there be any resettlement?
10.	How will negative impacts be mitigated?
11.	Under which administration was the project funded?

It is recommended that stakeholder engagement with the local communities directly affected by the Project should continue throughout the project life cycle.

5.2.4 Community Group Consultations

A Community Group Consultation exercise was undertaken for the Project in August 2024. The location of the consultation was in the Fanti area in ward 405. In 2019, other communities in Westpoint were also consulted and the feedback was incorporated into the report. These communities are expected to be the most affected by the Project. Communities consulted are presented in Figure 5-2 and Table 5-3. During the consultations conducted, participants were engaged in the project and asked about the socio-economic activities, major needs of the community, community's concerns, fears and expectations of the project. The questionnaire used for the CGC is presented in Appendix C.3 and the minutes of meetings are presented Appendix C.3.

The meetings offered an opportunity for pertinent stakeholders to express their concerns, emphasize noteworthy social, environmental, and economic project-related matters, and establish a shared understanding of how to tackle these significant concerns moving forward.

Table 5-3 Schedule of the public consultations and number of participants

No.	Date	Community	Participants' description	Number of attendees		
				Male	Female	**Total**
1.	August 14, 2024	Fanti Town, West Point	Fishermen, fish mongers, and business owners.	4	4	8
2.	February 21, 2019	Kru Beach	Fishermen, fish mongers, and business owners.	22	46	68
3.	February 22, 2019	New Westpoint	Fishermen, fish mongers, and business owners.	27	31	58
4.	February 20, 2019	Fanti Town	Fishermen, fish mongers, and business owners.	15	17	32
Total				**68**	**98**	**166**

Figure 5-2 Community Consultation conducted in 2024

5.2.4.1 Summary of Issues Articulated During Community Consultations

The main concerns and questions raised during the community consultations, as well as response, expectations and project positives mentioned are summarized in Table 5-4.

Table 5-4 Summary of issues articulated during community consultations.

Issues articulated
Main concerns raised
• Being compelled to stop fishing • Being relocated for construction • Being relocated once the land is protected • Loss of the beach as an entertainment area • Loss of access to the beaches • Increase in population at Westpoint • Increase in drug use • Increase in prostitution • Increase in theft incidents
Responses
• It is recommended that at least one landing site always remain operational, and that construction works should not be carried out simultaneously on both sites. • No large-scale resettlement is planned. Only areas directly needed for construction may be temporarily accessed, and mitigation measures will be developed for any affected households. • Some sections of the beach will be altered by the revetment, but community access points and a promenade will be designed to allow safe public use. • Codes of conduct for workers will be enforced. • Local labor will be prioritized where possible. • The Project does not include dredging; however, this concern will be communicated to the responsible government authorities.
Expectations
• Construction to begin soon • Dredging of the mouth bar to prevent accidents • Assistance from NGOs and the government for the fishing community • Provision of fishing materials at subsidized rates • Reduction in equipment prices by the government • Government assistance for fishermen to obtain loans
Project positive impacts
• Fewer accidents • More job opportunities for the youth • Processing sites and the opportunity to manage the fishing industry more effectively • Reduction in canoe losses • Fewer death incidents • Additional landing space

5.2.5 Focus Group Discussions

5.2.5.1 Women Focus Group Discussions

Women FGDs were held after the community consultation. An FGD was held on August 13, 2024 in the SAI as presented in Figure 5-3. The issues articulated during the FGDs are summarized in Table 5-4.

Figure 5-3 Photo from women focus group discussion

FGDs with women offered a safe environment for them to voice their worries, worries, and anticipated outcomes related to the Project. Insights from these discussions supplemented and broadened the feedback and concerns articulated by the communities during previous consultations. Moreover, it furnished a broader understanding of the circumstances surrounding women in the project area, contributing to the social baseline. The issues mentioned in the consultations were recorded and taken into consideration in which several measures were suggested to minimize these challenges in the mitigation measures. Questionnaires can be found in Appendix E.

Table 5-5 Summary of issues articulated during focus group discussions with women

Issues articulated
Main concerns raised
• The project might affect people's livelihoods. • Some folks living near the project site will have to move. • There's a risk of increased criminal activity. • Workers unfamiliar with local customs could struggle with earning income. • Some people might lose their homes. • There's potential for the spread of diseases like HIV.
Expectations
• More job opportunities. • Business growth. • The project should start and wrap up on time. • Women should be included in awareness campaigns about the project. • Employment opportunities for women need to be created. • Empowering businesses through things like microloans. • Skills training for women • Scholarships for schooling for women
Project positives
• New job opportunities • Business expansion

5.2.5.2 Ecosystem Services Focus Group Discussions and Interviews

FGDs were held with fishermen and fishmongers. FGDs considered in this report are those conducted in 2024 and 2019.

A total of four focus group discussions were held in the SAI. Two FGDs were held on August 2024 and two FGDs were held on February 2019. The FGDs included both men and women (Figure 5-4).

The information gained from these discussions reinforced and expanded the comments and concerns expressed by the communities in the earlier round of consultations. The insights gathered from these conversations reaffirmed and broadened the issues and viewpoints shared by the communities during the initial consultations. They offered valuable insights into the livelihoods of these groups, highlighting their reliance on ecosystem services for their social foundation. Furthermore, these FGDs served to gather essential biological data on significant flora and fauna for the purpose of establishing a baseline for conservation efforts. The questionnaires are available in Appendix F. A summary of the discussed issues is outlined in Table 5-6.

FGD with fishermen at Westpoint

FGD with fishmongers

Figure 5-4 Photos from FGDs conducted with fishermen and fishmongers

Table 5-6 Summary of issues articulated during focus group discussions on ecosystem services

Issues articulated
Main concerns raised
• Influx of people to the area which could increase the risk of crime • Loss of land • Relocation which would lead to loss of livelihood • Loss of homes due to construction
Expectations
• It will prevent the flooding • Offer more space for fishermen to land • For the project to start and end on time • Building a wharf for the safety of fishing canoes and nets • Construction of a nearby gas station so that fishermen can reach the stations easily • Include insurance in the cost of fishermen licence • Measures to stop burials happening in the sand • Economic development • Livelihood improvement • Improvement in sanitation facilities

Issues articulated
Project positives
• Places for the canoes to load • Governmental to help with fish sellers • Stopping sea erosions • It will help individuals save money and keep their canoes safe

5.3 STAKEHOLDER ENGAGEMENT PLAN

The ESIA contains interviews, focus groups and community consultation as part of the ongoing Stakeholder Engagement Plan (SEP). the project was discussed with stakeholders including relevant government departments, industry groups, NGOs, and individual community members. In addition, affected communities were consulted as well. It is anticipated that based on the communities' expressed views, the project will be fully accepted, if communities can stay where they are and are protected from eviction and compensated for any loss of livelihood, they might face due to the construction works.

The Safeguards Officer of the Project Management Unit (PMU) will be responsible for preparing and distributing regular project updates to keep interested stakeholders informed about the project's progress, following the Stakeholder Engagement Plan. Any inquiries, concerns, complaints, or grievances will be documented in a register and reported to the relevant manager. All materials must be published in English, as it is widely spoken in the area. However, it may also be necessary to publish the information in Fanti, a traditional Ghanaian dialect, as some community members primarily use this language at home.

5.4 COMMUNITY CONSULTATION

A community consultation group exercise was conducted in August 2024, as detailed in the relevant section. Additionally, a broader community consultation for the ESAR took place in February 2019. During these consultations, visits were made to the Westpoint community and a Community-Based Organization (CBO) located in Westpoint. The community reported several issues, including loss of lives, destruction of homes and workplaces, disruption to livelihoods, increased uncertainty, and a lack of alternative relocation options. Both fishing and non-fishing communities rely heavily on their location for their livelihoods, and the fear of losing land, flooding, forced relocation, and loss of access to plots they have used for decades is a significant concern.

The community has already been impacted by sea flooding, which has damaged their canoes and homes, displaced residents, and affected livelihoods. As a result, they generally support the idea of coastal protection, though they have some concerns. One of the primary concerns raised was the desire for residents to remain in place, as relocation would result in the loss of livelihoods, reduction of beach space for recreational activities, and fragmentation of the community. Residents feel they have the right to live in these areas, particularly because they

have played a role in maintaining the coastline. Another concern is the fear that wealthier individuals might push them out if the land is protected. Despite these concerns, the idea of coastal protection is welcomed by the community.

5.5 GRIEVANCE REDRESS MECHANISM

A Grievance Redress Mechanism (GRM) guidance note was supplemented. The GRM recommended is a system proven to work in poor communities in Liberia, is compliant with UNDP's Social Safeguards, follows customary norms and fits into the statutory administrative process of the Government of Liberia.

A GRM enables both internal and external stakeholders to ask questions and raise concerns, ensuring they are addressed appropriately. It serves as clear evidence of a commitment to promptly and carefully manage all reasonable issues and inquiries brought forward. All grievances must be documented, efficiently processed, and reported through the appropriate channels.

The process for resolving complaints involves several stages. At each stage, the complainant has the option to involve witnesses, traditional authorities, a non-governmental organization (NGO), or other civil society representatives to help and support. The steps of how a GRM operates is provided in Figure 5-5.

In line with UNDP guidance note, the Project will establish its own project-level Grievance Redress Mechanism (GRM). Appendix J.2.6 provides a detailed GRM that could be used for the project or adapted, as needed, to reflect the project's scale, scope, and community context. The GRM presented in Appendix J.2.6 is in alliance with UNDP's guidelines. The project-level GRM will ensure accessibility to all stakeholders, including vulnerable and marginalized groups, while maintaining compliance with national statutory procedures and international safeguards. Provisions will be made to update or modify the mechanism during implementation if monitoring or stakeholder feedback indicates the need for improvement.

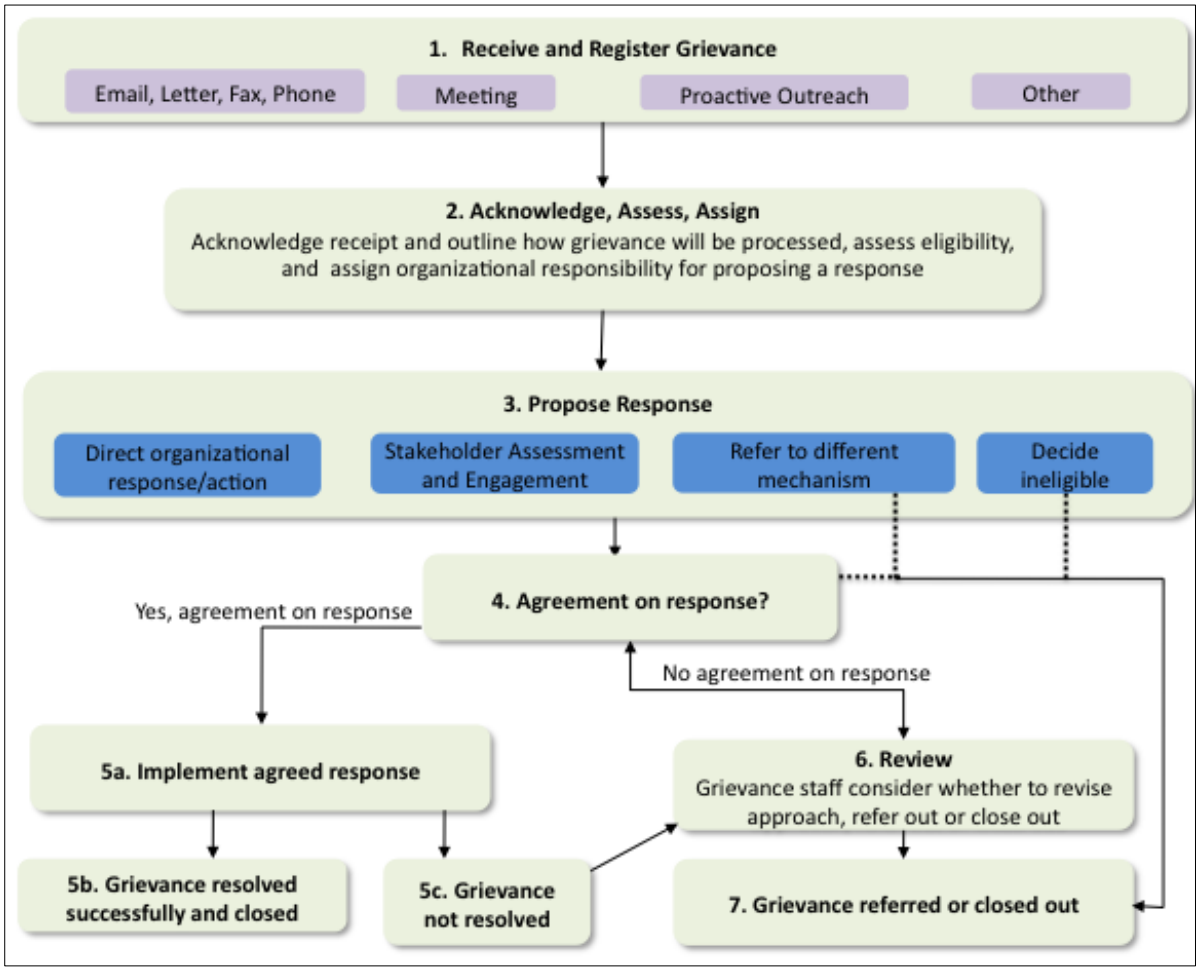


Figure 5-5 Grievance Redress Mechanism process (data source: Grievance Redress Mechanism Guidance Note - UNDP)

6 BASELINE CONDITIONS: THE PHYSICAL ENVIRONMENT

This section describes the baseline conditions of the physical environment in the project area. The physical environment comprises several aspects which include meteorological conditions, geology, topography and bathymetry settings, current, tides and waves regime, water resources and quality, soil and sediments, air quality and ambient noise conditions. Baseline conditions for each of these aspects are presented in the following subsections.

Understanding the baseline conditions of the physical environment will help assess the likely environmental impacts of developing the Project.

6.1 SOURCE OF BASELINE DATA

The assessment of the conditions of the physical environment is initially based on a review of available data such as aerial photography, topographic maps, public databases, published literature and previous and current studies conducted for the Project. It is then followed by conducting field surveys, and sampling and monitoring activities, and analysing sampling and monitoring results to obtain required data to prepare a complete ESIA Report.

6.2 CLIMATOLOGICAL CONDITIONS

The climate of Liberia is determined by the equatorial position and the distribution of low and high-pressure belts along the African continent and the Atlantic Ocean. A fairly warm temperature throughout the year with very high humidity is common because of the moderating influence of the ocean and the equatorial position (UNDP, 2006).

Meteorological parameters including rain, temperature, humidity, barometric pressure and wind direction and speed, are directly related to different aspects of the Project as they can influence sediment and erosion control activities, drainages, construction activities and the migration of air and noise pollutants. Thus, obtaining meteorological data is necessary for understanding the environmental conditions in the area and for adequately and comprehensively assessing environmental impacts.

The following sections present and assess meteorological data obtained from the MBI weather station; a Vantage Pro2 Plus meteorological station installed at Monrovia Breweries (MBI) around 5 km northeast from the site (UTM 29 N 705132 m; E 302704 m). This station provides data of several meteorological parameters between May 2019 and August 2024. Values collected from this station might vary slightly from the values that could have been collected from the site directly, however they are still considered representative enough to understand the meteorological conditions on site.

The data collected is based on 30-minute average recording intervals.

6.2.1 Rain

Rainfall levels play an important role in erosion and sediment loads, thus assessing the expected amount of rain can help in designing a drainages and control measures to protect the revetement structure.

Liberia has two seasons: a dry season, typically extending between November and April, and a wet season, typically ranging between and October. The months of heaviest rainfall vary from one part of the country to another but are normally between June and September.

The MBI station provided a full set of rainfall data for the period between May 2019 and December 2022. Average annual rainfall calculated at MBI station is 3,421.3 mm. Average monthly rainfall ranges between 30 mm in January and 638 mm in June (Figure 6-1). A decreasing trend in total rainfall can be noticed at the MBI station between 2019 and 2022 (Figure 6-2).

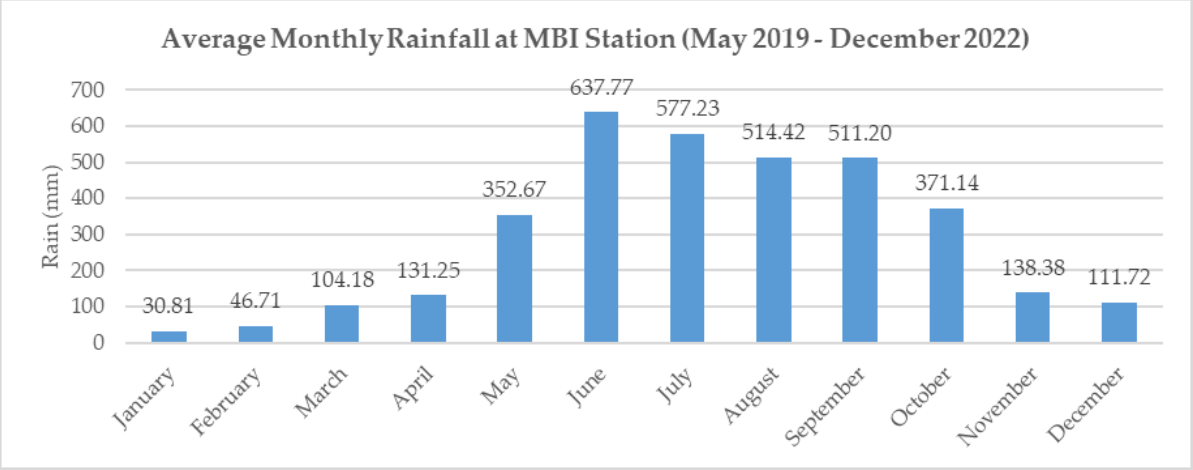


Figure 6-1 Monthly rainfall at MBI Weather Station between May 2019 and December 2022

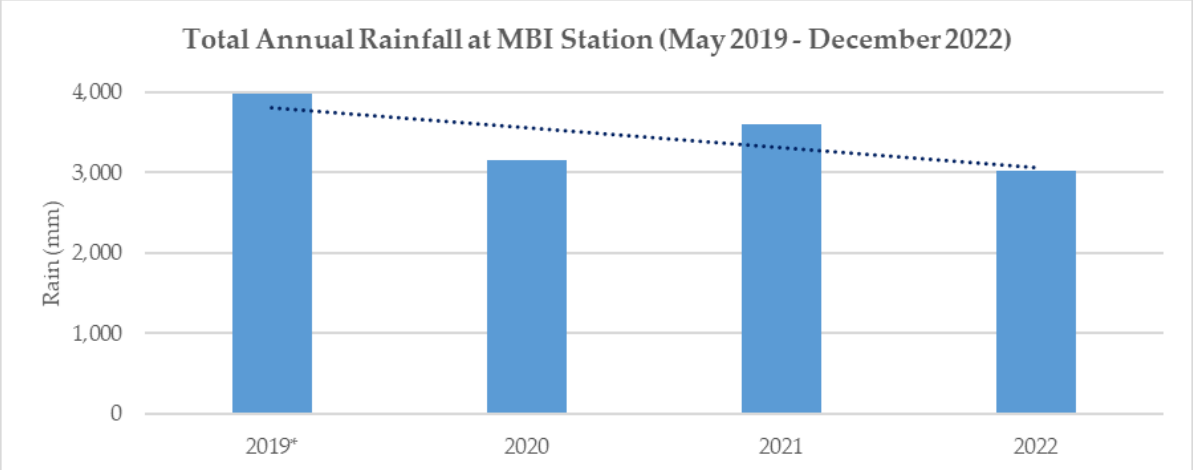


Figure 6-2 Total annual rainfall at MBI Weather Station between May 2019 and December 2022

6.2.2 Temperature

Generally, the temperature is warm throughout the country and there is little change between seasons. The highest temperature occurs between January and March and the lowest is between June and September. Average monthly temperature recorded at MBI station (Figure 6-3) ranges between 25.73°C and 28.61°C, with a minimum between 22.16°C and 23.2°C and a maximum between 30.38°C and 34.58°C.

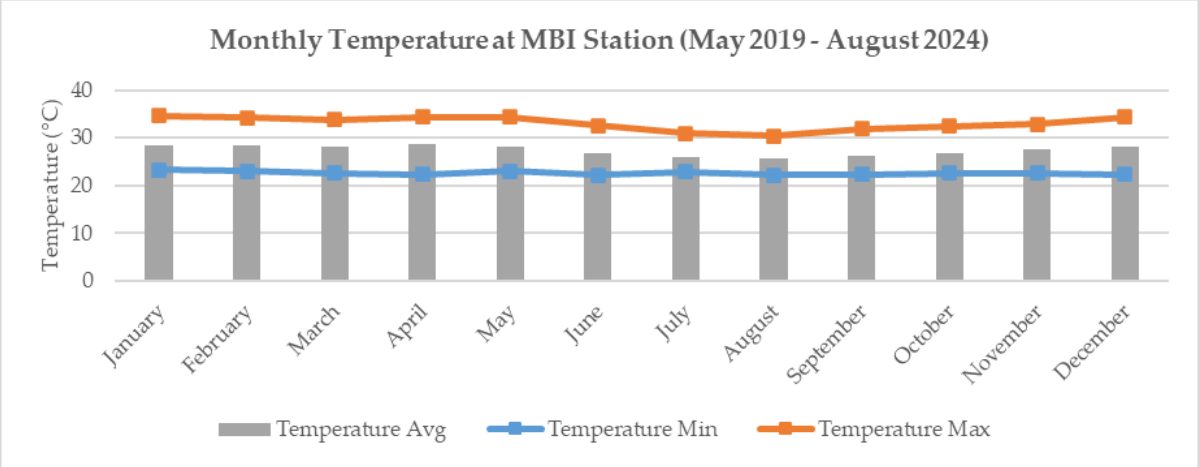


Figure 6-3 Monthly temperature at MBI Weather Station between May 2019 and August 2024

6.2.3 Relative Humidity

Humidity plays an important role in many of the photochemical and thermal reactions that take place in the atmosphere. In addition, water molecules can attach to corrosive gaseous pollutants, possibly emitted by vehicles, generators and mobile plants used by the Project, where emitted gases will dissolve in the water and form a harmful acid solution.

Humidity is generally high throughout the year with an average varying between 80% and 90%. A relative humidity of up to 100% is common during the wet season while it decreases in the dry season, dropping as low as 30% on some days. Figure 6-4 shows average humidity variations throughout the year recorded at the MBI station

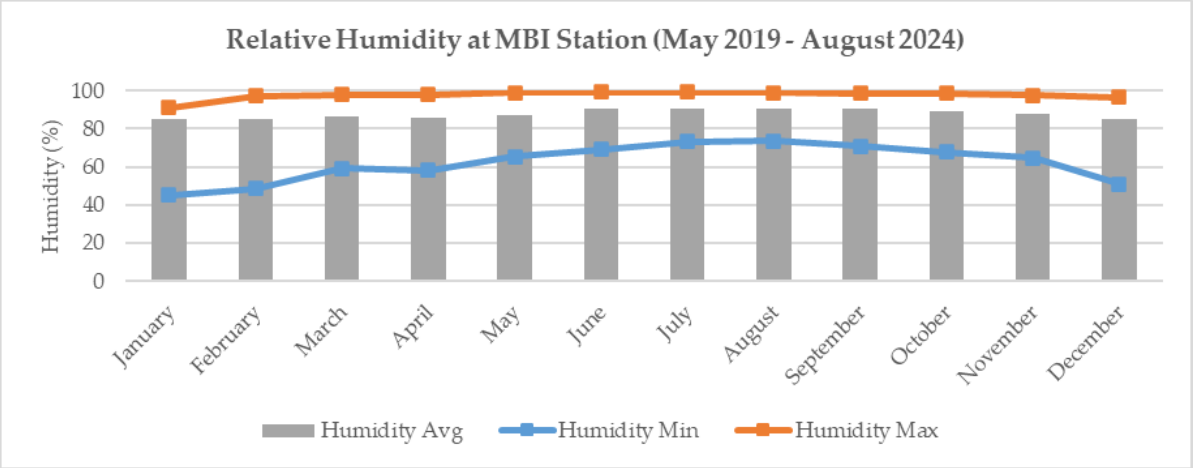


Figure 6-4 Monthly relative humidity at MBI Weather Station between May 2019 and August 2024

6.2.4 Barometric Pressure

Barometric pressure is pressure of the atmosphere at a given point on earth. Barometric pressure is slightly higher during the wet season, compared to the dry season. Average barometric pressure recorded at MBI station (Figure 6-5) varies between 1,007 mbar and 1,016 mbar, with a minimum of 1,002 mbar and a maximum of 1,019 mbar.

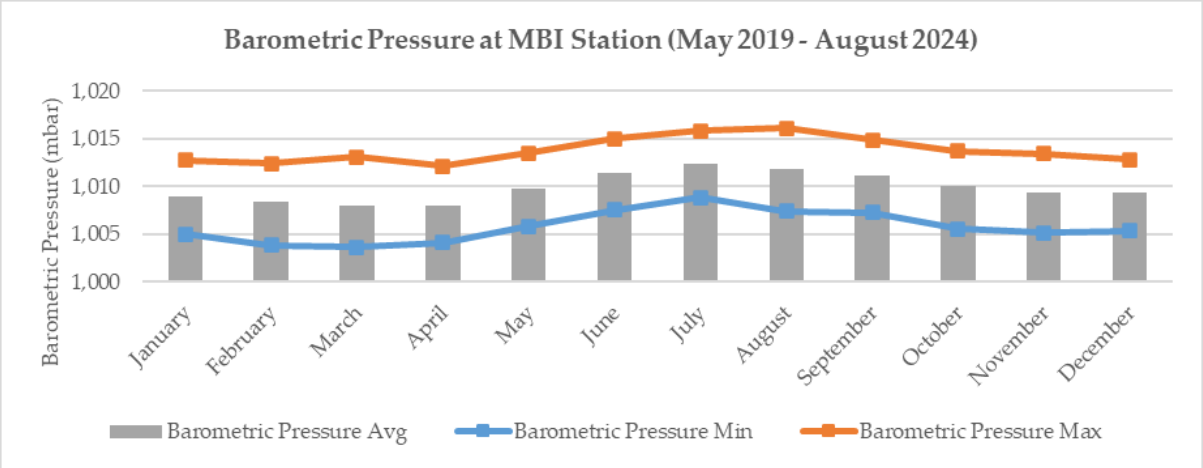


Figure 6-5 Monthly barometric pressure at MBI Weather Station between May 2019 and August 2024

6.2.5 Wind

Wind speed and wind direction determine the general direction and area affected by emissions and odour. In addition, the presence of turbulent winds enhances dispersion of pollutants, while the absence of strong winds results in a buildup of pollutants in a given area. Thus, it is important to understand the wind factor when designing a landfill to be able to depict most affected receptors and mitigate impacts on these receptors efficiently.

6.2.5.1 Wind Speed

Average wind speed recorded at MBI station (Figure 6-6) ranges between 1.13 m/s and 1.95 m/s with average peaks reaching 18.8 m/s (Figure 6-7). Wind speed does not vary greatly throughout the year; however, slight increase is observed between February and April and between August and September.

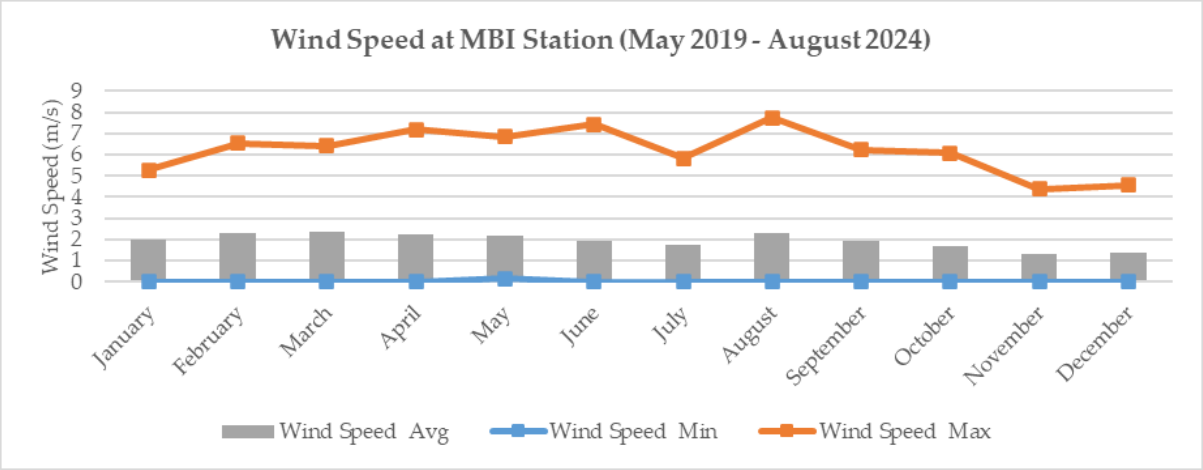


Figure 6-6 Monthly wind speed at MBI Weather Station between May 2019 and August 2024

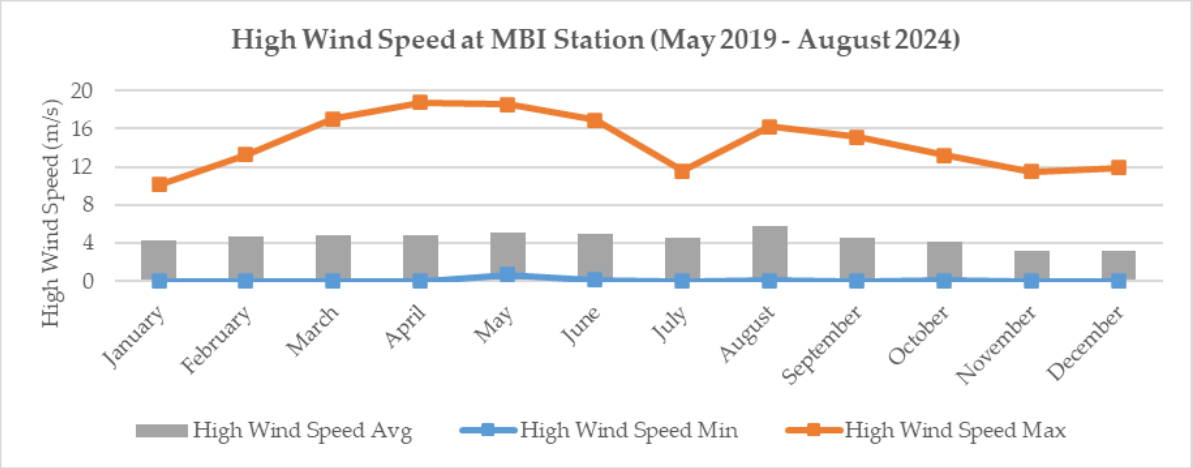


Figure 6-7 Monthly wind peak at MBI Weather Station between May 2019 and August 2024

6.2.5.2 Wind Direction

The dominant wind direction recorded at MBI station is generally towards the west-south-west throughout the year, coupled with dominant wind to the south-south-east between June and August and dominant wind to the north-east between November and January (Figure 6-8).

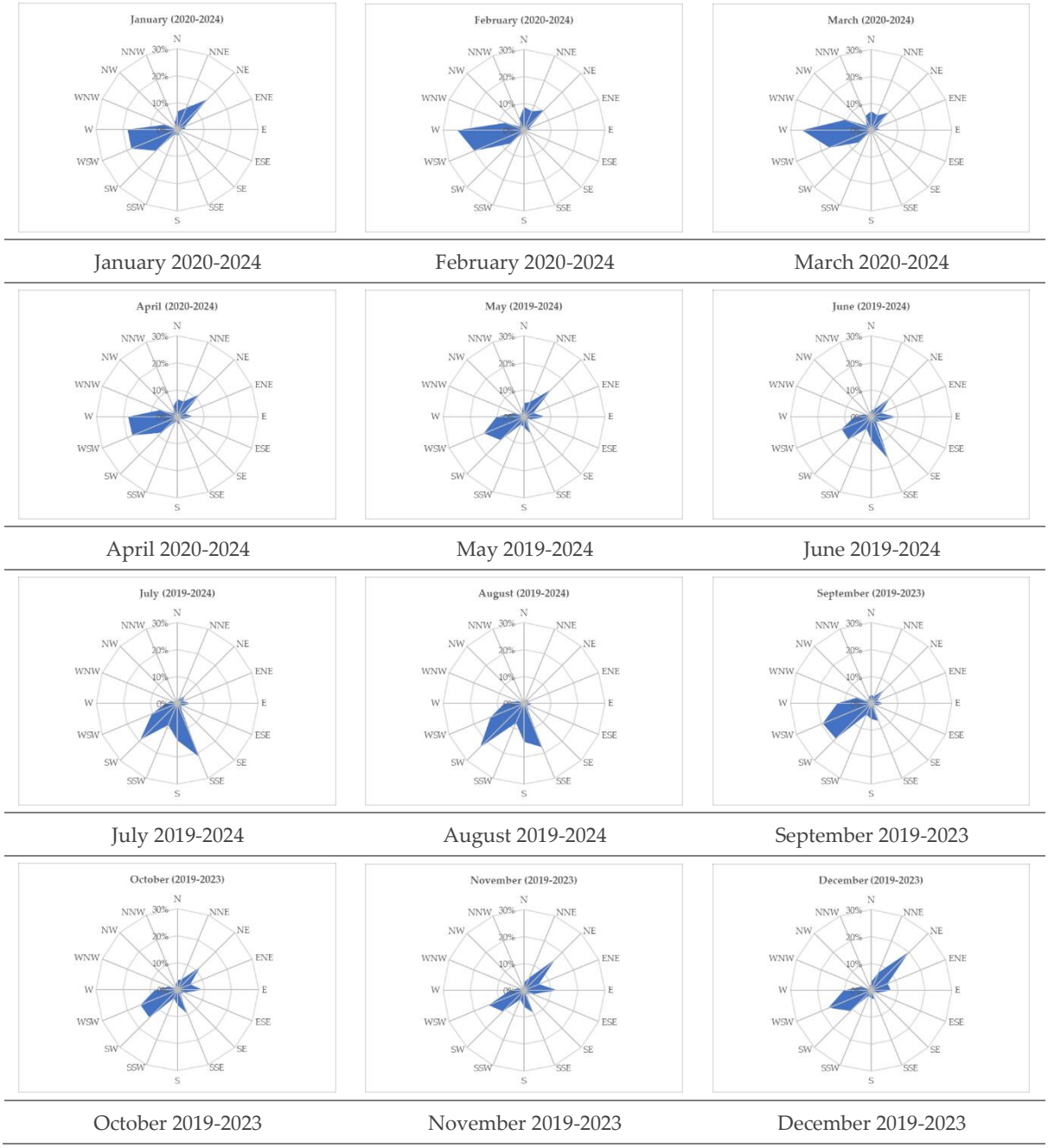


Figure 6-8 Average monthly wind direction at MBI Weather Station

6.3 GEOLOGY, TOPOGRAPHY, AND BATHYMETRY

6.3.1 Geological Setting

Geological investigations in Liberia have shown that nearly all of the terrain is underlain by Precambrian crystalline metamorphic rocks which form part of the West Africa shield known as the Guinea Shield. The rocks forming this crystalline shield are a series of granite, gneiss, and schist beds which have resulted from metamorphism by tectonic forces acting on a regional scale. The structural features of the rocks in this region are uniform over relatively

large areas. Gneissic structure and schistosity dip at high angles in most places and are often vertical.

The NW-SE orientation of Liberia's coastline has been shaped by geological features dating back to the Pan-African era (550 million years ago), which influenced the rifting of the West African margin during the Mesozoic era. The coastline features swash-aligned barrier beaches, enclosed lagoons, prograded beach ridge plains, and rocky headlands (Anthony, 1991; Jones; Bird, 2010).

Monrovia's coastal area mainly comprises Quaternary lagoonal and beach deposits, except for a Jurassic diabase rock formation at Cape Monrovia. This formation, found between west of West Point, to the north of Mamba Point, consists primarily of calcic plagioclase and clinopyroxene, with minor magnetite and ilmenite, making it more erosion-resistant than its surroundings. Further inland, along the coast, are fluvial and deltaic deposits of buff silt, sand, and possibly beach sands, covering a landscape of very low relief.

To better understand the geology of the site, on site investigation was conducted by the Hydro Engineering Study and Detailed Design (HESDD) (Brighten Development, 2023). Three boreholes were drilled to a depth pf 20 m BG or until reaching bedrock. Summary of the findings is presented in Table 6-1. The onsite investigation shows that the site is generally underlain by loose silty sand with small amounts of gravel and clayey material, that becomes denser gradually with depth. A layer of dark silty clay with organic matter and root inclusions was encountered at around 17 to 20 m BG in BH1 and BH2 covering the area beach strip centre to north of west point. Bedrock, suspected to be Gneiss was encountered in BH3, west of the Site, at around 12 m BG.

Table 6-1 Summary of results of geological investigation conducted by the HESDD (Brighten Development, 2023)

	BH1	BH2	BH3
Coordinates (UTM 29N)	300043.96 m E 700014.66 m N	299903.00 m E 699618.00 m N	299722.32 m E 699187.21 m N
Location	North - Around cross drain 2 location	Centre - Around cross drain 3 location	South - At landing site 2 location
Total Depth	20 m BG	20 m BG	14.3 m BG
GW encountered	3.10 m BG	1.82 m BG	2.65 m BG
Stratigraphic description	• 0 – 18 m BG: loose silty sand with gravel and clayey material gradually becoming denser with depth • 18 – 20 m BG: wet dark silty clay with organic matter and mangrove roots	• 0 – 17 m BG: loose silty sand with gravel and clayey material gradually becoming denser with depth • 17 – 20 m BG: soft to firm wet dark silty CLAY with organic matter	• 0 – 12.3 m BG: loose silty sand with gravel and clayey material gradually becoming denser with depth • 12.3 – 14.3 m BG: hard moderately weathered to fresh dark grey rock suspected to be gneiss
Rock encountered	No	No	Yes at 12.3 m BG

6.3.2 Topography and Bathymetry

Liberia can be divided into three distinct topographical areas. First, a flat coastal plain which extends up to 80 km inland, with creeks, lagoons, and mangrove swamps; second, an area of broken, forested hills with altitudes from 180–370 m, which covers most of the country; and third, an area of mountains in the northern highlands, with elevations reaching 1,384 m.

The project area falls within the flat coastal plain area in Monrovia. The bathymetry of West Point indicates a relatively steep seabed compared to the near-shore zone further north, though it still has a gentle slope overall, with shallow waters extend further than in other areas along the Monrovian coast. At West Point, the water depth reaches 8 meters only at about 500 meters offshore. The seabed in this area is composed of sand and silt, with an even slope and no rock outcrops (Earthtime Inc. and CDR International, 2019).

A topographic and bathymetric survey was conducted in the project area as part of the HESDD (Brighten Development, 2023). The topographic survey focused on the coastal region, covering depths from -3 m MSL to elevations of +3 m MSL or any designated reference point. The bathymetric survey extended over a 4 km stretch along the coastline of the project site and included part of the Mesurado River. Survey points and lines were spaced at 25 m intervals, with each line extending either to a depth of 5 m Chart Datum (CD) or 50 m from the shoreline (Brighten Development, 2023). The results, illustrated in Figure 6-9, indicate that the West Point coastline has a relatively steep slope. It also shows that the Mesurado River is shallow, with an average depth between -0.5 and -2.5 meters and with shallow sand dunes forming in several areas. A shallow mudflat forms at the mouth of the Mesurado River, hindering its flow into the sea. This area is often subjected to large waves, making it hazardous for ships, especially during high tide (Brighten Development, 2023).

Figure 6-9 Topography and Bathymetry at the Project area (Brighten Development, 2023)

6.3.3 Seismicity

Earthquake hazard in Liberia is classified as very low by the Global Facility for Disaster Reduction and Recovery (GFDRR). This means that the chance of potentially damaging earthquakes in the Project area is less than 2% in the coming 50 years (Thinkhazard!, 2020).

The last inland earthquake in Liberia occurred in 1995. It had a 4.5 magnitude on the Moment Magnitude scale (M) and a 10 km depth, and the epicentre was located around 16 km south-east of Tubmanburg, Bomi County (USGS, 2020).

The closest seismic active zone to Liberia is the Mid-Atlantic ridge, but it poses no major threat because of its distance from the Liberian shore. In 2024, Liberia was hit by 2 earthquakes with magnitudes between M 4.9 and M 5.4. These occurred along the Mid-Atlantic ridge at a distance of approximately 900 km from the Liberian coast and did not constitute any threat to Liberia (Earthquakes.Zone, 2024).

6.4 CURRENTS, TIDES AND WAVES

Liberian waters are located between two major West African upwelling areas: the Canary Current to the northwest and the Benguela Current to the east. The Equatorial Counter Current flows eastward between the North and South Equatorial Currents. The Guinea Current, which runs along the West African coast from Senegal to Nigeria, significantly influences Liberia's offshore waters (Ssentongo 1987).

Seasonal variations in the Guinea Current, influenced by the North Equatorial Counter Current and the Canary Current, result in minimum speeds in the months of November to February and maximum speeds between May and September (Longhurst, 1962; Ingham, 1970; Colin, 1988). The Guinea Current features upwelling areas with high biological productivity, and beneath it flows the Guinea Undercurrent in a westerly direction (Bakun, 1978; Binet, 1997; Binet and Marchal, 1995; Gyory et al., 2008).

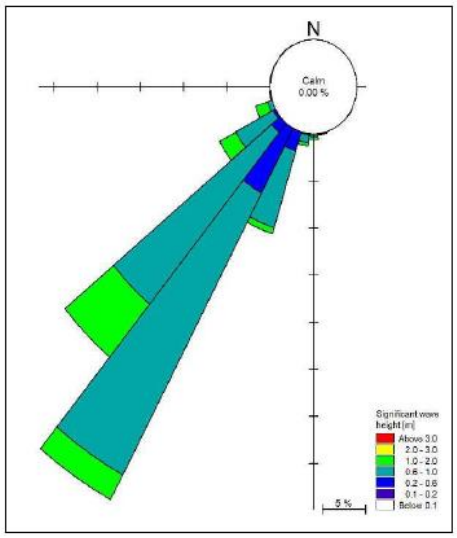
Monrovia experiences a semi-diurnal tide, with two high and two low tides each day. Tidal influence extends about 10 km inland in wetlands and rivers (Gatter, 1997).

The wave regime along Liberia's coast is dominated by long-period swell waves generated by distant South Atlantic storms. These energetic waves break strongly onto the shoreline and are relatively uniform in direction and height. Two main swell systems originate from the SSW (~200°N) and SSE (~160°N), with a weaker third system from the WNW (~300°N) (CDR International, 2019). Wave heights vary seasonally, ranging from 0.5 to 2 meters, with higher and the most extreme waves occurring between June and September during the rainy season (PhysE, 2010). Significant wave height generally ranges between 1.1 and 1.3 m, with occasional

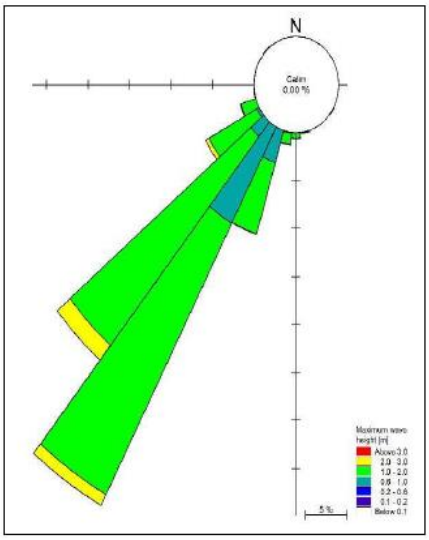
wave heights reaching up to 1.8 m. The predominant wave direction is SSW (CDR International, 2018).

6.4.1 Waves

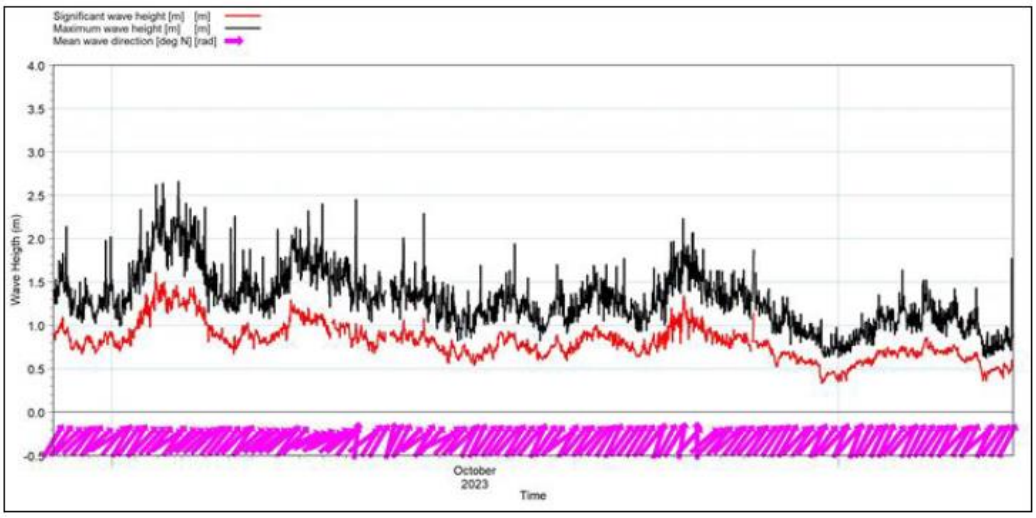
A wave data collection survey was conducted in the project area as part of the HESDD (Brighten Development, 2023). The data was gathered along the West Point coastline over a one-month period in October 2023, covering an offshore area extending 3 km and reaching depths of 10 to 20 meters. The survey results, displayed in Figure 6-10, indicated that waves predominantly originated from the southwest (SW) and south-southwest (SSW) directions. Most of the significant wave heights recorded ranged between 0.6 and 1 meter, with the maximum wave heights typically falling between 1 and 2 meters (Brighten Development, 2023).



Wave rose of significant wave height



Wave rose of maximum wave heigt

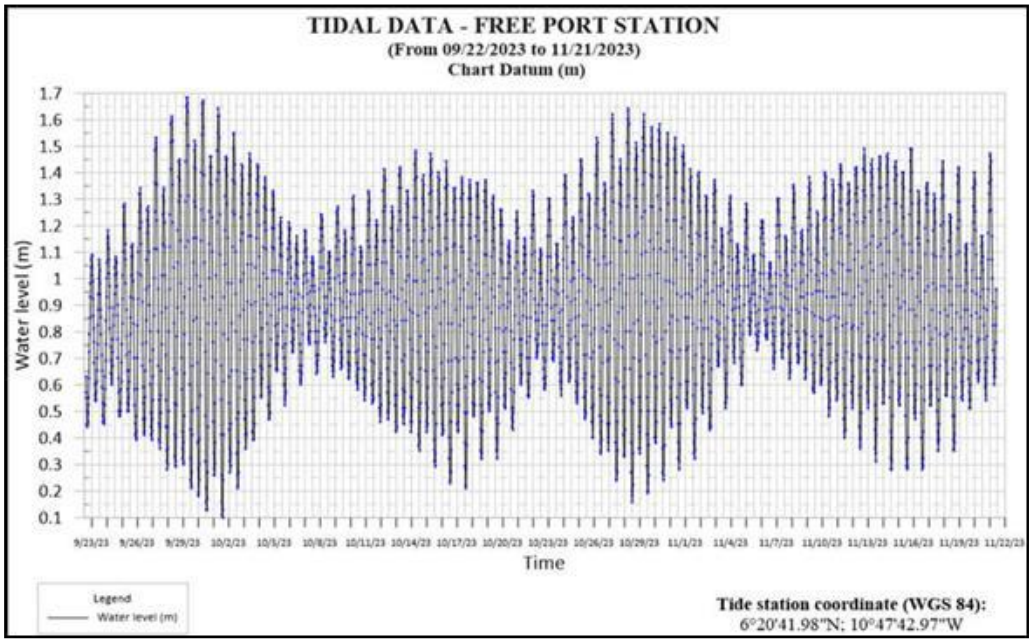


Spectrum of wave height (H1/3 and Hmax)

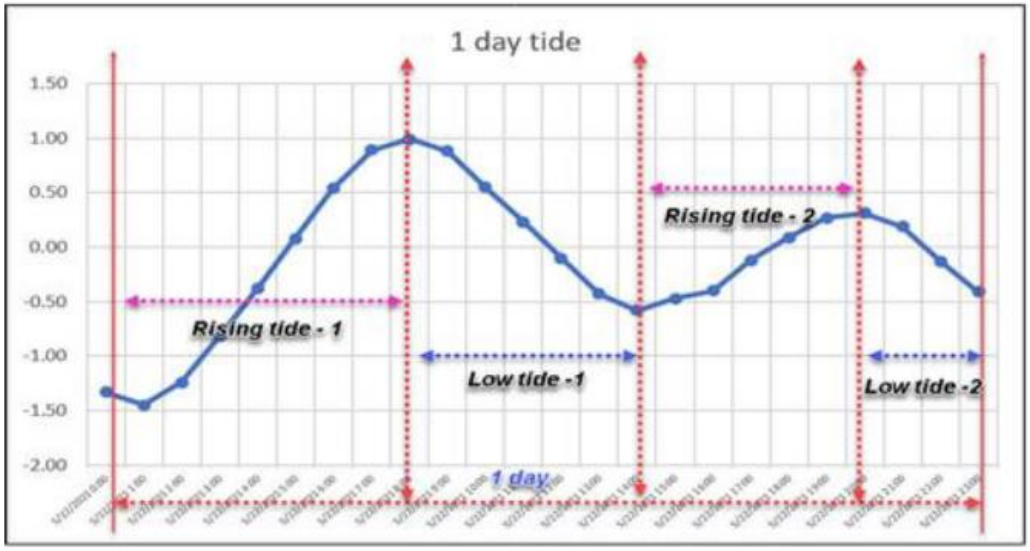
Figure 6-10 Waves direction and height (Brighten Development, 2023)

6.4.2 Tides

A tide data collection survey was conducted in the project area as part of the HESDD (Brighten Development, 2023). The data was collected over a two-month period between September and November 2023, covering a 10 km radius from the West Point coastline. The results indicated that the area's tidal regime is semi-diurnal, with two high tides and two low tides occurring daily (Figure 6-11). Key tidal level parameters recorded during the monitoring period, along with variations in tidal levels, are summarized in Table 6-2 (Brighten Development, 2023).



Tidal level variation between 22 September and 21 November 2023



Tidal level variations in 1 day

Figure 6-11 Tidal level variations (Brighten Development, 2023)

Table 6-2 Characteristics parameters of tidal level (Brighten Development, 2023)

Parameter	Value
Highest astronomical tide (HAT)	1.68 m
Mean high water springs (MHWS)	1.62 m
Mean high water (MHW)	1.34 m
Mean high water neaps (MHWN)	1.08 m
Mean Sea level (MSL)	0.90 m
Mean low water neaps (MLWN)	0.73 m
Mean low water (MLS)	0.46 m
Mean low water springs (MLWS)	0.15 m
Lowest astronomical tide (LAT)	0.10 m
Maximum Tidal Amplitude	1.54 m
Minimum Tidal Amplitude	0.29 m
Average Duration of Rising Tide	6 hours and 19 mins
Average Duration of low Tide	6 hours and 6 mins

6.5 WATER RESOURCES

6.5.1 Ocean Water

Liberian waters are consistently warm, ranging from 26-28°C, and have a relatively stable, shallow thermocline typically lying at mid-shelf, between 12-14 meters. This shallow thermocline results in limited water renewal, low productivity, and a greater influence of river discharge rather than upwelling (Longhurst, 1963).

Studies in Exxon Mobil's Block LB-13 (50-80 km offshore between Monrovia and Buchanan, water depths of 1,181-2,904 meters) in 2013 revealed a steep thermocline from about 20 to 40 meters from the water surface, with temperatures ranging from 3.43°C at the bottom to 26.98°C at the surface (TDI Brooks Intl. and InterAct PMTI, 2013). The thermocline and nutrients oscillate seasonally, according to the oscillation of the equatorial undercurrent (Acorn Intl. and Earthtime Inc., 2014).

Due to heavy rainfall and high river discharge, surface waters in Liberia have low salinity, typically below 32 parts per thousand (‰) (Longhurst, 1963). Water samples from Block LB-13 recorded salinity between 33.7 and 35.7‰, with a hallow lens of lower salinity water at the surface due to significant rainfall and river discharge, even during the dry season. A strong salinity gradient at 30-40 meters impacts water density and likely limits nutrient influx to the surface waters from below this mixed layer (Acorn Intl. and Earthtime Inc., 2014; TDI Brooks Intl. and InterAct PMTI, 2013).

The Mesurado Estuary (north of West Point) is saline even during low tide, demonstrating that it is more influenced by coastal waters than by the inland surface water. The implication is that impacts on coastal water quality may reach deep inside the Mesurado Estuary (Earthtime Inc. and CDR International, 2019).

6.5.2 Surface Water

The Mesurado River, which borders West Point to the north, is a small river that flows into the Atlantic Ocean and originates from the Mesurado Wetland inside Monrovia. It is considered to be Liberia's most polluted river. Pollution sources include informal dumping of municipal solid waste and direct discharge of human feces from public toilets built on stilts over the river. Blast fishing, using ammonium nitrate mixed with fuel oil (ANFO) or carbide with water, also occurs. ANFO explosions produce nitrates that can cause eutrophication, while carbide and water explosions generate calcium hydroxide (hydrated lime), which can make the water alkaline.

The Mesurado River is linked to the St. Paul River through Stockton Creek, which defines the eastern border of Bushrod Island. It is approximately 1.5 km long and generally extends in a north-to-south direction. Tidal variations result in daily changes in water level of Stockton Creek. Depending on tidal activities, water in this Creek flows either towards the south to pour in the Mesurado River, or towards the north to pour in the St. Paul River.

Seasonal precipitation causes considerable fluctuations in waterbody levels, often resulting in rivers and streams overflowing their banks along the coastal plains during the rainy season.

6.5.3 Groundwater

Quaternary deposits in the area, including beach, lagoonal, fluvial, and deltaic deposits, can serve as good aquifers for shallow wells. Groundwater depth in Monrovia ranges from 1.5 meters in the rainy season to 2.5 meters in the dry season, with heavy rainfall being the main source of recharge for the unconsolidated sediments. During the peak of the wet season, aquifer discharge can reach up to 30-40 mm per day, and many people use shallow wells to access this water (Earthtime Inc., 2015).

The water table is affected by saltwater intrusion from the ocean and brackish water from the Stockton Creek and Mesurado River systems, as well as oceanic tidal variations. Groundwater on Bushrod Island naturally contains contaminants like sulfide and sulfate due to the high levels of decaying organic matter in the unconsolidated material (Earthtime Inc., 2015).

6.5.4 Water Quality

6.5.4.1 Baseline Water Quality Collection

Baseline water quality data for the project area was initially established during the ESAR study conducted in 2019. During this study, seven samples were collected from the Mesurado River and estuary, and from offshore ocean waters along the West Point coastline. These samples are detailed in Table 6-3. To further strengthen and update this baseline, a more recent round of sample collection was performed for the ESIA. Five water samples were collected from the

locations outlined Table 6-4 and Figure 6-12. The samples included two marine samples collected at different distances from the West Point shoreline, two brackish water samples from the Mesurado River and estuary, and one groundwater sample from West Point township.

The samples collection methodology is described in Appendix G and photos showing sampling process are provided in Figure 6-13.

Table 6-3 Details of water samples collected during the ESAR (Coordinate System: WGS 1984 UTM Zone 29N)

Sample ID	Sample Type	Location	Northing	Easting	Date
6a	Brackish water	Mesurado River mouth	700631.00	300301.00	19 Feb 2019
6b	Marine water	Facing the Mesurado River mouth 300 m from shore	700419.76	299744.34	09 Feb 2019
MR1	Brackish water	Mesurado estuary, near mangrove island	700322.55	300647.59	19 Feb 2019
MR2	Brackish water	Mesurado estuary, near Providence Island	698983.91	300665.08	19 Feb 2019
MR3	Brackish water	Mesurado estuary, near wetlands	698238.87	301609.3	19 Feb 2019
7a	Marine water	Facing west point coast 360 m from shore	699700.54	299608.08	09 Feb 2019
7b	Marine water	Facing west point coast 1 km from shore	699833.45	298926.03	09 Feb 2019

Table 6-4 Water sampling locations and details (Coordinate System: WGS 1984 UTM 29N)

Sample ID	Type	Location	Northing	Easting	Date
GW01	Groudnwater	Open well next to the West Point Town Hall Water depth = 0.39 m	699862	300334	21 Aug 2024
M01	Marine water	Atlantic Ocean, facing Kru landing site, 150 m from shore	699620	299819	22 Aug 2024
M02	Marine water	Atlantic Ocean, facing Kru landing site,330 m from shore	699572	299580	22 Aug 2024
E01	Brackish water	Mesurado Estuary, low tide	699913	300674	22 Aug 2024
R01	Brackish water	Mesurado River, near Balli Island (the mangrove wetland), low tide	698444	301286	22 Aug 2024

Figure 6-12 Sampling Location map

Figure 6-13 Water sample collection

6.5.4.2 Laboratory Results and Analysis

Water quality results, along with the comparison to the relevant standards are presented in Table 6-5 for groundwater and Table 6-6 for marine and brackish water samples. The original laboratory report is included in Appendix H.

Groundwater results are compared to two local standards and one international drinking water guidelines; these are:

- Liberian water quality standards for domestic water (EPA, 2018).
- Liberian water quality standards Class I (Ministry of Health and Social Welfare, 1987): Drinking water; water supply for industry requiring drinking water.
- The World Health Organization Guidelines for Drinking Water quality (World Health Organization, 2022).

In general, water sample results were within the above-mentioned standards except for Nitrite and phosphate which slightly exceeded the Ministry of Health standard. Traces of some metals were also detected in the groundwater samples but where all within the applicable standard.

It is also with noting that Extractable Petroleum Hydrocarbons (EPH) were detected in the groundwater sample. Although there is no applicable standard for these parameters their presence in the sample might indicate a groundwater hydrocarbon contamination (Table 6-5).

Marine and Brackish water samples are compared to two local standards; these are:

- The Liberian water quality standards for coastal waters marine outfall, class SW-II which includes "water used for bathing, contact sports and commercial fishing" (Environmental Protection Management Law, 2009); and
- The Ministry of Health drinking water quality standard for class II waters which includes "water used for fisheries, cultivated fisheries, organized public bath, recreational water sports" (Ministry of Health and Social Welfare, 1987).

In general, water sample results were within the above-mentioned standards except

- Total dissolved solids (TDS), which exceeded the Ministry of Health standard in all sampling locations; and
- Total suspended solids (TSS), which exceeded the Ministry of Health standard in the ESAR sampling round but were below the standards for the recent samples collected.

Traces of some metals were also detected in the samples but where all within the applicable standard. EPH was detected only in the sample collected from the Estuary while Gasoline Range Organics (GRO) was detected in samples collected from the ocean and the Mesurado River. Although there is no applicable standard for these parameters their presence in the sample might indicate a groundwater hydrocarbon contamination (Table 6-6).

It is important to note that in areas where testing was conducted, the concentrations in samples collected during the ESAR study in February 2019 were generally higher than those in the recent sampling round from August 2024. This variation could be attributed to seasonal differences, with lower concentrations observed during the rainy season likely resulting from the dilution of contaminants due to heavy rainfall.

Table 6-5 Results of groundwater sample

Parameter	Unit	WHO (4th edition, 2022)	Liberian water quality standards, Class I (MoH, 1987)	Liberian water quality standards for domestic water (EPA, 2018)	GW01
					21-08-24
Ammoniacal Nitrogen as N	mg/l	*N/A*	*1.00*	*0.50*	0.433
COD, unfiltered (low level)	mg/l	*N/A*	*N/A*	*N/A*	<7
Conductivity @ 20 deg.C	mS/cm	*N/A*	*N/A*	*N/A*	0.121
Cyanide, Complex	mg/l	*N/A*	*N/A*	*N/A*	<0.05
Cyanide, Free	mg/l	*N/A*	*N/A*	*0.00*	<0.05
Cyanide, Total	mg/l	*N/A*	*0.00*	*0.00*	<0.05
Dissolved solids, Total (gravimetric)	mg/l	*600**	*500.00*	*1,000.00*	73
Nitrite as NO2	mg/l	*3.00*	*0.10*	*3.00*	0.132
pH	pH Units	*N/A*	*6.5 - 8.0*	*6.5 -8.5*	7.71
Phosphate (Ortho as PO4)	mg/l	*N/A*	*0.01*	*N/A*	0.623
Saline Nitrate as NO3	mg/l	*50.00*	*40.00*	*45.00*	2.3
Saline TON as NO3	mg/l	*N/A*	*N/A*	*N/A*	2.48
Saline Total Organic Carbon (TOC)	mg/l	*N/A*	*N/A*	*N/A*	2.52
Saline Total Oxidised Nitrogen as N	mg/l	*N/A*	*N/A*	*N/A*	0.56
Salinity	No units	*N/A*	*N/A*	*N/A*	<2
Suspended solids, Total	mg/l	*N/A*	*N/A*	*N/A*	<2
Turbidity	ntu	*N/A*	*N/A*	*50**	1.9
Metals					
Aluminium, Dissolved	µg/l	*N/A*	*N/A*	*200.00*	28.6
Arsenic, Dissolved	µg/l	*10.00*	*50.00*	*10.00*	7.08
Cadmium, Dissolved	µg/l	*3.00*	*0.00*	*5.00*	<0.05
Chromium, Dissolved	µg/l	*50.00*	*NA*	*100.00*	<0.5
Copper, Dissolved	µg/l	*2,000.00*	*10.00*	*1,000.00*	<1
Iron, Dissolved	mg/l	*0.3**	*0.10*	*0.30*	0.0316
Lead, Dissolved	µg/l	*10.00*	*100.00*	*10.00*	0.212
Manganese, Dissolved	µg/l	*80.00*	*100.00*	*50.00*	31.4
Mercury, Dissolved	µg/l	*6.00*	*0.00*	*2.00*	<0.02
Magnesium, Dissolved	mg/l	*N/A*	*N/A*	*30.00*	0.987
Zinc, Dissolved	µg/l	*N/A*	*1,000.00*	*2,000.00*	7.64
Hydrocarbons					
EPH (C6-C10)	µg/l	*N/A*	*N/A*	*N/A*	<100
GRO >C5-C10	µg/l	*N/A*	*N/A*	*N/A*	10
EPH Range >C10 - C40 (aq)	µg/l	*N/A*	*N/A*	*N/A*	178
Aliphatics >C10-C12	µg/l	*N/A*	*N/A*	*N/A*	<10
Aliphatics >C12-C16 (aq)	µg/l	*N/A*	*N/A*	*N/A*	<10
Aliphatics >C16-C21 (aq)	µg/l	*N/A*	*N/A*	*N/A*	<10
Aliphatics >C21-C35 (aq)	µg/l	*N/A*	*N/A*	*N/A*	<10
Aliphatics >C5-C6	µg/l	*N/A*	*N/A*	*N/A*	<10
Aliphatics >C6-C8	µg/l	*N/A*	*N/A*	*N/A*	<10
Aliphatics >C8-C10	µg/l	*N/A*	*N/A*	*N/A*	<10

Parameter	Unit	WHO (4th edition, 2022)	Liberian water quality standards, Class I (MoH, 1987)	Liberian water quality standards for domestic water (EPA, 2018)	GW01
					21-08-24
Aromatics >EC10-EC12	µg/l	*N/A*	*N/A*	*N/A*	<10
Aromatics >EC12-EC16 (aq)	µg/l	*N/A*	*N/A*	*N/A*	<10
Aromatics >EC16-EC21 (aq)	µg/l	*N/A*	*N/A*	*N/A*	<10
Aromatics >EC21-EC35 (aq)	µg/l	*N/A*	*N/A*	*N/A*	<10
Aromatics >EC5-EC7	µg/l	*N/A*	*N/A*	*N/A*	<10
Aromatics >EC7-EC8	µg/l	*N/A*	*N/A*	*N/A*	<10
Aromatics >EC8-EC10	µg/l	*N/A*	*N/A*	*N/A*	<10
GRO >C5-C12	µg/l	*N/A*	*N/A*	*N/A*	<50
Total Aliphatics & Aromatics >C5-35 (aq)	µg/l	*N/A*	*N/A*	*N/A*	<10
Total Aliphatics >C12-C35 (aq)	µg/l	*N/A*	*N/A*	*N/A*	<10
Total Aromatics >EC12-EC35 (aq)	µg/l	*N/A*	*N/A*	*N/A*	<10
Total EPH (C6-C40) (aq)	µg/l	*N/A*	*N/A*	*N/A*	178
Benzene	µg/l	*10.00*	*N/A*	*N/A*	<1
Ethylbenzene	µg/l	*300.00*	*N/A*	*N/A*	<1
m,p-Xylene	µg/l	*N/A*	*N/A*	*N/A*	<1
Methyl tertiary butyl ether (MTBE)	µg/l	*N/A*	*N/A*	*N/A*	<1
o-Xylene	µg/l	*N/A*	*N/A*	*N/A*	<1
Sum of BTEX	µg/l	*N/A*	*N/A*	*N/A*	<5
Sum of detected Xylenes	µg/l	*N/A*	*N/A*	*N/A*	<2
Toluene	µg/l	*700.00*	*N/A*	*N/A*	<1

Legend: Exceeded Liberia MOH Class I standard
N/A Not Available

Table 6-6 Results of marine and brackish water samples

Parameter	Unit	Standards		ESIA 2024 Samples				ESAR 2019 Samples						
		EPML 2009 (SW-II Waters)	MoH (Class II)	M01	M02	E01	R01	6a	6b	MR1	MR2	MR3	7a	7b
				22-08-24	22-08-24	22-08-24	22-08-24	19-02-19	09-02-19	19-02-19	19-02-19	19-02-19	09-02-19	09-02-19
Ammoniacal Nitrogen as N	mg/l	*N/A*	*3.00*	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
COD, unfiltered (low level)	mg/l	*N/A*	*N/A*	<175	153.00	<28	<28	512	27.3	1030	608	433	464	444
Conductivity @ 20 deg.C	mS/cm	*N/A*	*N/A*	21.60	18.10	4.22	3.97	46.1	46.6	45.9	46.3	45.5	45.5	45.8
Cyanide, Complex	mg/l	*N/A*	*N/A*	<0.05	<0.05	<0.05	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Cyanide, Free	mg/l	*N/A*	*N/A*	<0.05	<0.05	<0.05	<0.05	<0.5	<0.5	<0.5	<0.005	<0.005	<0.5	<0.5
Cyanide, Total	mg/l	*N/A*	*0.02*	<0.05	<0.05	<0.05	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dissolved solids, Total (gravimetric)	mg/l	*N/A*	*1,000.00*	16,500	14,100	2,470	2,430	41,000	37,500	40,000	39,200	39,300	37,000	36,200
Nitrite as NO2	mg/l	*N/A*	*1.00*	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
pH	pH Units	*6.5-8.5*	*6.0 - 9.0*	7.94	7.85	7.24	7.35	8.11	7.98	8.04	8.08	8.01	7.96	7.97
Phosphate (Ortho as PO4)	mg/l	N/A	0.02	<0.05	<0.05	<0.05	<0.05	NT	NT	NT	NT	NT	NT	NT
Saline Nitrate as NO3	mg/l	*N/A*	*60.00*	0.35	0.33	5.51	0.70	<0.3	0.694	0.669	<0.3	<0.3	0.351	<0.3
Saline TON as NO3	mg/l	*N/A*	*N/A*	0.35	0.33	5.51	0.70	<0.3	0.707	0.691	<0.3	<0.3	0.365	<0.3
Saline Total Organic Carbon (TOC)	mg/l	*N/A*	*N/A*	4.84	4.38	5.49	5.63	4.74	2.58	3.21	<2.5	<2.5	<2.5	<2.5
Saline Total Oxidised Nitrogen as N	mg/l	*N/A*	*N/A*	0.08	0.08	1.24	0.16	NT	NT	NT	NT	NT	NT	NT
Salinity	‰	*N/A*	*N/A*	14.90	12.30	2.60	2.40	33.7	34.1	33.5	33.8	33.2	33.2	33.4
Suspended solids, Total	mg/l	*N/A*	*30.00*	15.80	15.10	11.30	10.70	73	59.5	53.5	56	49	51.5	46
Turbidity	ntu	*30.00*	*N/A*	2.26	2.14	9.94	7.91	2.49	0.999	3.79	4.41	4.55	0.951	0.641
Metals														
Aluminium, Dissolved	µg/l	*N/A*	*N/A*	138.00	29.10	44.40	<0.7	NT	NT	NT	NT	NT	NT	NT
Arsenic, Dissolved	µg/l	*N/A*	*50.00*	0.66	<0.5	<0.5	<0.5	0.624	2.82	1.58	1.07	1.43	2.89	1.83
Cadmium, Dissolved	µg/l	*N/A*	*1.00*	<0.05	<0.05	<0.05	<0.05	<0.05	0.0109	<0.05	0.0583	<0.05	0.0127	<0.02
Chromium, Dissolved	µg/l	N/A	N/A	1.81	1.23	0.71	0.71	NT	NT	NT	NT	NT	NT	NT
Copper, Dissolved	µg/l	N/A	10	1.80	<0.5	0.84	<0.5	NT	NT	NT	NT	NT	NT	NT
Iron, Dissolved	mg/l	*N/A*	*1.50*	0.08	0.02	0.06	0.03	0.0101	<0.002	0.00564	0.00806	0.00524	<0.002	<0.004

Parameter	Unit	Standards		ESIA 2024 Samples				ESAR 2019 Samples						
		EPML 2009 (SW-II Waters)	MoH (Class II)	M01	M02	E01	R01	6a	6b	MR1	MR2	MR3	7a	7b
				22-08-24	22-08-24	22-08-24	22-08-24	19-02-19	09-02-19	19-02-19	19-02-19	19-02-19	09-02-19	09-02-19
Lead, Dissolved	µg/l	*N/A*	*100.00*	0.71	<0.3	<0.3	<0.3	<0.3	<0.05	<0.3	<0.3	<0.3	<0.05	<0.1
Manganese, Dissolved	µg/l	N/A	300	23.50	3.06	19.00	13.70	NT	NT	NT	NT	NT	NT	NT
Mercury, Dissolved	µg/l	*N/A*	*5.00*	0.00	0.01	0.00	0.01	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Magnesium, Dissolved	mg/l	N/A	N/A	467.00	393.00	83.10	78.20	NT	NT	NT	NT	NT	NT	NT
Zinc, Dissolved	µg/l	N/A	N/A	29.50	28.50	8.23	4.02	NT	NT	NT	NT	NT	NT	NT
Hydrocarbons														
EPH (C6-C10)	µg/l	*N/A*	*N/A*	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
GRO >C5-C10	µg/l	*N/A*	*N/A*	12.00	<10	<10	13.00	<10	<10	<10	<10	<10	<10	<10
EPH Range >C10 - C40 (aq)	µg/l	*N/A*	*N/A*	<100	<100	104.00	<100	<100	<100	<100	<100	<100	<100	<100
Aliphatics >C10-C12	µg/l	*N/A*	*N/A*	<10	<10	<10	<10	NT	NT	NT	NT	NT	NT	NT
Aliphatics >C12-C16 (aq)	µg/l	*N/A*	*N/A*	<10	<10	<10	<10	NT	NT	NT	NT	NT	NT	NT
Aliphatics >C16-C21 (aq)	µg/l	*N/A*	*N/A*	<10	<10	<10	<10	NT	NT	NT	NT	NT	NT	NT
Aliphatics >C21-C35 (aq)	µg/l	*N/A*	*N/A*	<10	<10	<10	<10	NT	NT	NT	NT	NT	NT	NT
Aliphatics >C5-C6	µg/l	*N/A*	*N/A*	<10	<10	<10	<10	NT	NT	NT	NT	NT	NT	NT
Aliphatics >C6-C8	µg/l	*N/A*	*N/A*	<10	<10	<10	<10	NT	NT	NT	NT	NT	NT	NT
Aliphatics >C8-C10	µg/l	*N/A*	*N/A*	<10	<10	<10	<10	NT	NT	NT	NT	NT	NT	NT
Aromatics >EC10-EC12	µg/l	*N/A*	*N/A*	<10	<10	<10	<10	NT	NT	NT	NT	NT	NT	NT
Aromatics >EC12-EC16 (aq)	µg/l	*N/A*	*N/A*	<10	<10	<10	<10	NT	NT	NT	NT	NT	NT	NT
Aromatics >EC16-EC21 (aq)	µg/l	*N/A*	*N/A*	<10	<10	<10	<10	NT	NT	NT	NT	NT	NT	NT
Aromatics >EC21-EC35 (aq)	µg/l	*N/A*	*N/A*	<10	<10	<10	<10	NT	NT	NT	NT	NT	NT	NT
Aromatics >EC5-EC7	µg/l	*N/A*	*N/A*	<10	<10	<10	<10	NT	NT	NT	NT	NT	NT	NT
Aromatics >EC7-EC8	µg/l	*N/A*	*N/A*	<10	<10	<10	<10	NT	NT	NT	NT	NT	NT	NT
Aromatics >EC8-EC10	µg/l	*N/A*	*N/A*	<10	<10	<10	<10	NT	NT	NT	NT	NT	NT	NT
GRO >C5-C12	µg/l	*N/A*	*N/A*	<50	<50	<50	<50	NT	NT	NT	NT	NT	NT	NT
Total Aliphatics & Aromatics >C5-35 (aq)	µg/l	*N/A*	*N/A*	<10	<10	<10	<10	NT	NT	NT	NT	NT	NT	NT

Parameter	Unit	Standards		ESIA 2024 Samples				ESAR 2019 Samples						
		EPML 2009 (SW-II Waters)	MoH (Class II)	M01	M02	E01	R01	6a	6b	MR1	MR2	MR3	7a	7b
				22-08-24	22-08-24	22-08-24	22-08-24	19-02-19	09-02-19	19-02-19	19-02-19	19-02-19	09-02-19	09-02-19
Total Aliphatics >C12-C35 (aq)	µg/l	*N/A*	*N/A*	<10	<10	<10	<10	NT	NT	NT	NT	NT	NT	NT
Total Aromatics >EC12-EC35 (aq)	µg/l	*N/A*	*N/A*	<10	<10	<10	<10	NT	NT	NT	NT	NT	NT	NT
Total EPH (C6-C40) (aq)	µg/l	*N/A*	*N/A*	<100	<100	104.00	<100	<100	<100	<100	<100	<100	<100	<100
Benzene	µg/l	*N/A*	*N/A*	<1	<1	<1	<1	<7	<7	<7	<7	<7	<7	<7
Ethylbenzene	µg/l	*N/A*	*N/A*	<1	<1	<1	<1	<5	<5	<5	<5	<5	<5	<5
m,p-Xylene	µg/l	*N/A*	*N/A*	<1	<1	<1	<1	<8	<8	<8	<8	<8	<8	<8
Methyl tertiary butyl ether (MTBE)	µg/l	*N/A*	*N/A*	<1	<1	<1	<1	<3	<3	<3	<3	<3	<3	<3
o-Xylene	µg/l	*N/A*	*N/A*	<1	<1	<1	<1	<3	<3	<3	<3	<3	<3	<3
Sum of BTEX	µg/l	*N/A*	*N/A*	<5	<5	<5	<5	<28	<28	<28	<28	<28	<28	<28
Sum of detected Xylenes	µg/l	*N/A*	*N/A*	<2	<2	<2	<2	NT	NT	NT	NT	NT	NT	NT
Toluene	µg/l	*N/A*	*N/A*	<1	<1	<1	<1	<4	<4	<4	<4	<4	<4	<4

Legend: Exeeded Liberia MOH Class II standard
N/A Not Available
NT Not Tested

6.6 SOIL AND SEDIMENTS QUALITY

6.6.1 Sediment Budget in the Project Area

The coastal system around Monrovia is relatively complex as it includes interactions with multiple coastal processes. A major part of the Monrovian coastline is a straight, sandy and wave-dominated coastline. The beach is rather steep with relatively coarse sediment, which is typical of a reflective coastline. The Monrovian coast is mainly subject to long period swell waves which induce an alongshore sediment transport along the coast. The direction of the net alongshore sediment transport is to the north-west (CDR International, 2018). In the project area, sediment transport always occurs in the north-western direction (CDR International, 2019).

There is no incoming sediment from the southern part of West Point, because this coastal area is isolated. Sediment originating from West Point is transported into the Mesurado basin where it sinks onto the growing sand spit around the southern breakwater of the Freeport or is lost offshore. As such, the beach in the project area is subjected to serious erosion (CDR International, 2019). In addition, sand mining is another sediment sink, as sand miners collect sand from the sand bars located north of the project area in their canoes and sell it for construction.

6.6.2 Sample Collection

Two sediment samples were collected along the West Point coast from the locations outlined Table 6-7 and Figure 6-12. The samples collection methodology is described in Appendix G and photos showing sampling process are provided in Figure 6-14.

Table 6-7 Sediment sampling locations and details (Coordinate System: WGS 1984 UTM 29N)

Sample ID	Location	Description	Northing	Easting	Date
S01	Sand spit north of West Point, eastern side	Light brown, sandy, friable and fine material	700300	300165	21 Aug 2024
S02	Shore south-west of West Point, along the Atlantic Ocean	Light brown, sandy, friable and fine material	699434	299889	21 Aug 2024

S01

S02

Figure 6-14 Sample collection

6.6.3 Laboratory Results and Analysis

The results of the sediment samples laboratory analysis, along with the comparison to the relevant standards are presented in Table 6-8. The original laboratory report is included in Appendix H.

As there is currently no definitive Liberian standard for soil and sediment quality, the test results were compared to the following international guidelines:

- The United States Environmental Protection Agency (USEPA) Regional Screening Levels (USEPA, 2023).
- The Dutch Intervention Values for Soil (Ministerie van Volkshuisvesting - Ruimtelijke Ordening en Milieu (VROM), 2013).

It is important to note that guidelines and standards in any country are based on a number of factors regarding both ecological and human health risks in that country, and that they do not necessarily apply equally well elsewhere. In addition, the testing methodology can give

varying results on account of the ways in which different chemical tests extract different fractions of elements and compounds within the soil. For these reasons, it is necessary to use professional judgement in interpreting soil analysis.

The sediment sample results were all in compliance with the above-mentioned standards. Metals such as iron, aluminium, and magnesium were detected in the samples, but their concentrations were within acceptable limits. These levels are likely due to the natural composition of the area's rocks. Additionally, no hydrocarbon concentrations were found in the collected samples.

Table 6-8 Results of sediments samples

Parameter	Unit	USEPA Regional Screening Levels (2023)	Dutch Standard (Soil Remediation Circular 2013)	S01	S02
				21/08/2024	21/08/2024
Colour	No units	N/A	N/A	Light Brown	Light Brown
Description	No units	N/A	N/A	Sand	Sand
Inclusion 1)	No units	N/A	N/A	None	Stones
Inclusion 2)	No units	N/A	N/A	None	None
Moisture Content Ratio (% of as received sample)	%	N/A	N/A	17.00	9.70
Acidity as HCl	mg/kg	N/A	N/A	<20	<20
Alkalinity, Total as CaCO3	mg/kg	N/A	N/A	135.00	52.70
Conductivity @ 20 deg.C	mS/cm	N/A	N/A	1.99	2.95
Exchangeable Ammonia as NH4	mg/kg	N/A	N/A	<15	<15
Nitrate as NO3, 2:1 water soluble	mg/kg	130,000	N/A	<1	1.18
Nitrite as NO2, 2:1 water soluble	mg/kg	7,800	N/A	<0.1	<0.1
pH	pH Units	N/A	N/A	9.15	8.70
Phosphate (ortho) as PO4	mg/kg	N/A	N/A	<1	<1
Water Soluble Sulphate as SO4 2:1 Extract	g/l	N/A	N/A	<0.004	0.08
Aluminium	mg/kg	77,000	N/A	3,030.00	1,030.00
Arsenic	mg/kg	N/A	76	41.00	13.90
Cadmium	mg/kg	N/A	13	<0.02	<0.02
Chromium	mg/kg	N/A	N/A	8.84	12.60
Copper	mg/kg	3,100.00	190	<1.4	3.21
Iron	mg/kg	55,000	N/A	19,600.00	12,800.00
Lead	mg/kg	400	530	6.07	7.14
Manganese	mg/kg	1,800	N/A	165.00	79.90
Mercury	mg/kg	11	N/A	<0.1	<0.1
Magnesium	mg/kg	N/A	N/A	2,180.00	585.00
Zinc	mg/kg	23,000	720	37.30	38.30
GRO >C5-C10	µg/kg	N/A	N/A	<20	<20
EPH >C10-C40	mg/kg	N/A	N/A	<35	<35
EPH (C5-C40)	mg/kg	N/A	N/A	<35	<35
Benzene	µg/kg	1,200	1,100	<1	<1

Parameter	Unit	USEPA Regional Screening Levels (2023)	Dutch Standard (Soil Remediation Circular 2013)	S01	S02
				21/08/2024	21/08/2024
Ethylbenzene	µg/kg	5,800	110,000	<1	<1
Methyl Tertiary Butyl Ether	µg/kg	N/A	N/A	<0.5	<0.5
o-Xylene	µg/kg	640,000	N/A	<2	<2
p/m-Xylene	µg/kg	550,000	N/A	<2	<2
Sum of BTEX	µg/kg	N/A	N/A	<7	<7
Toluene	µg/kg	4,900,000	32,000	<1	<1
Cation Exchange Capacity*	meq/100g	N/A	N/A	<1.5	<1.5

6.7 AIR QUALITY

Historic data on air quality levels in Monrovia are not available. The main sources of air pollutants in the Project area are:

- **Fuel combustion** (a significant contributor), emitting carbon dioxide (CO_2), nitrogen oxides (NO_x), sulfur dioxide (SO_2), particulate matter (PM), and volatile organic compounds (VOCs).
- **Combustion at the Liberia Electricity Corporation** on Bushrod Island (north-north-east of the project area) and in small-scale generators used across West Point and Monrovia.
- **Combustion from small industries**, often using low-quality fuels like leaded gasoline and high sulfur diesel.
- **Vehicular traffic**, including dust and exhaust emissions from roads. Vehicle exhaust contains VOCs, NOx, PMs, and carbon monoxide (CO) released from tailpipes during vehicle operation.
- **Motorized artisanal fishing vessels** emitting SO_2, NOx, and PMs.
- **Domestic cooking** and the **Harmattan**, a dry wind from the Sahara during the dry season, contribute dust and pollutant emissions.
- **Unpaved roads and occasional open burning of municipal solid waste** also release gaseous pollutants such as NOx, COx, SOx, PMs, methane (CH_4), ammonia, dioxins/furans, VOCs, and polycyclic aromatic hydrocarbons (PAHs).

Air quality monitoring took place at two different sampling locations, as shown in Figure 6-12 and Figure 6-15 and using the equipment shown in Appendix I.1. Monitoring included 30-minute monitoring of particulate matter (PM) concentrations of different sizes (PM2.5 and PM10) and 10-min monitoring of gaseous emission concentrations for each of methane (CH_4), carbon dioxide (CO_2), nitrogen dioxide (NO_2), sulphur dioxide (SO_2) and volatile organic

compounds (VOCs). Results are presented in Table 6-9 and Figure 6-16 and compared to national (EPA, 2009) and international standards (World Health Organization, 2021), where available.

Particulate matter concentrations for both PM2.5 and PM10 were high at AQ02 near the coastline. Although monitoring was conducted in the rainy season when natural dust suppression typically occurs, the beach and coastal area still showed high levels of dust.

AQ01 and N01

AQ02 and N02

Figure 6-15 Air quality and noise monitoring

Table 6-9 Air quality monitoring results and standards

Site ID	CO_2 (mg/m³)	NO_2 (mg/m³)	SO_2 (mg/m³)	CH_4 (mg/m³)	VOC (mg/m³)	PM10 (mg/m³)	PM2.5 (mg/m³)
Monitoring period	*10 minutes*	*10 minutes*	*10 minutes*	*10 minutes*	*10 minutes*	*30 minutes*	*30 minutes*
WHO	N/A	0.2 (1 hour)	0.5 (10 min)	N/A	N/A	0.045 (24 hrs)	0.015 (24 hrs)
Liberian standard	N/A	0.5 (instant peak)	N/A	N/A	N/A	0.15 (24 hrs)	N/A
AQ01 699886 m N 300375 m E	21/08/2024 9:06	21/08/2024 9:37	21/08/2024 9:55	21/08/2024 9:18	21/08/2024 9:52	21/08/2024 9:04	21/08/2024 9:04
	575.200	0.076	0.000	12.583	1.636	0.019	0.009
AQ02 699942 m N 300042 m E	21/08/2024 10:52	21/08/2024 11:23	21/08/2024 11:40	21/08/2024 11:06	21/08/2024 11:38	21/08/2024 10:51	21/08/2024 10:51
	611.800	0.083	0.000	13.167	1.155	0.077	0.021

Figure 6-16 Air quality monitoring results

6.8 NOISE

The background noise in the project area is primarily dominated by the constant sound of waves crashing along the shore, both day and night. During the day, additional noise sources include vehicular traffic along the heavily congested U.N. Drive, the main access road to the Freeport of Monrovia. This road is heavily used by various vehicles, including large trucks transporting containers to and from the port. Other notable noise sources include activities from nearby residential and commercial areas, such as craft work, market cycles, and the sound of small-scale private generators powering shops, homes, and small industries. Social activities like parties, loud music from bars, churches, and other events contribute to the noise throughout the day and night. The noise from motorized canoes passing through the area is also present but is short in duration.

Noise monitoring was conducted at two different locations as shown in Figure 6 12 and Figure 6 15. The sound-level meter was set to collect A-weighted noise level readings for a period of 30 min. The A-weighted noise measurement is the most representative measurement as it covers the full audio range 20 hertz (Hz) to 20 kilohertz (kHz) and reflects the closest response of the human ear. Details on the noise equipment used can be found in Appendix I.2.

EPML Noise Pollution Control and Standards Regulations (2017) for maximum permissible noise levels for general environment are presented in Table 6-10. The regulation characterizes the sites based on type of activities and assigns different noise limits for each category. The monitored sites fit within Category D described as residential including industry or small-scale production and commerce. Thus A-weighted equalized noise levels at the monitored sites should not exceed 60 dB(A).

Table 6-10 Maximum permissible noise levels for general environment (EPML - Noise Pollution Control and Standards Regulations, 2017)

Facility	Noise Limits Leq dB(A)	
	Day Time (6:00 to 22:00)	Nighttime (22:00 to 6:00)
A. Any building used as hospital, convalescence home, home for the aged, sanatorium and institutes of higher learning, conference rooms, public library, environmental or recreational sites.	45	35
B. Residential buildings	50	35
C. Mixed residential (with some commercial and entertainment)	55	45
D. Residential + industry or small-scale production + commerce	60	50
E. Industrial	70	60

Noise results are presented in Table 6-11. The recorded levels exceeded the permissible noise limits set for Category D at both locations. Noise levels at N02, near the coastline, were significantly higher than the noise further inland those further inland, most likely due to the intensified sound of waves and the presence of fishing activities in the area.

Table 6-11 Noise monitoring results

Code	Date	Site description	Time		LAImax (dB(A))	LAImin (dB(A))	LAeq (dB(A))	Wind		Activities
			Start	End				Direction	Speed (m/s)	
N01 699886 m N 300375 m E	21 Aug 2024	West Point Football Field, next to the West Point Town Hall.	9:10 AM	9:40 AM	91.5	59.3	66.4	S	1.8	• Light rain • Megaphone • Community dwellers conversing nearby • Motorcycle movement
N02 699942 m N 300042 m E	21 Aug 2024	Kru canoe landing site, on the shore facing the Atlantic Ocean.	10:45 AM	11:15 AM	87.6	62.6	71.3	S	2.3	• Light rain • Canoe landing activities • Fish mongering activities • Waves • Megaphone

7 BASELINE CONDITIONS: THE BIOLOGICAL ENVIRONMENT

This section describes the baseline conditions of the biological environment in the project area. The biological environment comprises several aspects which include conservation areas, habitats, flora and fauna. Baseline conditions for each of these aspects are presented in the following subsections.

Understanding the baseline conditions of the biological environment will help assess the likely impacts of developing the Project on biodiversity.

7.1 SOURCE OF BASELINE DATA

The assessment of the conditions of the physical environment is initially based on updating information from the environmental and social assessment conducted for the project in 2019, which presented a comprehensive literature review of biodiversity aspects for the Project, including information on habitats, species and conservation areas. It is then followed by conducting an eDNA field surveys, sampling, and analysing sampling results to obtain/ confirm some data on species that may be present.

7.2 CONTEXT

The coastal zone of Liberia is rich in resources that hold significant biological and socio-economic value. Spanning approximately 560 km, with a continental shelf of around 159,200 km² and territorial seas measuring about 14,894 km², Liberia produces roughly 7,616 metric tonnes of fish and 126 metric tonnes of molluscs and crustaceans annually (Republic of Liberia, 2017). This coastal region features extensive swamp vegetation, including mangrove forests and savannah woodlands. The mangrove forests contribute vital nutrients to nearby shallow lagoons and lakes, which serve as key habitats, spawning, and breeding grounds for numerous aquatic and marine species. Additionally, the marine environment provides essential ecosystem services, influencing local processes such as atmospheric carbon dioxide absorption. However, the coastal and marine environments face several pressures, including:

- Beach erosion caused by sea level rise and human activities like sand mining.
- Anthropogenic pollution from solid waste and sewage dumping, as well as river pollution.
- Urban development and population growth.
- Intensive and illegal fishing practices.
- Shipping activities and their associated impacts.

Overall, Liberia's marine and coastal database is limited, with scarce published information on the existence of coral reefs or seagrass beds in West Africa. While no major coral reefs or seagrass beds have been documented, it is probable that they occur sporadically along the coastline.

7.2.1 Habitats

The various coastal habitats in Liberia are presented in Sections 7.2.1.1 through 7.2.1.5 below. Information on Monrovia's coastal habitats and the West Point area is given where available.

7.2.1.1 Beaches

The coast of Liberia is dominated by narrow sandy beaches, intercepted with lagoons, estuaries, bays and brackish wetlands (USAID, 2008). Monrovia's coast is not an exception. Sandy beaches are found all along the coast of Monrovia and are only interrupted by minor rocky areas such as the Mamba Point area known as the Cape of Monrovia, some lagoon areas and two main estuaries: the St. Paul River Estuary and the Mesurado River Estuary. The project location in West Point is along the West Point beach, one of the main beaches of Monrovia.

Sandy beaches are difficult habitats for marine organisms as they are unstable and constantly change with the movements of waves, tides and currents. In Monrovia, the sandy beaches are under pressure by the impacts of sand mining, solid waste pollution, sewage pollution, human traffic and the expansion of the city among other causes. Observations along the West Point beach revealed the heavy pollution by solid waste (Figure 7-1). Coconut trees usually grow on these beaches, along with plant and grass species that are tolerant to salt and sand. These beaches are inhabited by few species of crabs, molluscs, and insects, in addition to sea birds that feed on these organisms. Sea turtles are reported to nest along the beaches in Liberia, but no mass nesting sites were identified. Sea turtles do not nest on beaches of Monrovia due to increased human traffic (day and night) and pollution on these beaches.

7.2.1.2 Coastal Savannah

Usually, nestled behind the beaches, is a stretch of coastal savannah, which consists of low grasses with scattered low trees. It also contains palm and coconut trees along with mangrove and Raphia palms (Wiles, 2005). It provides a refuge for a variety of birds as well as some species of small mammals and reptiles.

The propagation of the city of Monrovia towards its coast did not allow stretches of coastal savannah to grow. These are only found to the northern coast of Monrovia. In West Point, the coastal savannah does not exist. Housing structures directly fringe the beach of West Point (Figure 7-2).

Figure 7-1 Solid waste pollution along the West Point Beach

Figure 7-2 Absence of the coastal savannah at West Point

7.2.1.3 Coastal Wetlands and Mangrove Forests

Liberia has five coastal wetlands. These are: Lake Piso, Marshall, Mesurado, Bafu Bay and Lake Shepherd Wetlands. Coastal wetlands in Liberia mostly consist of mangrove forests which are either lagoonal, occurring in lagoons behind barrier islands that extend parallel to the beach, or deltaic, located in estuaries, such as the Mesurado Wetland in Monrovia, which lies behind the West Point area in the Mesurado River estuary. More information about the Mesurado Wetland is available in Section 7.2.2.1.

Mangroves are vital coastal forests that thrive at the intersection of ocean, freshwater, and land, offering significant environmental benefits, particularly in their ability to protect against storms and sea level rise. In Liberia, much of the primary mangrove forest has been replaced by secondary stands due to widespread destruction, particularly in major coastal cities like Monrovia.

The mangroves around Monrovia face severe threats from urban expansion and landfills, a situation exacerbated by the civil conflict when many displaced individuals established landfills in the Mesurado and Marshall Mangrove wetlands. This has led to the degradation of extensive mangrove areas, which are also exploited for charcoal production and for meat consumption. Overall, the health of Monrovia's mangroves is crucial for maintaining local biodiversity and combating climate change, but they are increasingly at risk from human activities.

7.2.1.4 Seagrass Beds

There is very limited available information on the occurrence, location, densities and species composition of seagrass in West Africa in general, and in Liberia in particular. It is likely that seagrass beds are found sporadically in Liberia in the intertidal and near shore waters. No large seagrass concentrations are yet identified (Green and Short, 2003), and no information on seagrass in the Monrovia area could be found.

7.2.1.5 Shelf Habitats

The shelf habitats of Liberia are largely understudied and dominated by soft sediments, primarily mud and sand, which form parallel strips along the coast. Between depths of 80 and 200 meters, fossil coral banks from the Holocene age are present, while rocky areas are minimal (Martos et al., 1991; Villegas and Garcia, 1983). The soft-bottom habitats lack significant vegetation like seaweeds and seagrasses (Castro and Huber, 2005), making them unvegetated communities where phytoplankton is the primary producer. Nutrients are mainly sourced from land, including estuaries and mangroves, as well as marine detritus. Faunal communities consist mainly of infauna, such as worms, snails, and clams, which

burrow into the sediment, and epifauna like anemones, shrimps, and crabs that live on the surface. Fish species like skates, rays, and soles are also common over these soft sediments.

In contrast, Liberia's limited rocky areas support a greater diversity of marine life, providing stable surfaces for seaweeds, barnacles, anemones, sponges, and other sessile organisms. These rocky habitats offer shelter and food for various fish and invertebrate species and their juveniles. Seabed rocks are important fishing grounds for commercially valuable species like snappers and groupers.

7.2.2 Conservation Areas and Internationally Recognized Areas

There is no nationally or internationally designated protected area within or near the project area. However, the Mesurado Wetland, one of five RAMSAR sites in Liberia, is situated along the Mesurado River mouth, extending approximately eight kilometres and beginning about one kilometre east of the project location in West Point (Figure 7-3).

7.2.2.1 Mesurado Wetland

The Mesurado Wetland is situated in the heart of the city of Monrovia (Figure 7-3). This estuarine wetland of 6,670 hectares is one of the five designated Wetlands of International Importance in Liberia. This site has a high ecological value, mainly due to three mangrove species (*Rhizophora harrisonii, R. mangle* and *Avicennia africana*) which are threatened by intense charcoal burning and fuel wood collection (The Ramsar Sites Information Service, 2006). The site provides a favourable habitat and feeding ground for several species of birds such as the African Spoonbill (*Platalea alba)*, the Common Pratincole (*Glareola nuchaltis)* and the Curlew (*Numenius arquata)*. The site hosts three reptile species. These are: the African Dwarf Crocodile (*Osteolaemus tetraspis*) which is classified as vulnerable by the IUCN Redlist, the critically endangered African Sharp-Nosed Crocodile (*Crocodylus cataphractus*), and the Nile Crocodile (*Crocodylus niloticus*) which is included in the CITES Appendix I for protection against over-exploitation through international trade. The Red Colobus Monkey *Procolobus badius*, and the Water Chevrotain *Hyemoschus aquaticus*, two mammal species considered endangered and protected in Liberia (See Appendix J.1.5), occur at the Mesurado Wetland, according to the Ramsar designation documents. Although not mentioned in the Ramsar documents, the West African Manatee *Trichechus senegalensis* (IUCN status: Vulnerable) may also be present in the Mesurado Wetland (Earthtime and CDR, 2019). Other mammals that are expected to occur in the coastal wetland areas of Monrovia are rats, mice, bats, duikers and antelope species. Detailed information on the diversity, structure and species abundance of these assemblages in the Wetland is not available.

The Mesurado Wetland has been under pressure due to the following main reasons:

- cutting of mangrove trees for fuel wood, construction material, medicinal use, etc.;

- disposal of solid waste in the wetland and trapping of solid debris carried by the Mesurado River and the Stockton Creek (Figure 7-4); and
- urban encroachment and construction of infrastructure in the wetland (Figure 7-5).

7.2.3 Coastal and Marine Fauna and flora

7.2.3.1 Coastal flora

Mangrove forests are the most important flora in the coastal area of Liberia. The most common mangrove species in Liberia is *Rhizophora racemosa*, but three other species are abundant in the country. These are *Rhizophora harrisonii*, *Rhizophora mangle* and *Avicennia germinans*, which are believed to occur in the Mesurado Wetland in Monrovia (The Ramsar Sites Information Service, 2006).

Also common in the coastal zones are palm trees such as the coconut tree (*Cocos nucifera*), the African oil palm (*Elaies guineensis*) and the raphia palms (*Raphia palma-pinus*, *Raphia vinifera* and *Raphia hookeri*). Mango trees (*Magnifera indica*), papaya trees (*Carica papaya*) and other fruit trees as well as some ornamental plants are also common in the coastal area.

Minor seagrass growth may occur in the coastal areas of Monrovia, especially in lagoons and wetland areas such as the Mesurado Wetland. Published data verifying their existence and taxonomy is not available. Liberia has only three recorded species of seagrass (*Cymodocea nodosa*, *Ruppia maritima* and *Halodule wrightii*), the most common being *Halodule wrightii* (Earthtime and CDR, 2019).

7.2.3.2 Marine flora

West Africa's algal species diversity is low compared to that of other marine regions. This is due to many contributing factors such as the seasonal upwelling, the seasonal inflow of turbid, silt-laden water, the seasonally lowered inshore salinity, the absence of suitable shallow water substrata, as well as the low habitat diversity and heterogeneity (Bolton et al., 2013).

Published information on seaweed species diversity in Liberia revealed about 90 different algal species (Table 7-1). This number may be underestimated because Liberia's seaweed diversity is under-investigated. Some of the listed, and other unidentified, seaweed species are expected to occur on rocky areas in the inter-tidal and subtidal zones of Monrovia's shore.

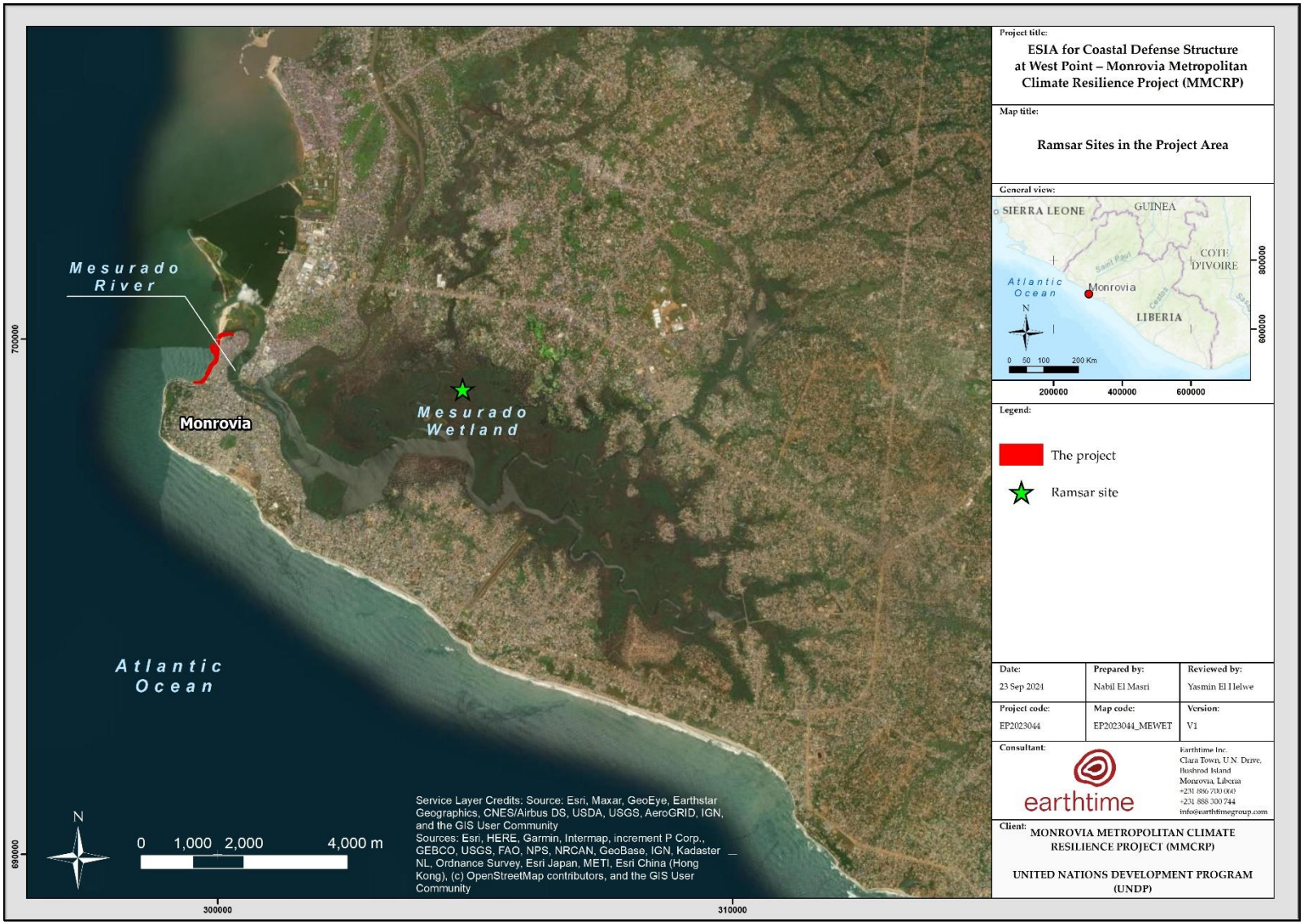


Figure 7-3 Map showing the Mesurado Wetland, a Ramsar site near the project are

Figure 7-4 Mangrove trees trapping solid waste at the Mesurado Wetland (Earthtime and CDR, 2019)

Figure 7-5 Expansion of the city at the expense of the Mesurado Wetland (Earthtime and CDR, 2019)

Table 7-1 Seaweed species identified in Liberia (adapted from John et al., 2004)

Green Algae (Chlorophyta)	Brown Algae (Phaeophyta)	Red Algae (Rhodophyta)		
Acetabularia pusilla	*Asteronema breviarticulatus*	*Acrochaetium dasyae*	*Erythrocladia irregularis*	*Jania adhaerens*
Bryopsis pennata	*Bachelotia antillarum*	*Acrochaetium daviesii*	*Erythrotrichia carnea*	*Jania verrucosa*
Bryopsis plumosa	*Basispora Africana*	*Amphiroa beauvoisii*	*Galaxaura marginata*	*Laurencia galtsoffii*
Caulerpa racemosa	*Chnoospora minima*	*Amphiroa peruana*	*Gelidiopsis planicaulis*	*Laurencia nidifica*
Caulerpella ambigua	*Colpomenia peregrine*	*Asparagopsis taxiformis*	*Gelidiopsis variabilis*	*Laurencia tenera*
Chaetomorpha antennina	*Dictyopteris delicatula*	*Bostrychia moritziana*	*Gelidium corneum*	*Polysiphonia ferulacea*
Chaetomorpha linum	*Dictyota bartayresiana*	*Bostrychia radicans*	*Gelidium crinale*	*Polysiphonia subtillissima*
Cladophora coelothrix	*Dictyota cervicornis*	*Bostrychia tenella*	*Gelidium pusillum*	*Pterocladiella capillacea*
Cladophora montagneana	*Dictyota ciliolate*	*Bryocladia cuspidate*	*Gracilaria gracilis*	*Taenioma perpusillum*
Cladophora prolifera	*Dictyota dichotoma*	*Bryocladia thyrsigera*	*Gracilaria rangiferina*	*Tricleocarpa fragilis*
Cladophora socialis	*Hincksia mitchelliae*	*Callithamniella tingitana*	*Grateloupia filicina*	*Wrangelia argus*
Cladophora vagabunda	*Hincksia rallsiae*	*Callithamnion granulatum*	*Grateloupia turuturu*	
Phyllodictyon anastomosans	*Lobophora variegate*	*Caloglossa leprieurii*	*Gymnogongrus nigricans*	
Ulva clathrata	*Padina antillarum*	*Catenella caespitosa*	*Gymnogongrus tenuis*	
Ulva fasciata	*Padina durvillaei*	*Centroceras clavulatum*	*Haliptilon subulatum*	
Ulva flexuosa	*Padina gymnospora*	*Ceramium flaccidum*	*Herposiphonia guineensis*	
Ulva lactuca	*Ralfsia expansa*	*Ceramium ledermannii*	*Herposiphonia secunda*	
Ulva rigida	*Sargassum vulgare*	*Chondracanthus acicularis*	*Hildenbrandia rubra*	
	Sphacelaria fusca	*Chondrophycus intermedius*	*Hypnea flagelliformis*	
	Sphacelaria rigidula	*Corallina pilulifera*	*Hypnea musciformis*	
	Sphacelaria tribuloides	*Cryptonemia seminervis*	*Hypnea spinella*	

7.2.3.3 Coastal Fauna

The **wetland** ecosystems of Monrovia support a very diverse assemblage of faunal species, some of which have high biological, conservational or economical values. Some faunal species of the Mesurado Wetland are listed in Table 7-2. The listing is extracted from the Ramsar site designation documents (2006). Detailed information on the diversity, structure and species abundance of these assemblages is not available. Although not mentioned in the Ramsar documents, the West African Manatee *Trichechus senegalensis* (IUCN status: Vulnerable) was recorded in the Mesurado Wetland (Earthtime and CDR, 2019). Other mammals that are expected to occur in the Mesurado Wetland are rats, mice, bats, duikers and antelopes. Apart from the crocodile species listed in Table 7-2, reptiles expected to exist in these wetlands are water snakes, lizards, skinks as well as turtles. In addition, a multitude of birds, molluscs, fish, crabs and shrimps are usually found in the wetlands. Nonetheless no published data about the exact taxonomy of these faunal species is available.

In contrast, the faunal diversity of sandy **beaches** along the coast is relatively very low. It is limited to some crab, lizard, mollusc and insect species as well as birds. Birds commonly found resting or feeding on sandy beaches in Liberia are terns, herons and waders (Gatter, 1997). Surveys carried out by Earthtime's social team during the environmental assessment carried out in 2019 for the MMCRP among various fishermen communities of Monrovia, including the fishermen of West Point, confirmed that sea turtles do not nest on the city's beaches. This is likely due to the high human traffic on these beaches. However, numerous records of turtle nesting activities are reported for the southeast beaches of Liberia up to Grand Bassa County (see Section 7.2.3.4 - Marine Reptiles).

Table 7-2 Some mammal, reptile and bird species of the Mesurado Wetland (adapted from The Ramsar Sites Information Service, 2006 and IUCN, 2024)

Class	English name	Scientific name	IUCN Red List Category
Mammals	Water Chevrotain	*Hyemoschus aquaticus*	Least Concern
	Red Colobbus Monkey	*Procolobus badius*	Endangered
Reptiles	African Dwarf Crocodile	*Osteolaemus tetraspis*	Vulnerable
	Nile Crocodile	*Crocodylus niloticus*	Least Concern
	African Sharp-Nosed Crocodile	*Crocodylus cataphractus*	Critically Endangered
Birds	Reef Heron	*Egretta gularis*	Least Concern
	African Spoonbill	*Platalea alba*	Least Concern
	Water Thick-knee	*Burhinus vermiculatus*	Least Concern
	Common Pratincole	*Glareola pratincola*	Least Concern
	Kentish Plover	*Charadrius alexandrinus*	Least Concern
	Grey Plover	*Pluvialis squatarola*	Least Concern
	Senegal Plover	*Vanellus lugubris*	Least Concern
	Spur-winged Plover	*Vanellus spinosus*	Least Concern
	Curlew	*Numenius arquata*	Near Theatened
	Whimbrel	*Numenius phaeopus*	Least Concern
	Spotted Redshank	*Tringa erythropus*	Least Concern
	Marsh Sandpipper	*Tringa stagnatilis*	Least Concern

Class	English name	Scientific name	IUCN Red List Category
	Redshank	*Tringa totanus*	Least Concern
	Turnstone	*Arenaria interpres*	Least Concern
	Sanderling	*Calidris alba*	Least Concern
	Knot	*Calidris canutus*	Near Theatened
	Curlew Sandpipper	*Calidris ferruginea*	Near Theatened
	Little Tern	*Sterna albifrons*	Least Concern
	Damara Tern	*Sterna balaenarum*	Least Concern
	Roseate Tern	*Sterna dougallii*	Least Concern
	Common Tern	*Sterna hirundo*	Least Concern
	Black Tern	*Sterna nigra*	Least Concern
	Arctic Tern	*Sterna paradisaea*	Least Concern
	Royal Tern	*Sterna maxima*	Least Concern
	Sandwich Tern	*Sterna sandvicensis*	Least Concern
	Caspian Tern	*Sterna tschegrava*	Least Concern
	Little Bee-eater	*Merops pusillus*	Least Concern
	Bar-breasted Fire-Finch	*Lagonosticta rufopicta*	Least Concern

7.2.3.4 Marine Fauna

Marine Invertebrates

Detailed surveys of marine invertebrates in Liberia are lacking. However, the nearshore zone has well developed crustacean and mollusc populations, including commercially valued species. Crustaceans include penaeid shrimps and crabs; molluscs include oysters, cones, conches, arcs, and volutes.

A list presented in Liberia's first National Biodiversity Strategy and Action Plan (NBSAP) in 2003 defined marine invertebrates for the locations of ELWA, Banjor and West Point (in Montserrado County) and Marshall (in Margibi County) (Table 7-3). It included species of different habitats, ranging from pelagic to benthic. No information on the exact methods of data collection was provided (GoL, 2003). However, the listed species can be commonly found in the project area.

Table 7-3 Marine invertebrates of ELWA, Banjor, Marshall and West Point (GoL, 2003b and IUCN, 2024)

Phylum	Scientific Name	Common Name	Habitat	IUCN RedList Category*
Cnidaria	*Physalia pelagica*	Portuguese Man of War	Pelagic	N/A
	Chironex fleckeri	Sea jelly fish	Pelagic	N/A
	Metridium senile	Sea anemone	Benthic	N/A
Mollusca	*Hatiotis tuberculata*	Abalone	Benthic	Vulnerable
	Scaphander punctostriatus	Sea snail	Moderately deep water	N/A
	Tonna galea	Tuna shell	Moderately deep water	N/A
	Phalium granulatum	Scotch bonnet	Shallow water	N/A
	Murex tryoni	Rock / dye shell	Deep water	N/A
	Purpura patula	Rock shell / dog winkle	Intertidal	N/A
	Ventricolaria	Venus clam	Shallow water	N/A

Phylum	Scientific Name	Common Name	Habitat	IUCN RedList Category*
	Crassostreaa virginica	Sea oyster	Shallow water	N/A
	Pecten raveneli	Scallop	Shallow water	N/A
	Liogo pealii	Squid	Pelagic	N/A
	Octopus vulgaris	Octopus	Benthic	Least Concern
Annelida	*Neanttes (Nereis) virens*	Clam worm	Benthic	N/A
Arthropoda	*Panulirus argus*	Spiny lobster	Benthic	Data Deficient
	Scyllarides	Shovel-nose lobster	Benthic	-
	Callinectes sapidus	Blue crab	Benthic	N/A
	Callappa flammea	Box crab	Benthic	N/A
	Oxypode quadrata	Ghost crab	Sandy beach	N/A
	Eupagurus bernhardus	Hermit crab	Benthic	N/A
	Squilla mantis	Mantis shrimp	Benthic	N/A
	Balanus balanoides	Barnacle	Benthic	N/A
Echinodermata	*Astropecten irregularis*	Starfish/sea star	Benthic	N/A
	Arabica puntulata	Sea urchin	Benthic	N/A
*N/A= Not available				

The benthic macrofaunal populations have not been described in detail. Le Loeuff and von Cosel (1998) sampled sedimentary macrofauna of northwestern Africa on the shelf, to a depth of 200 m. The dominant fauna at all depths sampled were Polychaete worms. The study found that the Liberian fauna was reduced in numbers. This was explained to be due to a diminished effect of nutrient upwelling and primary productivity compared with the Guinea coast to the north and Ivory Coast, inside the Gulf of Guinea, to the south. The benthos composition of the Liberian continental slope is still unknown. On a global scale, these communities, residing at uniformly low temperatures, contain a high proportion of cosmopolitan species numerically dominated by polychaete worms, bivalve molluscs, and pericarid crustaceans (Gage and Tyler, 1991). On the other hand, only one study (Longhurst, 1959) described the benthos of the deeper shelf and upper slopes of West Africa. Densities of organisms from depths exceeding 50 m were all below 100 per m^2.

In 2013, benthic sampling was carried out for Exxon Mobil's Block 13 Exploratory Drilling ESIA. The sampling took place in Block 13, located approximately 50 to 80 km offshore central Liberia, at depths between 1181 and 2904 m. The survey recorded 99 families of macrofauna. The abundance was observed to be less than typical abundance reported from continental slope sediments worldwide (TDI Brooks Intl. and InterAct PMTI, 2013). Crustaceans were the numerically dominant group (34%), followed by annelid (primarily polychaete) worms (31%), and then molluscs (23%), collectively comprising 88% of the macrofauna. Other higher order taxa collectively making up 12% of the total abundance included echinoderms, sipunculans (peanut worms), nematodes (round worms), nemerteans (ribbon worms), enteropneusts (acorn worms), platyhelminths (flatworms), hydroids, sea anemones, and bryozoans. Table 7-4 presents the abundance and types of macrofauna recorded in the study area. Of the 99 families identified, nine were most common and these made up more than 50% of the total abundance (Table 7-5). Dominant families were typical cosmopolitan inhabitants of shelf and

slope sediments worldwide (TDI Brooks Intl. and Interact PMTI, 2013). These included spionid, cirratulid, paraonid polychaetes, phoxocephalid amphipods and thyasirid and nuculanid (bivalve) molluscs.

Table 7-4 Macrofauna abundance and types in Exxon Mobil's Block 13 (Acorn Intl. and Earthtime Inc., 2014)

Phylum/Subphylum	Mean abundance per square metre	Comments
Crustacea	236	Most abundant were tanaidaceans, isopods, amphipods, ostracods and cumaceans
Mollusca	161	Most common included pelecypods (bivalves), gastropods (snails), scaphopods (tusk shells) and chaetodermatids.
Polychaeta worms	219	Most common were Paraonidae, Cirratulidae, Spionidae and Capitellidae
Other, including echinoderms, sipunculans (peanut worms), nematodes (round works), nemerteans (ribbon worms), enteropneusts (acorn worms), platyhelminths (flatworms), hydroids, sea anemones and bryozoans.	65	Of these, round worms were most abundant followed by peanut works, ribbon worms, acorn worms and flat worms. Sea anemones, sea-stars and sea cucumbers were also identified.

Table 7-5 Dominant families of macrofauna in Exxon Mobil's Block 13 (TDI Brooks Intl. and Interact PMTI, 2013)

Family	Major Taxon
Thyasiridae	Bivalve Mollusc
Nuculidae	
Paraonidae	Polychaete
Cirratulidae	
Spionidae	
Colletteidae	Tanaid Crustacean
Desmosomatidae	Isopod Crustacean
Phoxocephalidae	Amphipod Crustacean
Nematoda	Nematode

Marine Birds

In general, terns and most importantly black terns (*Chlidonias niger*) pass through the offshore waters of Liberia, mainly in the spring when food stocks are high (Gatter, 1997). A survey of the pelagic resources and marine ecosystems off West Africa undertaken by R/V Dr. Dridjtof Nansen in 2017 revealed an abundance of Arctic and comic terns offshore Liberia. The survey also identified a juvenile gannet, a skua and a white-fronted petrel. Birdlife International's database lists 19 species of intertidal, neritic and oceanic seabirds for Liberia (Table 7-6).

Table 7-6 Intertidal, neritic and oceanic seabirds of Liberia (Birdlife international, 2024 and IUCN, 2024)

Scientific name	English name	Family	IUCN Red List Category
Hydrobates leucorhous	Leach's Storm-petrel	Hydrobatidae (Northern Storm-petrels)	Vulnerable
Oceanites oceanicus	Wilson's Storm-petrel	Oceanitidae (Southern Storm-petrels)	Least Concern
Calonectris diomedea	Scopoli's Shearwater	Procellariidae (Petrels, Shearwaters)	Least Concern

Scientific name	English name	Family	IUCN Red List Category
Calonectris borealis	Cory's Shearwater	Procellariidae (Petrels, Shearwaters)	Least Concern
Puffinus puffinus	Manx Shearwater	Procellariidae (Petrels, Shearwaters)	Least Concern
Sula leucogaster	Brown Booby	Sulidae (Gannets, Boobies)	Least Concern
Xema sabini	Sabine's Gull	Laridae (Gulls, Terns, Skimmers)	Least Concern
Larus fuscus	Lesser Black-backed Gull	Laridae (Gulls, Terns, Skimmers)	Least Concern
Onychoprion fuscatus	Sooty Tern	Laridae (Gulls, Terns, Skimmers)	Least Concern
Sternula albifrons	Little Tern	Laridae (Gulls, Terns, Skimmers)	Least Concern
Gelochelidon nilotica	Common Gull-billed Tern	Laridae (Gulls, Terns, Skimmers)	Least Concern
Hydroprogne caspia	Caspian Tern	Laridae (Gulls, Terns, Skimmers)	Least Concern
Chlidonias niger	Black Tern	Laridae (Gulls, Terns, Skimmers)	Least Concern
Sterna hirundo	Common Tern	Laridae (Gulls, Terns, Skimmers)	Least Concern
Sterna paradisaea	Arctic Tern	Laridae (Gulls, Terns, Skimmers)	Least Concern
Thalasseus sandvicensis	Sandwich Tern	Laridae (Gulls, Terns, Skimmers)	Least Concern
Thalasseus maximus	Royal Tern	Laridae (Gulls, Terns, Skimmers)	Least Concern
Stercorarius parasiticus	Arctic Jaeger	Stercorariidae (Skuas)	Least Concern
Stercorarius pomarinus	Pomarine Jaeger	Stercorariidae (Skuas)	Least Concern

Marine Mammals

Specific records of marine mammal occurrences in Liberian waters are scarce. The most comprehensive data source on marine mammals in Liberia is the result of a focused literature review on the occurrence of both marine mammals and sea turtles, which was undertaken by Dr. Caroline R. Weir in 2013 as part of the ESIA for Exxon Mobil's Block LB-13 Exploratory Drilling Program. The literature review was able to locate reliable records for the confirmed occurrence of nine marine mammal species within the Liberian EEZ. These are:

- the Bryde's Whale;
- the Humpback Whale;
- the Sperm Whale;
- the Killer Whale;
- the Short-Finned Pilot Whale;
- the Pantropical Spotted Dolphin;
- the Spinner Dolphin, the Clymene Dolphin; and
- the West African Manatee (Weir, 2013).

A further 19 marine mammal species were confirmed to occur within the wider study area examined in the literature review and are considered very likely to occur in Liberian waters on an occasional or regular basis. These are: the Blue Whale, the Fin Whale, the Sei Whale, the Common Minke Whale, the Dwarf Sperm Whale, the Pygmy Sperm Whale, Cuvier's Beaked Whale, Gervais' Beaked Whale, the False Killer Whale, the Melon-Headed Whale, the Pygmy Killer Whale, the Atlantic Humpback Dolphin, the Rough-Toothed Dolphin, Risso's Dolphin,

the Bottlenose Dolphin, the Atlantic Spotted Dolphin, the Striped Dolphin, the Common Dolphin and Fraser's Dolphin. One further species, the Blainville's Beaked Whale, has not been documented within the study area but is expected to occur in the region based on its worldwide distribution (Weir, 2013).

Consequently, a marine mammal fauna list consisting of 29 confirmed and potential species was identified for Liberia, comprising six baleen whale species, three sperm whale species, three beaked whale species, 16 delphinid species (Figure 7-6) and a single species of Sirenia (sea cows and manatees). Of these, two species are of particular conservation importance in the region, the Atlantic Humpback Dolphin and the West African Manatee, as both are endemic to the tropical Atlantic coast of Africa and both are on the IUCN Red List of threatened species (Table 7-7). Both species inhabit nearshore coastal waters and estuaries (and freshwater rivers and lakes in the case of the manatee) and are therefore very vulnerable to human impacts such as by-catch, hunting, and habitat loss (Acorn Intl. and Earthtime Inc., 2014).

Figure 7-6 Dolphins 15 km off Monrovia (Extreme Fishing Charters, undated)

Table 7-7 Threatened and endangered marine mammal species found offshore Liberia (Acorn Intl. and Earthtime Inc., 2014 and IUCN, 2024)

Scientific name	Common name	IUCN Red List Category
Sousa teuszii	Atlantic Humpback Dolphin	Critically Endangered
Balaenoptera borealis	Sei Whale	Endangered
Balaenoptera musculus	Blue Whale	Endangered
Balaenoptera physalus	Fin Whale	Vulnerable
Physeter macrocephalus	Sperm Whale	Vulnerable
Trichechus senegalensis	West African Manatee	Vulnerable

Marine Reptiles

Accessible material in terms of specific records of sea turtle occurrence in Liberian waters and coastal areas is very limited. The focused literature review on the occurrence of both marine mammals and sea turtles in the area, which was undertaken by Dr. Caroline R. Weir in 2013 as part of the ESIA for Exxon Mobil's Block LB-13 Exploratory Drilling Program, concluded that information available on sea turtles in Liberian waters is largely generic and anecdotal, and refers predominantly to -mostly dead- sea turtles encountered during opportunistic surveys and unverified reports from fishermen (Acorn Intl. and Earthtime Inc., 2014).

However, the review did confirm that four species of sea turtles are present in Liberian waters and nest in Liberia: the Olive Ridley, Leatherback, Green and Hawksbill turtles (Table 7-8). Anecdotal references to the occurrence of nesting Loggerhead turtles did not seem to be supported by verified records, although it should be expected that foraging loggerhead turtles do occur at sea within the Liberian EEZ (Weir, 2013). Satellite-tracked Loggerhead turtles from the Cape Verde population travelled at least as far south as Sierra Leone on foraging excursions (Hawkes et al., 2006) and may be expected to also venture into Liberian waters.

Table 7-8 Confirmed Sea turtles of Liberia (Acorn Intl. and Earthtime Inc., 2014 and IUCN, 2024)

Scientific name	Common name	IUCN Red List Category
Eretmochelys imbricata	Hawksbill Turtle	Critically Endangered
Chelonia mydas	Green Turtle	Endangered
Lepidochelys olivacea	Olive Ridley	Vulnerable
Dermochelys choriacea	Leatherback Turtle	Vulnerable

Basic information on sea turtles nesting in Liberia cover only the southeastern part of Liberia. Information relating to the northern part of Liberia could not be located. In 2003, the Save My Future Foundation (SAMFU) published data on turtle nesting on beaches of Sinoe, Grand-Kru and Maryland County. More recently (since 2013), the Sea Turtle Watch (STW), another local non-governmental organisation (NGO), has been doing some work on sea turtle conservation in the Grand Bassa and Rivercess counties. Findings of both the SAMFU and the STW show that the Olive Ridley and Leatherback turtles are the most abundant species in Liberia, followed by the Hawksbill and Green turtles.

On the other hand, no information could be located regarding the distribution of these animals at sea, although it can be expected that most - if not all - of the sea turtle species recorded use both coastal and pelagic waters in Liberia's EEZ for foraging and migrating and are present in these habitats throughout the year (Weir, 2013). Furthermore, anecdotal information suggests a nesting period from September to March, which corresponds with the documented nesting seasonality of Green, Leatherback and Olive Ridley turtles in nearby countries. It should also be considered that males, non-breeding females and immature turtles may occupy foraging habitat year-round, and that seasonality of nesting behaviour is only a small - although crucial with regards to population longevity - part of the overall picture (Weir, 2013).

Despite national and international initiatives to protect these endangered species, sea turtles are still hunted for food throughout Liberia. Their eggs are also collected by humans, destroyed by dogs and pigs on the beaches, and occasionally caught by artisanal fishermen in nets. However, lately, a better level of awareness with regards to sea turtle conservation is observed among coastal communities. Earthtime investigations in 2019 revealed that fishermen in Monrovia do not catch or kill sea turtles. However, as it is the case for marine mammals, it is very unlikely that the by-caught sea turtles are returned to sea, given the high poverty level of the fishermen communities.

Marine Fish

Information on fish diversity and abundance in Liberia is relatively more available when compared to other marine faunal groups. Fisheries of Liberia are rich and diverse, and the fisheries sector is rather developed. The sector provided about 16,500[1] metric tonnes of fish in 2018. Research on fisheries is ongoing and the sector is progressing continuously. The NAFAA is working with partners such as the World Bank to improve the sector. However, the sector is still lacking information on the biology and distribution of fish species.

A list of the fish species encountered in the Liberian waters is presented in Table 7-9. Data presented in this table is extracted from the following main reports:

- Arcelor Mittal Liberia, 2013. Environmental Appraisal of the Transhipment of Iron Ore Offshore from the Port of Buchanan.
- Psomadakis, 2013. Important coastal fishery species of Liberia. A pocket Guide. FAO FishFinder Programme. Rome, FAO.

The environmental assessment conducted by Earthtime for the MCCRP in Monrovia in 2019 revealed that Cassava Croakers (Cassava Fish), West African Ilisha (Gbapele), Sardine (Bonny) and Barracuda (Pipe fish) are the most abundant in the coastal waters of Monrovia, up to 6 Nautical Miles (NM). Cassava Croakers seem to be mostly abundant at 2-3 NM offshore. Other fish commonly present are Groupers, Snappers and the Lesser African Threadfin (Butternose). Tuna species (Figure 7-7), Wahoos, Marlins and Sailfish (all three are locally called Napleh), Sharks and Rays are more common in the offshore waters beyond 6 NM. The fishing season extends usually from October to May. June to September is considered to be a low season for net fishing (Cassava, Sardine, Barracuda, Ilisha, etc.) but the high season for hook and line fishing, which targets mostly Snappers on rocky bottoms. This means that the fish is mostly abundant from October to May (examples shown in Figure 7-8), except for

[1] The number is the sum of artisanal and industrial fishing production of 2018 as extrapolated from the NAFAA Research and Statistic Division Report of 2018.

fish foraging on rocky bottoms, such as Snappers, which are frequent between June and September.

(a)

(b)

Figure 7-7 Yellowfin Tuna at sea off Monrovia (Extreme Fishing Charters, 2018)

(a)

(b)

(c)

(d)

Figure 7-8 Fish caught at West Point in February 2019 (a) Cassava Fish (Pseudolithus sp), Pipefish (Sphyrnea sp) and Snakefish (Muraenidea family); (b) Cassava Fish (Pseudolithus sp), Pipefish (Sphyrnea sp) and Pojoe (Carangidae family); (c) Forbor (Corypheana sp); (d) Red snapper (Lutjanus sp)

Table 7-9 Marine fish species of Liberia (adapted from ArcelorMittal, 2013, Psomadakis, 2013 and IUCN, 2024)

Family	Latin name	English name	Liberian name	IUCN red List Category*
Albulidae	*Albula vulpes*	Bonefish	Bonita	Near Threatened
Ariidae	*Arius latiscutatus*	Rough-Head Sea Catfish	Catfish	Least Concern
Ariidea	*Ablennes hians*	Flat Needlefish	Gar Fish, Silver Gar Fish	Least Concern
Batrachoididae	*Perulibatrachus elminensis*	Guinean Toadfish	Sea Frog, Satan Fish	Least Concern
Belonidae	*Tylosurus crocodilus*	Hound Needlefish	Susuah, Gar Fish	Least Concern
Carangidae	*Alectis alexandrina*	Alexandria Pompano	Sand Cavalla, Pojoe, Bohead	Least Concern
Carangidae	*Alectis ciliaris*	African Pomano	Bonsweah, Antaya	Least Concern
Carangidae	*Caranx crysos*	Blue Runner	Short Trouser	Least Concern
Carangidae	*Caranx fischeri*	Longfin Crevalle Jack	Cavalla	Least Concern
Carangidae	*Caranx hippos*	Common Jack, Black Or Yellow Cavalli	Yellow Cavalli	Least Concern
Carangidae	*Caranx senegallus*	None	Pelepe	Least Concern
Carangidae	*Chloroscombrus chrysurus*	Atlantic Bumper	Pojoe, Petepe, Yewon	Least Concern
Carangidae	*Selar crumenophthalmus*	Bigeye Scad	Zipper	Least Concern
Carangidae	*Selene dorsalis*	African Moonfish	Wai-Wai	Least Concern
Carangidae	*Seriola carpenteri*	Guinean Amberjack	Pojoe, Siayea, Blaffo, Tomleh	Least Concern
Carangidae	*Trachinotus goreensis*	Longfin Pompano	Sand Cavalla, Small Cavalla, Camoge	Least Concern
Carangidae	*Trachinotus ovatus*	Pompano, Silver Fish	Kangba Chi, White Silverfish	Least Concern
Carcharhinidae	*Prionace glauca*	Blue Shark	Blue Shark	Near Threatened
Carcharhinidae	*Rhizoprionodon acutus*	Milk Shark	Shark, Won	**Vulnerable**
Centracanthidae	*Spicara nigricauda*	Blacktail Picarel	Tanny, Tunny	Least Concern
Clupeidae	*Ethmalosa fimbrata*	Bonga Shad	Bonga	Least Concern
Clupeidae	*Sardinella aurita*	Round Sardinella	Bonny	Least Concern
Clupeidae	*Sardinella maderensis*	Mediterranean Sardine	Bonny	**Vulnerable**
Coryphaenidae	*Coryphaena equiselis*	Pompano Dolphinfish	Forbor	Least Concern
Coryphaenidae	*Coryphaena hippurus*	Mahi Mahi, Dorado, Common Dolphinfish	Forbor	Least Concern
Cynoglossidae	*Cynoglossus browni*	Nigerian Tonguesole	Yellow Solefish	Data Deficient
Cynoglossidae	*Cynoglossus monodi*	Guinean Tonguefish	Brown Solefish	Near Threatened
Dasyatidae	*Dasyatis margarita*	Daisy Stingray	Stinger	**Vulnerable**
Drepaneidae	*Drepane Africana*	African Sicklefish	Punkin, Pumpkin Fish	Least Concern
Echeneidae	*Echeneis naucrates*	Live Sharksucker Or Suckerfish	Washboard Fish	Least Concern
Elopidae	*Elops lacerta*	Bony Fish	Ten-Pound	Least Concern

Family	Latin name	English name	Liberian name	IUCN red List Category*
Elopidae	*Elops Sengalensis*	Senegalese Ladyfish	Ten-Pound	Data Deficient
Epinephelidae	*Epinephelus aeneus*	White Grouper	Rock Fish	Near Threatened
Glaucostegidae	*Glaucostegus Cemiculus*	Blackchin Guitarfish	Shovelnose Stinger	**Critically Endangered**
Gymnuridae	*Gymnura altavela*	Spiny Butterfly Ray	Sea Bat, Stinger	**Endangered**
Haemulidae	*Brachydeuterus auritus*	Bigeye Grunt	Grunta, Boie-Boie	Near Threatened
Haemulidae	*Pomadasys jubelini*	Somapt Grunt	White Grunta	Least Concern
Hemigaleidae	*Paragaleus pectoralis*	Atlantic Weasel Shark	Little Tiger Shark	**Endangered**
Hemiramphidae	*Hemiramphus brasiliensis*	Ballyhoo, Ballyhoo Halfbeak	Pentan	Least Concern
Istiophoridae	*Istiophorus albicans*	Atlantic Sailfish	Napley, Diawoo	N/A
Istiophoridae	*Istiophorus platypterus*	Sailfish	Napleh, Black Napleh	**Vulnerable**
Istiophoridae	*Makaira nigricans*	Blue Marlin	Dawu, Blue Napleh	**Vulnerable**
Labridae	*Bodianus speciosus*	Blackbar Hogfish	Unknown	Data Deficient
Lethrinidae	*Lethrinus atlanticus*	Atlantic Emperor	Grouper	Least Concern
Lobotidae	*Lobotes surinamensis*	Atlantic Tripletail	Sea Bougar	Least Concern
Lutjanidae	*Lutjanus agennes*	African Red Snapper	Red Snapper	Data Deficient
Lutjanidae	*Lutjanus dentatus*	African Brown Snapper	Black Gripper	Data Deficient
Lutjanidae	*Lutjanus fulgens*	Golden African Snapper	Red Grouper, Snapper	Least Concern
Lutjanidae	*Lutjanus goreensis*	Gorean Snapper	Grouper	Data Deficient
Megalopidae	*Megalops atlanticus*	Tarpon	Tarpon	**Vulnerable**
Mugilida	*Mugil bananensis*	Banana Mullet	Molly Fish	Least Concern
Mullidae	*Pseudupeneus prayensis*	West African Goatfish	Chicken Soup Fish	**Vulnerable**
Muraenesocidae	*Cynoponticus ferox*	Guinea Pike Conger	Silver Snakefish	Least Concern
Muraenidae	*Echidna peli*	Pebbletooth Moray	Snakefish	Least Concern
Muraenidae	*Enchelycore nigricans*	Viper Moray	Snakefish	Least Concern
Muraenidae	*Gymnothorax vicinus*	Brown Conger, Purple Mouthed Moray	Brown Snakefish	Least Concern
Muraenidae	*Muraena helena*	Mediterranean Moray	Snakefish	Least Concern
Muraenidae	*Muraena robusta*	Stout Moray	Snakefish	Least Concern
Ophicthidae	*Ophichthus ophis*	Spotted Snake Eel	Snakefish	Least Concern
Polynemidae	*Galeoides decadactylus*	Lesser African Threadfin	Butternose	Near Threatened
Polynemidae	*Pentanemus quinquarius*	Royal Threadfin	Bear-Bear, Gbukar	**Vulnerable**
Pomacentridae	*Abudefduf saxatilis*	Sergeant Major, Damsel Fish, Five Finger	Bear-Bear, Gbukar	Least Concern
Priacanthidae	*Priacanthus arenatus*	Atlantic Bigeye	Snapper Old Lady, Chicken Soup Fish, Loton	Least Concern

Family	Latin name	English name	Liberian name	IUCN red List Category*
Pristigasteridae	*Ilisha Africana*	West African Ilisha	Gbapele	Least Concern
Psettodidae	*Psettodes belcheri*	Spottail Spiny Turbot	Black Solefish	Data Deficient
Rajidae	*Raja miraletus*	Brown Skate, Twineye Skate	Stinger	Least Concern
Rhinobatidae	*Rhinobatos irvinei*	Spineback Guitarfish	Shovelnose Stinger	**Critically Endangered**
Sciaenidae	*Pseudotolithus elongatus*	Bobo Croaker	Rock Head Cassava	Least Concern
Sciaenidae	*Pseudotolithus epipercus*	Guinea Croaker	Black Cassava Fish	Least Concern
Sciaenidae	*Pseudotolithus moorii*	Cameroon Croaker	Cassava	Least Concern
Sciaenidae	*Pseudotolithus senegalensis*	Cassava Croaker	Shortneck Cassava Fish	**Endangered**
Sciaenidae	*Pseudotolithus senegallus*	Law Croaker	Short Neck Cassava Fish	**Vulnerable**
Sciaenidae	*Pseudotolithus typus*	Bar, Croaker, Long Neck Croaker	Long Neck Cassava Fish	Least Concern
Scianidae	*Petroscion peli*	Boe Drum	Cassava	Least Concern
Scombridae	*Euthynnus alletteratus*	Little Tunny	Round Blood Fish	Least Concern
Scombridae	*Katsuwonus pelamis*	Skipjack Tuna	Yanwien, Blood Fish	Least Concern
Scombridae	*Scomberomorus tritor*	West African Spanish Mackerel	Mackerel	Least Concern
Scombridae	*Thunnus alalunga*	Albacore Tuna	Kpasea, Blood Fish	Least Concern
Scombridae	*Thunnus albacares*	Yellowfin Tuna	Kpasea, Yellowfin	Least Concern
Scombridae	*Thunnus obesus*	Bigeye Tuna	Bigeye Tuna	**Vulnerable**
Serranidae	*Cephalopholis nigri*	Niger Hind	Unknown	Least Concern
Serranidae	*Cephalopholis taeniops*	Bluespotted Seabass	Chicken Soup Fish, Kru-Kru	Least Concern
Soleidae	*Synaptura cadenati*	Guinean Sole	Solefish	Data Deficient
Sparidae	*Dentex gibbosus*	Pink Dentex	Grunter	Least Concern
Sparidae	*Dentex macrophthalmus*	Large Eyed Dentex	Red Snapper	Least Concern
Sparidae	*Dentex maroccanus*	Morocco Dentex	Snapper	Least Concern
Sparidae	*Pagellus acarne*	Axillary Seabream, Quayantee	Snapper	Least Concern
Sparidae	*Pagrus caeruleostictus*	Blue Spotted Sea Bream	White Snapper	Least Concern
Sphyraenidae	*Sphyraena afra*	Guinean Barracuda	Pipe Fish, Cuta	Least Concern
Sphyrnidae	*Sphyrna lewini*	Scalloped Hammerhead Shark	Airplane Shark	**Critically Endangered**
Sphyrnidae	*Sphyrna mokarran*	Great Hammerhead Shark	Airplane Shark	**Critically Endangered**
Squatinidae	*Squatina oculata*	Smoothback Angelshark	Frog Stinger	**Critically Endangered**
Stromateidae	*Stromateus fiatola*	Blue Butterfish	Marry Fish	Least Concern
Tetraodontidae	*Ephippion guttifer*	Prickly Puffer	Ewray	Least Concern
Tetraodontidae	*Lagocephalus laevigatus*	Smooth Puffer	Ewray Poison Fish	Least Concern

Family	Latin name	English name	Liberian name	IUCN red List Category*
Triakidae	*Mustelus mustelus*	Common Smoothhound	Shark	**Endangered**
Trichiuridae	*Trichiurus lepturus*	Largehead Hairtail	Silverfish	Least Concern
Xiphidae	*Xiphias gladius*	Swordfish	Unknown	Near Threatened
*N/A= Not available				

7.3 NUISANCE SPECIES, PESTS AND VECTORS

Nuisance species are not dangerous or toxic but can negatively disrupt ecosystems and environments. In Liberia, nuisance species are primarily alien invasive species, which have crossed natural barriers and entered ecosystems where they have not previously existed. Invasive species are a common threat to biodiversity. The faunal and floral species of this type found in Liberia's marine, terrestrial and freshwater environments are listed in Table 7-10. Some of these may be present in the project area.

Table 7-10 Invasive species of Liberia (adapted from Invasive Species Specialist Group, 2024)

Flora Species	Fauna Species
Terrestrial	
Bidens pilosa	*Civettictis civetta*
Cardiospermum grandiflorum	*Columba livia*
Cenchrus polystachios	*Cricetomys gambianus*
Chromolaena odorata	*Estrilda astrild*
Dioscorea bulbifera	*Maconellicoccus hirsutus*
Eichhornia crassipes	*Psittacula krameri*
Imperata cylindrica	*Solenopsis reminate*
Lantana camara	*Vibrio cholerae*
Leucaena leucocephala	-
Lygodium microphyllum	-
Panicum repens	-
Paspalum scrobiculatum	-
Phymatosorus scolopendria	-
Rhizophora mangle	-
Rottboellia cochinchinensis	-
Freshwater	
-	*Lates niloticus*
-	*Tilapia zillii*
-	*Cyprinus carpio*
Marine	
Hypnea musciformis	-

The two major pest species throughout Liberia are the mosquito and the Variegated Grasshopper (*Zonocerus variegates*). There are numerous species of mosquitoes known in Liberia, and while not all the species feed on humans, many do, creating welts on their victims. Mosquitoes need standing or stagnant water to reproduce, so human activities from damming or impounding water can increase mosquito numbers on a local level.

Vectors are an agent that carries or transmits disease. Mosquitoes are not only pests but are the primary vectors of diseases in humans, particularly malaria. In Liberia, malaria is the leading cause of morbidity and mortality, accounting for over 40% of all outpatient consultations, 18% of inpatient deaths, and approximately 21,000 deaths annually among

children under the age of five. All mosquito species must have water in which to complete their lifecycle. While mosquitoes need stagnant water to lay eggs and for larval development, the quality and location of water can vary from water collected in tree holes, tidal pools in salt marshes, sewage effluent ponds, irrigation pastures, temporary rainwater ponds, and so on. Human development and increase in changing land use are the leading cause in creating more available reproductive locations for mosquitoes. Wetland areas crossed by the road provide stagnant water for mosquitoes. Mosquitoes are widespread in the project area.

7.4 THE BIOLOGICAL ENVIRONMENT IN WEST POINT

The beach in the project area is narrow and sandy and is home to a few species of crabs, molluscs, lizards and birds as elsewhere in the altered littoral fringe habitats close to Monrovia. Data on the biological diversity found on this beach are not available in the literature. The biological value is expected to be low as this is a beach which is constantly frequented by the fishermen and local community of West Point. It is polluted by solid waste and is widely used by the West Point community for defecation, due to the lack of toilets available in the township. The coastal savannah that usually fringes beaches in Liberia is not present on the geomorphological formation underlying West Point, which is an unconsolidated sand spit: built structures start immediately above the active inter-tidal beach (Figure 7-2). Also, there is no mangrove development along the beach, because of the exposure to strong waves. However, a small patch of mangroves is found on the little island located behind the northern end of the beach at the outlet of the Mesurado River. Some mangrove trees, as well as some coastal savannah species, are also observed on the small beach created by the sand deposits south of the northern breakwater of the Monrovia port (Figure 7-9). On the northern end of West Point also, nested behind the beach, is a small lagoon that is surrounded by built structures and is being filled with solid waste and old tires to make space for new structures. It is heavily polluted by this waste and does not harbour any valuable biological life (Figure 7-10).

Data on the continental shelf biodiversity in front of the West Point beach are also not available. However, it is expected that the usual soft bottom-dwelling (infauna and epifauna) species described earlier are found (Section 7.2.3.4). Interviews with the West Point Kru fishermen during the environmental and social assessment conducted by Earthtime in 2019, revealed that the most commonly fished species in the nearshore waters of West Point are Barracuda (Pipe Fish), Cassava Croakers (Cassava Fish) and Snappers. The high proportion of Snappers in the landings suggests that there are patches of rocky seabed offshore from West Point because these species are usually caught over rocky bottoms.

Figure 7-9 Drone image of the northern end of West Point showing the Mesurado River mouth, the mangrove island and the vegetation on the beach south of the Freeport's southern breakwater (Earthtime and CDR, 2019)

Figure 7-10 Drone image showing the lagoon nested behind the northern end of West Point's beach; the picture shows the dumping of solid waste around the lagoon (Earthtime and CDR, 2019)

7.4.1 eDNA Survey

7.4.1.1 Methodology

Environmental DNA (eDNA) sampling was used to assess the presence of fauna species in the project area. The method relies on the collection of eDNA, which is trace DNA left behind

by various species in the environment. eDNA is deposited in the environment through excretion, shedding, mucous secretions, saliva, etc. It can be collected in environmental samples such as water or sediment and used to identify the organisms that it originated from (NatureMetrics, 2023).

Once environmental samples are received at the laboratory, eDNA is extracted and then amplified through polymerase chain reaction (PCR). DNA sequences obtained from the samples are matched to DNA sequences in reference databases, allowing species identification.

Sampling of eDNA samples was undertaken by Earthtime on August 22 and August 23, 2024. The protocol followed for collection of samples follows the main steps listed below.

1. Collection of water
2. Filtration of water
3. Preservation of DNA
4. Shipping of samples to the laboratory

The detailed protocol is available in Appendix G.3. Sample collection method is shown in Figure 7-11. Samples were shipped to Argaly Laboratories in France for analysis.

General setup

B01, B02 and B03

B04, B05 and B06

B07, B08 and B09

Figure 7-11 eDNA sample collection

7.4.1.2 Summary of Lab Methodology

After field sampling of the environmental matrix of interest, the eDNA is extracted in the laboratory through an adapted protocol. Specific DNA sequences of one or several taxa, called "metabarcodes", are then amplified by a PCR and sequenced using “Next Generation Sequencing” techniques. The PCR primers selected for DNA amplification are those of the COI-MG2 marker, targeting metazoans in general to cover both vertebrates and invertebrates. Following several bioinformatics processing steps, the sequences obtained are assigned to their taxon of origin.

7.4.1.3 Sampling design

Samples were taken from three main locations in the Atlantic Ocean and the Mesurado River and estuary.as described in Table 7-11 and shown in Figure 6-12. At each location, 3 replicates were collected to allow for increased detection accuracy and improved results.

Table 7-11 eDNA sampling locations and details (Coordinate System: WGS 1984 UTM 29N)

Sample ID	Location	Northing	Easting	Date
B01	Atlantic Ocean, facing Kru landing site, 270 m from shore	699572	299645	22 Aug 2024
B02				
B03				
B04	Mesurado River, near Balli Island (mangrove wetland), low tide	698444	301286	22 Aug 2024
B05				
B06				
B07	Mesurado Estuary, high tide	699974	300709	23 Aug 2024
B08				
B09				

7.4.1.4 Results and analysis

The environmental DNA (eDNA) sampling exercise was conducted to survey biodiversity in three distinct habitats within the project areas: coastal, estuarine, and riverine. The study

employed the COI_MG2 metabarcoding marker to identify a wide range of organisms, including fish, invertebrates, birds, mammals, and reptiles.

7.4.1.4.1 Methodology and Data Quality

The sequencing depth averaged 102,288 reads per sample after filtering, which the lab deemed sufficient to characterize the global diversity targeted by the COI_MG2 marker. Quality controls were free from contaminants, indicating satisfactory manipulation quality.

7.4.1.4.2 Biodiversity Findings

The survey identified 949 Molecular Operational Taxonomic Units (MOTUs)[2] and 241 distinct taxa. It's important to note that multiple MOTUs can be associated with a single taxon, explaining the lower number of taxa compared to MOTUs.

Among the 241 identified taxa, 52 correspond to vertebrates (including fish, mammals, birds, and one shark species), 39 to proteobacteria, 33 to arthropods, 14 to annelids, 22 to diatoms, and 19 to chlorophytes. Other taxa include bryozoa, rotifers, streptophytes, molluscs, cnidaria, echinoderms, and worms (Figure 7-12).

Of the 52 vertebrate taxa identified, 37 are fish, eight are mammals, four are birds, and one is a reptile (Figure 7-13).

The full lab results are presented in Appendix H.2.

7.4.1.4.3 Notable Findings

The results revealed similar patterns of identified taxa and sequence numbers in groups of three samples (B01 to B03; B04 to B06; B07 to B09), corresponding to biological replicates of the three habitats studied.

Some replicates contained sequences assigned to Homo sapiens, suggesting possible contamination during sampling or laboratory processing. The poor diversity identified in certain targeted taxonomic groups indicates that the COI_MG2 marker may not have been optimal for a comprehensive survey of these communities. The amplification of numerous microorganisms, algae, and plants likely hindered the detection of animals of interest.

Only 110 taxa were identified to the species level. Among them 47 species are from target fauna groups, including 8 annelids, 13 arthropods, 20 fishes, two birds, two cnidarians, and 2 mammals.

[2] An MOTU is a unique DNA sequence observed for a metabarcoding marker that can be associated with a taxon

The highest species diversity was observed in samples B07-B09, suggesting that the estuarine habitat may be the most biodiverse among the three habitats sampled (Table 7-12).

The eDNA survey identified 13 species with confirmed presence in Liberia, as indicated by the literature. Additionally, there are 4 species for which potential presence in Liberia is suggested, although they have not been definitively confirmed (Table 7-12).

7.4.1.4.4 Species of Conservation Concern

The survey identified three target species of conservation concern, all found in estuarine samples (Table 7-12).

- Angola Dentex (*Dentex angolensis*) - Near Threatened
- Royal Threadfin (*Pentanemus quinquarius*) - Vulnerable
- Shortfin Mako Shark (*Isurus oxyrinchus*) - Endangered

7.4.1.4.5 Introduced and Invasive Species

The survey detected the presence of *Meleagris gallopavo* (Wild Turkey) and *Spilopelia chinensis* (Spotted Dove) (Table 7-12), both of which may have been introduced by humans to Liberia. Common invasive species such as *Mus musculus* (House Mouse) and *Rattus norvegicus* (Brown Rat) were also identified in the samples.

7.4.1.4.6 Implications and Limitations

It's important to understand that the data represents species presence in the weeks preceding eDNA collection but does not exclude the potential presence of unidentified species or seasonal variations. The identification certainty varies among taxa, with some identified with 100% certainty while others may correspond to closely related taxa absent from the reference database. Global DNA reference databases contain millions of barcodes, but gaps remain, particularly in regions and taxonomic groups that are more diverse and less studied.

The COI_MG2 marker's broad amplification range, while allowing for diverse organism detection, may have limited the detection of specific animal groups of interest.

This eDNA survey provides valuable insights into the biodiversity of the studied habitats, highlighting the presence of species of conservation concern and potentially introduced species. However, the limitations of the COI_MG2 marker in detecting certain animal groups of interest should be considered when interpreting these results and planning future surveys.

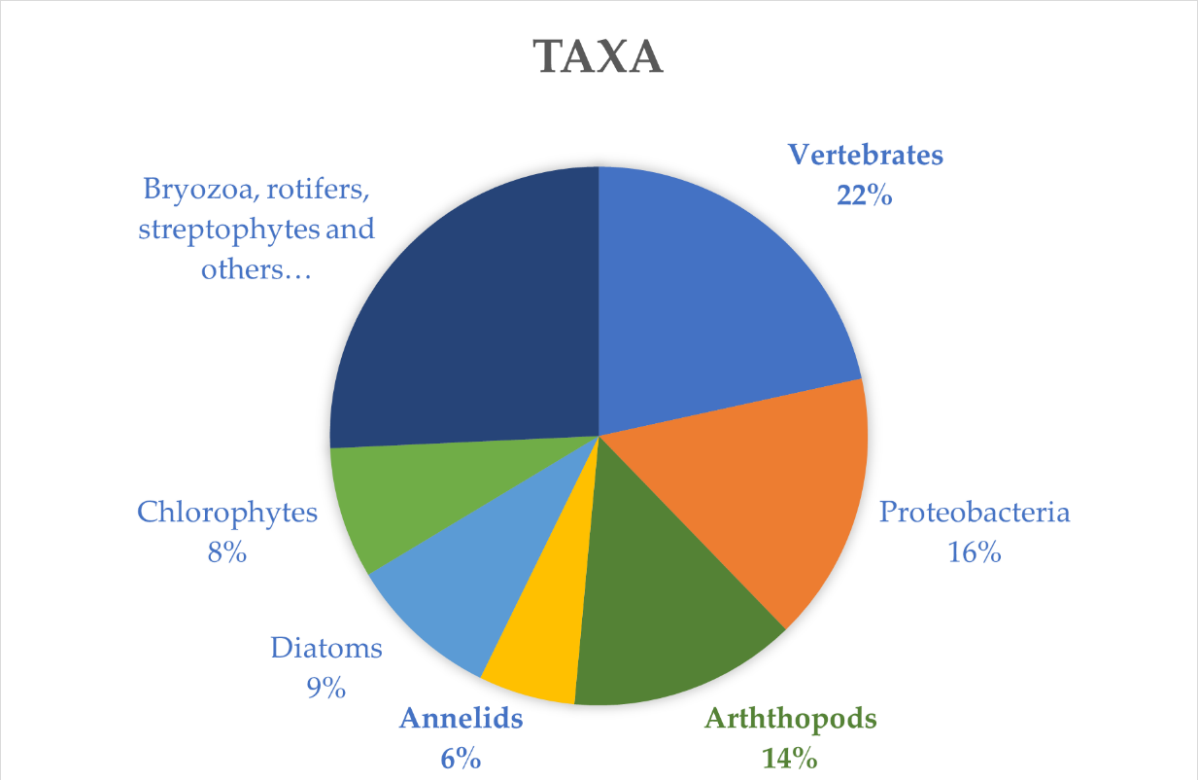


Figure 7-12 Taxa distribution among MOTUs

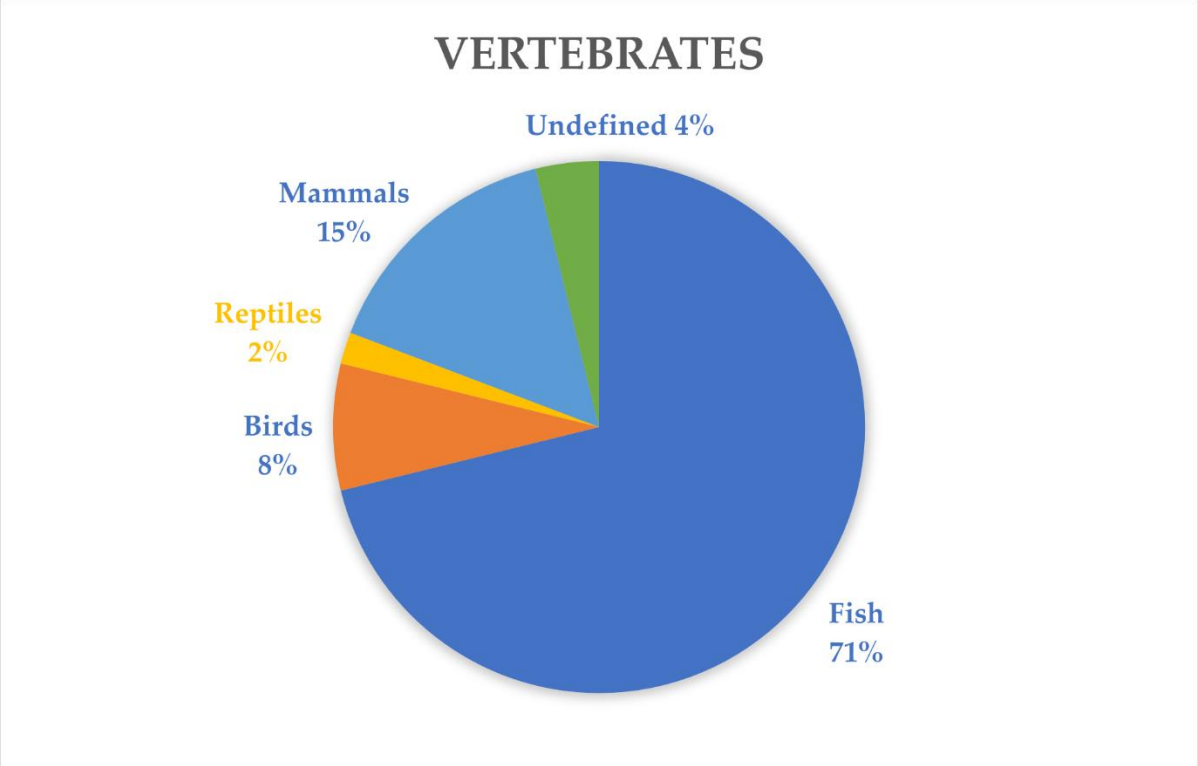


Figure 7-13 Vertebrates classes distribution among MOTUs

Table 7-12 Species of target fauna groups identified in the eDNA survey

Phyllum	Class_name	Family_name	Species_name	IUCN Redlist Category 2024	B01	B02	B03	B04	B05	B06	B07	B08	B09	Presence in Liberia confirmed in literature?	Potential presence in Liberia?	Remarks
Annelida	Clitellata	Lumbricidae	*Bimastos rubidus*	n.g.									x			
Annelida	Clitellata	Lumbricidae	*Dendrobaena octaedra*	n.g.							x	x				
Annelida	Clitellata	Naididae	*Dero environmental sample*	n.g.			x				x	x	x			
Annelida	Clitellata	Naididae	*Nais communis*	n.g.						x		x				
Annelida	Clitellata	Glossoscolecidae	*Pontoscolex corethrurus*	Data Deficient								x				
Annelida	Polychaeta	Polynoidae	*Arctonoe vittata*	n.g.							x	x				
Annelida	Polychaeta	Protodrilidae	*Megadrilus hochbergi*	n.g.	x	x	x				x	x	x			
Annelida	Polychaeta	Pisionidae	*Pisionidens sp. MDD01-Achotines-G1_1*	n.g.								x				
Arthropoda	Branchiopoda	Sididae	*Diaphanosoma excisum*	n.g.							x					
Arthropoda	Branchiopoda	Chydoridae	*Ovalona pulchella*	n.g.					x							
Arthropoda	Hexanauplia	Ergasilidae	*Acusicola margulisae*	n.g.						x						
Arthropoda	Hexanauplia	Centropagidae	*Centropages ponticus*	n.g.			x	x	x	x	x					
Arthropoda	Hexanauplia	Cylindropsyllidae	*Evansula pygmaea*	n.g.				x								
Arthropoda	Hexanauplia	Cyclopidae	*Mesocyclops sp. MZUSP 36185*	n.g.				x		x						
Arthropoda	Hexanauplia	Cyclopidae	*Thermocyclops oithonoides*	n.g.				x	x	x						
Arthropoda	Hexanauplia	Calanidae	*Undinula vulgaris*	n.g.		x	x						x			
Arthropoda	Insecta	Chironomidae	*Chironomus kiiensis*	n.g.									x			
Arthropoda	Insecta	Blattidae	*Periplaneta americana*	n.g.							x					
Arthropoda	Insecta	Bostrichidae	*Rhyzopertha dominica*	n.g.								x				
Arthropoda	Malacostraca	Portunidae	*Callinectes sapidus*	n.g.							x			•		
Arthropoda	Malacostraca	Talitridae	*Platorchestia parapacifica*	n.g.									x			
Chordata	Actinopteri	Carangidae	*Alepes kleinii*	Least Concern							x	x				
Chordata	Actinopteri	Hemiodontidae	*Anodus elongatus*	Least Concern						x						
Chordata	Actinopteri	Carangidae	*Caranx crysos*	Least Concern								x		•		
Chordata	Actinopteri	Claroteidae	*Chrysichthys cf. cranchii FDBS-2022*	Least Concern				x		x	x	x	x			
Chordata	Actinopteri	Coryphaenidae	*Coryphaena hippurus*	Least Concern									x	•		
Chordata	Actinopteri	Sparidae	*Dentex angolensis*	Near Threatened								x	x	•		
Chordata	Actinopteri	Eleotridae	*Eleotris amblyopsis*	Least Concern				x	x	x	x	x	x			
Chordata	Actinopteri	Lobotidae	*Lobotes surinamensis*	Least Concern									x	•		
Chordata	Actinopteri	Mormyridae	*Marcusenius senegalensis*	Least Concern			x								•	Yes (Present in wetlands in Guinea and Ivory Coast)
Chordata	Actinopteri	Mormyridae	*Mormyrops anguilloides*	Least Concern									x	•		
Chordata	Actinopteri	Mormyridae	*Mormyrus rume*	Least Concern						x				•		
Chordata	Actinopteri	Mugilidae	*Mugil curema*	Least Concern				x	x	x	x	x	x	•		
Chordata	Actinopteri	Polynemidae	*Pentanemus quinquarius*	Vulnerable								x		•		
Chordata	Actinopteri	Mormyridae	*Petrocephalus soudanensis*	Least Concern							x				•	Yes (Present in wetlands in Guinea and Ivory Coast)
Chordata	Actinopteri	Scombridae	*Sarda sarda*	Least Concern							x	x	x	•		
Chordata	Actinopteri	Carangidae	*Seriola rivoliana*	Least Concern							x	x	x	•		
Chordata	Actinopteri	Sphyraenidae	*Sphyraena ensis*	Least Concern	x								x			
Chordata	Actinopteri	Sphyraenidae	*Sphyraena putnamae*	Least Concern	x							x	x			
Chordata	Actinopteri	Cichlidae	*Tylochromis polylepis*	Least Concern								x	x			

Phyllum	Class_name	Family_name	Species_name	IUCN Redlist Category 2024	B01	B02	B03	B04	B05	B06	B07	B08	B09	Presence in Liberia confirmed in literature?	Potential presence in Liberia?	Remarks
Chordata	Aves	Phasianidae	*Meleagris gallopavo*	Least Concern									x		•	Yes (may be introduced by humans)
Chordata	Aves	Columbidae	*Spilopelia chinensis*	Least Concern									x		•	Yes (may be introduced by humans)
Chordata	Chondrichthyes	Alopiidae	*Isurus oxyrinchus*	Endangered								x		•		
Chordata	Mammalia	Muridae	*Mus musculus*	Least Concern								x	x			Yes (Common mouse- Invasive)
Chordata	Mammalia	Muridae	*Rattus norvegicus*	Least Concern							x	x	x			Yes (Common rat - Invasive)
Cnidaria	Hydrozoa	Olindiidae	*Craspedacusta sowerbii*	n.g.			x				x	x				
Cnidaria	Hydrozoa	Obeliidae	*Obelia sp. XKS-2016a*	n.g.	x						x	x				

Legend
n.g. = not given
• = Yes

8 BASELINE CONDITIONS: THE SOCIO-ECONOMIC ENVIRONMENT

This section provides an overview and analysis of the existing socio-economic conditions in the areas to be affected by the Project, including demographics, access to key services and infrastructure, education and skills, social capital, livelihoods and land use, economic activities, land ownership and tenure, incomes and expenditures, governance, ecosystem services, and gender issues. It focuses on the area located in the direct vicinity of the Project site, as these communities will be the most affected by project activities during construction, operation, and decommissioning.

Understanding the socio-economic baseline conditions will help assess the likely impacts of developing the Project on socio-economy.

8.1 SOURCE OF BASELINE DATA

The collection of socio-economic baseline data about the selected communities was done through three main activities:

- **Town survey** through a **Key Informant Interview** (KIIs) undertaken in the affected community; details about these KIIs are described in Section 8.2.3.
- **Focus Group Discussions** (FGDs) with selected types of groups that were considered to be affected differently by the project: these are the women, fishmongers, and fishermen; details about these FGDs are described in Section 8.2.4.
- **Community Consultation Group (CCG):** Community consultation was held in the social area of influence in order to understand the communities' perspective for the project, identify their priorities and engage them in the project's activities.
- **Desk based research:** The desk research component of this study relied heavily on existing data sources. Primarily, the Environmental and Social Assessment Report (ESAR) prepared in 2019 for the project served as a foundational resource. This report, which included fieldwork to document the social area of influence, provided valuable insights that remain relevant to the current investigation. The Liberian Population and Housing Census of 2022 and the Demographic and Health Survey of 2019 were also consulted. These data sets offered comprehensive demographic information, including population distribution, housing characteristics, and health indicators, which were crucial for understanding the socio-economic context of the study area.

8.2 PROJECT SOCIAL AREA OF INFLUENCE

This section provides an overview and analysis of the existing socio-economic conditions in the areas to be affected by the Project. It focuses on the area located in the direct vicinity of the Project i.e., the communities living around the proposed coastal revetment structure at the coastline of Westpoint as these will be the most affected by the project activities during construction, operation, and decommissioning. Impacts on the broader area, which this Project will serve during its operation phase, will be discussed in the impact assessment (section 9); mitigation and management of such impacts will also be provided in the relevant sections (Sections 10 and 11). Moreover, the built-up areas are presented in Figure 3-1 to visualize the areas impacted.

8.2.1 General Description of the Social Area of Influence

West Point is divided into seven administrative zones, with three administrative zones bearing the impact of coastal erosion which are: Community 401 (Kru Town), Community 402 (Power Plant), and Community 407 (Du Side Field). These communities are situated dangerously close to the seashore, making them vulnerable to annual flooding and erosion, resulting in significant property loss. The affected areas are characterized by sub-standard housing, increasing the impact of the erosion. Despite efforts by previous governments to relocate residents, these attempts have been met with resistance. Residents, primarily fishermen, protested the move due to the need to live near their source of livelihood—the sea. Later, structures were built in Brewerville near the beach, but many residents eventually returned to West Point, pointing out the complexities of relocation and the community's connection to the coastal environment.

West Point is not only home to a large community but is also considered a desirable location due to its strategic proximity to the city centre. This position allows residents to reduce both travel time and transportation costs, making it a convenient area for daily commuting and enhancing access to business opportunities. Despite the challenges posed by coastal erosion and sub-standard housing, the community's location remains a key factor that attracts individuals seeking economic benefits and livelihood prospects. This blend of accessibility and business potential makes West Point a crucial area for residents, even amidst ongoing environmental risks.

8.2.2 Methodology

8.2.2.1 Desk Review

The desk review draws on various key resources, with two primary sources providing significant insight. The first is the ESAR developed in 2019, offering a comprehensive background on the social area of influence and its communities. The fieldwork included in

the ESAR remains highly relevant to the current project. The second primary resource is the Liberia Population and Housing Census, published in 2022, which serves as the most recent and authoritative document on Liberian demographics.

8.2.2.2 Fieldwork

The social baseline assessment was conducted over a three-day period, from Monday, August 12, 2024, to Wednesday, August 14, 2024. The initial day focused on creating awareness within the West Point community about the upcoming exercise. The team met with Township Commissioner, who granted permission for the study and assigned a guide, to assist in navigating the township. Accompanied by the guide, the team engaged key members of the fishing community, including the heads of the Fanti fishing community and Kru fishermen, to gather insights from the most affected areas. The team also visited key public facilities, recording GPS coordinates for significant sites such as law enforcement institutions and other notable structures. A transect survey was conducted to identify and document the locations of key public structures, learning institutions, religious institutions, and areas directly impacted by sea erosion.

The second and third days of the fieldwork were dedicated to data collection through FGD, KII, and consultation meetings with various community members. These sessions included individuals directly impacted by the sea erosion, fishermen, fishmongers, and other community residents. A total of five surveys were conducted, involving 42 participants, comprising 19 females 2 of whom are disabled individuals, and 19 males. This comprehensive approach ensured that data was collected from a wide cross-section of the community, offering valuable insights into the social and economic impacts of coastal erosion on the West Point community. The summary of the participants in the field work is presented in Table 8-1.

Table 8-1 Summary of type of interviews and number of interviewees

No.	Type of interview	Females			Male			Grand total
		Participants	Disabled	Total	Participants	Disabled	Total	
1	Key informant interview	0	0	0	1	0	1	1
2	Women focus group	4	2	6	0	0	0	6
3	Fisher mongers focus group	2	0	2	8	0	8	10
4	Fishermen focus group	0	0	0	8	0	8	8
5	Fish mongers' discussion	5	0	5	2	0	2	7
6	Public consultation	4	2	6	4	0	0	10

8.2.3 KII Interview

A key informant interview (KII) was conducted with the township commissioner to gain an understanding of the overall situation in the social area of influence (SAI). The interview provided valuable information about key services and structures in the area, as well as the community's fears and expectations regarding the project. Additionally, the interview offered insights into issues related to women in the community. The questionnaire used for the KII can be found in Appendix K.

8.2.4 Focus Group Discussions

Focus Group Discussions (FGDs) were undertaken with selected types of groups that were affected differently by the project: these are the women, fishermen, and fishmongers.

- Women Focus Group - the information gained from these discussions provided general information about the situation of women in the project area and fed the gender related aspects of the baseline. The discussions also provided a free space for women to express their concerns, their fears, and their expectations regarding the Project. One focus group discussion was held specifically for women with six women present from the SAI. Questionnaires are presented in Appendix E. More details about these FGD are described in section 5.2.5.1.
- Ecosystem Services Focus Groups (fishermen and fishmongers) - the information gained from these discussions provided specific information about the ecosystem services provided in the project area and the people whose livelihoods depend on them or is closely related to them. These FGDs and interviews also sought to get feedback from these groups on the Project as part of the stakeholder engagement activities. In total three FGDs were undertaken, involving a total of 25 individuals. Questionnaires are presented in Appendix F. More details about these FGD are described in section 5.2.5.2.

8.3 DEMOGRAPHIC AND ETHNIC COMPOSITION

8.3.1 Population

The 2022 census (LISGIS, 2022) recorded the population of Montserrado county recorded the population of 1,920,965 people. Greater Monrovia recorded a population of 5,250,187 people. The distribution of the population by district in Montserrado is represented in Table 8-2. As the most populous county in Liberia, Montserrado accounts for slightly over a third of the country's total population, with a share of 36.7%. The county's demographic composition includes 50.9% females and 49.1% males. However, within the SAI, according to Township Commissioner Hon. MacPherson Daweh, West Point has an estimated population of

approximately 55,000 people. About one-third of these residents, who live along the beach, are directly affected by sea erosion, which continuously destroys property and poses a significant threat to their lives.

Montserrado is predominantly urban, with 91.7% of its population residing in urban areas and only 8.3% in rural areas. Based on the Table 8-2, Greater Monrovia have the second highest population in the county where the demographic composition includes 50.45% females and 49.55% males. Cities Alliance, a global partner of UN-Habitat, estimated that by 2016, nearly a quarter of Liberians—approximately 1 million people—were living in the slums of Greater Monrovia. These residents faced numerous challenges, including poor housing conditions, inadequate water supply, minimal sanitation, poorly constructed housing, lack of basic social services and infrastructure, limited financial resources, and severe overcrowding (Front Page Africa, 2017). These communities play a crucial role in Monrovia's economy by supplying essential goods and services to its population. Coastal areas, in particular, ensure a sustainable supply of fish to the city and offer a range of services that benefit both fishing and non-fishing communities. These services include canoe and boat repairs, net repairs, small-scale metalwork, food provision, building materials, transportation, and health and education services, all of which support and enhance the daily lives of Monrovian residents.

Table 8-2 Population distribution by county, administrative district, and sex (Source: LISGIS 2022)

	Total	Female	Male
Montserrado County	1,920,965	942,559	978,406
Careysburg	55,284	27,611	27,673
West Point Township	30,847	15,915	14,932
St. Paul River	172,384	85,174	87,210
Todee	49,361	25,754	23,607
Borough of New Kru Town	71,739	35,724	36,015
Gardnersville Township	127,566	62,270	65,296
Barnersville Township	65,493	31,254	34,239
Lousana Township	26,057	13,033	13,024
Paynesville Township	617,492	298,858	318,634
Congo Town Township	91,632	44,161	47,471
New georgia Township	99,845	49,017	50,828
Caldwell Township	112,166	54,055	58,111
Greater Monrovia	161,891	81,659	80,232
Garglohn Township	126,281	63,432	62,849
Johnsonville Township	112,927	54,642	58,285

8.3.2 Gender Composition

In Liberian low-income communities, there is a noticeable division of roles and income generation based on gender. Both men and women need to earn money to sustain themselves. Women-headed households are less common, comprising 33% of the total, compared to 66.3%

male-headed households (LISGIS, 2021). This suggests that women generally have lower status, less influence in decision-making, and limited access to property and resources. Many women who lead households are either divorced or widowed, which limits their livelihood options.

Based on the ESAR conducted in 2019, in many areas of Liberia, including the proposed project target regions, women are primarily responsible for caring for their families, especially children, while also needing to generate their own income. Their income-generating activities may either depend on their partners' work or be independent, with some women running their own businesses or having other income-earning strategies. Women typically locate their businesses near their homes to maximize sales and income while also caring for their families. In contrast, men often engage in hawking or work farther from home.

In artisanal fishing communities, men primarily handle the fishing, while women, often their wives or female relatives, are responsible for processing and selling the fish. Typically, up to three women are involved in processing and selling the catch from each man's canoe or boat. They purchase the fish from the boat owner on the beach, clean it nearby, and then either sell it to hawkers or suppliers in town or take it to be smoked. Both men and women engage in fish smoking, and both sell the smoked fish. This creates a separate group from the fishermen and the fishmongers. As a result, fishing, processing, and selling fish is a family activity that supports entire households, with one fisherman's catch potentially supporting 5-12 people. Fish mongering allows women to generate independent income, providing direct support for their children while being close to home and sales opportunities (EJF, 2012).

These communities, primarily operating within an informal economy, face various social difficulties due to underlying insecurity. While both men and women are affected by unemployment and drug abuse, women are particularly vulnerable to exploitation by disadvantaged men who are frustrated by their lack of progress in society. This often results in high rates of teenage pregnancies and drives some women into prostitution. Thus, while poverty impacts everyone in coastal urban communities, its effects are disproportionately felt by women (Earthtime Inc. and CDR International, 2019).

8.3.3 Ethnicity

Fieldwork revealed that West Point Township is home to a diverse population, including people from various ethnic backgrounds as well as foreign nationals from West African countries such as Ghana, Sierra Leone, Côte d'Ivoire, Nigeria, Mali, and Burkina Faso. The dominant ethnic groups in the township include South easterners (Kru, Grebo, Krahn), Fanti, Fula, Vai, Gola, Gio, Mano, Mandingo, along with several smaller tribal groups. Despite this ethnic diversity, the residents of West Point have lived in harmony. Based on the census published in 2022, the proportions of ethnic Liberians by group are listed in Table 8-3.

Table 8-3 Ethnic groups in Liberia (adapted from LISGIS, 2022)

Ethnic Group	Percentage of Population
Kpelle	20.2%
Bassa	13.6%
Grebo	9.9%
Gio	7.9%
Mano	7.2%
Kru	5.5%
Lorma	4.8%
Krahn	4.5%
Kissi	4.3%
Madingo	4.2%
Gola	3.8%
Vai	3.8%
Other African tribes	3%
Gbandi	2.9%
Mende	1.7%
Sapo	1%
Belle	0.7%
Other Liberian Ethnic Group	0.4%
Dey	0.3%
Non-African	0.3%

Kpelle and Bassa form the largest groups in Liberia; the Bassa, Gio, Kru are often fishermen; the Grebo, Mandingo, are often in trade and transport, the Mano, Krahn, Gola, Gbandi, Loma, Kissi, Vai, Belleh, Mende and Dey are originally agriculturalists.

Liberia is home to various nomadic and semi-nomadic groups such as the Fula, who primarily engage in trade and originate from the drier Sahel region, and the Fanti, who are typically fishermen or fish traders from Ghana, living in Liberia both seasonally and increasingly on a permanent basis. There is also a small group of Popo(h) fishermen originally from Togo. Additionally, the population includes Americo-Liberians, descendants of free-born and formerly enslaved African Americans who began arriving in Liberia from 1822, and Congo People, descendants of Caribbean immigrants. These groups constitute about 5% of the population and have historically played a significant role in the country's political sphere, maintaining substantial influence today (WPR, 2019).

The Fanti are originally an ethnic group from Ghana who moved up the coast in the 1920s to capitalize on the fishing opportunities off the coast of Liberia. Their population grew significantly, leading to their inclusion as an ethnic group in Liberia's 1984 census. Many Fanti are now in their third or fourth generation in Liberia, having married into local ethnic groups and obtained Liberian documents. Although some Fanti returned to Ghana during the civil war, many remained and continued to supply Monrovia. The Fanti primarily reside in Fanti Town in the West Point area, parts of New Kru Town, and around the Africa Hotel complex (EJF, 2012).

The second largest low-income community in Monrovia is composed primarily of the Kru people, many of whom reside in the New Kru Town community on Bushrod Island. Originally from Grand Kru Territory in Maryland County and Sinoe County, the Kru are ethnic Liberians. They form the third largest indigenous group, making up 7% of the population, and their language is one of the main languages spoken in the country. The Kru are significant socio-political players in Liberia, alongside the Krahn and Mano people.

It should be emphasized that all ethnic groups are found in most communities and whilst fishing is mainly the preserve of the Fanti, Kru and former Popo, that other tribes, particularly the Bassa are involved in fishing in Liberia and are often found in Monrovia as crew or mongers.

8.3.4 Poverty

The data is grouped by county rather than district; therefore, it is difficult to use to describe only the low-income communities in Monrovia, but it is all there is. In 2022, Liberia had an estimated 1,187,514 households, with an average household size of 4.4 persons. Of the approximately 5 million people in the country, 49.6% are male and 50.4% are female. Montserrado County has the largest population, with 1,920,965 individuals, accounting for just over a third of Liberia's total population. The average household size in Montserrado County is 4.3 persons, slightly below the national average, with around 449,989 households (LISGIS, 2022).

The 2016/2017 Household Income and Expenditure Survey (HIES) is the last official document that discusses the levels of poverty in Liberia. The HIES survey calculated three poverty lines: the food poverty line, defined as the line below which individuals cannot meet their basic food needs; the absolute poverty line, defined as the line below which individuals cannot meet their food and non-food minimum needs, and the extreme poverty line, defined as the line below which individuals' total food and non-food consumption falls below the minimum food requirements.

The headcount for absolute poverty in the country stands at 54.1%. In rural areas, poverty impacts 70.0% of the population, while in urban areas, the absolute poverty rate is 43.3%. Montserrado County has the lowest regional absolute poverty rate at 31.6%, reflecting higher employment opportunities and income generation. Interestingly, the food poverty rate in Montserrado slightly exceeds the absolute poverty rate, at 32.5% compared to 31.6%. This suggests that while some households have enough expenditures to surpass the absolute poverty threshold, a significant portion of their resources is allocated to non-food expenses, leaving less for food. Extreme poverty affects 12.2% of households nationwide, with Montserrado County having the lowest rate at 6.6%. These statistics highlight lower poverty

levels in the capital area, though they mask significant disparities in household incomes and access to necessities (HIES, 2016).

Low-income communities in the county typically demonstrate the highest poverty indicators, including elevated rates of unemployment and underemployment, as well as a heavier dependence on informal sector work. In contrast, higher-income communities, where formal sector employment is more prevalent, tend to have better access to wages that can cover essential needs.

Nationally, 65.5% of total spending is allocated to food, which includes the market value of home-produced goods, while 34.5% is directed towards non-food expenses, such as estimated rent for homeowners and the use value of household assets. In rural areas, food spending is higher, at 73.2%, compared to 60.2% in urban areas. This reflects the generally higher poverty levels in rural regions, where a larger portion of the budget is dedicated to food, whereas urban areas face more significant non-food costs, such as rent and transportation. Montserrado County has the lowest proportion of food spending relative to total spending, at 55.4%, with less than 2% of food spending coming from home production, compared to 20% nationally. Education spending in Montserrado is the highest in the country, making up 16.3% of non-food expenditures, compared to 12% nationally, while health spending is close to the national average at 2.2% (HIES, 2016).

The highest levels of poverty are found among household heads under age 20, 71.0%, but these represent less than 0.5% of total household heads. The lowest poverty rate, 45.8%, is found for household heads between age 20 and 29. The poverty rate for households' head between age 30 and 39 is 51.2%, 55.9% for age 40 to 49, 59.3% for age 50 to 59, and 58.5% for household heads above age 60 (HIES, 2016).

Households where the head has no formal education experience the highest poverty levels, with 69.3% living in poverty, compared to 59.6% for households where the head has some primary education, 47.0% for those with some secondary education, and 23.6% for households with a head who has post-secondary education. Interestingly, food poverty is higher among those with secondary education than overall poverty, which aligns with the fact that most individuals with post-secondary education reside in Montserrado. The disparity, however, is more pronounced than between Montserrado and other regions, suggesting that individuals with higher education are more likely to prioritize non-food expenses over food consumption due to the significantly high costs of living outside of food expenditure (HIES, 2016).

8.3.5 Religion and Culture

Based on the fieldwork conducted, the communities in the Social Area of Influence (SAI) consist of a mix of Christians, Muslims, and Animists. According to the 2022 National Census, 84.9% of Liberia's population practices Christianity, while Muslims make up 12%,

predominantly from the Mandingo and Vai ethnic groups. Other religions account for less than 1% of the population, and 2.6% of individuals are not affiliated with any religion (LISGIS, 2022). Within the SAI, it was reported that there are approximately 25 churches and 5 mosques. Figure 8-1 shows some of the religious structures found in the area. Figure 8-2 presents a map for the sites' location.

Religious structures

Churches and mosques found in the SAI

(a) Central Mosque

(b) WP Community Mosque

(c) Church of Pentecost Liberia

(d) John Kofi Asmah United Methodist Church

Figure 8-1 Religious structures present in the SAI

Figure 8-2 Map for religious sites locations

8.3.6 Vulnerable Groups

None of the ethnic, tribal, or language groups in Liberia forms a distinct majority, as shown in Table 8-3. The ethnic composition of Liberian society does not include any group that can be more readily identified as "indigenous" according to the international definition used by the UNDP (UNDG, 2009) and other agencies (IFC, 2012a; IFC, 2012b). Internationally, the term "indigenous" refers to communities with distinct languages, cultures, and livelihoods that are significantly different from the mainstream groups in a country, often resulting in additional disadvantages or the need for different engagement approaches.

While every ethnic group and tribe in Liberia possesses its own language and customs, these differences are not significant enough to warrant special status for any group. Historically, the main division was between the descendants of former slaves who returned to Liberia—the Americo-Liberian/Congo people—and the indigenous tribes. However, laws that created separate rights have been abolished, and no group is currently disadvantaged by law or practice in a way that requires separate consideration. In mixed communities, most people experience similar levels of poverty and lack access to services and opportunities for improving their livelihoods. The study area found that no communities are uniquely disadvantaged; all are equally vulnerable (Earthtime Inc. and CDR International, 2019).

The primary causes of social exclusion in these low-income communities are poverty and lack of opportunities. The legacy of the 20-year civil war includes a failure in educational opportunities, resulting in limited learning, lack of study skills, and insufficient knowledge. Consequently, job opportunities for those with low literacy levels or few skills are scarce. Additionally, acquiring further skills is challenging without proper education, restricting advancement (Earthtime Inc. and CDR International, 2019).

People are incredibly resourceful in finding ways to generate income and work hard to make a living. Goods are sold from wheelbarrows, roadside stalls, or door to door. Many households have micro workshops for producing small quantities of industrial products, food processing, or operating repair shops within their homes. Transportation of goods and people in low-income communities is provided by vehicle taxis, tuk-tuks/kekeh, motorcycle and bicycle taxis, handcarts, human porterage, as well as buses and trucks. These activities require significant time and energy, diverting efforts from potential advancement (Earthtime Inc. and CDR International, 2019).

8.4 ACCESS TO KEY SERVICES AND INFRASTRUCTURE

An overview of the facilities and services available in the SAI was obtained during the town survey (KIIs) and is presented in Table 8-4. A map that shows the location of key services and infrastructure is presented in Figure 8-4.

In the SAI, there are around four elementary schools and two high schools. There are no universities, or vocational schools present in the area. More information about access to education in the SAI is available in Section 8.6.

According to the KII, there are two community markets which are Westpoint Market and Waterside Market; both of which operate 7 days a week. Residents sell their produce in the local markets as well as the general markets in Waterside. These markets sell fruits, vegetables, legumes, lappas, etc… There are no processing facilities for fish in all the affected areas. The only means of processing is by drying using local materials and firewood, mangrove. All the markets in the SAI are under the Liberian Market Association (LMA). Figure 8-3 presents pictures of the markets.

There is one standard clinic and one private laboratory within the SAI. In addition, there are several drug stores that provide necessary medicine and medical essentials. People within the SAI are usually referred to John F. Kennedy Medical Hospital or other private hospitals outside the SAI. More information about the health situation in the SAI is available in section 8.5. On the other hand, there are around 25 churches and 5 mosques in the SAI. More information on religious practices and access to religious services in the SAI is available in section 8.3.5. In addition, there are official offices in the SAI such as magisterial court and police offices. Cell phone coverage is also present in addition to other services such as water taxis, tailors and coal sellers are also found in the SAI. Information about the presence, location and pictures of the key services and infrastructure is presented in Table 8-4 , Figure 8-3, and Figure 8-4.

Table 8-4 Key structures and infrastructure found in the SAI (Data source: KII)

Services	Presence in West Point Township
Elementary school	Yes
Secondary school	Yes
College	-
Vocational school	-
Health post	Yes
Hospital	No
Church	Yes
Mosques	Yes
Bank	Yes
Market hall	Yes
Cooperatives	Yes

Services	Presence in West Point Township
Police post	Yes
Tailor	Yes
Coal Sellers	Yes
Water Taxi	Yes
Cell phone coverage	Yes

(a) Magisterial Court

(b) Police Depot

(c) Old West Point General Market

(d) General photos from markets

(e) Tailor

(f) Coal seller

(g) Water taxi

(h) Kehkeh

Figure 8-3 Pictures for some of the key structures and infrastructure present in the SAI

Figure 8-4 Map for the key services and infrastructures found in the SAI (source: KII and fieldwork)

8.5 HEALTH

Liberia is one of the poorest countries in the world. Civil wars 1980-2003 killed around 250,000 people and displaced many more and destroyed most of the country's healthcare facilities. World Health Organisation (WHO) statistics (WHO, 2021) show that life expectancy in Liberia has risen from 47 post war to 63.5 years but is still much lower than the world average and other West African countries. In 2021, the leading cause of death in Liberia was Malaria. Communicable diseases such as malaria, HIV/AIDS, tuberculosis, and meningitis are widespread (IHME, 2021).

HIV/AIDS remains a major health issue in Liberia, currently affecting around 33,000 individuals, with nearly 60% of them being women. Liberia's limited capacity to treat this disease results in a survival rate of only about 1.2% for those infected. The youth significantly contribute to the ongoing HIV/AIDS crisis post-conflict, primarily due to the high prevalence of unprotected sex among adolescents. Additionally, malnutrition is prevalent, especially in low-income areas, with 30% of children nationwide experiencing stunted growth (LISGIS, 2021).

Approximately 38% of girls in Liberia have undergone female genital mutilation (FGM), a practice deeply embedded in the culture and considered essential for ensuring a girl's purity before marriage (LISGIS, 2021). This practice results in numerous health complications and can sometimes be fatal. In 2016, Reuters reported that Liberia's parliament had removed a ban on FGM from a new domestic violence law. Initially submitted in September 2015, the law had listed FGM as a criminal offense, but opposition from several politicians in April led to the removal of the FGM provision from the bill (Guilbert, 2016).

8.5.1 Health Situation in the SAI

The West Point Community is served by a single standard clinic, which is owned and operated by the Catholic Archdiocese of Monrovia. In addition, there is one private laboratory available to residents. Many people also rely on local shops and drug stores to purchase tablets and other medical supplies. Common illnesses in the community include pneumonia (cold), cough, and malaria. While the clinic manages minor cases, more severe conditions are referred to John F. Kennedy Medical Hospital or other private hospitals. Overall, the health situation in the township is considered fair.


(a) Star of the Sea Health Center

(b) Medical Laboratory

Figure 8-5 Photos of health facilities in the SAI

8.5.2 Access to Water in the SAI

The fieldwork conducted reveals that the communities within the study area face a significant shortage of safe drinking water. Residents rely primarily on commercial mineral water companies for their drinking water needs. While a few hand pumps have been provided by non-governmental organizations (NGOs), some of these pumps have been damaged and become dysfunctional. In addition, it was reported that there is a limited effort that is being made to repair the dysfunctional hand pumps or address the safety of drinking water issues.

8.5.3 Sanitation Facilities

There is a visible issue with the sanitation facilities and cleanliness in the SAI. As shown in Figure 8-6 and Figure 8-7. The SAI contains public bathrooms; however, the number of these facilities is insufficient to meet the population's needs. Additionally, maintaining cleanliness in the bathrooms is challenging. Fieldwork indicates that while individuals are assigned to clean them, many people find it easier to use beaches and public spaces as makeshift latrines rather than locating a public bathroom, dealing with dirty conditions, or cleaning it themselves. Consequently, using beaches and spaces between houses as makeshift latrines

has become a normalized behavior in the area. This practice has several negative consequences, such as contaminating the water, which poses public health risks, and polluting living spaces, which could lead to disease outbreaks.

According to site visits conducted for the development of this ESIA, the sanitation problem is particularly evident at the edges of the township, where heaps of debris accumulate. These piles can be found along the seashores and riverbanks as shown in Figure 8-8. Within the township, among the clustered structures, sanitation is relatively better due to a group of women responsible for cleaning. However, the collected debris is often dumped on the beach, and large amounts of garbage are discarded along the roads, increasing the likelihood of illnesses.

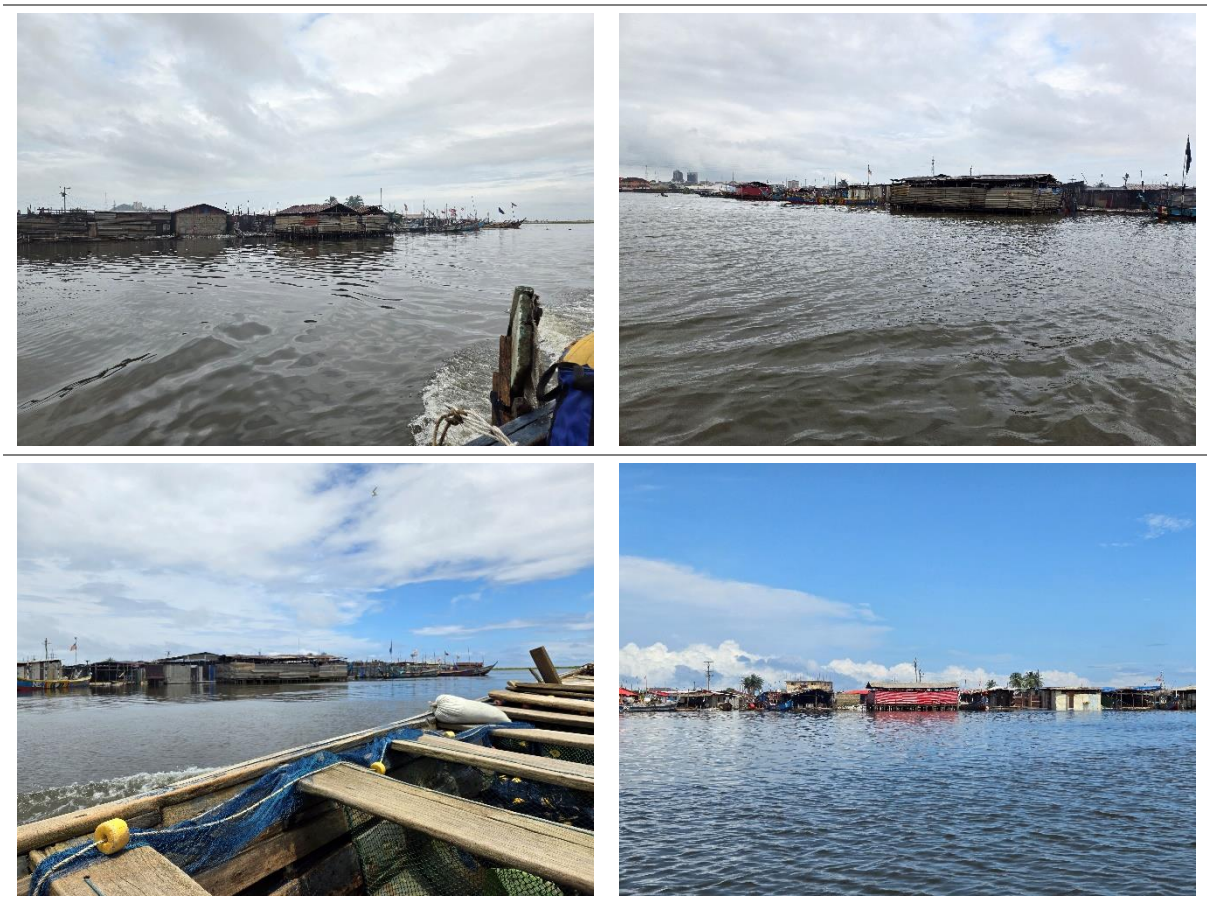


Figure 8-6 Public bathrooms in the SAI

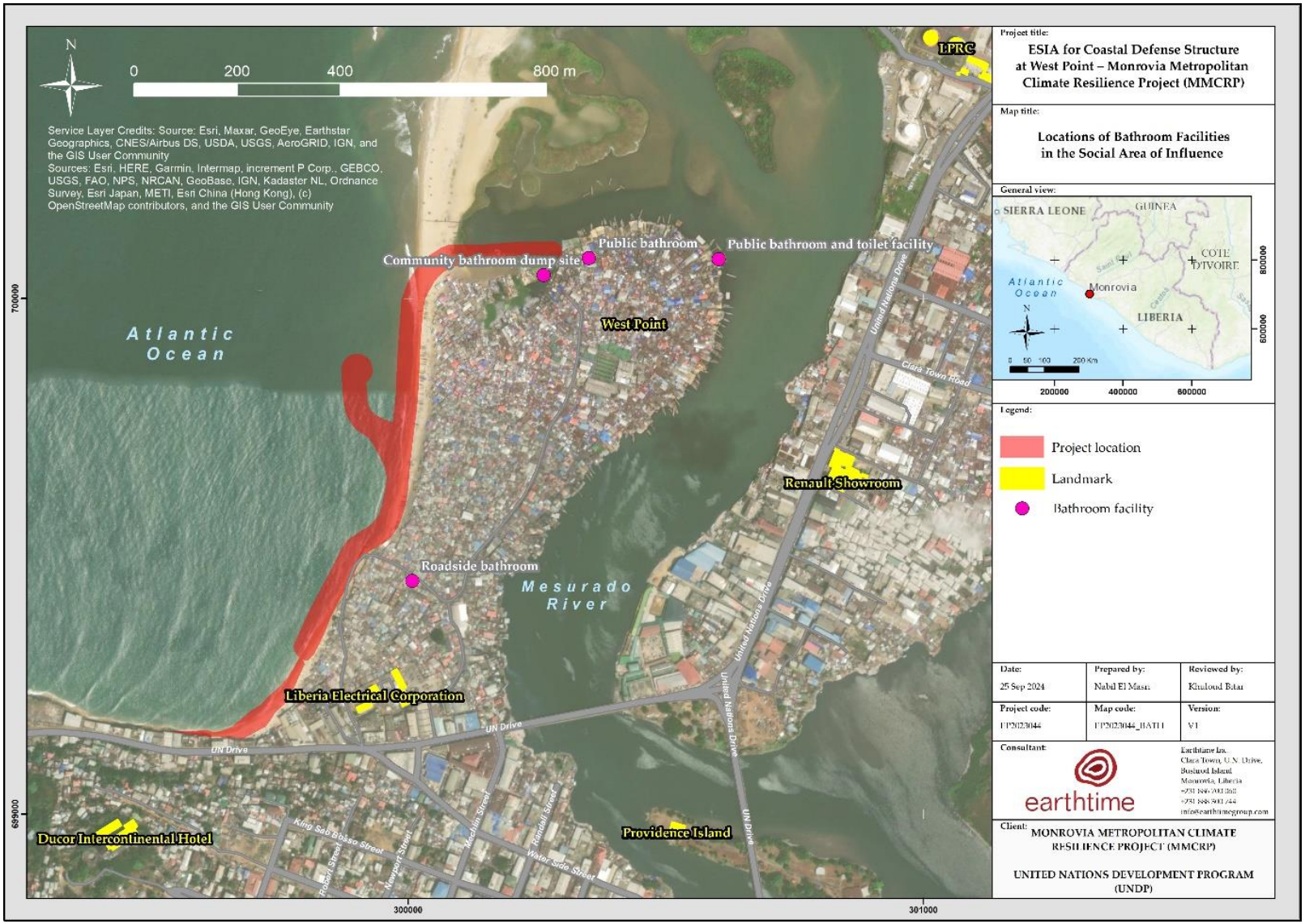


Figure 8-7 Location of bathroom facilities in the SAI

Figure 8-8 Debris and garbage at the beaches in the SAI

8.6 EDUCATION AND SKILLS

Education service delivery in Liberia was severely affected by the First Liberian Civil War and Second Liberian Civil War; between 1989 and 2003 and literacy levels plummeted. Education in Liberia is allegedly free for primary students attending a government school, but most of these schools lack adequate learning facilities and extra funds are requested from parents.

Liberia's education sector is hampered by inadequate schools and supplies, as well as a lack of qualified teachers and corruption. A Primary School Certificate is achieved at the end of six years primary education and a Liberia Junior High School Certificate Examination (after three years), and a Liberia Senior High School Certificate (a further three years) can be achieved.

Higher education is provided by several public and private universities. The University of Liberia is the country's largest and oldest university. Located in Monrovia, the university opened in 1862 and today has six colleges. Other universities and colleges, most faith-based, have opened in the country since the end of the civil war.

Approximately 60 percent of the population in Liberia is literate. Literacy rates are higher in urban areas (71.8%) compared to rural areas (45.1%), and higher among males (65.1%) than females (54.6%). Approximately one-third of the population is currently attending school,

with equal numbers of males and females enrolled. School attendance is higher in urban areas (40.7%) compared to rural areas (27.2%). The percentage of males who have completed school (21.8%) is roughly 1.5 times that of females. Additionally, the completion rate is about 2.7 times higher in urban areas compared to rural areas. The drop-out rate is higher in rural areas (15.6%) than in urban areas (13.0%).

More than two-thirds (67.9%) of those who have completed school have finished secondary education, with this proportion being similar in both urban and rural areas. Around 18% of school completers have attained tertiary education. The rate of tertiary education completion is twice as high in urban areas compared to rural areas (LISGIS, 2022). Montserrado County has the highest percentage of both women and men who have completed senior high school or higher, with 26% of women and 40% of men achieving this level of education (LISGIS, 2021).

Poorer residents are less likely to be literate, with a literacy rate of 42.9%. Most students (49.2%) walk between 10 and 30 minutes to reach school, and nearly all students arrive within 60 minutes, though 6.6% take longer. Textbooks are primarily borrowed from schools (47.4%) or owned by households (33.4%). In urban areas, 42% of students own their textbooks, whereas in rural areas, 74.3% borrow textbooks from schools (LISGIS, 2016).

8.6.1 Access to Education in the SAI

West Point has only one public school, the Nathaniel V. Massaquoi Public School. Additionally, there are a few other educational institutions in the area, including Our Lady Star of the Sea Catholic Elementary and Junior High School, the Muslim English and Arabic Elementary School, and one private high school which is J.K.A. High School. However, a significant number of children from the community attend schools in central Monrovia, ranging from elementary and junior high schools to senior high schools and universities. There are no universities or vocational schools in the SAI. Figure 8-9 presents pictures of some of the educational facilities in the SAI.

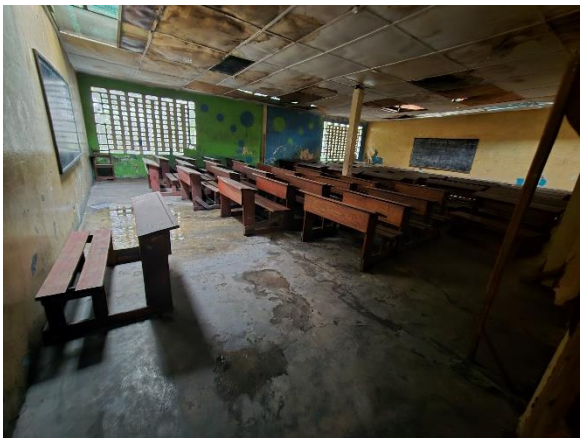



Figure 8-9 Pictures of educational facilities present in the SAI

8.7 GOVERNANCE

Based on the fieldwork conducted, it was reported that the community currently faces a high crime rate due to its dense population and numerous attractions for criminals. Common offenses include disorderly conduct, simple and aggravated assaults, and daily property theft, as reported by local authorities. This trend is expected to persist, exacerbated by the presence of many unemployed youths. The community's law and order are maintained by the Township Commissioner and Governors. Offenders are subject to fines or imprisonment based on the severity of their crimes.

In the SAI, there is a committee called the Community Development Committee (CDC). As per the KII and CCG, the CDC that has been trained in leadership skills by NGOs and Montserrado county authority. The CDC has 11 members and meetings are usually held once a month or when the situation necessitates it. Women are not present amongst leadership positions in the committee. Even though the committee does not have specific bylaws and constitution to govern the community but depends on the township ordinance. According to the community, CDC cooperates with community members to direct the construction of structures in the community such as constructing special facilities. Even though the CDC doesn't have a financial system in place, it is reported that efforts are being made to establish it.

According to the KII, there are cultural organizations in the community. In addition, there are no shrines or place of worship next to churches or mosques. It was reported that there are around ten saving and loan associations in the SAI.

8.8 LIVELIHOOD IN THE SAI

Residents of West Point and other coastal communities in Monrovia primarily rely on petty trade, fishing, and fish mongering for their livelihoods. A smaller percentage of residents engage in other occupations, such as security guard services, operating commercial

motorbikes or vehicles, and undertaking small contracts for fellow community members. Unemployment and poverty rates are high in West Point, particularly among the over 90% of residents who depend on fishing and fish mongering, primarily those of Kru and Fanti descent. Community leaders are actively working to encourage residents to diversify their livelihoods and explore alternative economic opportunities beyond the fishing and fish mongering industries.

8.9 FISHERIES

The marine fishery resources of Liberia are harvested by two distinct types of fisheries:

- The artisanal canoe fishery, which operates in estuaries and shallow inshore waters extending from the shoreline to a depth of 20-40 meters.
- The industrial trawl fishery, which is intended to operate in deeper open waters, targeting finfish or shrimp. It is illegal for trawling to occur within 6 nautical miles of the coast.

There are three different types of artisanal fishing units: small Kru canoes, medium Kru canoes, and large Fanti canoes which are illustrated in Figure 8-10.

(a) Fanti canoes in the SAI

(b) Kru canoes in the SAI

Figure 8-10 Pictures of canoes present in the SAI

The Liberian artisanal fisheries exhibit a pronounced gender division. Fishermen are predominantly male, while fish mongering is primarily undertaken by women. This gendered distribution of labour holds significance in a country where gender equality is not fully established, particularly as women occupy the more economically powerful role as revenue receivers at the point of sale. As a result, the fishery provides relatively equitable support to the communities it serves.

The West Point and New Kru Town fisheries have demonstrated their resilience and sustainability. Despite the political instability and disruptions caused by the civil wars between 1980 and 2003, the fishing industry continued to operate due to its self-sufficiency and minimal reliance on external inputs. The survival of the city during this period can be attributed, in part, to the food supply provided by the fishery (CDR International, 2019a).

Table 8-5 Fishing equipment used in the project area (Source: ESAR)

Canoe type	Operated by	Capacity	Size	Mechanism	Fishing time	Fishing gear	Target species
Kru	Mainly Liberians (Kru) Some Togolese (Popo)	1-3 men	Small (< 6 m)	Hand-dug tree trunks with a moulded depth of about 60 cm, with or without sails. Propelled by sails or paddles, some powered by 7 horsepower outboard engines.	Depart in the morning with an offshore wind and return in the afternoon with the onshore wind. A minority stays out overnight and returns the next morning.	Hook and line; occasionally gillnets	Mostly demersal
	Liberians (Kru)	3-5 men	Medium (> 6 m)				
Fanti	Ghanaians (Fanti)	12-20 men	Large (10-15 m)	Dug-out or planked, powered by 10-40 horsepower outboard engines	Up to 4 days at sea	Ring nets, purse nets, large gillnets specifically adapted for different species	Mostly small pelagic

8.10 SURVEY OF FISHING COMMUNITIES IN SAI

To understand the operations of the fishing communities and industries within the SAI, several surveys were conducted in 2024 as part of the ESIA including focus group discussions with fishermen and fishmongers, key informant interviews, and community consultations. In addition, the surveys that were conducted in 2019 for the development of the ESAR remain relevant to the current project.

8.10.1 Location

The fishing communities are situated along the Atlantic Coast of Monrovia in various locations with suitable beaches for landing canoes. As Monrovia has grown, these communities have become increasingly congested, leading to heightened pressure on housing and the development of slum conditions. These informal settlements are characterized by high population density, low-income levels, and a lack of urban planning. They often occupy public land without private ownership and are typically characterized by makeshift buildings constructed from materials ranging from mats and straw to corrugated iron sheets. These communities generally lack road access and basic services. Many of these communities have been established for at least four decades and claim "squatter's rights" based on the principle of "adverse possession."

West Point, a coastal community located within Greater Monrovia Districts, Montserrado District, is experiencing severe erosion and flooding. Three administrative zones, Community 401 (Kru Town), Community 402 (Power Plant), and Community 407 (Du Side Field), are particularly vulnerable due to their proximity to the seashore. These areas have been significantly impacted by the annual erosion and flooding, resulting in property losses. The substandard construction of structures in these regions further exacerbates their vulnerability to these environmental hazards. The project location is presented in Figure 3-1. There are two fishing communities identified in the SAI which are:

1. Kru Beach – West Point
2. Fanti Town – West Point

According to the ESAR, each community elects an unpaid Community Chairman who communicates with the city administration. Fishing communities also have a Fishing Association led by a Fishing Chairman who oversees fishing-related matters and resolves disputes. Additionally, each community has a Fish Mongering Association with a Chairwoman responsible for managing the sale of fish and settling disputes. Such "Associations" are a common aspect of Liberian community organization, regulating membership, collecting small monthly fees, overseeing activities, and resolving conflicts.

Fishing communities need direct access to gently sloping beaches for landing canoes, selling fish, repairing nets, and storing equipment when the sea is too rough as shown in Figure 8-11. Without access to these coastal spaces, fishing activities would be impossible. Coastal areas are limited and must be preserved to ensure fishermen can continue supplying fish to Monrovia and the rest of Liberia. Using beaches for other purposes, like storing construction materials, would harm fishing communities. Depending on the size of the community, one to three beaches or landing stages are used, and in some areas, multiple communities, including Fanti and Kru, share the same beaches (Earthtime Inc. and CDR International, 2019). Table 8-6 shows the fishing communities and the names of landing beaches within the SAI. The structures and beaches found in the SAI are all presented in Figure 8-12.

Table 8-6 Fishing beaches by community (Source: focus group discussions and ESAR)

Location	Fishing community	Name of landing beach
West Point – Township within the Monrovia City Council	Kru Beach	Power Plant
		Du Side
		Kru Beach
	Fanti Town, Association called "God Sees You Fish"	West Point
		Doe Community Beach
		Clara / Vai Town Beach
	White Flour/ Power plant	Power Plant

(a) Fishermen repairing their nets at West Point Fanti Town

(b) Storage of nets on the beach in West Point Fanti Town

Figure 8-11 Material used in fishing in the SAI

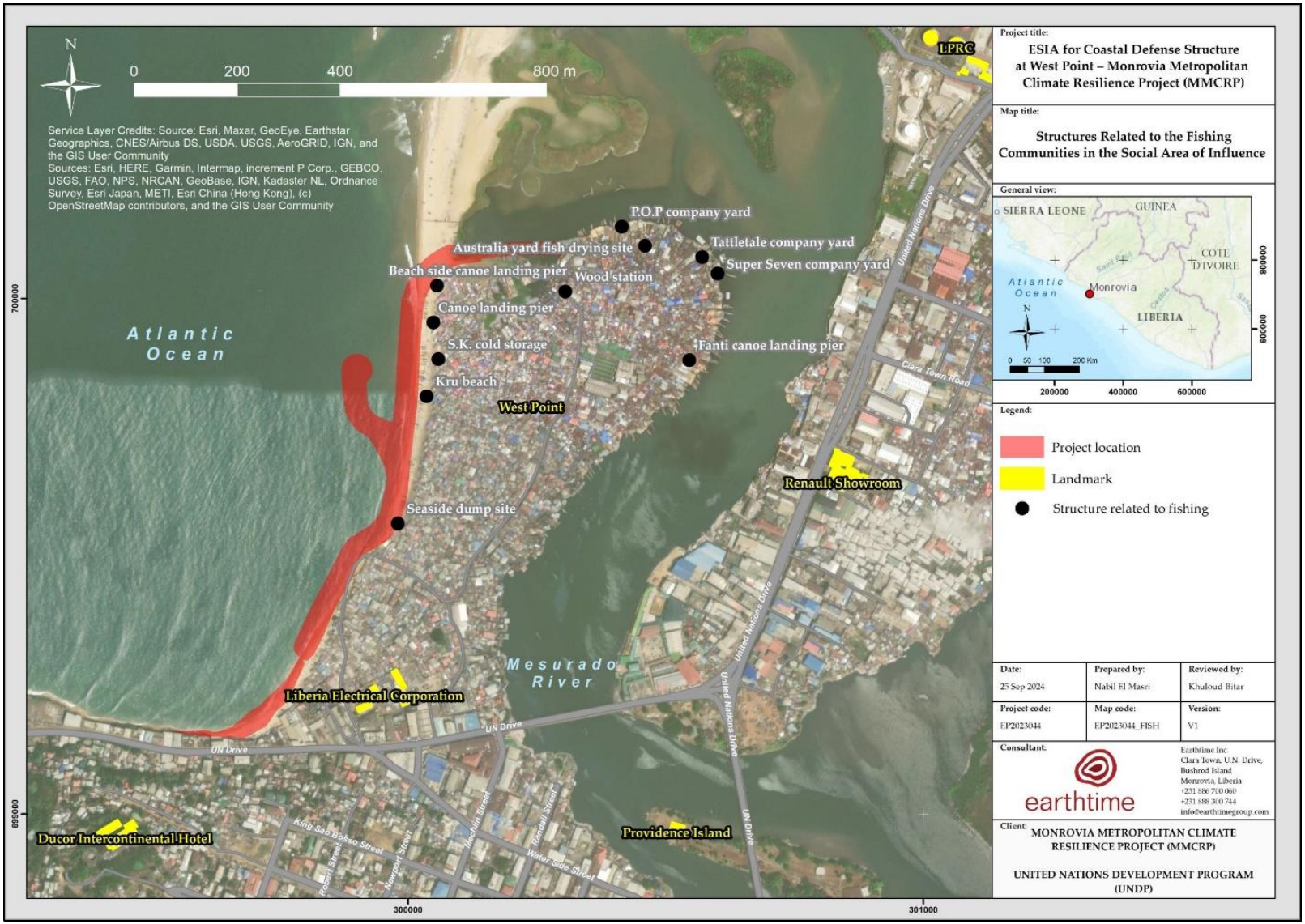


Figure 8-12 Structures related to fishing communities in the SAI (source: Focus group discussion and KII)

8.10.2 Ethnicity

Fishing communities in Liberia are generally made up of Kru, Fanti, or Popo people, who identify with these groups. The Kru are an ethnic group native to southeast Liberia, specifically Maryland County. Known for their maritime expertise, they have a long tradition of fishing and have intermarried with other ethnic groups since the civil war. Kru fishermen are also recognized for working on international fishing crews.

The Fanti originally came from Ghana and have been fishing in Liberia since the 1920s. Although not citizens, the Fanti were recognized in the 1984 census as a population group. Some have since intermarried with Liberians and obtained citizenship. They are the largest fishing group in Monrovia, using larger boats and fishing in different areas than the Kru. Fanti communities are spread along the Liberian coast, in places such as Bassa, Cape Palmas, Cape Mount, and Sinoe.

Popo fishermen, originally from Togo, migrated to Liberia in the 20th century, settling in small communities in Monrovia and other parts of the country. Over time, they have integrated and intermarried with Liberians, with some obtaining citizenship.

Bassa fishermen are commonly found on the beaches in southern Monrovia. Communities are often mixed, with Fanti and Popo living and fishing together, while Popo and Kru fishermen can be found in West Point. Disputes within the community are typically resolved by the Fishing Chairman, Fish Mongering Chairwoman, or Community Chairman. If these efforts fail, the issue is taken to the Borough Governor or Township Commissioner's Office (Earthtime Inc. and CDR International, 2019).

8.10.3 Fishing Equipment

The fishing equipment used by fishermen's groups at the different fishing communities is presented in Table 8-7 based on the ESAR conducted in 2019.

Table 8-7 Fishing equipment by community (Data source: ESAR)

Fishing community	Number of crews / boats	Population (2008 census)	Canoe type	Nets used◊	Crew
Kru Beach, West Point*	236-387	Men 7,130 Women 4,966 Total 14,096	Motorised canoes	2, 3, 4 and 5 finger sized nets (gillnets)	2-5 persons
			Paddling Canoes (Kru), 6-13 m in length		1-3 persons
Fanti Town, West Point	105	Men 2,708 Women 2,721 Total 5,429	Motorised canoes 40 HP (some made in Ghana)	Bonny net – Gbapele nets (gillnets) - Use GPS and compass - Life jackets	4-15 persons
			Paddling canoes 6-15 m in length		1-3 persons
◊ English name in parentheses * Called Lagoon East and West in census ** Called Fish Town in census					

8.10.4 Fishing Activity

In the SAI, fishing is primarily a male-dominated activity, though a small number of women own canoes, hire crews, and manage their own fish sales. According to the surveys conducted, motorized canoes are typically larger, have more crew members, take longer trips, and catch a wider variety of fish. Crews from Fanti Town in West Point travel the farthest, sometimes going on trips up to four days north along the coast. Some crews sell their catch to northern communities to cover the costs of the return journey, especially if bad weather risks spoiling the fish. This group often has conflicts with Senegalese fishers over access to northern Liberian fishing areas (Earthtime Inc. and CDR International, 2019). The fishing activities present in the SAI are presented in Table 8-8.

The fishing industry in Liberia is a vital source of income for many, particularly women, who commute to and from various fishing beaches to buy, process, and sell fish. Despite the economic hardships they face, these individuals remain dedicated to their work, which is often the sole means of supporting their families. The women, known for their strength and endurance, carry heavy loads of fish on their heads as they travel from one community to another.

When asked about their priorities, the fishermen and fishmongers consistently emphasized the importance of education for their children, food for their families, and essential household items. Additionally, they recognized the demanding nature of their work and the need to maintain good health to continue their livelihood.

Table 8-8 Fishing activities of communities in the project area (data source: ESAR)

Community	Type	Fishing trip duration	Seasonal variation of catch		Fishing location	Usual fish species in catch (local names)	Shark and ray catches
			High season	Low Season			
Kru Beach, West Point	Kru	• Up to one day • They usually go out in the morning and come back when ready	• For nets: October to January and March to May • For hook and line: June to September	For nets: June to September	1-4 NM offshore	• Pipefish • Cassava Fish • Snappers	Sharks, *only occasionally*
Fanti town, West Point	Fanti	1-4 days at sea	October to May	June to September	Travel all the way up the coast to Cape Mount	• Bonny • Tuna • Napleh • Pipe Fish • Cassava Fish • Pojoe • Michel • Shark • Grunta	Sharks and rays

8.10.5 Community Stability and Status

Fishermen live close to their beaches and boats in overcrowded, poor environmental conditions, in areas lacking water and sanitation, electricity, buildings of permanent materials and access. The areas are subject to sea flooding as well as from poor land drainage. Thefts from houses and boats etc. are common and have serious impacts on the ability of households to survive. Men are the fishermen, women the food processors and sellers of the fish. West Point community reports drownings but no violence over access to fishing. The Fanti Town, West Point community reports drownings and deaths as well as gang problems owing in part to their more extensive and dangerous trips and conflicts with Senegalese fishermen. This community has seen a 5-10% rise in the numbers of fishermen here (Earthtime Inc. and CDR International, 2019).

Based on recent fieldwork, it was reported that fishermen mostly operate individually and not in groups.

many of the fishermen and fishmongers do not live within the community; instead, they commute regularly to buy, process, and sell fish. Most of these workers are young women, who, judging by their physical appearance, appear healthy and strong. They can carry large quantities of fish on their heads, moving from one community to another to sell their goods. However, casual conversations reveal the economic hardship they face, which forces many to travel between different fishing beaches in search of fish to buy and resell. Both the men and women involved in this work rely on fish processing and marketing as their primary means of supporting their families. When asked what they primarily spend their income on, they highlighted children's education, family food, household necessities, and healthcare—essential due to the physically demanding nature of their work, which requires them to remain in good health.

8.10.6 Income from Fishing

The data presented in Table 8-9 are the result of deliberations by groups of fishermen and so can only be considered indicative. Fishermen often resort to petty trading and general labour contracts when fishing is low (Earthtime Inc. and CDR International, 2019).

Table 8-9 Income from fishing based on deliberations by groups of fishermen (data source: ESAR, 2019)

Kru Beach, West Point
• Kru canoe can bring in LRD 500-1,000 per day per fisherman for 200 days per year • Sales have increased in value by 25% over the last three years • A motorised canoe 10-15 m long costs USD 1,500 to 2,000 • A Kru paddle canoe costs USD 150-400

Fanti Town, West Point
- A Kru canoe can bring in LRD 0-1,000 per day per fisherman, for around 200 days per year
- The yield to a Fanti motorised canoe fisherman is highly variable and is spread over several days – around LRD 1,000-2,000 per man for 200-300 days a year

8.10.7 Project Impacts

All fishing communities were aware of and supported the proposal to protect the coastline, expressing strong views on how the project should be designed and implemented. The greatest concern for fishermen is the risk of drowning, as most cannot swim, and Kru canoes are especially prone to capsizing while hauling in nets. Providing access to life jackets and a rope with a buoyancy ring on each beach could significantly reduce the number of drownings each year.

Based on the FGDs, KIIs, and surveys conducted in both 2024 for this ESIA, and in 2019 for the development of the ESAR, these are the concerns voiced by the community:

- Flooding: Frequent flooding threatens the health, welfare, and income of many families. Some communities experience daily flooding during the rainy season, with homes being washed away. This constant exposure erodes both health and family welfare.
- Limited Land for Expansion: The lack of land hinders community growth. Homes are small, often made from impermanent materials, and lack access to water, sanitation, and vehicle access. Without roads, there are no ambulances or firefighting services.
- Loss of Income: As land is reclaimed by the sea, income opportunities diminish. Most community members have limited skills and alternative means of earning a living.
- Damage to Canoes: Rising water levels and coastal storms increase the risk of damaging their canoes, a crucial tool for their livelihood.
- Competition with Senegalese Fishermen: There is resentment toward Senegalese fishermen, who use larger trawl nets that deplete the fish stock.

The people generally supported the project, but showed some concerns:

- Beach access: The community fears losing access to the beaches, which are vital as landing sites. They need unobstructed access to the shore, with landing sites that are low enough for canoes to beach easily and close to their homes.
- Fear of fishing restrictions: There is concern that they may be forced to stop fishing altogether.

- Relocation during construction: They worry that being relocated during construction will disrupt their fishing activities, as they need to live near the sea for their livelihood.
- Permanent relocation after land protection: Most communities currently have no land rights, as they live on public land previously considered unfit for building. As the value of the land rises, there are fears that permanent structures will encroach on their community, pushing them out.
- Loss of beach for recreation: The beach is a significant social space, especially for activities like smoking weed, which serves as a form of relaxation for many in the slums.

The project also offers several opportunities that were welcomed by the community:

- Local Employment: They see potential for local youth to be employed in construction.
- Infrastructure requests: The community is requesting landing piers, stages, and processing sites to help manage the fishing industry more effectively.
- Security of tenure: They also welcome the idea of securing land rights, providing them with more stability in their living conditions.

This revision enhances readability while maintaining the original meaning of the concerns and opportunities raised.

8.10.8 Capacity Building

The fishing communities require capacity building to strengthen the development of the industry and enhance their ability to adapt to fluctuations in fishing as a source of income. Based on the surveys conducted in 2024 and in 2019 as part of the ESAR, the fishermen's groups have suggested the following:

- Provision of life jackets and life guard;
- Cold stores with power nearby to store catch, cool boxes to transport the catch;
- Loans for nets and repairs/ maintenance;
- Increased literacy and numeracy;
- Safe and strong landing piers;
- Public toilets, water and sanitation for the community; and
- Supply of electricity from the Liberia Electricity Corporation (LEC).

8.10.9 Fish Mongering Activities

The data collected at FGDs with fishmongers at Westpoint Township in 2024 and 2019 are presented in this section and summarized in Table 8-10.

Table 8-10 Fish mongering activities by community (data source: ESAR, KII, and FGD)

Community and association name	Approximate no. of mongers	Type of fish bought (local names)	Processing	Sales per day per fishmonger	Number of days of sales per year
Kru Beach, West Point	240	• Bonny • Cassava Fish • Catfish • Gbapele • Grouper • Grunta • Karngbay • Kruta • Napleh • Pipefish • Rock fish • Snappers • Sole fish • No endangered species	• Fresh • Dried • Smoked • Fresh fish stored in private cold store when needed	• LRD 1,000-5,000 during the high season • LRD 500-2,000 during the low season	200-290 days
Fanti Town, West Point (*West Point Fishmongers Association*)	1,000+	• Bonny • Cassava Fish • Catfish • Gbapele • Grouper • Grunta • Karngbay • Napleh • Pipefish • Pojoe • No endangered species • Rarely a shark	• Fresh • Dried • Smoked	LRD 500-1,000	280 days

Fish mongering covers a complex interacting group of actions, as shown in Figure 8-13. Once the fish is bought from fishermen at the landing site, it is either sold immediately or processed through drying or smoking before being sold. The fish is marketed in several ways, including door-to-door sales within the community, in non-fishing areas, or sold fresh in Monrovia's markets, such as the evening fish market on Benson Road. Fish is also sold to external traders for further resale in Monrovia or for transport to inland markets.

The shortest marketing journey for fresh fish involves a single seller and buyer, while longer processes involve multiple traders, with the fish being processed and transported across the country. Monrovia’s fish market has a broad reach, as smoked fish is transported to inland regions, with prices increasing at each stage of the trade.

Fishmonger buys directly from the boat →
- Sells on own account in community or nearby
- Sells to another seller who takes to a large market in Monrovia
- Dries fish locally
- Smokes fish locally
- Sells to another seller who will
    - Sell on own account
    - Sells to another trader

- Dries fish
  - Sells on own account
  - Sells to another trader
- Smokes fish
  - Sells on own account
  - Sells to another trader

Figure 8-13 Diagram showing fish mongering activities (data source: ESAR, KII, and FGD)

8.10.9.1 Purchase of Fish

Fishmongers are aware of the approximate time boats will land and typically gather on the beach from early afternoon onwards. For Kru canoes, landings can occur anytime between 10 am and 5 pm. The fishing community also uses mobile phones to communicate landing times when in range.

In the community, fishmongers are free to purchase from any crew, but many prefer to buy from crews they are connected to through family, marriage, or friendship. However, these ties are not a requirement. Aspiring fishmongers typically start by selling Gbapele, a small silver fish of mixed species, within local communities. Only after establishing a reliable customer base are, they allowed to purchase larger fish. Those selling larger fish often have regular household customers who consistently buy from them.

Fish are usually sold by the 10-liter bucket, which can contain either a single species or a mix of fish, and negotiations over price and fish type are common. A bucket of Gbapele generally costs between LRD 1,200 and 1,800. Most fishmongers pay for their fish upon receipt, although some purchase on credit, paying the crew after making their sales.

The fishmongers claim they usually avoid handling turtles, dolphins, and rays due to their attendance at a workshop on endangered species. However, if these species are caught, they may be hidden from NAFAA inspections and sold (Earthtime Inc. and CDR International, 2019).

8.10.9.2 Processing and Sale of Fish

Fish can be sold and resold several times between landing and consumption, with processing occurring at any stage by different buyers or sellers along the supply chain. There are three primary methods of fish processing, detailed below:

1. **Fresh Fish:** After purchase, fresh fish are typically washed and either arranged in bowls or wrapped in plastic and cardboard boxes as shown in Figure 8-14. The fishmonger may then walk around her community or a nearby one, selling door to door along a designated route, or take the fish to a larger market. Some may sell fresh fish at the evening or pass it on to another seller who follows the same process. Fresh fish are generally sold whole, without gutting or internal cleaning, unless the fish is too large for a single buyer. There is a growing trend of fishmongers renting cold storage to keep fish fresh for longer periods, which helps increase their income.

(a) Fresh fish at Westpoint

Figure 8-14 Fresh Fish at the SAI (Data source: Fieldwork – 2024)

2. **Dried Fish:** Fish that are no longer entirely fresh are often air-dried, known locally as **muin-muin**, using salt. This process typically takes place outside homes on mats, nets, or roofs as shown in Figure 8-15. Sometimes spices are added to the salt for additional flavour. Drying helps preserve the fish for a longer period, preventing it from spoiling. Although dried fish is less popular than smoked fish and caters to a smaller market, it often fetches the same price. Not all fishmongers engage in drying fish, making it a niche practice that adds some value to the catch (Earthtime Inc. and CDR International, 2019).

Figure 8-15 Fish drying at Westpoint (Data source: ESAR, 2019)

3. **Smoked Fish:** Smoking fish is a labour-intensive process, typically carried out by fishmongers who purchase fish specifically for this purpose. The smoking is done close to the landing areas, near the selling site, and is predominantly a female-dominated activity, though some men also participate as shown in Figure 8-16.

   The process involves using an empty oil drum, fired with mangrove wood. The fish are placed on wire grids and covered with makeshift lids. In some cases, entrepreneurs modify the oil drums by combining three into one to create larger smoking containers. Smoked fish is commonly sold to traders who transport it to inland regions, as well as to marketers from larger urban markets who come to buy supplies. Smoked fish plays a significant role in the diet of people across Liberia, contributing greatly to the country's protein intake (Earthtime Inc. and CDR International, 2019).

Figure 8-16 Smoking fish at Westpoint

8.10.9.3 Coastal Protection Issues

Based on the fieldwork conducted in 2024, and the fieldwork that was conducted earlier in 2019, the fishmongers live in the same coastal communities as the fishermen, making them equally vulnerable to rising sea levels and wave-driven erosion. All these communities experience flooding, particularly during the rainy season, sometimes even daily. This has resulted in the loss of loved ones, homes, and property, and disrupts fish processing and marketing activities when the community is submerged. Fish smoking, for example, becomes impossible during floods.

According to fishmongers in focus groups, sea flooding and coastal erosion are their most pressing concerns, outweighing other issues like clean water, sanitation, and healthcare. They are particularly worried about being displaced if coastal erosion destroys their community or if sea defense projects lead to the loss of their homes. The fishmongers' future is deeply tied to the fishermen and their proximity to the shoreline. While they support coastal protection initiatives, they emphasize the importance of maintaining access to the beach for their businesses and keeping their homes in their current locations.

Concerns associated with flooding are:

- Loss of life;
- Loss of houses, businesses, equipment, income;
- Land take to build the protection;
- Loss of beach landing sites;
- Relocation away from the community;
- Spoiling of beaches with construction materials; and
- Loss of recreation space on beaches.

The communities hope for development – improvements to fish related incomes, provision of schools, clinics, roads, savings and credit schemes. Capacity building for fish mongers could be:

- Provision of cold rooms near to landing sites;
- Micro loans/ savings and credit etc. for fish selling;
- Provision/ promotion of cool boxes; and
- Workshops on fish handling hygiene and a quality recognition system.

8.10.10 Land Ownership and Customary Tenure

West Point, a well-established area in Monrovia, is centrally located, fully integrated into the urban economy, and situated on public land. As a result, it functions as an informal administrative unit within the city and has benefited from substantial infrastructure development. It is Monrovia's most recognized informal settlement and among its oldest. The settlement occupies a flat, sandy area near the busy Waterside market. In the 1940s, sand from dredging operations for new port facilities on Bushrod Island was used to build up the area, making West Point largely reclaimed land with clear public ownership. Unlike many parts of Monrovia, where historical land claims may arise, West Point's status is relatively straightforward. Residents recall that in 1960, West Point was officially designated as one of Monrovia's townships and now accommodates up to 70,000 people across six communities. Many of these residents, about a third, arrived during the conflict as displaced persons, contributing to the settlement's physical growth (Earthtime Inc. and CDR International, 2019).

Before the 1989-2003 Liberian civil wars, efforts were made to relocate residents of West Point and other slums to newly developed housing estates. However, these resettlement initiatives had limited success, as the allocation of homes in these estates was reportedly influenced by

personal connections in addition to actual need, resulting in minimal impact on the informal settlements they were intended to replace. Although the Liberian National Housing Authority, established before the war, is still operational, it is now largely seen as focused on market development and would require significant restructuring to effectively address the current conditions in slum areas (Earthtime Inc. and CDR International, 2019).

Over time, West Point has increasingly functioned as a de facto administrative unit, complete with its own township administrative office, a magistrate's court, a police station, numerous schools, churches, mosques, and a recently completed asphalt access road. Many residents reportedly earn enough to live above the poverty line through jobs in the Waterside market and the local fishing industry. The township also places significant importance on its system of squatters' rights certificates and views itself as having established a form of social contract with local authorities. While residents acknowledge that the area's flat and exposed terrain may eventually make its dense residential use unsustainable, they believe they are entitled to a resettlement plan that keeps the community intact and compensates for the loss of livelihoods tied to their current location (Earthtime Inc. and CDR International, 2019).

8.11 GENDER ISSUES

A focus group discussion was conducted as shown in Figure 5-3. Information about women's concerns, fears, needs, and expectations are presented in detail in section 5.2.5.1.

Based on the fieldwork conducted in the SAI and to the West Point Women for Health and Development, the rate of sexual and gender-based violence (SGBV) and rape is moderate despite the congestion of the community. This is due to constant awareness and efforts by the Women Health and Development organization to ensure that perpetrators are taken to the law. In the case of rape, the case is handled by the police through the rightful referral process that starts with the victim being taken to a clinic for property medical examination and documentation after which the victim is sent to the Safe Home while the case is being investigated. Cases of violence are directly handled by the police and the magisterial. The presence of these facilities in the community is reason for the low in violence.

9 ENVIRONMENTAL AND SOCIAL ASSESSMENT OF IMPACTS

9.1 APPROACH

The approach followed to assess the likely impacts that will result from the Project is presented in Figure 9-1 and described in the subsections below.

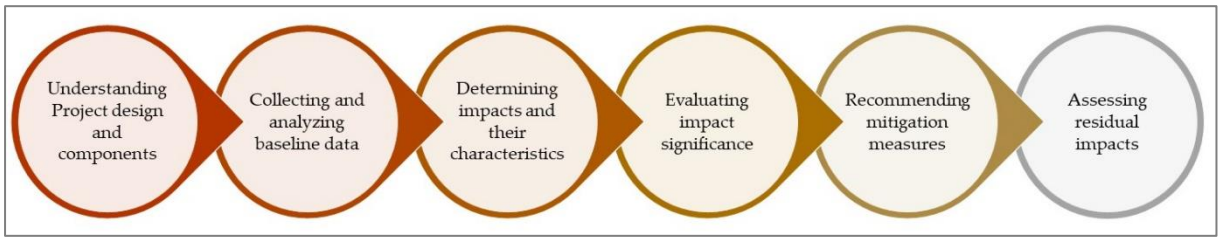


Figure 9-1 Assessment of impacts approach

In line with the EPML 2003 and the UNDP and GCF requirements, this impact assessment predicts and appraises the Project's likely positive and negative impacts, in quantitative terms to the greatest extent possible. It identifies mitigation strategies and any residual negative impacts that cannot be mitigated and explores opportunities for enhancement.

The impact assessment methodology, matrices and associated evaluation criteria used in this ESIA were developed based on established and widely recognized environmental and social impact assessment methodologies. While the matrices have been tailored to reflect the specific sensitivities of the Liberian context, their structure and criteria are aligned with internationally accepted frameworks and national regulatory requirements, including:

- The Environmental Protection and Management Law of Liberia (EPML, 2003) and related EPA guidelines
- The UNDP Social and Environmental Standards and associated impact assessment guidance
- The Green Climate Fund (GCF) Environmental and Social Safeguards
- The International Finance Corporation (IFC) Performance Standards (2012), particularly PS1 on Environmental and Social Risk Assessment and Management
- Best practice principles from the International Association for Impact Assessment (IAIA) for impact characterization and significance evaluation

These sources provide the basis for determining magnitude, sensitivity, and significance of impacts, ensuring that the assessment framework applied in this ESIA is robust, transparent, and consistent with both national and international standards.

9.1.1 Understanding Project Design and Components

The first step in the impact assessment relies on the understanding of Project design and components. A thorough review of project plans was carried out to ensure that all details are considered when analysing impacts.

9.1.2 Collection of Baseline Data

The impact assessment is based on a comprehensive analysis of the environmental and social baseline conditions within the Project's area of influence. Both primary and secondary sources have been utilized to inform this analysis, as described in Sections 6, 7 and 8.The baseline studies provide a detailed understanding of the key physical, biological, socio-economic, and cultural elements of the environment that might be affected by the Project.

9.1.3 Determination of Impacts and their Characteristics

The Project as described in Section 3 within the environment described in Sections 6, 7 and 8 will result in a number of positive and negative consequences. These are the environmental and socio-economic impacts identified through the assessment process as being associated with the Project. Possible areas of impact have been reviewed in light of the stakeholder engagement and public consultation findings and then subjected to independent review by environmental and social specialists.

The potential environmental and social impacts are characterized before they are assessed and evaluated, to provide consistency in the way impacts under different topics are described. The impact characteristics are based on criteria shown in Table 9-1. The characterization of impacts is undertaken within the context of the necessity of compliance with the legal setting and requirements that are described in Section 2.

Table 9-1 Impact characteristics definitions

Characteristic	Definition	Designations
Causality	The relationship of the Project to the impact in terms of cause and effect.	Direct Indirect Cumulative Accidental
Extent and scale	The areal coverage of the impact in relation to the project area. Roads, railways and watercourses acting as linear vectors can expand local impacts.	Local Project Regional National
Duration	The period over which a resource or receptor is affected.	Temporary (<2 years) Short term (2-5 years) Medium term (5-10 years) Long-term (10-15 years) Permanent (>15 years)
Frequency	A measure of the constancy, regularity, or periodicity of the	One-off

Characteristic	Definition	Designations
	impact.	Occasional Seasonal Frequent Constant
Magnitude	The seriousness of the impact in its effects on resources or receptors. It is a function of impact intensity, duration and geographic extent.	Negligible Small Medium Large
Sensitivity	Nature and sensitivity of the receiving environment, resource or receptor.	Low Medium High

When categorizing an impact, mitigation or control measures that are already part of the project design are taken into account. Additional mitigation measures to reduce significant impacts to acceptable levels are proposed as necessary and appropriate in Section 10 and defined in operational terms in Section 11.

The causality of impacts can be defined in detail as follows.

- **Direct**: impacts that result from the direct interaction between a project activity and the receiving environmental attribute.
- **Indirect**: impacts that follow from primary interactions between a project activity and its environment as a result of subsequent interactions within the environment, such as soil loss as a consequence of land clearing affecting downstream aquatic habitats.
- **Cumulative**: impacts acting together to affect a particular environmental resource receptor (usually due to other past, present, and reasonably foreseeable projects in close proximity of the project area that could also affect the receiving environment), as well as induced impacts resulting from unplanned but predictable activities enabled by the Project that may occur later or at a different location.
- **Non-normal or accidental**: impacts that result from unplanned events, such as floods, human errors, mechanical breakdowns, etc.

Magnitude and sensitivity are assessed using the criteria presented in Table 9-2 and Table 9-3, respectively, using a quantitative approach. Where quantification is not possible, a qualitative approach is followed instead, combining a semi-quantitative approach with expert experience and judgment.

Table 9-2 Impact magnitude matrix

Medium	Criterion	Magnitude rating			
		Negligible	Small	Medium	Large
Soil	*Damage extent (scale/extent)*	Occasional damage to soil affecting a very small area (less than 10 m^2).	Occasional damage to soil affecting a small area (between 10 and 50 m^2) or affecting one season of crops (6 months).	Frequent damage to soil affecting a small area (between 10 and 50 m^2), or damage to soil affecting a relatively larger area (between 50 m^2 and 0.5 ha) or affecting two season of crops (12 months).	Any widespread (more than 0.5 ha), longer than 12 months or permanent (likely to be irreversible) damage to soil.
	Soil removal	Occasional minimal soil removal (<1.5 m^3).	Occasional small removal of soil (between 1.5 and 7.5 m^3).	Frequent removal of small quantities of soil (between 1.5 and 7.5 m^3) or removal of higher volumes of soil (between 7.5 and 750 m^3).	Large removal of soil (>750 m^3).
Water resources (groundwater and surface water)	*Pollution type, duration and extent*	No pollution of groundwater or surface water body other than a small fraction of fine suspended sediment (fine silt- or clay-sized).	Pollution of groundwater or surface water body by sediments for a period expected not to exceed 24 hours and localized to one pump or one small creek.	Chemical and/or bacteriological pollution of groundwater or surface water body for a period expected not to exceed 24 hours and localized to one pump or one small creek.	Any widespread (more than one pump or one small creek) or long-term (>24 hours) pollution of groundwater or surface water body.
	Smothering extent	Smothering of swamps (<10 m^2) and water courses (<50 m) with sediment.	Smothering of swamps (between 10 and 50 m^2) and water courses (between 50 and 250 m) with sediment.	Smothering of swamps (between 50 m^2 and 0.5 ha) and water courses (between 250 m and 1 km) with sediment.	Widespread smothering of swamps (more than 0.5 ha) and water courses (more than 1 km) with sediment.
	Water quantity	Minimal removal of water comparable to the usual removal of water by any household, or up to 10% of volume.	Small consumption of water exceeding the usual household consumption and expected to result in a noticeable decrease in water quantity, or between 10 and 25% of volume.	Expected moderate decrease in water quantity for a short period of time (less than 48 hours) or between 25 and 50% of volume.	A major decrease in water quantity for a short period of time (less than 48 hours) or a moderate decrease in water quantity for a longer period of time or more than 50% of volume or expected to result in water shortages or affect the aquatic ecosystems.

Medium	Criterion	Magnitude rating			
		Negligible	Small	Medium	Large
Air quality	*Dust and pollutant emission level and duration of emissions*	• Emissions from project activities are expected to be very low compared to baseline conditions and relevant standard (<5% variation). • No visible increase in dust level. • Emissions occur temporarily and occasionally (less than 4 hours and no more than once in 30 days).	• Emissions from project activities are expected to be low compared to baseline conditions and relevant standard (5-20% variation). • Visible increase in dust level that is not expected to cause nuisance or lead to adverse health effects. • Emissions occur temporarily on a short term effect (4 to 8 hours and no more than once in 15 days).	• Emissions from project activities are expected to be moderately high compared to baseline conditions and relevant standard (20-50% variation). • Visible increase in dust level that is expected to cause nuisance or lead to minor adverse health effects, or minor damage to property, crops or ecology. • Emissions occur frequently and have a short-term effect (8 to 16 hours and more than once in 7 to 15 days).	• Emissions from project activities are expected to be high compared to baseline conditions and relevant standard (>50% variation). • Visible increase in dust level that is expected to cause significant nuisance or lead to considerable adverse health effects or considerable damage to property, crops, or ecology. • Emissions occur frequently and have a long term effect (more than 16 hours and at least once in 7 days).
Noise	*Noise level, duration and frequency*	• Noise produced occasionally and temporarily. • Noise level produced is below the relevant standards and is not expected to increase the background level noise by more than 3 dB.	• Noise produced frequently and temporarily. • Noise level produced is expected to be occasionally slightly higher than the relevant standards but is not expected to increase the background level noise by more than 5 dB.	• Noise produced frequently and having a short-term effect. • Noise level produced is expected to occasionally be somewhat higher than the relevant standards and is expected to increase the background level noise by 5 to 10 dB.	• Noise produced continuously and having a long-term effect. • Noise level produced is expected to be occasionally much higher than the relevant standards and is expected to increase the background level noise by >10 dB.
Vibration	*Vibration level and damage extent*	Vibration not likely to be noticed.	Vibration might be noticed by very sensitive receptors for most vibration frequencies. Damage is not expected.	Vibration is noticed with possible damage to buildings at low frequencies of <4 Hz.	Vibration is noticed and could be intolerable with possible damage to buildings at any frequency.

Medium	Criterion	Magnitude rating			
		Negligible	**Small**	**Medium**	**Large**
Biodiversity	*Extent of plant or animal loss*	No loss of plant or animal life (excluding minor damage to grass and insects).	Loss of plant or animal life (ess than 10 common trees or mammals, birds, amphibians, fish or reptiles lost, proportionate for grassland and insects).	Loss of plant or animal life (between 50 and 100 common trees or mammals, birds, amphibians, fish or reptiles lost, proportionate for grassland and insects).	Significant loss of plant or animal life (any protected species; more than 100 common trees or mammals, birds, amphibians, fish or reptiles lost; proportionate for grassland and insects).
Visual amenity	*Visual quality*	No noticeable change to visual amenity; the project is barely perceptible or has minimal effects on the existing landscape.	Minor changes to visual amenity that may be noticeable but do not significantly detract from the overall aesthetic value.	Noticeable changes that moderately detract from visual amenity, impacting the aesthetic experience and perception of the landscape.	Substantial changes that severely detract from visual amenity, greatly altering the landscape and community experience.
Socio-economy	*Proportion of people affected, frequency and duration of impact*	A small proportion of people (less than 10%) in the project area of influence is affected occasionally and temporarily (few days to 1-2 weeks).	A small proportion of people (less than 10%) in the project area of influence is affected for a short period of time (a few weeks to 1 month) or occasionally for a medium duration of time (a few months to a year).	• A small proportion of people (less than 10%) in the project area of influence is affected for a long period of time (over many months) or frequently for a medium duration of time (a few months to a year). • A relatively big proportion of people (10 to 30%) in the project area of influence is affected for a short period of time (a few weeks to 1 month) or occasionally for a medium duration of time (a few months to a year).	A big proportion of people (more than 30%) in the project area of influence is affected for a long period of time (over many months) or frequently for a medium duration of time (a few months to a year).

Medium	Criterion	Magnitude rating			
		Negligible	Small	Medium	Large
Health and safety	*Injury/illness level and duration*	Nothing attributable to the injury or illness of a person in relation to any aspect of project activities.	Anything attributable to the short-term (less than 7 days) injury or illness of a person through any form of workplace or project site injury, accident, smothering, drowning, poisoning, burning, asphyxiation, or other cause.	Anything attributable to the medium-term (1 week to 1 month) injury or illness of a person through any form of workplace or project site injury, accident, smothering, drowning, poisoning, burning, asphyxiation, or other cause.	Anything attributable to the death or long-term (more than 1 month) injury or illness of a person through any form of workplace or project site injury, accident, smothering, drowning, poisoning, burning, asphyxiation, or other cause.

Table 9-3 Impact sensitivity matrix

Medium	Criterion	Sensitivity / value rating		
		Low	Medium	High
Soil	*Soil capability*	Low fertility or unworkable soils	Moderately fertile or workable soils	Highly fertile or economically important soils
	Use	Not used for agriculture	Used for agriculture (including tree crops) as a secondary source of livelihoods	Used for annual or rotational crop production agriculture as a primary source of livelihoods
Water resources (groundwater and surface water)	*Water quality baseline conditions*	Water very polluted prior to project by other sources of contamination	Water moderately polluted prior to project by other sources of contamination	Clear and clean water baseline conditions
	Use	Water not used for drinking, cooking, bathing or washing; not a source of livelihoods; low biodiversity	Secondary source of drinking water and/or cooking water; water used for bathing and washing activities; secondary source of livelihoods (fishing); moderate biodiversity	Primary source of drinking water and/or cooking water; primary source of livelihoods (fishing); presence of species of conservation value (for surface water)
Air quality	*Air quality baseline conditions*	Urban/congested areas or areas where baseline concentrations normally exceed local and international standards	Urban/non congested, peri-urban areas, rural/congested or areas where baseline concentrations occasionally exceed local and international standards	Rural/remote/pristine areas or areas where baseline concentrations are almost always below local and international standards
Noise	*Noise level baseline conditions*	Urban/congested areas or areas where baseline levels normally exceed local and international standards	Urban/non congested, peri-urban areas, rural/congested or areas where baseline levels occasionally exceed local and international standards	Rural/remote/pristine areas or areas where baseline levels are almost always within local and international standards
Vibration	*Vibration baseline conditions*	Locations where baseline levels normally exceed local and international standards	Locations where baseline levels occasionally exceed local and international standards	Rural/remote/pristine areas or other locations where baseline levels are almost always within local and international standards

Medium	Criterion	Sensitivity / value rating		
		Low	Medium	High
Biodiversity	*Type of habitat*	Modified habitat (as per IFC definition)	Natural habitat (as per IFC definition)	Critical habitat (as per IFC definition)
	Presence of relevant species in the area, or presence of potential suitable habitat for relevant species	Presence only of Least Concern species (as per IUCN)	Presence only of least concern and near threatened species (as per IUCN) or potential suitable habitat for them	Presence of threatened species (IUCN Redlist - Critically Endangered, Endangered and/or Vulnerable species) or potential suitable habitat for them
	Species adaptability	High ability to adapt to changes brought by the Project.	A known ability to at least in part adapt to changes brought by the Project.	No known ability to adapt to changes brought by the Project.
Visual amenity	*Community perception/ Cultural significance*	The area affected does not have any cultural, historical, or aesthetic significance to the local communities.	The area has some cultural importance, with occasional community practices or traditions associated with the landscape. Communities recognize its aesthetic value, but it is not central to their identity or livelihood.	The landscape holds substantial cultural and historical significance for the community, with regular practices, traditions, or ceremonies associated with it. The visual and environmental quality is important for community pride and identity.
Socio-economy	*Vulnerability*	Minimal vulnerabilities	Moderate vulnerabilities	Major vulnerabilities
	Adaptability to change	Demonstrated high ability to adapt to changes brought by the Project.	A demonstrated ability to at least in part adapt to changes brought by the Project.	No evidence of a community's ability to adapt to changes brought by the Project.
Ecosystem services*	*Location value*	Services not available elsewhere	Services available in a far area	Services available in a nearby area
Community health and safety	*Vulnerability*	Demonstrated high ability to adapt to threats brought by the Project.	A demonstrated ability to at least in part adapt to threats brought by the Project.	No evidence of a community's ability to adapt to threats brought by the Project.

Medium	Criterion	Sensitivity / value rating		
		Low	Medium	High
Occupational health and safety	*Original condition of the worker(s)*	Healthy workforce in the prime of life.	Workers more than 50 years old or minor medical conditions among workers.	Pregnancy or significant existing medical conditions among workers
	Working conditions	Office working or light day-time duties.	Stressful conditions in the work site, such as some time spent working at height, handling machines or night-time working.	Very stressful conditions in the work site, such as full night shifts, or constant proximity to machines, high emissions of noise or working near chemicals/ hazardous materials.
	Worker experience	Experienced employee: more than 10 years in the role and fully trained.	Trained employee with 3 to 10 years in the role.	Inexperienced employee: less than 3 years in the role or very limited training.

**Note: Ecosystem services are the benefits that humans obtain from the natural environment and healthy ecosystems; ecosystem services assessed include:*

- *Provisioning services, such as food, drinking water, timber, wood fuel, medicinal plants.*
- *Cultural services, such as recreational, spiritual, religious, and other non-material benefits.*

9.1.4 Evaluation of Impact Significance

To establish the significance of an impact, magnitude and sensitivity are looked at in conjunction to evaluate whether an impact is significant, and to what extent. A simple matrix, presented in Table 9-4, is used to assign a significance class for each input in the form of an identified potential impact.

Table 9-4 Impact significance matrix

	Significance of impact	Sensitivity		
		Low	Medium	High
Magnitude of impact	**Negative impacts**			
	Negligible	Negligible	Negligible	Negligible
	Small	Negligible	Minor	Moderate
	Medium	Minor	Moderate	**Major**
	Large	Moderate	**Major**	**Major**
	Positive impacts			
	Positive	Minor	Moderate	**Major**

9.1.5 Recommendation of Mitigation Measures

Once the significance of a given impact has been characterized using the above matrix, the next step is to evaluate what mitigation measures are required. Consistently with the standard mitigation hierarchy adopted by the EPML 2003, the priority in mitigation is to apply mitigation measures to the source of impact. The mitigation hierarchy adopted in this ESIA is presented in Figure 9-2 and can be summarized as follows.

- **Avoid** adverse impacts from the onset and enhance positive impacts and benefits to communities, and the physical and biological environments, to the greatest extent feasible.
- Where avoidance is not possible, **reduce** impacts to acceptable levels, by reducing the duration, intensity and/or extent of impacts that cannot be fully avoided.
- Once impacts have been reduced, **mitigate or remedy** the residual adverse impacts to acceptable levels, by establishing specific actions to ensure the Project will comply with relevant national laws and regulations, and meet the requirements of applicable UNDP and GCF standards.
- Where significant residual impacts remain, **compensate for or offset** them, where technically and financially feasible. This involves the replacement of a resource in kind, or with a different resource of equal or greater value. It is important to note that more than one option is often required for a particular impact.

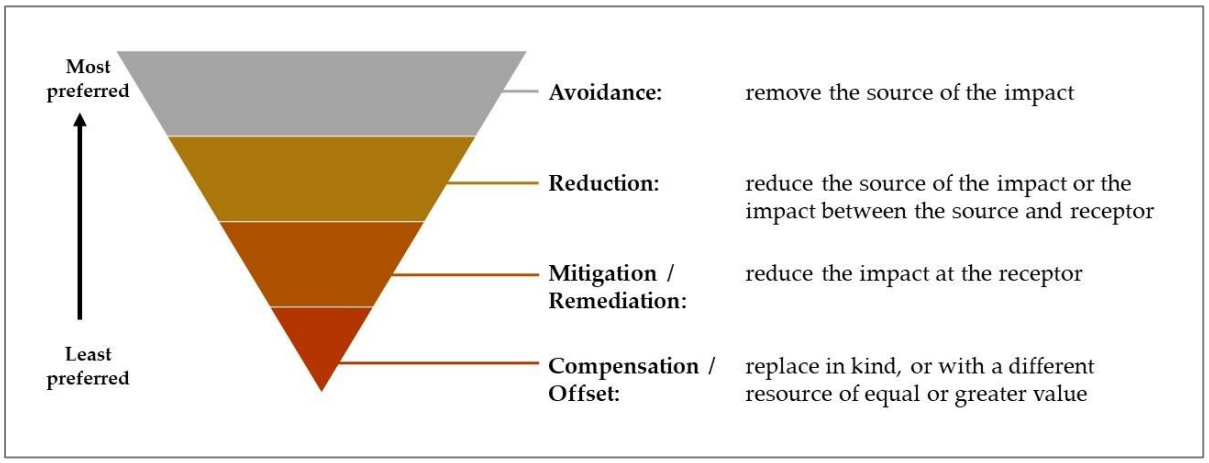


Figure 9-2 Mitigation hierarchy

Where positive impacts are expected, a mitigation strategy of **enhancement** may be applied to improve the anticipated outcomes of the Project at all stages. In other words, enhancement can be defined as a deliberate effort made in the design phase, and following phases of the Project, to ensure the success of a wider range of direct and indirect benefits that may result from the Project. An example of enhancement can be given for the positive impact from job creation resulting from the Project. Although the Project will result in the creation of jobs for a number of people, these jobs are temporary, as they are limited to the construction phase of the Project. The benefits from temporary job creation could be enhanced by providing trainings to the employed persons in order to provide them with the necessary skills to take on other jobs at the end of their employment for the Project.

9.1.6 Assessment of Residual Impacts

Once mitigation measures and their anticipated effectiveness have been identified, the final step is to assign residual impact significance. This is essentially a repeat of the impact assessment steps but includes the assumed implementation of the additional declared mitigation measures, so as to provide an understanding of the severity of the impact that will remain, with the mitigation measures in place. Sometimes the residual impacts are not known initially. Part of the function of the environmental monitoring process, as a component of the Environmental and Social Management Plan (ESMP), is to help identify them and find corrective actions.

9.2 Assessment of Impacts

In line with UNDP requirements, the Project underwent a Social and Environmental Screening Procedure (SESP). The screening assessed the Project against the UNDP Social and Environmental Standards (SES) and identified potential environmental and social risks. Based on this assessment, the Project has been assigned a Moderate Risk categorization, indicating that potential adverse impacts are site-specific, largely reversible, and manageable through

the mitigation measures integrated into the Project design and the Environmental and Social Management Plan (ESMP). The SESP findings have been considered throughout this ESIA to ensure consistency with the SES framework and to strengthen the assessment of potential impacts and proposed mitigation strategies.

The impact assessment matrix in Table 9-5 shows the actual assessment of the environmental and social impacts identified as likely to occur as a result of the Project. This follows the methodology described above. Refer to Table 9-1,Table 9-2, Table 9-3, and Table 9-4 for the definitions of the categories and terms employed in the matrix. The column 'Mitigation strategy' only includes the strategy that will be followed. Actions to be implemented are defined in Section 11.4.

The impact matrix works through a series of categories, listed below.

A. Positive Impacts

B. Negative Impacts

    1. General Environmental Impacts
    2. Impacts on communities
    3. Impacts on Environmental Health and Safety
    4. Impacts on Occupational Health and Safety
    5. Impacts from Labour and Working Conditions
    6. Impacts on Cultural Heritage
    7. Impacts from Waste
    8. Impacts from Hazardous Materials
    9. Impacts on Water Resources
    10. Impacts on Coastal Sediment Resources
    11. Impacts on Soil and Land Resources
    12. Impacts on Air Quality and Climate
    13. Impacts from Noise and Vibration
    14. Impacts on Fauna and Flora
    15. Impacts on Visual Amenity

Table 9-5 Impact assessment matrix

Potential impact and cause		Phase*	Causality	Extent and scale	Duration	Frequency	Magnitude	Sensitivity	Significance	Mitigation strategy	Residual significance after mitigation
A.	**Positive Impacts**										
A01	Creation of jobs and enhanced local economy	C-D	Direct	Regional	Short term	Constant	Medium	Medium	Moderate	-	-
A02	Improved landing sites for local fishermen	O-D	Direct	Project	Permanent	Constant	Medium	High	Major	-	-
A03	Reduced beach erosion and protection of local structures and infrastructure from flooding leading to improved livelihoods of local communities	O-D	Direct	Project	Permanent	Constant	Medium	High	Major	-	-
A04	Creation of leisure areas for the local communities (green promenade)	O-D	Direct	Project	Permanent	Constant	Medium	Medium	Moderate	-	-
A05	General improved national climate resilience management and land-use planning in relation to climate-change (Output 2)	O-D	Direct	National	Long term	Constant	Large	High	Major	-	-
A06	Improved protection of mangroves in Monrovia, particularly in the Mesurado Wetland (Output 3)	O-D	Direct	Regional	Long term	Constant	Medium	High	Major	-	-
A07	Improved livelihoods of fish mongers (mostly women) through the provision of cook-stoves and cold storage facilities (Output 3)	O-D	Direct	Regional	Long term	Constant	Medium	High	Major	-	-
A08	Creation of artificial habitats for marine life (revetment)	O-D	Indirect	Local	Permanent	Constant	Small	Medium	Minor		

Potential impact and cause		Phase*	Causality	Extent and scale	Duration	Frequency	Magnitude	Sensitivity	Significance	Mitigation strategy	Residual significance after mitigation
B.	**Negative Impacts**										
1.	**General Environmental Impacts**										
1.1.	General environmental damage in the form of degraded water resources, degraded land, lowered quality of living, reduced quality of resources, etc.	C-O-D	Cumulative	Regional	Temporary to long term	Frequent	Medium	Medium	Moderate	Avoidance Reduction Mitigation Remediation Compensation	Negligible
1.2.	Limited awareness or respect about the importance and value of the environment among labour force leads to an excessive amount of damage to resources or disruption of people's livelihoods.	C	Indirect	Project	Temporary to short-term	Frequent	Medium	Medium	Moderate	Avoidance Reduction	Negligible
1.3.	Risk of inconsistent (or lack of) maintenance of installed structures during operation or after decommissioning leading to impacts on the environment and community safety.	O-D	Direct	Local	Long-term	Occasional	Medium	High	**Major**	Avoidance Reduction Mitigation	Negligible
2.	**Impacts on communities**										
2.1.	Incoming workers do not respect local communities, leading to social disruption.	C-O-D	Indirect	Local	Temporary	Frequent	Small	Medium	Minor	Reduction Mitigation	Negligible
2.2.	Local people's livelihoods are adversely affected by project activities.	C-O-D	Direct	Local	Temporary	Constant	Medium	High	**Major**	Avoidance	Negligible
2.3.	Cumulative losses are incurred by social groups unable to respond to change.	C-O-D	Indirect	Local	long term	Constant	Small	High	Moderate	Mitigation	Minor
2.4.	Project-affected persons are unable to seek the redress of their grievances.	C-O-D	Direct	Local	Temporary	Occasional	Medium	Medium	Moderate	Reduction Avoidance	Negligible

Potential impact and cause		Phase*	Causality	Extent and scale	Duration	Frequency	Magnitude	Sensitivity	Significance	Mitigation strategy	Residual significance after mitigation
2.5.	Sexual exploitation and gender-based violence increase in local communities, particularly due to the influx of temporary labourers	C-O-D	Direct	Local	Temporary	Occasional	Medium	High	**Major**	Avoidance Reduction Mitigation	Negligible
2.6.	Disrupting fishing and leisure activities due to the installation of materials stores, workshops, machinery parking areas, laydown yards, vehicle movement, etc.	C-O-D	Direct	Local	Temporary	Constant	Small	Medium	Moderate	Mitigation	Negligible
2.7.	The disruption of the social relationship the communities share with the beach and their ability to access it at all points. The beach represents a social and an entertainment space for the communities.	C-O-D	Direct	Local	long term	Constant	Medium	Medium	Moderate	Mitigation	Minor
2.8.	The possibility of economic displacement due to the disruption of fishermen and fishmongers' usual activities in the area.	C-O-D	Direct	Local	Temporary	Constant	Large	High	**Major**	Avoidance Reduction Mitigation	Negligible
2.9.	Spread of communicable diseases such as HIV in the communities due to the increase of population and the influx of workers.	C-O-D	Direct	Project	Temporary	Occasional	Large	High	**Major**	Avoidance Mitigation	Minor
2.10.	Fishermen would lose access to landing sites during construction.	C-O-D	Direct	Local	Temporary	Constant	Large	High	**Major**	Avoidance Reduction Mitigation	Negligible
2.11.	Disrupting fishing and leisure activities due to the installation of materials stores, workshops, machinery parking areas, laydown yards, vehicle movement, etc.	C-O-D	Direct	Local	Temporary	Constant	Medium	Medium	Moderate	Mitigation	Negligible

Potential impact and cause		Phase*	Causality	Extent and scale	Duration	Frequency	Magnitude	Sensitivity	Significance	Mitigation strategy	Residual significance after mitigation
2.12.	The impacts of the project such as economic displacement and influx of workers would be prolonged if the project is not completed within the timeframe.	C-O-D	Direct	Local	Temporary	Constant	Medium	Medium	Moderate	Mitigation	Negligible
3.	**Impacts on Environmental Health and Safety**										
3.1.	Injuries occur to the public, especially children, during on-site works or along the roads during transportation of material to and from the site.	C	Accidental	Regional	Temporary to long term	Occasional	Small	High	Moderate	Reduction Mitigation	Negligible
3.2.	Infectious and contagious diseases are spread amongst the local communities.	C	Indirect	Project	Temporary	Occasional	Small	Medium	Minor	Avoidance Mitigation	Negligible
4.	**Impacts on Occupational Health and Safety**										
4.1.	Injury caused by inappropriate use of tools, machinery or materials, or use of them by untrained personnel.	C	Accidental	Project	Short term	Occasional	Small	Medium	Minor	Avoidance Mitigation Remediation	Negligible
4.2.	Injury caused by uncontrolled exposure to heat, noise, fire, electrical hazards, chemicals, and hazardous materials.	C	Accidental	Project	Temporary to long term	Occasional	Large	Medium	**Major**	Avoidance Mitigation Remediation	Minor
4.3.	Workers involved hazardous work, or hazardous substances, are unaware of the risks involved.	C	Indirect	Project	Temporary to long term	Frequent	Medium	Medium	Moderate	Avoidance	Negligible
4.4.	Potential of slipping in the ocean due to slippery surfaces.	C	Accidental	Project	Temporary to long term	Occasional	Large	Medium	**Major**	Avoidance Mitigation Remediation	Negligible
4.5.	Potential of falling into the ocean and drowning.	C	Accidental	Project	Temporary to long term	Occasional	Large	Medium	**Major**	Avoidance Mitigation Remediation	Negligible
4.6.	Injury caused by traffic accidents.	C	Accidental	Regional	Temporary to long term	Occasional	Large	Medium	**Major**	Avoidance Mitigation Remediation	Minor

Potential impact and cause		Phase*	Causality	Extent and scale	Duration	Frequency	Magnitude	Sensitivity	Significance	Mitigation strategy	Residual significance after mitigation
4.7.	Prolonged heat and ultraviolet (UV) light exposure.	C	Indirect	Project	Temporary	Seasonal	Small	Medium	Minor	Avoidance Mitigation Remediation	Negligible
4.8.	Risk of catching infectious diseases such as malaria, typhoid, and other water-borne diseases.	C	Accidental	Regional	Temporary	Occasional	Medium	Low	Minor	Avoidance Mitigation Remediation	Negligible
4.9.	Risk of contracting sexually transmitted diseases such as HIV/AIDS, among others.	C	Accidental	Regional	Temporary to long term	Occasional	Large	Low	Moderate	Avoidance Mitigation Remediation	Negligible
5.	**Impacts from Labour and Working Conditions**										
5.1.	Conditions of employment are unfair to or unequal among workers.	C	Indirect	Project	Short term	Frequent	Small	Medium	Minor	Avoidance Mitigation	Negligible
5.2.	Local people are not given adequate opportunities for employment, and outsiders are brought in instead. Women quota is not respected. Children are employed on the sites. Vulnerable groups are excluded from employment.	C	Indirect	Project	Short term	Frequent	Small	High	Moderate	Avoidance	Negligible
5.3.	Accommodation for workers is inadequate or unhealthy.	C	Indirect	Project	Short term	Frequent	Small	Medium	Minor	Avoidance Mitigation	Negligible
5.4.	Poor sanitation at work sites, including vessels, leads to illnesses in workers and pollution of the environment.	C	Indirect	Project	Short term	Frequent	Small	Medium	Minor	Avoidance Mitigation	Negligible
5.5.	Workers are unable to redress their grievances.	C	Indirect	Project	Short term	Frequent	Small	Medium	Minor	Avoidance Mitigation	Negligible

Potential impact and cause		Phase*	Causality	Extent and scale	Duration	Frequency	Magnitude	Sensitivity	Significance	Mitigation strategy	Residual significance after mitigation
6.	**Impacts on Cultural Heritage**										
6.1.	Damage to unexpected cultural or archaeological sites potentially found.	C	Indirect	Project	Permanent	Occasional	Small	High	Moderate	Avoidance Mitigation [Relocation Plan – Chance finds policy]	Negligible
7.	**Impacts from Waste**										
7.1.	Pollution of soil, beach, air and/or water resources (surface water and/or groundwater) and ill-due to incorrect storage, management, and/or disposal of solid and/or liquid waste including hazardous waste on site.	C-O-D	Direct	Regional	Temporary	Frequent	Small to Medium	Low	Negligible to Minor	Avoidance Reduction Mitigation	Negligible
7.2.	Pollution of soil or water from poor sanitation at work sites.	C	Direct	Project	Temporary	Frequent	Small to Medium	Low	Negligible to Minor	Avoidance Mitigation	Negligible
7.3.	Pollution of ocean water due to incorrect storage, management, and/or disposal of solid and/or liquid waste including hazardous waste on vessels.	C	Direct	Project	Temporary	Frequent	Small	Medium	Moderate	Avoidance Reduction Mitigation	Negligible
7.4.	Pollution due uncontrolled disposal of dredged silt material onshore or offshore and/or contaminated dredged material.	C	Direct	Project	Temporary	One-off	Medium	Low to High (depending on the disposal site)	**Minor to Major**	Avoidance Mitigation Remediation	Negligible

Potential impact and cause		Phase*	Causality	Extent and scale	Duration	Frequency	Magnitude	Sensitivity	Significance	Mitigation strategy	Residual significance after mitigation
8.	**Impacts from Hazardous Materials**										
8.1.	Pollution to air, soil or water and danger (illness or injury) through uncontrolled spills during the storage, handling or delivery of fuel, oil, lubricants or other hazardous materials in project sites.	C	Direct	Project	Temporary	Frequent	Small to Medium	Low	Negligible to Minor	Avoidance Mitigation Remediation	Negligible
8.2.	Potential contamination of the marine water through uncontrolled spills of fuel, oil, lubricants or other hazardous materials from vessels.	C	Direct	Project	Temporary	Frequent	Medium	Medium	Moderate	Avoidance Mitigation Remediation	Negligible
8.3.	Pollution to air, soil or water and danger (illness or injury) from refuelling operations at project camps, workshops, plants, and construction sites.	C	Direct	Local	Temporary	Frequent	Small to Medium	Low	Negligible to Minor	Avoidance Mitigation Remediation	Negligible
9.	**Impacts on Water Resources**										
9.1.	Pollution of surface water (coastal, marine, estuarine, riverine) and/or groundwater by waste, sewage, sediment, oil or chemicals.	C	Direct	Project	Temporary	Frequent	Medium	Low to Medium	Minor to Moderate	Avoidance Mitigation	Negligible
9.2.	Increased turbidity and depletion of oxygen in the coastal water from construction, dredging, reclamation, and/or potentially from the disposal of dredged material.	C	Direct	Local	Temporary	Frequent	Medium	Medium	Moderate	Avoidance Mitigation	Minor

Potential impact and cause		Phase*	Causality	Extent and scale	Duration	Frequency	Magnitude	Sensitivity	Significance	Mitigation strategy	Residual significance after mitigation
9.3.	Potential contamination of the ocean water through the potential release of contaminants through the mobilisation of potentially contaminated sediments during dredging, reclamation and/or disposal of dredged material.	C	Direct	Local	Temporary	Frequent	Medium	Medium	Moderate	Avoidance Mitigation	Minor
9.4.	Potential contamination of the surface water and/or groundwater through uncontrolled spills (fuel, oil, lubricants, cement, paint) from machinery, vehicles, and engines on site due to equipment defects, uncontrolled refuelling activities or improper storage of hazardous materials on site.	C	Direct	Project	Temporary	Frequent	Medium	Low	Minor	Avoidance Mitigation Remediation	Negligible
9.5.	Potential contamination of the marine water through uncontrolled spills of fuel, oil, lubricants or other hazardous materials from vessels.	C	Direct	Local	Temporary	Occasional	Medium	Medium	Moderate	Avoidance Mitigation Remediation	Negligible
9.6.	Potential contamination of the marine water from bilge water and deck runoff from vessels.	C	Direct	Local	Temporary	Occasional	Small	Medium	Minor	Avoidance Mitigation	Negligible
9.7.	Extraction of freshwater resources affects water supply for the communities in the project area.	C	Indirect	Regional	Temporary	Seasonal	Small	Medium	Minor	Reduction Mitigation	Negligible

Potential impact and cause		Phase*	Causality	Extent and scale	Duration	Frequency	Magnitude	Sensitivity	Significance	Mitigation strategy	Residual significance after mitigation
10.	**Impacts on Coastal Sediment Resources**										
10.1.	Shore and nearshore sediment erosion and deposition change as a result of physical coastal interventions potentially leading to erosion and habitat loss - Potential for the Mesurado estuary to act as a sediment sink due to the geomorphological changes of the beach after the interventions.	O-D	Indirect	Regional	Permanent	Constant	Large	High	**Major**	Reduction Mitigation	Minor
10.2.	Potential presence of unexploded ordinances (UXO) in the construction sites causing safety impacts to the workers and the public	C	Indirect	Local	Temporary	Occasional	Negligible	High	Negligible	Mitigation	Negligible
10.3.	Illegal sand mining activities along the West Point beach destabilising the revetment wall, causing more erosion and increasing the risk of flooding from the ocean.	O-D	Indirect	Local	Long term	Frequent	Small	High	Moderate	Reduction Mitigation	Negligible
11.	**Impacts on Soil and Land Resources**										
11.1.	Soil contamination occurs as a result of project activities or poor waste management.	C	Direct	Project	Temporary	Frequent	Small	Low	Negligible	Avoidance Mitigation Remediation	Negligible
11.2.	Disposal of excess soil or silt leads to damage to land at the disposal site.	C	Direct	Local	Long term	Constant	Medium	Low to High (depending on the disposal site)	**Minor to Major**	Avoidance Mitigation Remediation	Negligible to Minor

Potential impact and cause		Phase*	Causality	Extent and scale	Duration	Frequency	Magnitude	Sensitivity	Significance	Mitigation strategy	Residual significance after mitigation
12.	**Impacts on Air Quality and Climate**										
12.1.	Dust and other emission levels at sensitive receptors increase due to construction and transportation activities.	C	Direct	Project	Temporary	Seasonal	Small	Low	Negligible	Reduction	Negligible
12.2.	Increase in local air pollution from vehicle and machinery emissions.	C	Direct	Project	Temporary	Frequent	Small	Low	Negligible	Mitigation	Negligible
13.	**Impacts from Noise and Vibration**										
13.1.	Nuisance and health risk from increased ambient noise and vibration from construction activities and the operation of vessels, machinery, vehicles, and generators on site.	C	Direct	Project	Temporary	Frequent	Medium	Medium	Moderate	Avoidance Reduction Mitigation	Minor
13.2.	Increased noise and vibration in the ocean due the operation of dredgers disturbing marine fauna.	C	Direct	Local	Temporary	Frequent	Medium	Medium	Moderate	Avoidance Reduction Mitigation	Minor
13.3.	Nuisance from increased noise or vibration from traffic movement to and from the site.	C	Direct	Project	Temporary	Frequent	Small	Low	Negligible	Avoidance Reduction Mitigation	Negligible
14.	**Impacts on Fauna and Flora**										
14.1.	Removal, direct physical damage or alteration to beach and/or intertidal and/or offshore natural habitats/species through excavation and/or dredging, and/or to spawning grounds/nurseries by smothering through dredging and disposal of dredged material offshore or to terrestrial habitats due to in land disposal of dredged materials	C	Direct and Indirect	Project	Long term	Frequent	Medium	Low to Medium (depending on disposal site for dredged material)	Minor to Moderate	Avoidance Reduction Mitigation Remediation	Negligible to Minor

Potential impact and cause		Phase*	Causality	Extent and scale	Duration	Frequency	Magnitude	Sensitivity	Significance	Mitigation strategy	Residual significance after mitigation
14.2.	Lighting at night attracts birds and fish and leads to potential physical hazards to these species.	C-O-D	Direct	Local	Long term	Constant	Small	Medium	Minor	Reduction Mitigation	Negligible
15.	**Impacts on Visual Amenity**										
15.1.	Degradation of visual amenity through the disruption of the natural landscape, obstruction of ocean view affecting the overall recreational appeal, and cultural significance of the area.	C-O-D	Indirect	Project	Permanent	Constant	Medium	Medium	Moderate	Reduction Mitigation	Minor

* Phases:

C = Construction, O = Operation, D = Decommissioning

9.3 IMPACT LOCATION

The identified environmental and social impacts will not all occur in the project area. Some of them are general and may occur almost anywhere – such as air quality degradation and noise and vibration. Others are likely only to occur in limited sites: fuel spills, for example, are most likely in fuel storage locations and refuelling sites. The main locations where the different impact groupings are likely to occur are shown in Table 9-6. The mitigation measures will therefore be specific to these locations, and the monitoring of environmental and social performance will also be determined largely by the locations of the impacts and their mitigation.

Table 9-6 Likely locations of the identified environmental and social impacts

Impact category	Location of likely impacts
1. General Environmental Impacts	All work sites and access roads
2. Impacts on communities	All work sites and access roads
3. Impacts on Environmental Health and Safety	All work sites and access roads
4. Impacts on Occupational Health and Safety	All work sites, including vessels
5. Impacts from Labour and Working Conditions	All work sites, including vessels
6. Impacts on Cultural Heritage	At excavation and dredging locations
7. Impacts from Waste	All work sites, including vessels
8. Impacts from Hazardous Materials	All work sites, including vessels, and along access roads
9. Impacts on Water Resources	All work sites, including vessels
10. Impacts on Coastal Sediment Resources	Along the revetement and extending to nearby coastal areas
11. Impacts on Soil and Land Resources	All work sites and access roads
12. Impacts on Air Quality and Climate	All work sites and access roads.
13. Impacts from Noise and Vibration	All work sites, including vessels, and along access roads.
14. Impacts on Fauna and Flora	At excavation and dredging areas, and at dredging material disposal area
15. Impacts on Visual Amenity	At construction sites during construction and along the revetment wall during operation

9.4 IMPLICATIONS OF THE IMPACT ASSESSMENT

9.4.1 Positive Impacts

The Project will deliver significant positive impacts on the local community, fishermen, and fish mongers who have long suffered from severe beach erosion and flooding in West Point. A number of positive impacts are identified in the impact register in Table 9-5, and are summarized below. These range in type, but the most significant are socio-economic.

- *Reduced Beach Erosion and Flood Protection:* The revetment will reduce beach erosion and protect local structures and infrastructure from flooding, directly improving the livelihoods of local communities.
- *Creation of Jobs and Enhanced Local Economy:* The Project will provide much-needed employment opportunities and boost local economy through the purchase of supplies

for the Project, stimulating economic growth in the area. Contractors are encouraged to employ local labour, including local women, to work on the Project. Local skilled, semi-skilled and unskilled labour is available in the affected areas and people expect to be able to gain some employment from the Project. Employing local people and using local suppliers as appropriate should be encouraged in the Contractual arrangements.

- *Improved Landing Sites for Fishermen:* Fishermen will benefit from enhanced landing sites, improving their daily operations and potentially increasing their income.
- *Creation of Recreational Areas:* The Project will create recreational spaces, such as a green promenade, offering new areas for community engagement and leisure.
- *Improved Livelihoods of Fish Mongers:* The project will enhance the livelihoods of fish mongers, who are mostly women, through the provision of cook-stoves and cold storage facilities, enabling more sustainable and profitable practices.
- *Improved National Climate Resilience Management:* The project's focus on enhancing national climate resilience involves strengthening institutional capacity, implementing integrated coastal zone management, and promoting sustainable land-use practices. By equipping government agencies and local communities with the tools and knowledge needed to adapt to climate change, the project ensures more resilient and informed decision-making in coastal planning. This leads to better coordination and response to climate events, reduced vulnerability of infrastructure, and a proactive approach to managing climate risks like sea-level rise and increased storm intensity. Additionally, the project raises public awareness and encourages community involvement, empowering locals to actively participate in climate adaptation efforts, thus contributing to a more resilient and sustainable coastal environment.
- *Improved Protection of Mangroves:* Protecting mangroves in Monrovia, especially in the Mesurado Wetland, provides crucial coastal defence by reducing erosion and buffering against storm surges, thus protecting communities and infrastructure from flooding. The project enhances these vital ecosystem services by establishing community-led co-management agreements, promoting sustainable use, and involving locals in conservation efforts. By preserving mangrove habitats, the project supports biodiversity, maintains fisheries, and provides alternative livelihoods that reduce pressure on these ecosystems. Furthermore, mangroves play a significant role in carbon sequestration, contributing to climate change mitigation efforts and strengthening Liberia's overall environmental resilience.
- *Creation of Artificial Habitats:* Revetments can provide new hard surfaces that support marine organisms such as algae, barnacles, mussels, and other sessile species that

prefer rocky substrates. These structures can mimic natural rocky shorelines and create habitats that attract small fish, crustaceans, and other marine life, enhancing local biodiversity.

9.4.2 Negative Impacts

From the impact register matrix in Table 9-5, it is clear that a large number of potential impacts have been identified. All of these could become significant and require some form of mitigation measure. More details on the practical guidance on the implementation of the mitigation measures are described in the ESMP in Section 11 Those that are identified as being of major significance are given particular consideration.

In general, the use of strong mitigation measures means that the residual impacts are expected to be negligible in most cases. However, a number of the potential impacts can realistically not be eradicated completely and have been classed as still having minor impact following the application of the appropriate mitigation measures. This classification can be seen in Table 9-5 in the last column titled "Residual significance after mitigation". Residual impacts are presented in the subsection below.

9.4.2.1 Residual Impacts on the Socio-Economic Environment

Even with good impact control and management practice, some impacts on socio-economy cannot be fully mitigated and certain residual impacts will still happen. These mainly include the following.

- Unfair conditions of employment, which could still happen intentionally or unintentionally by the contractor.
- Poor behaviour by workers, leading to increased sexual harassment and trafficking for sex of women employees and local women and children.
- Impacts on community health, such as the potential spread of communicable diseases.

9.4.2.2 Residual Impacts on the Biophysical Environment

Even with good impact control and management practice, some impacts on the physical environment cannot be fully mitigated and certain residual impacts will still happen. These are explained below.

- *Impacts on Occupational Health and Safety:* Even with stringent safety measures, residual risks to workers remain due to potential exposure to hazards such as heat, noise, fire, electrical issues, chemicals, and hazardous materials during construction activities. Traffic accidents involving construction vehicles also pose a continuous safety risk to both workers and the surrounding community, even after implementing traffic

management plans. Therefore, it is advised to strictly implement and enforce health and safety mitigation measures and forbid irresponsible behaviour within the workforce. Workforce training in health an safety mitigation should be required under contractual agreements with the Contractor.

- *Impacts on Water Resources:* Increased turbidity in coastal waters due to construction and excavation activities, dredging and reclamation are likely to be reduced by applying the relevant mitigation measures but cannot be eliminated completely. On the other hand, even with careful monitoring and sediment control measures, the potential release of contaminants from disturbed sediments during dredging remains a concern. If dredged materials are disposed of offshore, there is a risk of contaminating ocean water through the mobilization of potentially contaminated sediments, further degrading water quality and impacting aquatic ecosystems and local fisheries.

- *Impacts on Coastal Sediment Dynamics:* The physical alterations from coastal interventions will inevitably cause changes in sediment dynamics, leading to erosion or deposition changes that cannot be fully controlled. Strict care should be applied during the design phase to reduce and mitigate this impact. These shifts may result in habitat loss and potentially transform the Mesurado estuary into a sediment sink, altering local geomorphology and ecosystem functions.

- *Impacts on Soil and Land Resources:* If dredged material is disposed of onshore, residual impacts from the disposal of excess soil or silt will remain, potentially degrading disposal sites, altering landforms, and impacting local vegetation. Even with careful site selection and management, the disposal of dredged material could still cause lasting damage to terrestrial habitats, resulting in long-term impacts on soil and land resources.

- *Impacts from Noise and Vibration:* Construction and operational activities will continue to generate noise and vibration that exceed natural levels, posing ongoing nuisances and health risks. Despite mitigation measures, elevated noise and vibration from equipment, vessels, and vehicles will disturb nearby communities and marine life.

- *Impacts on Fauna and Flora:* The project's physical interventions, including dredging and excavation, will inevitably cause some damage to beach and intertidal habitats, affecting species that rely on these areas for spawning, feeding, and shelter. If dredged material is disposed of offshore, it could smother vital ecological areas, while onshore disposal could disrupt terrestrial habitats.

- *Impacts on Visual Amenity:* Despite efforts to minimize visual disruptions, the physical changes to the coastline will degrade the natural landscape and alter ocean views,

impacting the recreational appeal and cultural significance of the West Point beach. The presence of construction activities and potential disposal sites, whether onshore or offshore, will affect the visual amenity, leaving a lasting impact that cannot be fully restored through mitigation.

These residual impacts highlight the complexities of managing the Project. The uncertainty surrounding the disposal location of dredged materials further emphasizes the need for adaptive management, ongoing monitoring, and community involvement to minimize and address these enduring negative effects.

10 ENVIRONMENTAL AND SOCIAL MITIGATION

10.1 OVERVIEW

The PMU and its contractors will follow sustainable resource management requirements to ensure the best possible conservation of the natural environment. The PMU is committed to providing a sound and friendly working environment during project implementation by complying with statutory environmental, health and safety laws and regulations. In this regard, the PMU must have an Environmental and Social Management System (ESMS) in place that would address all aspects of its operation and include the following.

- Environmental Policy
- Energy Policy
- Community Engagement Guide
- Diversity and Inclusion Policy
- Human Rights Policy
- GBV, Sexual Exploitation and Harassment Policy
- Anti-Fraud Policy
- ISO 45001:2018 Occupational Health and Safety Plan
- Risk Management Policy

Additional policies and plans will need to be put in place to cover other environmental and social management issues, as defined in Section 11, as part of the overarching ESMP.

10.2 APPROACH

Impacts are classified in Section 9 according to the three main receptor groups (the physical, biological, and socio-economic environments) which may come about through the development and operation of the Project. The focus of impact reduction, mitigation and management can be summarized as follows:

- **Bio-physical environment**: To avoid significant water pollution and sediment erosion, to limit noise, dust, and other alterations to the landscape, to conserve and protect water resources and air quality, and to avoid significant impacts on biodiversity, through the effective management of dredging and light pollution.
- **Socio-economic environment**: To minimize the negative and enhance the positive

socio-economic impacts on the affected communities. Equally, to ensure the health and safety of project staff and contractor employees, as well as that of local people and communities within the immediate operational areas.

The hierarchy of options for mitigation used in the impact assessment is explained in detail in Section 9.1.5 The potential impacts associated with the Project and the mitigation strategies proposed are listed in Section 9. In order to keep this document simple and practical, the detailed mitigation measures are not included in Section 10 but in Section 11, which is designed to be immediately usable as a self-standing ESMP. Instead, only the rationale behind mitigation measures is given in Section 10.3.

10.3 MITIGATION MEASURES

10.3.1 Basis of Environmental Mitigation

The potential environmental impacts arising from project activities are described and in Section 9. Mitigation of impacts on the physical environment aims at preventing or reducing the expected pollution or alteration to soil, sediment, water resources, air quality and ambient noise and to minimize the damage on the receptors of these impacts, whether human society or biodiversity. This is based on the key principles underlying the EPML 2003: everyone has a right to a clean and healthy environment; and no one has a right to pollute any part of another person's environment. It is also aimed at minimising impacts on habitats and fauna and flora species by project activities.

Sections 6 and 7 describes the physical and biological environment in and around the project site and highlights the baseline environmental conditions at these locations. Impacts on surface water resources will mainly affect the coastal waters along and around the West Point beach and, potentially, the Mesurado river mouth, depending on the weather and tide conditions, possibly affecting the biodiversity, fisheries and other community activities in these areas. Local communities and biodiversity will also be considered sensitive receptors for other environmental impacts like air quality, noise, alteration to sediment fluxes, and visual disturbance specifically at nighttime.

In order to safeguard these sensitive receptors and to reduce potential negative impacts of the Project, a number of environmental mitigation principles are identified, as follows.

- Ensuring that the construction and dredging methods are following the best practices, and all required environmental measures and procedures.
- Ensuring that project design follows the best practices and guarantee the most environmental and efficient outcomes throughout the lifetime of the Project.
- Ensuring that all project activities follow the best practices and relevant

environmental and social guidelines.

- Limiting the footprint of the Project and associated infrastructure to the absolute minimum required for operational safety.
- Rehabilitating disturbed areas once construction activities are completed, by spreading the sand/sediment that was previously removed, to promote native species restoration.
- Ensuring that steps are taken to prevent further beach erosion and the consequent changes in sediment fluxes along the beach and in the Mesurado estuary.
- Taking the necessary measures to ensure that surface water resources do not get contaminated and do not exceed the national standards as a result of project activities.
- Minimizing the disturbance of the beach in general and preventing the unnecessary removal of coastal fauna and flora species.
- Ensuring all disturbed sites associated with the Project's construction are rehabilitated once their use is complete.
- Implementing a strict and complete monitoring plan to ensure that all resources are within national standards and that all project activities are following the suitable mitigation measures and environmental best practices.

Even with the best of intents and the strictest safeguards, large projects will always have residual impacts on the environment. The ESMP recommends strong mitigation measures to endeavour to avoid and minimize pollution and other damage, and to implement rehabilitation works to help restore the environment (see Section 11).

10.3.2 Basis of Social Mitigation

The potential social impacts arising from project activities are described and in Section 9.

Best socio-economic safeguarding practices avoid or sufficiently reduce the impact of activities evaluated in the ESIA to below the level at which the impact would be significant. If such best practices are in place, additional mitigation or compensation of potential adverse impacts may not be needed. For adverse impacts that are not reduced to acceptable levels by best social safeguarding practices—i.e., impacts are determined to be significant—further mitigation or compensation would be required to reduce their significance.

The aim of mitigation in the socio-economic environment is to minimize the negative and enhance the positive socio-economic impacts on affected and neighbouring communities within the project SAI, as well as in Westpoint Township, and the wider region as affected by

the Project. It is also to ensure the health and safety of the local people and communities within the immediate operational area, as well as that of project staff and contractor employees.

The Project recognizes the potential for economic displacement, where individuals or households may lose access to land, resources, or income-generating opportunities as a result of project activities, even if no physical resettlement occurs. In the case of West Point, this may include temporary or permanent restrictions on fishermen's access to landing sites and beaches, disruptions to women engaged in fish processing and trade, or reduced opportunities for small-scale informal businesses that depend on beach activities. Where such displacement occurs, measures will be taken to avoid or minimize disruption to livelihoods, and where unavoidable, to restore or improve affected persons' income-earning capacity and living standards in line with national requirements and international standards.

On the positive side, the project offers benefits, such as the employment of workers for the project phase, and the resulting induced economy resulting from the increased demand on food, goods and services for the Project and the people working for it. These will contribute to increased economic development.

Other socio-economic impacts that are considered as negative and needing mitigation include:

- Impacts resulting from the influx of workers to the project area and the stemming pressure on local communities and resources.
- Impacts on community health, safety, and wellbeing.
- Impacts on occupational health and safety.
- Impacts on workers' rights and wellbeing.
- Impacts on community relations.

A number of social mitigation principles are identifiable for the Project, as follows.

- Updating the SEP for the Project and engaging stakeholders in a consistent and regular manner and managing their expectations.
- Establishing a Grievance Redress Mechanism to receive and respond to complaints by affected groups.
- Ensuring that steps are taken to prevent unnecessary influx of work seekers to the project SAI.
- Ensuring steps are taken to prevent problems that may arise from the influx of workers to the area.
- Active management, protection, and monitoring of nearby water sources.
- Taking action to remedy impacts on communities from dust and emissions, noise, and

vibration.

- Applying public health measures for disease control and prevention.
- Ensuring fair, equal, transparent, local, and distributed employment throughout the SAI.
- Application of an occupational health and safety management system and provision of personal protective equipment (PPE) to all staff and workers at all work sites.
- Ensuring that the contractors have written employment contracts which are Liberian Employment- and Labor Law-compliant, and which offer equal opportunities and conditions, and have a demonstrable worker GRM that enables worker support when responding to allegations of sexual harassment and violence.
- Ensuring that contractors have a team investigating sexual harassment or violence allegations led by an independent third party contracted from a Liberian NGO with gender experience.
- Providing full PPE to all staff and labourers.
- Implementing livelihood restoration measures to address economic displacement and safeguard incomes of project-affected persons, particularly fishermen, fishmongers, and informal traders.

10.3.3 Mitigation of Cross-Cutting Impacts

Specific activities or materials have cross-cutting impacts: they can be placed in more than one of the above groups, because they affect two or three of the physical, biological, and socio-economic environments. These include the following.

- **Atmospheric emissions**: it is necessary to minimize adverse effects on air quality from engine exhausts and dust. Steps are taken to ensure that operations abide by national standards for air quality (gaseous and particulate).
- **Noise and vibration**: it is necessary to minimize adverse noise pollution from machinery operation and traffic, and vibration due to continuous operation of machinery. Steps are taken to ensure that operations abide by national standards for noise levels.
- **Water quality:** it is necessary to minimize adverse effects on water quality from sediment disturbance and contamination. Impacts on water quality can directly impact fish and other marine and aquatic species, and by extension other species and people that rely on the water sources for use or livelihood. Steps are taken to ensure that operations abide by national standards for water quality, as well as GIIP.
- **Solid and liquid waste generated by the Project**: the production and accumulation of waste materials must be minimized by promoting recycling and ensuring that any

waste material created is dealt with appropriately.

- **Hazardous materials**: it is necessary to ensure the safe storage, handling, and ultimate disposal of high-risk substances such as petroleum products, lubricants and cement, which are hazardous both to people and the environment. Particular measures are taken to prevent pollution by hazardous substances, especially hydrocarbons.
- **Sediment disturbance:** disturbance to coastal and marine sediments must be minimised to the extent possible to avoid drastic changes in the coastal sediment fluxes that might have considerable impacts on coastal morphology and subsequent impacts on coastal biodiversity and local communities. The Project design must aim at preventing and mitigating such changes.

11 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

This section presents the Environmental and Social Management Plan (ESMP). It has been written in such a way that it can be used as a stand-alone document that specifies the key project participants (Section 11.2), their responsibilities (Section 11.3), the mitigation measures that must be implemented and monitored to ensure that the environment and society are safeguarded (Section 11.4), the monitoring plan (Section 11.5), the environmental and social reporting requirements (Section 11.6), and the environmental and social action plan and its associated budget for the implementation of the ESMP (Section 11.7).

11.1 OBJECTIVES

The objective of the ESMP is to ensure that the environment and society are safeguarded during the implementation of the proposed Project, in compliance with all relevant technical, regulatory, and institutional requirements. This is the document that must be followed to ensure that identified and potential project impacts are kept within the allowable levels, unanticipated impacts are mitigated at an early stage, and the expected project benefits are realized.

The ESMP is designed as a cover-all, one-stop mitigation, and monitoring plan for all environmental, social and health and safety impacts. As such, it incorporates elements of a range of possible sub-plans which, in some ESMPs, are listed separately. In this ESMP, the sub-plans are combined into a single entity. This makes both management and monitoring simpler and ensures that there are no gaps between the different safeguard elements.

The ESMP will be strictly implemented without ignoring any detail. The execution of the ESMP facilitates the efficient implementation of mitigation measures to minimize impacts and prevent accidents, in a context of good management and information sharing among project personnel.

11.2 PROJECT PARTICIPANTS

Project participants are listed below:

- The GCF, which is the lending entity.
- The UNDP, which will provide oversight and quality assurance services to the MMCRP
- The PMU at the EPA, which is the project proponent and responsible for the implementation of the Project in terms of technical matters and procurement.
- The Contractor or contractors responsible for the design, construction and operation

of the Project.

- The EPA, which is the regulator that provides the necessary environmental permits and makes sure that the Project abides by national regulations.

11.3 RESPONSIBILITIES FOR ESMP IMPLEMENTATION

This section specifies the responsibilities of the different parties for implementation of the ESMP.

11.3.1 Environmental and Social Mitigation

The application of mitigation measures required under this ESMP is the responsibility of the EPA through its PMU and its contractor. The EPA should require its contractor to develop their own C-ESMP in accordance with this ESMP. The contractor should also prepare and implement their own Occupational Health and Safety Plan (OHSP), SGBV/SEA/SH prevention plan, Emergency Preparedness and Response Plan (EPRP), Waste Management Plan (WMP), Dredging Management Plan (DMP) and Labour Management Plan (LMP), Livelihood Restoration Plan (LRP), Traffic Management Plan (TMP), AND Grievance Redress Mechanism (GRM). The contractor should establish an Environmental and Social Management System (ESMS).

The contractor's ESMS and plans will be reviewed by the PMU Environmental and Social Officers and approved by the PMU Project Coordinator. The PMU should require the contractor to recruit an Environmental Officer, an ISO 45001:2018 certified Health and Safety Officer and a Social and Gender Officer assisted by a Community Liaison Officer (CLO). The PMU is responsible to instruct, observe, and monitor its contractors against their ESMP and other plans' provisions. The PMU should make sure that corrective actions are applied by the contractors, when necessary.

11.3.2 Environmental and Social Monitoring

Environmental and social monitoring is the responsibility of the EPA/PMU. The PMU must monitor the Contractor against their C-ESMP and OHSP, EPRP, WMP and DMP. For this purpose, the PMU must recruit their own Environmental Officer, ISO 45001:2018 certified Health and Safety Officer, Social and Gender Officer and Community Liaison and CLO who will be responsible to monitor the Contractor and report monthly to the PMU. The PMU officers and Project Coordinator must monitor the Contractor's compliance with their ESMP and other plans' provisions.

An Independent Third Party (ITP) consultant must undertake the monitoring program set out in Section 11.5.4. The PMU is responsible to ensure that the monitoring program is carried out

fully and on time. The PMU Environmental, OHS and Social Officers are responsible to review the monitoring reports of the ITP consultant when submitted. The PMU can also undertake the monitoring itself if deemed necessary.

The PMU Environmental, Social and Gender, and Health and Safety Officers must perform regular and surprise inspections. Every year, an integrated environmental, social and health and safety audit should be carried out by an ITP auditor to assess compliance with the C-ESMP and other plans. The PMU will request for any violations to be corrected by the Contractor and monitor the Contractor's actions and undertakings in correcting violations.

11.3.3 Responsibilities of Key Staff

The following section specifies the roles and responsibilities of the PMU and Contractor key staff involved in the implementation of this ESMP.

11.3.3.1 PMU Project Coordinator

The PMU is charged by UNDP with the responsibility for implementing the Project. The PMU Project Coordinator (PC) has the following responsibilities with respect to environmental and social management.

- Representing the PMU with respect to ultimate responsibility for operational actions and effects.
- Ensuring that the Contractor is contractually bound to implement the requirements of this ESMP.
- Ensuring that sufficient resources are provided to meet the requirements of this ESMP.
- Reviewing and approving the Contractor's environmental and social plans (ESMP, OHSP, EPRP, WMP, DMP, LMP, LRP, and TMP based on the recommendations made by the PMU Environmental, Health and Safety, and Social and Gender Officers.
- Ensuring mitigation measures and any other corrective measures are enforced.
- Reviewing monitoring reports issued by the PMU Environmental, Health and Safety, and Social and Gender Officers, and ensuring that all non-compliances are communicated to the Contractor and immediately corrected.
- Leading environmental and social compliance reviews.
- Liaising with UNDP on overall issues relating to the Project.
- Reviewing conditions following completion of site works.

11.3.3.2 PMU Environmental Officer

The PMU must have an Environmental Officer (EO) who has the following responsibilities with respect to environmental management.

- Ensuring that sufficient resources are provided to meet the relevant requirements of this ESMP.
- Ensuring that relevant environmental elements of this ESMP are incorporated into the contracts held with the Contractor.
- Reviewing the Contractor's ESMP, EPRP, WMP, DMP, and other plans.
- Monitoring and reporting all issues of environmental compliance to the PMU PC.
- Directing the Contractor regarding environmental compliance requirements and other matters of environmental importance.
- Communicating site environmental issues with regulators and other interested parties.
- Liaising with UNDP on overall issues relating to environment, environmental performance data, environmental incident reports, etc.
- Participating in environmental compliance reviews.
- Reviewing conditions following completion of site works.
- Enforcing all environmental mitigation measures, and any other corrective measures.

11.3.3.3 PMU Health and Safety Officer

The PMU must have an ISO 45001:2018, OHSAS 18001:2007 certified Health and Safety Officer (HSO) who has the following responsibilities.

- Ensuring that sufficient resources are provided to meet the relevant requirements of this ESMP.
- Ensuring that relevant health and safety elements of this ESMP are incorporated into the contracts held with the Contractor.
- Reviewing the Contractor's ESMP, OHS, EPRP, WMP, DMP and other plans.
- Monitoring and reporting all issues of health and safety compliance to the PMU PC.
- Directing the Contractor regarding health and safety compliance requirements and other health and safety matters of importance.

- Communicating site health and safety issues with regulators and other interested parties.
- Liaising with UNDP on overall issues relating to health and safety, accident reports, etc.
- Participating in health and safety compliance reviews.
- Enforcing all health and safety mitigation measures, and any other corrective measures.

11.3.3.4 PMU Social and Gender Officer and Community Liaison Officer

The PMU project team must include a Social Team consisting of a suitably experienced Social and Gender Officer (SGO) with experience in management of social issues in construction. The SGO must be supported by a Community Liaison Officer (CLO) to work at the local level. The responsibilities of the Team are listed below.

- Developing, managing, updating, and implementing the Stakeholder Engagement Plan.
- Planning and leading community consultation meetings.
- Ensuring the design and delivery of effective information campaigns using various media.
- Liaising with UNDP on overall social and gender issues.
- Liaising with both County and District administrations, Chiefdom systems, Community groups and Contractor to implement and assist in resolution of grievances.
- Liaising with Contractor to encourage and promote local employment over imported labour, especially of unskilled and semi-skilled jobs to go to women.
- Informing community members of employment opportunities, assisting local people to apply.
- Liaising with experienced Liberian NGOs to find those able to design training courses on aspects of employee behaviour, sexual harassment and GBV, gender equity, conflicts over employment opportunities and foreign workers, cultural awareness and chance find processes.
- Ensuring social mitigation measures are gender-sensitive and address the specific needs of women and vulnerable groups.

- Reviewing the Contractor's ESMP, OHSP, EPRP, LMP, LRP, TMP and other plans.
- Monitoring and supervising Contractor compliance with training and grievance systems.
- Monitoring achievement of economic resettlement reviewing completion and recommending and implementing further measures if PAPs fail to reinstate their livelihoods.
- Participating in socio-economic compliance reviews.
- Reviewing conditions following completion of site works.
- Enforcing all socio-economic mitigation measures, and any other corrective measures.
- Monitoring and reporting all issues of socio-economic compliance to the PMU PC.

11.3.3.5 Contractor Site Manager

The Contractor is responsible for complying with environmental and social requirements for all field activities covered by this ESMP and their own C-ESMP and other plans (OHSP, EPRP, WMP, DMP, LMP). The Contractor is also responsible for the actions of any sub-contractors they may engage.

The Contractor's Site Manager (SM) is responsible for the following.

- Direct overview of field personnel at the project work sites.
- Ensuring that all operations comply with the environmental standards that may be set from time to time by the EPA under the provisions of the Environmental Protection and Management Law (2003).
- Ensuring that the control measures provided for in the various documents of the Project's health, safety, environmental and community safeguards systems are both understood and implemented by site personnel.
- Training staff in appropriate environmental, social, health and safety awareness issues, and ensuring that the key messages are passed on to the labourers in the work crews.
- Setting up plans for action to be taken in the event of accidents and other emergencies threatening human welfare.
- Setting up plans for action to be taken in the event of spills or leakages of hazardous materials, and other environmental emergencies.

- Taking reasonable measures to avoid or mitigate impacts to the environment which may arise from the Project's activities (mitigation measures shall include awareness raising and training of all staff with respect to the possible environmental impacts during site works, and emergency incidents, such as accidents and pollution from fuel spills).
- Monitoring of C-ESMP implementation, by maintaining appropriate records and communications on site issues (environmental, health and safety, social and gender), their status of compliance, and making these available to representatives of the PMU and UNDP, as required.
- Participating in environmental, social, and health and safety compliance reviews.
- Participating in community consultative meetings.
- Identifying significant matters pertaining to environmental and social compliance.
- Liaising with the PMU's Officers on the need for corrective action in the event of unexpected environmental or community problems emerging during the course of operations.

11.3.3.6 Contractor Environmental Officer

Each Contractor mut have an Environmental Officer (EO) who supports the Site Manager in all environmental matters and has the following duties.

- Communicating with all of the Contractor's staff regarding environmental compliance requirements and other matters of environmental importance.
- Keeping Contractor Management informed on overall issues relating to the Project's environmental standards and compliance.
- Supporting staff in planning for action to be taken in the event of spills or leakages of hazardous materials, and other environmental emergencies.
- With the Contractor's Social Team, supporting staff in planning for actions to be taken in the event of accidents and other emergencies threatening human welfare.
- With the Contractor's Health and Safety Officer and the Social Team, supporting staff in the provision of environmental awareness and community interaction training.
- Leading environmental compliance reviews.
- With the Contractor's Social Team, reviewing conditions following completion of works on site.

- Liaising with staff for the implementation of all environmental mitigation measures.
- Identifying additional environmental mitigation or corrective measures that are deemed to be necessary in the course of operations.
- Implementing the control measures in this plan and any other corrective measures.
- Preparing reports on all aspects of environmental compliance for the SM.
- Supporting the PMU EO and ITP consultants and providing them with all the necessary information required for the monitoring program and reporting.

11.3.3.7 Contractor Health and Safety Officer

Each Contractor mut have an ISO 45001:2018 certified Health and Safety Officer (HSO) who supports the SM in all health and safety matters and has the following duties.

- Communicating with all of the Contractor's staff regarding health and safety compliance requirements and other matters of health and safety importance.
- Keeping Contractor Management informed on overall issues relating to the Project's health and safety standards and compliance.
- With the Contractor's EO and the Social Team, supporting staff in planning for actions to be taken in the event of accidents and other emergencies threatening human welfare.
- Supporting the Contractor's EO in planning for actions to be taken in the event of spills or leakages of hazardous materials, and other emergencies.
- Leading health and safety compliance reviews.
- Liaising with staff for the implementation of all health and safety mitigation measures.
- Identifying additional health and safety mitigation or corrective measures that are deemed to be necessary in the course of operations.
- Implementing the health and safety control measures in this plan, the Contractor's OHSP and any other corrective measures.
- Preparing reports on all aspects of health and safety compliance for the SM.
- Supporting the PMU HSO and ITP consultants and providing them with all the necessary information required for the monitoring program and reporting.

11.3.3.8 Contractor Social and Gender Officer

Each Contractor must have a responsible Social and Gender Officer (SGO) who supports the SM in all social matters and is ideally supported by a CLO (see Section 11.3.3.8). The SGO has the following duties.

- Communicating with all of the Contractor's staff regarding social compliance requirements and other matters of social importance.
- Keeping Contractor Management informed on overall issues relating to the Project's social standards and compliance.
- With the Contractor's CLO, supporting staff in planning for actions to be taken in the event of emergencies threatening human welfare.
- With the Contractor's CLO, supporting staff in the provision of social awareness and community interaction training.
- Leading social compliance reviews.
- With the Contractor's EO and CLO, reviewing conditions following completion of works on site.
- Liaising with staff for the implementation of all social mitigation measures.
- Identifying additional social mitigation or corrective measures that are deemed to be necessary in the course of operations.
- Implementing the control measures in this plan and any other corrective measures.
- Promoting and monitoring the recruitment of women for the Project.
- Implementing training and awareness campaigns on GBV, SEA/SH, and respectful behaviour, and ensuring accessible reporting mechanisms for addressing such issues.
- Making arrangements with a Liberian-based violence NGO to lead investigations into allegations of GBV and SEA/SH as and when they arise.
- Preparing reports on all aspects of social compliance for the SM.

11.3.3.9 Contractor Community Liaison Officer

The Contractor's CLO supports the Contractor's SM, SGO, and other staff in all matters of relations with, and the welfare and support of, local communities. They have the following duties.

- Liaising with community, particularly in relation to engagement with communities,

enabling participation, implementation of grievance mechanisms, implementation of employment policy, and participation in determining and ensuring resettlement requirements.

- Communicating with staff regarding liaison with communities and other matters of importance to local inhabitants.
- Keeping management informed on relevant community issues, disputes, incident reports, etc.
- With the Contractor's environmental and social staff, supporting staff in planning for actions to be taken in the event of accidents and other emergencies threatening human welfare.
- With the Contractor's environmental and social staff, supporting staff in the provision of environmental awareness and community interaction training.
- Participating in social compliance reviews.
- Active involvement in Community Consultative Meetings.
- With the environmental and social staff, reviewing conditions following completion of works on site.
- Liaising with staff for the implementation of all community support measures.
- Identifying additional community mitigation or corrective measures that are deemed to be necessary in the course of operations.
- Implementing the community support measures in this plan and any other corrective measures.
- Preparing reports on all aspects of community relations for the SM.

11.3.3.10 Contractor's Human Resources Manager

The contractor's Human Resources Manager's (HRM) duties involve managing job design, recruitment, employee relations, performance management, training, and development. The Contractor's HRM reports to the contractor's Project Manager.

The contractor's HRM's responsibilities are listed below.

- Managing the recruitment and selection process.
- Taking reasonable measures to employ local people in the work crews with at least 30% women, particularly those whose livelihoods have been adversely affected by the

Project.

- Keeping employment records.
- Ensuring the safeguarding of employee rights.
- Ensuring the wellbeing of the employees.
- Ensuring that all employees are treated fairly and equally.
- Designing and implementing strong measures to prevent GBV and SEA/SH.
- Ensuring employees are provided with basic needs such as food, drinking water, rest and sleep, accommodation, and clean sanitation facilities.
- Ensuring an internal contractor confidential employee GRM is in place, is communicated to employees and is implemented.

11.3.3.11 Ship Masters

Ship Masters are the masters or commanders of ships or any other type of vessel, also called captains. They have the ultimate responsibility for everything related to their ships/vessels and crews. Ship Masters report to the contractor's Site Manager.

The responsibilities of Ship Masters are described below.

- Ensuring that ships operating on behalf of the Project abide by the provisions of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocols of 1978 relating thereto ("MARPOL" or "MARPOL 73/78") and its Annexes, the London Dumping Convention as well as local maritime regulations.
- Reporting any of the following incidents to the Site Manager within 24 hours while in Liberian territorial waters or within 50 nautical miles of the Liberian coast, in line with Protocol I of MARPOL 73/78.
    - Any discharge or probable discharge of oil or any other noxious liquid.
    - Any discharge or probable discharge of harmful substances in packaged form.
    - Damage, failure, or breakdown of the ship, including grounding, collision, fire, explosion, structural failure, mechanical, hydraulic or electrical failure of any sort, and flooding.
- Keeping ship records (Oil Record Book and Garbage Record Book).
- Ensuring vessels have ship-board oil pollution emergency plan, WMP, ISPP certificate, and EIAPP Certificate as per MARPOL requirements.

- Agreeing on an emergency shutdown procedure and signals to trigger this with the refuelling staff at the refuelling facility before starting the refuelling operation.
- Overseeing refuelling operations.
- Ensuring that all crew members are following health and safety measures.
- Keeping inventory of spill onboard clean-up material.
- Ensuring that crew is trained in refuelling and spill response.
- Ensuring that proper hazardous materials management is applied on board the ship.
- Ensuring that spills and releases are cleaned up immediately.

11.3.4 Capacity Building

The proper implementation of the ESMP is highly dependent on the available existing capacity and awareness of the PMU's and the Contractor's staff, the surrounding community, and other concerned stakeholders.

Training workshops are required to increase environmental, OHS, and social awareness of all individuals concerned with the Project and to train and follow-up with the workers who are specifically involved in the site operation.

11.3.4.1 Environmental Awareness Workshop

The PMU personnel, and the Contractor's professional staff involved in the site operations will be required to attend environmental training workshops prior to project initiation and throughout the project life. The objective of these workshops is to ensure appropriate environmental awareness, knowledge, and skills for the implementation of environmental mitigation and monitoring measures. In order to increase local environmental awareness, the workshops can also be opened for individuals from the local community. They will be conducted twice a year during the construction phase. The workshops will increase the environmental awareness of the participants by covering at least the following topics:

- Environmental laws, regulations, and standards.
- Project's potential impacts on the surrounding environment.
- Impact prevention and mitigation measures.
- Health and safety impacts and adequate mitigation measures.
- Sampling techniques and environmental monitoring guidelines.

11.3.4.2 Social Awareness Workshop

The PMU personnel, and the Contractor's professional staff involved in the site operations will be required to attend social training workshops prior to project initiation and throughout the project life. The objective of these workshops is to ensure appropriate social awareness, knowledge, and skills for the implementation of social mitigation and monitoring measures. In order to increase local social awareness, the workshops can also be opened for individuals from the local community. They will be conducted twice a year during the construction phase. The workshops will increase the social awareness of the participants by covering at least the following topics:

- Community awareness.
- Respect and non-discrimination.
- GBV and SEA/SH.

11.3.4.3 Site Operation Training Workshop

On-site workers should receive appropriate training to undertake the duties of implementing the necessary mitigation measures. The training workshops should cover at least the following issues:

- Project's potential impacts on the surrounding environment.
- Project's potential impacts on occupational and public health and safety.
- Sources of impacts.
- Mitigation measures to be applied.
- Proper on-site behaviour expected on the environmental and social levels.
- Proper handling and storage of hazardous material and waste.
- Dredging management
- Vessel operation and management
- Spill contingency plans.
- Accidents and emergency plans.

This could be achieved by small workshops conducted during the construction and operation phases for one or two days on a quarterly basis.

11.4 MANAGEMENT AND MONITORING OF MITIGATION MEASURES

The environmental and social mitigation and monitoring matrix lays out the arrangements for safeguarding the environment and society through the practical mitigation of identified impacts.

11.4.1 Components of the Environmental and Social Mitigation and Monitoring Matrix

The environmental and social mitigation and monitoring matrix (see Section 11.4.2 Table 11-1) works through a series of different subject elements. These are listed below as 15 headings under four categories of safeguard. The potential impacts identified in the ESIA are listed under these headings, so that each aspect of environmental and social protection can be easily found among the mitigation and monitoring tables. Overlap is removed by allocating impacts to only one heading. This problem arises because some environmental impacts become impacts on communities: for example, the management of air emissions is covered under heading 12, although its effects are felt mainly by the community receptors, for which more general impacts from the project are covered under heading 3.

The safeguard categories and impact mitigation headings are as follows.

Overall safeguards

1. General Environmental Protection

Protection of people

2. Community protection measures, including gender and social inclusion
3. Environmental Health and Safety
4. Occupational Health and Safety
5. Labour and Working Conditions
6. Cultural Heritage

Pollution control

7. Waste Management
8. Hazardous Material Management

Environmental safeguards

9. Water Resources Management

10. Coastal Sediment Resources Management
11. Soil and Land Resources Management
12. Air Quality Management, including GHG emissions
13. Noise and Vibration Management
14. Fauna and Flora Protection
15. Visual Amenity

11.4.2 Environmental and Social Mitigation and Monitoring Matrix

The environmental and social mitigation and monitoring matrix forms the core of the ESMP, since it shows exactly what must be done, by whom, when and to what standard. It also shows who will monitor its implementation, when and how.

The column “Standard to be met” in Table 11-1 includes references to applicable UNDP and GCF standards, as well as to the standards and guidelines presented in Appendix J.

The cost associated with the implementation of the mitigation measures is assumed to be part of operational costs. Where this is not the case, the additional cost is presented in Section 11.7

Table 11-1 Environmental and social mitigation and monitoring matrix

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
1.	**General environmental protection**						
1.1.	General environmental damage in the form of degraded water resources, degraded land, lowered quality of living, reduced quality of resources, etc.	• Avoid damage to any part of the environment (water, soil, plants, animals, human resources and settlements) as far as possible. • If damage cannot be avoided, then mitigate or compensate for the damage. • Avoid any work beyond the agreed boundaries of the work sites. • Agree on mitigation or compensation arrangements before starting any work. • Do not hide any damage or pollution. In the event of an accident, it is better to consult the EPA and agree on a mitigation plan than to risk prosecution under the law.	Contractor's EO, HSO and SGO	All standards and guidelines	• Before starting work • Monthly • After completion of constructio n	PMU EO, HSO and SGO	• Visual inspection • Documentation
1.2.	Limited awareness or respect about the importance and value of the environment among labour force leads to an excessive amount of damage to resources or disruption of people's livelihoods.	• Develop and implement an induction program for all site personnel, which includes as a minimum an outline of the minimum requirements for environmental management relating to the site. • Ensure that the site supervisors brief all workers at the start of every job, and at the beginning of each week, on the main environmental messages. • Ensure that all professional and technical staff respect the environment and understand why they must. • Do not allow staff and workers to neglect environmental issues. This may	Contractor's EO and SGO	All standards and guidelines	Monthly	PMU EO and SGO	• Interviews with the site-workers

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
		lead to offences under the Environment Protection and Management Law. • Do not ignore blatant disregard for environmental and social issues by professional and technical staff.					
1.3.	Risk of inconsistent (or lack of) maintenance of installed structures during operation or after decommissioning leading to impacts on the environment and community safety.	• Establish a regular inspection schedule to assess the condition of the revetment and breakwater. • Ensure consistent maintenance and repair of the revetment, breakwater, geotextile base and drainages. • Ensure regular cleaning of debris, sand, and vegetation around the revetment and the breakwater. • Properly manage stormwater runoff to avoid excessive water flow over the revetment. • Conduct awareness campaigns about the importance of protecting the coastline and preventing activities that may damage the revetment and breakwater (e.g., illegal sand mining, littering).	PMU EO and SGO	• UNDP Standard 1,2,3,8. • IFC PS1,4,6.	Quarterly during operation	PMU PC	• Visual inspection • Documentation
2.	**Community protection measures, including gender and social inclusion**						
2.1.	Local communities are not engaged and consulted in a satisfactory and timely manner, or vulnerable groups are not included in	• Undertake regular meetings with community leaders and community interest groups. • Carry out community consultation on the purpose and benefits of making changes to land use. • Get community buy-in on any change of land use.	Contractor's SGO, contractor's CLO	Guideline J.2.2, J.2.5	• Before starting work • Monthly during site operations	PMU SGO	• Interviews with communities • To be completed at each check • Focus group discussions with vulnerable groups

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
	community consultations	• Community consultation during detailed design must ensure that the final layouts are compatible with community needs. • Ensure awareness of the Grievance Redress Mechanism process. • Develop a stakeholder engagement plan and make sure that all the provision agreed upon in the plan are implemented and abided by. • Support communities in times of crisis to the greatest extent possible.					
2.2.	Incoming workers do not respect local communities, leading to social disruption.	• Use and update the SEP and matrix. • Employ local labour as much as possible. • Ensure that the Worker Code of Conduct is implemented. • Ensure that the site supervisors brief all workers at the start of every job, and at the beginning of each week, on the main messages regarding respect for the local communities. • Ensure that all professional and technical staff respect the local communities and behave well. • Do not ignore blatant disrespect for communities by professional and technical staff. • All labour camps must be located at least 2 km away from the local villages and towns.	Contractor's CLOs	Guideline J.2.1	• Monthly during site operations	• Supervision by PMU CLO and supported by PMU'S SGO	• Documentation

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
2.3.	Local people's livelihoods are adversely affected by project activities.	• Establish an equitable and fair employment strategy. Liaise with the CLO to ensure that it is understood in the local communities (i.e. that it is transparent). • Give priority to local men and women in labour crews, and those whose livelihoods are affected by project activities. • Pay the usual accepted County wage rates. • Do not demand unpaid work by locals. • Contractor must agree a construction schedule with the fishermen and fish mongers before mobilisation, to ensure that fishing is not disrupted.	Contractor's SGO, contractor's CLO	Guidelines J.2.2.1 , J.2.2.2 and J.2.4	• Monthly during site operations	PMU SGO	• Documentation • Interviews with communities • To be completed at each check
2.4.	Cumulative losses are incurred by social groups unable to respond to change.	• Give priority to local men and women in labour crews, and those whose livelihoods are affected by project activities. • Maintain an active policy to ensure gender equality and opportunities for vulnerable groups. • Pay the usual accepted County wage rates. • Do not demand unpaid work by locals.	Contractor's SGO	Guidelines J.2.2.1 and J.2.2.2 , J.2.4	Monthly during site operations	PMU SGO	• Interviews with communities • To be completed at each check
2.5.	Project-affected persons are unable to seek the redress of their grievances.	• Develop a Grievance Redress Mechanism. • Ensure that the Grievance Redress Mechanism is widely publicised and that it is understood and accessible in all project-affected communities. • Treat all complaints and disputes with	Contractor SGO, contractor CLO, SM	Guideline J.2.6.1 , J.2.7	• Before starting work • Monthly during site operations	PMU SGO, PMU CLO	• Documentation • Interviews with communities • To be completed at each check

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
		respect and fairness. Explain decisions to community leaders and get their support.					
2.6.	Sexual exploitation and gender-based violence increase in local communities, particularly due to the influx of temporary labourers	• Maximise the use of local labour, to reduce influxes. • Issue policy statements on the project's adherence to Liberian law regarding sexual exploitation (including minors and prostitution) and gender-based violence. • Maintain a zero-tolerance punitive regime among all project and all service providers' staff and workers. • Include awareness raising on these issues in trainings and site briefings. • Issue policy statements on the project's adherence to Liberian law and the Bank's ESS 2 regarding sexual exploitation (including minors and prostitution) and gender-based violence. • Maintain a zero-tolerance punitive regime among all project and contractors' staff and workers. • Ensure the internal grievance redress mechanism recognizes confidentiality of complainants. • Include awareness raising on these issues in trainings and site briefings. • Publicize the GRM process. • Ensure complainants receive support.	Contractor SGO, contractor CLO, SM, contractor's HRM	Guideline J.2.7.1J.2.4 , and J.2.7.2	• Before starting work • Monthly during site operations	PMU Health and Safety Officer, supported by PMU SGO	• Interviews with workers • To be completed at each check
2.7.	The disruption of the social relationship the	• Create alternative social and recreational spaces for the communities.	Contractor SGO, contractor CLO,	Guideline J.2.2 , J.2.5	• Before starting	PMU SGO, PMU CLO	• Documentation • Interviews with

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
	communities share with the beach and their ability to access it at all points. The beach represents a social and an entertainment space for the communities.	• Ensure that the communities will still have access to the beach to continue their traditional activities. • Designate access beach points • Develop compensation activities for the communities.	SM, contractor's HRM		work • Monthly during site operations		communities
2.8.	The possibility of economic displacement due to the disruption of fishermen and fishmongers' usual activities in the area.	• Ensure that the work on the two landing sites doesn't occur simultaneously, but gradually so that fishermen will always have access to one of the landing sites. • Develop a livelihood restoration plan (LRP) (Appendix P) that can compensate for the possible losses and assist the fishermen and fishmongers during the project construction and decommissioning. • Ensure capacity building training as part of the LRP to provide training on specific skills and business management to support the affected individuals handle the economic transition. • Offer micro-loans and credit support as part of the LRP to help fishermen and fishmongers adapt to the new situation.	Contractor SGO, contractor CLO, SM, contractor's HRM	• Guideline J.2.8 • IFC PS5	• Before starting work • Monthly during site operations • At the end of operations.	MU SGO, PMU CLO	• Documentation • Interviews with communities • Surveys and FGDs with communities • Progress checks • Observations
2.9.	Spread of communicable diseases such as HIV in the communities due to the increase of population and the influx of workers.	• Improve the hygiene and sanitation facilities in the affected communities. • Conduct public awareness campaigns and educational campaigns to help affected individuals protect their health and community.	Contractor's HSO Contractor's CLO Contractor's SGO	• Guideline J.2.2 • UNDP Standard 3 • IFC PS 4	• Before starting work • Monthly during site operations	PMU HSO PMU CLO PMU SGO	• Documentation • Interviews with communities • Observations

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
2.10.	Fishermen would lose access to landing sites during construction.	• Ensure that the two designated landing sites are not being constructed or renovated at the same time. • Ensure that one landing site is always operational.	Contractor's CLO Contractor's PC	Guideline J.2.2	• Before starting work • Monthly during site operations	PMU SM PMU CLO	• Site inspection • Documentation
2.11.	Disrupting fishing and leisure activities due to the installation of materials stores, workshops, machinery parking areas, laydown yards, vehicle movement, etc.	• The location for the contractor's' materials stores, workshops, machinery parking areas, laydown yards, etc. must be agreed upon with community leaders and agreed by the project in advance.	Contractor's HSO Contractor's CLO	Guidelines J.2.2.1	Monthly during the running of construction contracts.	PMU Environmental Officer	• Site inspection
2.12.	The impacts of the project such as economic displacement and influx of workers would be prolonged if the project is not completed within the timeframe.	• Ensure the completion of the program within the timeframe suggested.	Contractor's PC	Guideline J.2.2, J.2.8	• Before starting work Monthly during site operations	PMU PC	• Documentation
2.13.	Increased traffic on public roads leading to more accidents and generating nuisance levels of dust and noise, especially on the roads between the project area and the port of Monrovia and those between the	• Develop and implement a Traffic Management Plan. • Minimize vehicle movements. • Enforce transport rules and regulations rigorously. • Conduct driving safety awareness campaigns.	Contractor's HSO	ESS4	Monthly during site operations	PMU HSO	• Documentation • Field supervision

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
	project area and the quarry site(s).	• Do not tolerate any poor behaviour, dangerous driving or even minor traffic infringements by any staff or sub-contractors. • Do not allow dust generation to affect the ambient air quality outside the site. • Spray dust suppression water as required, but ensure it is not applied at such rates that it causes erosion and washing out of the roads.					
3.	**Environmental health and safety**						
3.1.	Injuries occur to the public, especially children, during on-site works or along the roads during transportation of material to and from the site.	• Ensure full separation of the public from all working sites. • Fence off all working areas. • Buffer zones (No Entry) should be established around dredging areas on land and at sea. • Maintain a clean site so that dangerous articles are not left lying around near the work site, especially at night. • Ensure ambulance services are available for use in an emergency. • Minimize vehicle movement as far as practicable. • Enforce strict speed limits on earth tracks by placing speed bumps. • Conduct driving safety awareness campaigns. • Do not tolerate any poor behaviour, dangerous driving or even minor traffic infringements by any staff or sub-contractors.	Contractor HSO, SGO and CLO	• UNDP Standard 3 • IFC PS 4	• Before starting work • Monthly • After completion of construction	PMU HSO and SGO	• Visual inspection • Documentation

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
		• Conduct random breath tests for drivers. • Ensure the Project employs a GRM that is known to the public. • Keep records of external grievances and address them according to the GRM. • The contractor must prepare and implement an EPRP as per guidelines detailed in Appendix L. The EPRP must be updated regularly, and the workers must be trained in its use.					
3.2.	Infectious and contagious diseases are spread amongst the local communities.	• Ensure workforce have access to health services. • Ensure that non-local workers are accommodated in sound, dry buildings, with good ventilation and clean water supplies, and with good cleanliness and sanitation arrangements. • Provide bed nets to all non-local workers. • Monitor and control the habitats of malaria vectors. • Provide awareness training to workers and nearby communities, on the prevention of contagion and infection from diseases such as influenza, Ebola, Covid-19 and sexually transmitted diseases and HIV. • Encourage workers to abstain from sex with local people, or to use suitable protection such as condoms. • The contractor must prepare and implement an EPRP as per guidelines	Contractor HSO, SGO and CLO	• UNDP Standard 3 • IFC PS 4	• Before starting work • Monthly	PMU HSO and SGO	• Interviews with workers • Documentation

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
		detailed in Appendix K. The EPRP must be updated regularly, and the workers must be trained in its use.					
4.	**Occupational health and safety**						
4.1.	Injury caused by inappropriate use of tools, machinery or materials, or use of them by untrained personnel.	• Ensure that workers are given safety inductions, toolbox talks and full daily and weekly briefings. • Provide all crews and personnel with PPE appropriate for the work they are doing. • Do not allow workers onto a site unless they are wearing the appropriate safety gear. • Develop a culture of admonishment for unsafe acts. • Train people in the use of the tools and machinery that they will be operating. • Keep first aid kits on all work sites and ensure they remain stocked, and all items are in-date. • Ensure that there are two people on each work site trained in first aid response. • Ensure that tools, machinery, and materials are of high standard quality and that they are maintained, repaired, and replaced as needed. • The contractor must prepare and implement an Occupational Health and Safety Plan as per guidelines detailed in Appendix M.	• Contractor SM • Contractor HSO • Ship Masters	• UNDP Standard 7 • IFC PS2 • Guideline J.2.10	Monthly	PMU HSO	• Documentation • Visual inspection • Interviews with site workers and crews

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
		• The contractor must prepare and implement an EPRP as per guidelines detailed in Appendix K. The EPRP must be updated regularly, and the workers must be trained in its use.					
4.2.	Injury caused by uncontrolled exposure to heat, noise, fire, electrical hazards, chemicals, and hazardous materials.	• Ensure that workers are given safety inductions, toolbox talks and full daily and weekly briefings. • Provide all crews and personnel with PPE appropriate for the work they are doing. • Develop a culture of admonishment for unsafe acts. • Restrict access to areas with exposure to heat, noise, fire, electrical hazards, chemicals, and hazardous materials to the strictly necessary personnel. • Train people in the activities they will be carrying out. • Use international labelling for identifying hazardous substances. • Follow the hazardous materials management guidelines fully (Guideline J.2.10). • The contractor must prepare and implement an Occupational Health and Safety Plan as per guidelines detailed in Appendix M. • The contractor must prepare and implement an EPRP as per guidelines detailed in Appendix L. The EPRP must be updated regularly, and the workers must be trained in its use.	• Contractor SM • Contractor HSO • Ship Masters	• UNDP Standard 7 • IFC PS2 • Guideline J.2.10	Monthly	PMU HSO	• Documentation • Visual inspection • Interviews with site workers and crews

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
4.3.	Workers involved hazardous work, or hazardous substances, are unaware of the risks involved.	• Obligate managers to set good examples for respecting safety on site. • Ensure that all persons dealing with hazardous substances are trained in handling those materials, in using the adequate PPE, and in first aid measures to be taken in the case of an accident. • Ensure that all persons dealing with hazardous substances are adequately informed about the risks and have read and understood the Material Safety Data Sheet (MSDS) of each substance. • Provide all persons handling hazardous substances with the proper PPE (anti-slip rubber shoes, gloves, masks, etc.).	• Contractor SM • Contractor HSO • Ship Masters	• UNDP Standard 7 • IFC PS2 • Guideline J.2.10	Monthly	PMU HSO	• Documentation • Interviews with site workers and crews
4.4.	Potential of slipping in the ocean due to slippery surfaces.	• Ensure that all potentially slippery surfaces, including vessel decks, are regularly inspected and maintained to prevent the existence of cracks, worn or missing parts, and other falling and tripping hazards. • Keep all such surfaces clear of grease and waste to avoid risk of slipping. • Immediately clean up spills. • Ensure that everyone working on slippery surfaces wear hard hats and steel-toed and slip-resistant shoes. • Ensure that first aid kits are available onboard all vessels. • Ensure the presence of people who know what to do if there is an accident, and who are trained to use the first aid kit on vessels.	• Contractor SM • Contractor HSO • Ship Masters	• UNDP Standard 7 • IFC PS2 • Guideline J.2.10	Monthly	PMU HSO	• Documentation • Visual inspection • Interviews with site workers and crews

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
		• The contractor must prepare and implement an Occupational Health and Safety Plan as per guidelines detailed in Appendix M. • The contractor must prepare and implement an EPRP as per guidelines detailed in Appendix L. The EPRP must be updated regularly, and the workers must be trained in its use.					
4.5.	Potential of falling into the ocean and drowning.	• Provide safety and awareness trainings on the dangers of working on vessels and near water. • Provide all persons working on vessels and near the ocean with the proper PPE (life jackets, slip-resistant shoes, etc.). • Ensure that the vessels operate at the minimum necessary speed. • Monitor weather conditions, so as to avoid activities during bad weather conditions. • Train an appropriate number of workers in water rescue operations and the use of rescue equipment. • Maintain water rescue teams trained and available on vessels and on site. • Maintain appropriate rescue equipment on vessels and on site (life buoys, boat hooks, lifelines, life jackets, adequate boat available for safe and timely rescue, etc.). • Inform all workers about rescue procedures.	• Contractor SM • Contractor HSO • Ship Masters	• UNDP Standard 7 • IFC PS2 • Guideline J.2.10	Monthly	PMU HSO	• Documentation • Visual inspection • Interviews with site workers and crews

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
		• Keep stairs, ladders, doorways, ramps, walkways, and gangways clear on vessels. • The contractor must prepare and implement an Occupational Health and Safety Plan as per guidelines detailed in Appendix M. • The contractor must prepare and implement an EPRP as per guidelines detailed in Appendix L. The EPRP must be updated regularly, and the workers must be trained in its use.					
4.6.	Injury caused by traffic accidents.	• Ensure the contractor prepares and implements an EPRP as per guidelines detailed in Appendix J. • Conduct driving safety awareness campaigns. • Enforce speed limits on-site and off-site. • Do not tolerate any poor behaviour, dangerous driving or even minor traffic infringements by any staff or sub-contractors. • Conduct random breath tests for drivers. • The contractor must prepare and implement an Occupational Health and Safety Plan as per guidelines detailed in Appendix M. • The contractor must prepare and implement an EPRP as per guidelines detailed in Appendix KAppendix L. The EPRP must be updated regularly,	• Contractor SM • Contractor HSO • Ship Masters	• UNDP Standard 7 • IFC PS2	Monthly	PMU HSO	• Documentation • Visual inspection

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
		and the workers must be trained in its use.					
4.7.	Prolonged heat and ultraviolet (UV) light exposure.	• Provide all crews and personnel with awareness trainings on the risks and prevention of prolonged sun exposure. • Provide crews and personnel are with enough safe drinking water. • Provide crews and personnel with appropriate PPE and products for UV light protection (sun protection clothing, hats or helmets, sunscreen, etc.). • Provide shaded areas on site and on vessels to allow resting times for crews and personnel. • The contractor must prepare and implement an Occupational Health and Safety Plan as per guidelines detailed in Appendix M.	• Contractor SM • Contractor HSO • Ship Masters	• UNDP Standard 7 • IFC PS2 • Guideline J.2.10	Monthly	PMU HSO	• Documentation • Visual inspection • Interviews with site workers and crews
4.8.	Risk of catching infectious diseases such as malaria, typhoid, and other water-borne diseases.	• Ensure that all workers and personnel are given awareness trainings about the risks and prevention of malaria, typhoid, and other water-borne diseases prevalent in Liberia. • Monitor and control potential habitats for malaria vectors. • Provide that all crews and personnel are with new mosquito nets, irrespective of their place of accommodation. • Ensure that all crews and personnel wear pants and long sleeve shirts, especially between dusk and dawn when mosquito activity is very high.	• Contractor SM • Contractor HSO • Ship Masters	• UNDP Standard 7 • IFC PS2	Quarterly	PMU HSO	• Documentation • Visual inspection • Interviews with site workers and crews

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
		• Consider providing crews and personnel with prophylactic medication and discuss this option with them. • Provide all crews and personnel with clean drinking water. • Maintain washrooms in clean and good working conditions. • Provide soap, water, and toilet paper at all washrooms.					
4.9.	Risk of contracting sexually transmitted diseases such as HIV/AIDS, among others.	• Ensure that all workers and personnel are given awareness trainings about the risks and prevention of HIV/AIDS and other STDs. • Encourage workers to abstain from sex with local people, or to use suitable protection such as condoms.	• Contractor SM • Contractor HSO • Ship Masters	• UNDP Standard 7 • IFC PS2	Quarterly	PMU HSO	• Documentation • Interviews with site workers and crews
5.	**Labour and working conditions**						
5.1.	Conditions of employment are unfair to or unequal among workers.	• Contractor to prepare and implement a Labour Management Plan. • Ensure that written conditions of contract are checked by the PMU Social and Gender Safeguards Specialist prior to employing any person on this project. • Ensure that existing employees have a written and signed contract. • The contract must comply with the Liberian Employment and Labor Law 2011 and/or the IFC ESS2, whichever more stringent. • The contract has to specify a Worker Code of Conduct and the penalties for contravention.	Contractor HRM	• UNDP Standard 7 • IFC PS2 • Guideline J.2.3, J.2.4	• Before starting work • Quarterly	PMU SGO	• Interviews with workers • Documentation

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
5.2.	Local people are not given adequate opportunities for employment, and outsiders are brought in instead. Women quota is not respected. Children are employed on the sites. Vulnerable groups are excluded from employment.	• Contractor to prepare and implement Labour Management Plan. • Contactor to employ local labour at unskilled level and seek semi and skilled workers locally as far as is possible. • Contractor should aim for 30% women employees. • Children under 16 of age should not be employed, as per the Liberian law. • Avoid the employment of those aged 16 to 18. • Encourage the employment of vulnerable people, even if only for short-term opportunities.	Contractor HRM	• UNDP Standard 7 • IFC PS2 • Guideline J.2.3, J.2.4	• Before starting work • Quarterly	PMU SGO	• Interviews with workers • Documentation
5.3.	Accommodation for workers is inadequate or unhealthy.	• Ensure that workers are accommodated in sound, dry buildings, with good ventilation and clean water supplies, and with good cleanliness and sanitation arrangements. • Provide bed nets to all non-local workers. • Monitor and control the habitats of malaria vectors. • Instruct foremen and supervisors to check that their local workers are able to find suitable accommodation. • If accommodation has to be provided in some part of the site, it must be large enough, clean, dry, screened from mosquitoes and with good running water and sanitation.	Contractor SM, HRM and HSO	• UNDP Standard 7 • IFC PS2	• Before starting work • Quarterly	PMU HSO	• Visual inspection • Interviews with workers • Documentation

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
		• Never expect workers to share crowded or unsanitary accommodation.					
5.4.	Poor sanitation at work sites, including vessels, leads to illnesses in workers and pollution of the environment.	• Provide proper water closet toilet facilities at all long term (> 1 month) work sites. • Do not allow water to run out at toilets. • Maintain all toilets in a clean and sanitary condition. • Ensure that toilets on vessels are maintained and operated in accordance with international maritime standards. • Provide proper earth pit latrines at all work sites where work will be undertaken for periods of up to one month. • Fill the latrines in once they become full and when site work is complete. • Do not allow site workers to defecate in the open anywhere on the site or in its vicinity. • Add the use of sanitation arrangements in toolbox talks.	Contractor SM, HSO and Ship Masters	• UNDP Standard 7 • IFC PS2 • Guideline J.2.19	• Before starting work • Monthly	PMU HSO	• Visual inspection • Documentation
5.5.	Workers are unable to redress their grievances.	• Contractor to have in place an internal GRM for employees and workers. • Ensure all employees and workers know how to make a complaint. • The process must be noted in the conditions of employment, advertised in the office and reinforced during toolbox talks. • Contractor to subcontract a lead investigator from a suitably qualified and experienced Liberian NGO to lead	Contractor SM and HRM	• UNDP Standard 7 • IFC PS2	• Before starting work • Quarterly	PMU PC	• Documentation • Interviews with workers

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
		investigations of allegations of sexual harassment and gender- based violence.					
6.	**Cultural heritage**						
6.1.	Damage to unexpected cultural or archaeological sites potentially found	• If an unexpected archaeological site is discovered, use the chance find guideline (J.2.9) • If damage to cultural sites cannot be avoided, agree compensation measures with the local community, through the CLOs.	Contractor SM, Ship Masters, and CLO and PMU CLO	• UNDP Standard 4 • IFC PS8 • Guideline J.2.9	Quarterly	PMU SGO	• Documentation • Interviews with local community members
7.	**Waste management**						
7.1.	Pollution of soil, beach, air and/or water resources (surface water and/or groundwater) and ill- due to incorrect storage, management, and/or disposal of solid and/or liquid waste including hazardous waste on site.	• Prohibit littering and the burning of waste. • Prohibit the discharge of any type of waste into the ocean. • Collect and segregate waste into hazardous and non-hazardous at the source. • Avoid waste spills during storage and handling. • Store the different types of hazardous waste in separate containers with secondary containment. • Dispose of project waste in the most environmentally sound manner possible, using EPA-certified collectors. • Deal with hazardous waste according to international best practice and EPA guidelines. • Ensure use of PPE by staff when handling all forms of waste. • Train employees and workers to apply	Contractor SM and EO	• UNDP Standard 8 • IFC PS3 • Liberian Standard J.1.1, J.1.2 • Guideline J.2.18, J.2.19	Monthly	PMU EO	• Documentation • Visual inspection • Soil, water and air quality monitoring

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
		the necessary waste management measures. • Ensure that the contractor develops and implements a Waste Management Plan (WMP) based on principles of reduction, recovery, recycling, and reuse.					
7.2.	Pollution of soil or water from poor sanitation at work sites.	• Provide proper water closet toilet facilities at all long term (> 1 month) work sites. • Do not allow water to run out of toilets. • Maintain all toilets in a clean and sanitary condition. • Provide proper earth pit latrines at all work sites where work will be undertaken for periods of up to one month. • Fill the latrines in once they become full and when site work is complete. • Do not allow site workers to defecate in the open anywhere on the site or in its vicinity. • Add the use of sanitation arrangements in toolbox talks.	Contractor SM and EO	• UNDP Standard 8 • IFC PS3 • Liberian Standard J.1.2 • Guideline J.2.19	Monthly	PMU EO	• Visual inspection • Documentation
7.3.	Pollution of ocean water due to incorrect storage, management, and/or disposal of solid and/or liquid waste including hazardous waste on vessels.	• Ensure that all vessels operating on behalf of the Project carry a WMP and the equipment required to implement it, as per MARPOL 73/78. • Ensure that all vessels operating on behalf of the Project carry a full and up-to-date Garbage Record Book, as per MARPOL 73/78.	Contractor SM, EO and Ship Masters	• UNDP Standard 8 • IFC PS3 • IMO MARPOL 73/78 • Liberian Standard J.1.2	Monthly	PMU EO	• Documentation • Visual inspection • Water quality monitoring

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
		• Ensure that sewage on-board vessels is collected in specific impervious corrosion-resistant containers. • If vessels equipped with a water closet and certified to carry more than 15 persons are used, ensure they carry a valid International Sewage Pollution Prevention (ISPP) Certificate issued in accordance with MARPOL 73/78 Annex IV. • If sewage from the vessels will be transferred to an onshore sewage treatment facility, ensuring that the sewage is transferred to an EPA certified facility via a suitably designed truck, operated under a valid Environmental Permit issued by the EPA. • Secure a prior agreement with an EPA-certified sewage collector for the disposal before the sewage is discharged from the vessels or barge. • Ensure that the pipes used for discharge from the vessel to the truck, and the receiving flange on the truck, comply with the specifications given in MARPOL 73/78 Annex IV.		• Guideline J.2.20			
7.4.	Pollution due uncontrolled disposal of dredged silt material onshore or offshore and/or	• Develop and implement a Dredging Management Plan (DMP) that includes sediment characterisation, assesses disposal options and locations, and provides measures to manage the	Contractor SM, EO and Ship Masters	• UNDP Standard 8 • IFC PS3 • Liberian Standard J.1.2	Bi-weekly during dredging and disposal of dredged material	PMU EO	• Documentation • Visual inspection • Water Quality Monitoring • Weather Monitoring

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
	contaminated dredged material.	impacts of the dredging and disposal activities (Appendix N). • Choose a disposal site with minimal environmental impact. Factors include water depth, currents, and presence of sensitive habitats. • Avoid ecologically sensitive locations such as rocky seafloor or wetlands, as these are areas with relatively high biodiversity. • Consider using disposal methods that confine the dredged material, such as bottom dumping within designated areas or using containment structures. • Avoid disposal of dredged material during periods of extreme weather conditions and waves. • If necessary, cover the disposed material with clean sediment to prevent contaminant release and minimize impact on biodiversity. • Ensure the contractor is contractually bound to the prevention of pollution from ships.					
8.	**Hazardous material management**						
8.1.	Pollution to air, soil or water and danger (illness or injury) through uncontrolled spills during the storage, handling or delivery of fuel, oil,	• Follow the hazardous materials management guidelines fully. • Use the safest available transportation option. On roads, use convoys with accompanying support. • Deliver only to prepared locations.	Contractor SM, EO and HSO	• UNDP Standard 8 • IFC PS3 • Liberian Standard J.1.1, J.1.2	• Before start of work • Monthly	PMU EO and HSO	• Visual inspection • Documentation

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
	lubricants or other hazardous materials in project sites.	• Use international labelling for identifying hazardous substances. • Use of cement, ready-mix concrete, asphalt, etc. at plants is to be carried out according to strict protocols. • Only use the designated storage areas, with bunding of 150% volume of total capacity. • Only use facilities located down gradient of public water supply boreholes and distant from watercourses. • Ensure that there are retention systems, including walls, bunds, and lined drains to contain any spillage. • Ensure that there is hard standing, with a drainage system that includes oil/water separators. • Maintain supplies of spill kits and granules in all vehicles and at all offloading locations. • Ensure competent drivers and close supervision. • Check facilities, safeguards, and procedures for any potential explosions to occur. • The contractor must prepare and implement an EPRP as per guidelines detailed in Appendix L. The EPRP must be updated regularly, and the workers must be trained in its use. • Enforce the reporting system for spillage incidents.		• Guideline J.2.12, J.2.13, J.2.14, J.2.15, J.2.16, J.2.17			

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
		• Provide emergency training to all personnel involved in the movement and handling of hazardous materials. • Maintain emergency response / fire-fighting teams trained for a spillage event and appropriate equipment at each facility. • Take rapid action if uncontained spills and leakages occur, to prevent soil, and ground and surface water contamination. • Do not allow soil to become contaminated and effectively sterilized, or for water courses to be affected by runoff carrying toxic substances, affecting community water supplies, aquatic biodiversity, and wildlife.					
8.2.	Potential contamination of the marine water through uncontrolled spills of fuel, oil, lubricants or other hazardous materials from vessels.	See Impact no. 9.4	See Impact no. 9.4	See Impact no. 9.4	See Impact no. 9.4	See Impact no. 9.4	See Impact no. 9.4
8.3.	Pollution to air, soil or water and danger (illness or injury) from refuelling operations at project camps, workshops, plants, and construction sites.	• Follow the hazardous materials and refuelling management guidelines fully (J.2.12, J.2.13, J.2.14). • Spill kits are to be carried by all refuelling vehicles. • Refuel vehicles only on impermeable hard standings with controlled drainage (traps and interceptors). • Plant refuelling on site is to be carried	Contractor SM and EO	• UNDP Standard 8 • IFC PS3 • Liberian Standard J.1.1, J.1.2 • Guideline J.2.14	• Before start of work • Monthly	PMU EO	• Visual inspection • Documentation • Sampling of surface water, groundwater and/or soil when accidents occur

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
		out according to strict protocols for refuelling in unprotected areas. • Enforce the reporting system for spillage incidents.					
9.	**Water resources management**						
9.1.	Pollution of surface water (coastal, marine, estuarine, riverine) and/or groundwater by waste, sewage, sediment, oil or chemicals.	• Do not dispose of anything into any kind of water body. • Keep earthworks, work sites, tracks and other cleared areas as far as possible from the sea or other water bodies. • Where earthworks, tracks, roads and other cleared areas are within 50 m of the sea, watercourses or other water bodies, take special care to ensure that fuel, oil and other hazardous substances, and any earthworks, are properly contained. • Designated areas for storage of fuels, oils, chemicals or other hazardous liquids must have compacted impermeable bases and be surrounded by a bund to contain any spillage. Refuelling must be undertaken in areas away from water systems. • Construction materials must not be stockpiled in proximity to surface water where there is any possibility of release into the environment. • Cover stockpiles with tarps or other materials to wind and rain erosion. • Construction equipment must be removed from proximity to surface	Contractor SM and EO	• UNDP Standard 8 • IFC PS3 • Liberian Standard J.1.2 • Guideline J.2.11, J.2.12, J.2.13, J.2.14, J.2.15, J.2.16, J.2.17, J.2.18, J.2.19	• Before starting work • Monthly	PMU EO	• Visual inspection • Documentation • Water quality monitoring

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
		water at the end of each working day or if heavy rainfall is predicted. • Check all vehicles, equipment and material storage areas daily for possible fuel, oil and chemical leaks. • Schedule major earthworks only in the dry season. • Avoid any disturbance to the seafloor during periods of heavy winds and waves in order to limit the dispersion of disturbed sediments. • Consider the use of silt curtains or turbidity barriers, to contain sediment runoff during dredging activities. • Schedule works in stages to ensure that disturbed areas are stabilised progressively and as soon as practicable after completion of works. • Use surface protection measures to control erosion. • Regulate construction site water discharge and runoff using sediment ponds. • Develop and implement site specific measures to address drainage control, sediment and erosion controls and stockpiling of materials during construction. • Ensure that the machines that will be shipped into Liberia for the construction of the protective interventions are certified for use in					

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
		coastal environment and are inspected by the consultant prior to shipping. • The contractor must prepare and implement an EPRP as per guidelines detailed in Appendix L. The EPRP must be updated regularly, and the workers must be trained in its use. • Monitor coastal, estuarine and freshwater surface and groundwater quality routinely.					
9.2.	Increased turbidity and depletion of oxygen in the coastal water from construction, dredging, reclamation, and/or potentially from the disposal of dredged material.	• Cover stockpiles with tarps or other materials to wind and rain erosion. • Avoid any disturbance to the seafloor during periods of heavy winds and waves in order to limit the dispersion of disturbed sediments. • Consider the use of silt curtains or turbidity barriers, to contain sediment runoff during dredging activities and if the dredged material is to be disposed of nearshore • Develop and implement a Dredging Management Plan (DMP) that includes sediment characterisation, assesses disposal options and locations, and provides measures to manage the impacts of the dredging and disposal activities (Appendix N). • Monitor coastal water quality during works.	Contractor SM, EO and Ship Masters	• UNDP Standard 8 • IFC PS3 • Liberian Standard J.1.2 • Guideline J.2.11	Bi-weekly	PMU EO	• Documentation • Visual inspection • Water quality monitoring • Weather monitoring
9.3.	Potential contamination of the ocean water through	• Before starting dredging or nearshore excavation assess the sediment to be	Contractor SM, EO and Ship Masters	• UNDP Standard 8 • IFC PS3	Bi-weekly	PMU EO	• Documentation • Visual inspection

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
	the potential release of contaminants through the mobilisation of potentially contaminated sediments during dredging, reclamation and/or disposal of dredged material.	dredged/excavated to identify or rule out potential hazardous materials. • If hazardous materials were found ensure the contractor prepares and implements a management plan to manage such materials. • Choose dredging methods that minimize disturbance to the marine environment and reduce the release of pollutants into the water. • Avoid any disturbance to the seafloor during periods of heavy winds and waves in order to limit the dispersion of disturbed sediments. • Develop and implement a Dredging Management Plan (DMP) that includes sediment characterisation, assesses disposal options and locations, and provides measures to manage the impacts of the dredging and disposal activities (Appendix N). • Monitor coastal water quality during works.		• Liberian Standard J.1.2 • Guideline J.2.11			• Water quality monitoring • Weather monitoring
9.4.	Potential contamination of the surface water and/or groundwater through uncontrolled spills (fuel, oil, lubricants, cement, paint) from machinery, vehicles, and engines on site due to equipment	• Store hazardous materials in separate containers with secondary containment. • Ensue that containers of hazardous materials are properly labelled and that only waterproof labels are used. • Ensure that hazardous materials storage areas are protected from rain and sea water.	Contractor SM and EO	• UNDP Standard 8 • IFC PS3 • Liberian Standard J.1.2 • Guideline J.2.11	Monthly	PMU EO	• Documentation • Visual inspection • Interviews with site workers • Audit • Water quality monitoring

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
	defects, uncontrolled refuelling activities or improper storage of hazardous materials on site.	• Ensure that water accumulated in hazardous materials storage areas are properly drained. • Maintain supplies of appropriate spill kits capable of containing and absorbing spills wherever fuel, oil and lubricants are stored or handled and used when necessary. • Maintain emergency response / fire-fighting teams trained for a spillage event and appropriate equipment on site. • Ensure that firefighting personnel and spill clean-up personnel are present and at standby before refuelling operations start. • Ensure that all persons dealing with hazardous substances are trained in handling those materials. • Provide emergency training to all personnel involved in the movement and handling of hazardous materials. • Immediately clean up spills and releases. • Ensure that the contractor is contractually bound to follow national regulations and international conventions on the prevention of pollution at sea. • The contractor must prepare and implement an EPRP as per guidelines detailed in Appendix L. The EPRP must be updated regularly, and the workers					

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
		must be trained in its use. • Monitor coastal, estuarine and freshwater surface and groundwater quality routinely.					
9.5.	Potential contamination of the marine water through uncontrolled spills of fuel, oil, lubricants or other hazardous materials from vessels.	• Ensure that all vessels operating on behalf of the Project abide by the relevant MARPOL 73/78 convention provisions and guidelines. • Store hazardous materials in separate containers with secondary containment. • Ensue that containers of hazardous materials are properly labelled and that only waterproof labels are used. • Ensure that hazardous materials storage areas are protected from rain and sea water. • Ensure that water accumulated in hazardous materials storage areas are properly drained. • Ensure that oil water separators are installed on all project vessels. • Ensure that the MARPOL 73/78 Annex 1 provisions on refuelling of ships are applied. • Ensure that all appropriate checks are made and that effective communications between the vessel crews and the refuelling team onshore are established prior to starting the refuelling of vessels, if applicable.	Contractor SM, EO and Ship Masters	• UNDP Standard 8 • IFC PS3 • IMO MARPOL 73/78 • Liberian Standard J.1.2 • Guideline J.2.20, J.2.22	Monthly	PMU EO	• Visual inspection • Documentation • Audit • Water quality monitoring

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
		• The contractor must prepare and implements an EPRP as per guidelines detailed in Appendix J. The EPRP must be updated regularly, and the workers must be trained in its use. • Maintain supplies of appropriate spill kits capable of containing and absorbing spills in water. • Ensure that all vessels operating on behalf of the Project have a full and up to date Oil Record Book. • Ensure that all vessels operating on behalf of the Project have a ship-board oil pollution emergency plan. • Maintain emergency response / fire-fighting teams trained for a spillage event and appropriate equipment on site. • Ensure that all persons dealing with hazardous substances are trained in handling those materials. • Provide emergency training to all personnel involved in the movement and handling of hazardous materials. • Immediately clean spills and releases. • Ensure that the contractor is contractually bound to follow national regulations and international conventions on the prevention of pollution at sea.					
9.6.	Potential contamination of the marine water from	• Ensure that the vessels are equipped with oil-water separators that are	Contractor SM, EO and Ship Masters	• UNDP Standard 8 • IFC PS3	Monthly	PMU EO	• Visual inspection • Documentation • Audit

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
	bilge water and deck runoff from vessels.	compliant with IMO MEPC 107(49) guidelines. • Never allow the discharge of water with oil concentrations above 15 ppm. • Ensure that the bilge water is passed through an oil-water separator before it is pumped overboard. • Ensure the vessels' deck runoff is directed to an oil water separator. • Ensure that the location, volume and timing of discharge of bilge water into the ocean are recorded in the vessels' Oil Record Books. • Requiring that all oil or oil residues are retained onboard and discharged onshore through an EPA-approved waste collector.		• IMO MARPOL 73/78 • Liberian Standard J.1.2 • Guideline J.2.20, J.2.21			• Water quality monitoring
9.7.	Extraction of freshwater resources affects water supply for the communities in the project area.	• Ensure that all community water supplies are safeguarded. Confirm the location of local water supplies before extracting. Be prepared to bring in clean water for communities where the works have polluted their water sources • Do not extract so much water from a supply that the normal users are short.	Contractor EO	• UNDP Standard 8 • IFC PS3	• Before starting work • Monthly	PMU EO	• Visual inspection • Documentation
10.	**Coastal sediment resources management**						
10.1.	Shore and nearshore sediment erosion and deposition change as a result of physical coastal interventions potentially leading to	• The intervention design must take into account the sediment flux regime in the area of intervention. • The contractor must have a clear plan for the management of such changes.	PMU EO	• UNDP Standard 2 • IFC PS1	• Before starting work • Quarterly	PMU PC	• Visual inspection • Documentation • Sediment flux monitoring

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
	erosion and habitat loss - Potential for the Mesurado estuary to act as a sediment sink due to the geomorphological changes of the beach after the interventions.	The plan must be based on a robust marine and estuarine sediment survey. • Develop and implement a Restoration and Rehabilitation Plan (see Appendix O). • Continuously monitor local marine and estuarine sediment transport and adapt mitigation measures accordingly, during construction and after decommissioning.					
10.2.	Potential presence of unexploded ordinances (UXO) in the construction sites causing safety impacts to the workers and the public	• If anything, that looks like a bomb is seen during project activities, stop work immediately. Clear the area and notify the supervisor. • The incident should be reported to the Armed Forces of Liberia (AFL). • Activities may be resumed once clearance is received from AFL. • Conduct awareness training with project employees and workers on measures to be implemented in case an UXO is found.	Contractor SM and HSO	• UNDP Standard 2 • IFC PS1	Throughout the project	PMU HSO	• Walkover visual inspections • Interviews with workers
10.3.	Illegal sand mining activities along the West Point beach destabilising the revetment wall, causing more erosion and increasing the risk of flooding from the ocean.	• The Integrated Coastal Zone Management (ICZM) that is to be prepared under Output 2 of the Project must include provisions for the prevention and mitigation of illegal sand mining activities along the coast, such as: ○ measures for strengthening and enforcing the relevant Liberian policy and regulations	PMU EO and SGO	N/A	• Before staring work • Quarterly	PMU PC	• Documentation • Visual inspection

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
		○ conducting awareness campaigns and engagement of the community and the construction industry in the monitoring and enforcement ○ ensuring sustainable livelihoods alternatives for sand miners ○ imposing strict penalties for those involved in illegal sand mining • Measures indicated by the ICZM must be implemented and enforced along the beach in West Point.					
11.	**Soil and land resources management**						
11.1.	Soil contamination occurs as a result of project activities or poor waste management.	• The contractor must prepare and implements an EPRP as per guidelines detailed in Appendix J. The EPRP must be updated regularly, and the workers must be trained in its use. • If contamination is suspected (outside of the project footprints), undertake a site contamination investigation, activate management procedures and obtain advice, permits and approval (as required). • Adhere to best practice for the removal and disposal of contaminated soil/ material from site (if required), including contaminated soil within the project footprints. • Ensure that drainage control measures for runoff do not come in contact with contaminated areas (including contaminated material within the	Contractor SM and EO	• UNDP Standard 8 • IFC PS3 • Guideline J.2.12, J.2.13, J.2.14, J.2.15, J.2.16, J.2.17, J.2.18, J.2.19	• Before start of work • Monthly	PMU EO	• Visual inspection • Documentation • Sampling of soil when accidents occur

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
		project footprints) but are instead directed/diverted to stable areas for release. • Avoid importing fill that may result in site contamination and lacks accompanying certification or documentation. • Apply mitigation measures for waste management and hazardous materials management above.					
11.2.	Disposal of excess soil or silt leads to damage to land at the disposal site.	• Soil removed from excavations and dredged material is to be beneficially reused. • Excess soil and dredged material should be tested to confirm suitability for proposed use. • Develop and implement a DMP that includes sediment characterisation, assesses disposal options and locations, and provides measures to manage the impacts of the disposal activities Appendix N). • Choose a disposal site with minimal environmental impact. • Avoid ecologically sensitive locations such as wetlands, as these are areas with relatively high biodiversity. • Avoid disposal of soil and silt material during periods of extreme weather conditions. • If necessary, cover the disposed material with clean soil to prevent	Contractor SM and EO	• UNDP Standard 8 • IFC PS3 • Guideline J.2.18	• Before start of work • Monthly	PMU EO	• Visual inspection • Documentation

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
		contaminant release and minimize impact on biodiversity.					
12.	**Air quality management, including GHG emissions**						
12.1.	Dust and other emission levels at sensitive receptors increase due to construction and transportation activities.	• Implement effective dust management measures in all areas during construction and operation. • Do not allow dust generation to affect the ambient air quality outside the site. • Restrict speeds on roads and access tracks. Enforce strict speed limits on earth tracks by placing speed bumps. • Enforce dust control measures during the dry season. • Stop work in very windy, dry weather. • Locate material stockpile areas as far as practicable from sensitive receptors. Cover if appropriate. • Spray water onto dry earth surfaces and stockpiles, if possible • Rubbish receptacles should be covered and located as far as practicable from sensitive locations.	Contractor SM and EO	• UNDP Standard 8 • IFC PS3 • Liberian Standard J.1.1	Monthly	PMU EO	• Visual inspection • Documentation • Air quality monitoring
12.2.	Increase in local air pollution from vehicle and machinery emissions.	• Use only vehicles, equipment and vessels with engines that comply with national emissions standards. • Ensure vehicles and machines are switched off when not in use. • Ensure only vehicles required to undertake works are operated on site. • Ensure all construction vehicles, ships, plant and machinery are maintained vessels operated in accordance with	Contractor SM and EO	• UNDP Standard 8 • IFC PS3 • Liberian Standard J.1.1	Monthly	PMU EO	• Visual inspection • Documentation • Air quality monitoring

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
		design standards and specifications. • Locate storage areas for vehicles, ships, plant and equipment as far as practicable from sensitive locations. • Direct exhaust emissions of mobile plant away from the ground. • Ensuring that if engines with a power output of more than 130 kW are used in vessels, they should be of a standard quality and have a valid Engine International Air Pollution Prevention (EIAPP) Certificate.					
13.	**Noise and vibration management**						
13.1.	Nuisance and health risk from increased ambient noise and vibration from construction activities and the operation of vessels, machinery, vehicles, and generators on site.	• Use good quality quiet engines, generators, and machinery to the extent possible and maintain them regularly to avoid excessive noise and vibration. • Operate vehicles and vessels at the minimum necessary speed. • Ensure that the exposure of the workers and personnel to vibrations is within the safe time limits for the level of vibration that they are exposed to, by allowing them to take rest times off as needed. • Provide the crews and personnel with noise cancelling headphones when performing activities resulting in noise-exceeding standards.	Contractor SM, EO and Ship Masters	• UNDP Standard 3, 7 • IFC PS 2, 4 • Liberian Standard J.1.3, J.1.4	Monthly	PMU EO	• Documentation • Visual inspection • Noise monitoring

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
		• Avoid operations at night as far as possible, to avoid potential disturbance to fishermen and local communities. • Ensure that the project has a Grievance redress mechanism (GRM) in place, implemented and known to the public. • Ensure that the Contractor has an internal GRM for employee grievances.					
13.2.	Increased noise and vibration in the ocean due the operation of dredgers disturbing marine fauna.	• Select vessels with quieter engines, generators, and other onboard machinery and maintain them regularly to avoid excessive noise and vibration. • Consider the use of dredging methods that produce lower noise levels, such as hopper dredges compared to suction dredges, if possible. • Utilize dredging equipment with noise reduction features like bubble curtains or shrouds around dredge heads. • Gradually increase engine power and dredging power to allow marine life to move away from the noise source. • Control the disposal of dredged material to minimize the spread of noise and vibrations.	Contractor SM, EO and Shop Masters	• UNDP Standard 1 • IFC PS 6	Bi-weekly	PMU EO	• Documentation • Visual inspection • Interviews with site workers • Audit
13.3.	Nuisance from increased noise or vibration from traffic movement to and from the site.	• Maintain vehicles in good working order. • Minimize vehicle movement as far as practicable. • Enforce strict speed limits on earth tracks by placing speed bumps. • Limit activities to daytime as far as practicable.	Contactor SM and EO	• UNDP Standard 3, 7 • IFC PS 2, 4 • Liberian Standard J.1.3, J.1.4	Monthly	PMU EO	• Documentation • Visual inspection • Noise monitoring

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
		• Maintain roads in good condition (smooth surfaces) to minimize vibration. • Do not allow vehicles to remain idling. • Ensure that the project has a Grievance redress mechanism (GRM) in place, implemented and known to the public.					
14.	**Flora and fauna protection**						
14.1.	Removal, direct physical damage or alteration to beach, intertidal and/or habitats/species through excavation and/or dredging, and/or to spawning grounds/nurseries by smothering through dredging and disposal of dredged material offshore or to terrestrial habitats due to in land disposal of dredged materials	• Limit vegetation clearing and minimise habitat disturbance through adequate protection and management of retained vegetation. • Ensure that all site personnel are made aware of sensitive fauna/habitat areas and the requirements for the protection of these areas and species. • Minimise the excavation and dredging activities to the extent possible. • Choose excavation and dredging methods that minimize sediment disturbance. • Rehabilitate and restore disturbed habitats through beach nourishment. • Select disposal sites for dredged material with minimal ecological significance. • If dredged material is to be disposed of offshore, avoid locations with rocky seafloor, as these are areas with relatively high biodiversity. • Develop and implement a DMP that includes to assesses disposal options	Contractor SM, EO and Ship Masters	• UNDP Standard 1 • IFC PS 6 • Liberian Standard J.1.5	Monthly	PMU EO	• Visual inspection • Documentation

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
		and locations and provides measures to manage the impacts of the disposal activities (Appendix N). • The DMP must include a study of habitats within the designated dredging area and disposal site to understand existing biodiversity. • The DMP must outline measures to effectively manage and monitor the potential impacts of dredging activities and dredged material disposal on the habitats and marine species. • Develop and implement a Restoration and Rehabilitation Plan (see Appendix O).					
14.2.	Lighting at night attracts birds and fish and leads to potential physical hazards to these species.	• Avoid working at night as far as possible, so as to limit the use of lights. • Ensure that light use is minimal. • Prohibit the use of projector lights and use the lowest intensity of light appropriate for the task. • Use adaptive light controls to manage light timing, intensity and colour. • Use lights with reduced or filtered blue, violet and ultra-violet wavelengths. • Install lights on a low level, only lighting the object or area intended to be lit, to avoid light spill.	Contractor SM and EO	• UNDP Standard 1 • IFC PS 6 • Liberian Standard J.1.5	Monthly	PMU EO	• Documentation • Visual inspection
15.	**Visual amenity**						
15.1.	Degradation of visual amenity through the disruption of the	• Use natural materials and design low-profile structures to blend with the environment.	Contractor SM and EO	• UNDP Standard 1 and 4	Monthly	PMU EO	• Documentation • Visual inspection

Potential impact and cause		Mitigation measure	Responsibility for implementation	Standard to be met and/or guideline	Monitoring of mitigation measure implementation		
					Check timing	Responsibility for checking	Assessment method
	natural landscape, obstruction of ocean view affecting the overall recreational appeal, and cultural significance of the area.	• Landscape with native vegetation to soften the appearance and restore natural aesthetics. • Incorporate curved or organic forms to harmonize structures with natural surroundings. • Add public amenities like walkways and viewpoints to enhance visual appeal. • Maintain the structures regularly to prevent deterioration and debris accumulation. • Minimize lighting to reduce light pollution and visual disturbance. • Position structures strategically to avoid obstructing key viewpoints and scenic areas, to the extent possible.		• IFC PS1 and 8			

11.5 ENVIRONMENTAL AND SOCIAL MONITORING PLAN

The monitoring plan is an integral part of the ESMP. It ensures that the legal obligations and the environmental and social safeguards identified as necessary in the impact management and mitigation sections (Section 11.4.2) are all satisfactorily complied with, so as to reduce the impact of the Project on the environment and people.

There are two aspects to the monitoring exercise: compliance monitoring and impact detection monitoring, further described in the subsections below.

11.5.1 Objectives of the Environmental and Social Monitoring Plan

The main objectives of environmental monitoring are to:

- Assess the changes in environmental and social conditions.
- Monitor the effective implementation of mitigation measures described in Section 11.4.2.
- Indicate potential problems in order to allow prompt implementation of effective corrective measures, so as to minimize the negative impacts generated.

Monitoring will be particularly important where:

- Environmental impacts cannot be estimated with suitable certainty.
- The efficiency of mitigation measures is uncertain.
- Impacts on the socio-economic environment are expected, or health and safety issues need to be addressed.

11.5.2 Compliance Monitoring

The PMU is responsible for ensuring compliance of project activities with the mitigation measures, reference standards and guidelines set out in the mitigation and monitoring matrix of this ESMP (Table 11-1). This must be performed continuously throughout the life of the Project.

The PMU's monitoring is applied through:

- Continuously monitoring the implementation of the control and mitigation measures set out in this ESMP.
- Adopting remedial action and further mitigation and control measures when deemed necessary.

- Continuously testing and measuring project compliance with reference standards and guidelines.
- Record keeping of all environmental, social and OHS aspects of the Project. These include, but are not limited to, incident records, maintenance records of generators, equipment and vehicles, quantity and quality records for waste produced and disposed of by the Project, community or employees' complaints records, and internal and external grievance records. A simple form for incident monitoring is suggested in Table 11-2. It shows the overall trends in performance and allows senior management to determine if the Project's environmental, social and health and safety compliance is improving or degrading.

Table 11-2 Suggested yearly incident monitoring indicator comparison table

Category of impacts		Number of incidents											
		2023											
		Q1			Q2			Q3			Q4		
		M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
1.	General Environmental Impacts												
2.	Impacts on communities												
3.	Impacts on Environmental Health and Safety												
4.	Impacts on Occupational Health and Safety												
5.	Impacts from Labour and Working Conditions												
6.	Impacts on Cultural Heritage												
7.	Impacts from Waste												
8.	Impacts from Hazardous Materials												
9.	Impacts on Water Resources												
10.	Impacts on Coastal Sediment Resources												
11.	Impacts on Soil and Land Resources												
12.	Impacts on Air Quality and Climate												
13.	Impacts from Noise and Vibration												
14.	Impacts on Fauna and Flora												
15.	Impacts on Visual Amenity												
Legend: M: Month, Q: Quarter													

11.5.3 Impact Detection Monitoring

Impact detection monitoring includes periodic sampling and audit exercises to assess the impact of the Project's operations on the environment, human health and safety and social aspects, and to ensure progress towards minimizing the negative impacts generated.

When an environmental and/or social impact is spotted, efforts must be made to:

- Identify the most probable cause.
- Verify the proper implementation of the specified mitigation measures.
- Review the capacity of staff to implement mitigation measures effectively.
- Review the effectiveness of environmental management and monitoring measures and propose alternative actions as appropriate.
- Increase the monitoring frequency to assess the effectiveness of remedial measures.
- Verify the proper implementation of good housekeeping practices.

11.5.4 Environmental and Social Monitoring Program

The environmental and social monitoring program (Table 11-3) has been developed to cover both compliance monitoring and impact detection monitoring. It includes details on the monitoring of weather data, soil quality, sediment deposition, groundwater quality, surface water quality, air quality, noise and vibration, solid waste produced by the project, society – including employees, handling of fuel, and health and safety.

The monitoring plan shall be strictly implemented without ignoring any of the details in Table 11-3. An independent third party (ITP) consultant must be responsible for the overall implementation of the monitoring in close coordination with the PMU. Quarterly monitoring reports and yearly environmental, social and health and safety audits must be issued, as described in Section 11.6.

The environmental and social monitoring program may need to be revised and updated throughout the lifetime of the Project, as detailed in Box 11-1.

Box 11-1 Revising and updating the Environmental and Social Monitoring Program

When to Revise and Update the Environmental and Social Monitoring Program

- Throughout and/or after a year of monitoring, covering a dry and a rainy season.
- When there are organizational reforms in the Project.
- When project design or activities are updated or changed, including additional facilities.
- When operational procedures are updated or changed.

Table 11-3 Environmental and Social Monitoring Program

Monitoring activity	Equipment or method	Parameter	Location	Phase*	Duration and time of day	Frequency	Responsibility	Cost (USD)
Weather data								
Monitoring of Meteorological Parameters	Weather station	• Rain • Wind speed • Wind direction • Humidity • Temperature • Solar radiation • UV index	On site, near the planned office location or in a suitable location within the West Point Township	C-O-D	Continuous	Continuous	PMU	USD 10,000
Soil and Sediment								
Quality Routine Monitoring	Sampling and laboratory analysis	As per the baseline parameters in Table 6-8	Two samples: • 1 along the West Point Coastline • 1 from sediments North of the revetment on the estuary side	C	N/A	Quarterly	ITP Consultant, supported by PMU Env. Officer	USD 6,400 per year (USD 1,600 per round at USD 800 per sample)
				O - D	N/A	Bi-annually	ITP Consultant, supported by PMU Env. Officer	USD 3,200 per year (USD 1,600 per round at USD 800 per sample)
Erosion and sediment influx	Visual inspection, photographic documentation, and audit	Signs of erosion and sediment deposition	• Along the revetment structure • North of the revetment near the swamp • Mesurado estuary • Mesurado River	C-O-D	N/A	Quarterly	PMU technical engineer and env. officer	Should be part of the PMU operational cost
Erosion and sediment influx	Surveys such as Bathymetric surveys, Remote sensing and LIDAR	Signs of erosion and sediment deposition	Along the coastline and the Mesurado estuary and River	O-D	N/A	Yearly	ITP Consultant	TBD based on type of survey and consultant

Monitoring activity	Equipment or method	Parameter	Location	Phase*	Duration and time of day	Frequency	Responsibility	Cost (USD)
Quality In case of spill, contamination, or complaints	Sampling and laboratory analysis	As per the baseline parameters in Table 6-8 with added parameters depending on contamination type	Depending on the location of contamination/ complaint	C-O-D	N/A	Depending on severity of contamination	ITP Consultant, supported by PMU Env. Officer	TBD based on contamination event @ approx. USD 1,100 per sample.
Groundwater quality								
Quality Routine monitoring	Sampling and laboratory analysis	As per the baseline parameters in Table 6-5	1 borehole at West Point township	C	N/A	Quarterly	ITP Consultant, supported by PMU Env. Officer	USD 4,400 per year (USD 1,100 per round (per sample))
Quality In case of spill, contamination or complaints	Sampling and laboratory analysis	As per the baseline parameters in Table 6-5 with added parameters depending on contamination type	Depending on the location of contamination/ complaint	C	N/A	Depending on severity of contamination	ITP Consultant, supported by PMU Env. Officer	TBD based on contamination event @ approx. USD 1,500 per sample.
Surface water quality & level								
Quality Routine monitoring	Sampling and laboratory analysis	As per the baseline parameters in Table 6-5	At least 3 samples: • Offshore opposite the West Point Coastline • At the Mesurado estuary mouth • At the Mesurado River	C	N/A	Quarterly	ITP Consultant, supported by PMU Env. Officer	USD 13,200 per year (USD 3,300 per round at USD 1,100 per sample)
				O-D	N/A	Bi-annually	ITP Consultant, supported by PMU Env. Officer	USD 6,600 per year (USD 3,300 per round at USD 1,100 per sample)
Quality and Level Routine monitoring	Multi parameter in-situ water quality probe	• Water level • pH / ORP • Temperature • Conductivity • Dissolved oxygen • Turbidity	• At the fish landing site 01 • At the north of the revetement near the swamp	C-O-D	Continuous	Continuous	ITP Consultant, supported by PMU Env. Officer	USD 30,000 @ USD 15,000 per device

Monitoring activity	Equipment or method	Parameter	Location	Phase*	Duration and time of day	Frequency	Responsibility	Cost (USD)
Quality In case of spill, contamination or complaints	Sampling and laboratory analysis	As per the baseline parameters in Table 6-5 with added parameters depending on contamination type	Depending on the location of contamination/ complaint	C	N/A	Depending on severity of contaminatio n	ITP Consultant, supported by PMU Env. Officer	TBD based on contamination event @ approx. USD 1,500 per sample.
Air quality								
Routine monitoring (*Duration is based on the shortest standard available to compare with, and could change accordingly)*	Handheld monitor Aeroqual S500 or similar with different sensors	• CO • CO_2 • NO_2 • SO_2 • VOC • CH_4 • PM10 • PM2.5 • H_2S	At all active working sites and nearby receptors	C	10 mins to 1 hour depending on the parameter and available stanadard	Monthly	ITP Consultant, supported by PMU Env. Officer	USD 20,000 for equipment and sensors cost
In case of complaints	Handheld monitor Aeroqual S500 or similar with different sensors	Depending on the complaint	Depending on the complaint location	C-D	Depending on the complaint	Depending on the findings	ITP Consultant, supported by PMU Env. Officer	To be determined based on complaint
Noise and vibration								
Routine monitoring	Noise & Vibration meter	• Lmin • LAeq • Lmax	At all active working sites and nearby receptors	C	24 hours Or at least 1-hour daytime and 1-hour night-time	Monthly	ITP Consultant, supported by PMU Env. Officer	USD 15,000 for equipment and sensors cost
In case of complaint	Noise & Vibration meter	• Lmin • LAeq • Lmax	Depending on the complaint location	C-D	Depending on the complaint	Depending on the findings	ITP Consultant, supported by PMU Env. Officer	To be determined based on complaint

Monitoring activity	Equipment or method	Parameter	Location	Phase*	Duration and time of day	Frequency	Responsibility	Cost (USD)
Solid Waste Produced by the Project								
Solid waste generation and disposal	• Visual inspection • Photographic documentation • Audit	Waste minimization, proper segregation, and disposal of waste	Project site	C-O	N/A	Monthly	• Contractor during construction • PMU Env. Officer during Operation	Under construction and operational cost
Handling of fuel								
Fuel offloading, storage and dispensing Oil-water separators	• Visual inspection • Photographic documentation • Audit	• Proper fuel offloading from tankers into fuel tanks • proper refueling activities, proper maintenance of facilities • Adequate equipping with spill kits and firefighting equipment • Proper maintenance of oil-water separators and bunds	• Fuel storage areas • Refueling areas • Workshop • Vehicle washing station	C-O	Not applicable	Monthly and random spot checks	• Contractor during construction • PMU Env. Officer during Operation	Under construction and operational cost

Monitoring activity	Equipment or method	Parameter	Location	Phase*	Duration and time of day	Frequency	Responsibility	Cost (USD)
Society, including employees								
Stakeholder engagement and grievance redress/ community relations	• Documentation (stakeholder engagement matrix and grievance records) • Photographic documentation • Interviews with communities	• Information • Publicity • Consultation • Engagement • Grievance redress Mechanism	Communities in the SAI	Not applicable	Not applicable	Quarterly	Contractor's SGO	Under operational cost
Community health and safety	• Documentation (medical reports, accident reports, GRM) • Interviews with communities and health workers • Audit	• Infectious and contagious disease • HIV/AIDS • Waterborne disease • Injuries (minor, medium and major) and deaths from accidents caused by the Project	Communities in the SAI	Not applicable	Not applicable	Quarterly	Contractor's SGO	Under operational cost
Influx management	• Visual inspection • Photographic documentation • Interviews with workers and communities • Grievance records	• Influx size and management • Worker behavior management • Accommodation of workers	• Communities in the SAI • Project site	Not applicable	Not applicable	Quarterly	Contractor's SGO	Under operational cost

Monitoring activity	Equipment or method	Parameter	Location	Phase*	Duration and time of day	Frequency	Responsibility	Cost (USD)
Labour and working conditions	• Visual inspection • Photographic documentation • Documentation (Contracts, internal grievances) • Interviews with workers and communities	• Employment conditions • Working conditions • Women rights and SGBV • Social inclusion	• Communities in the SAI • Project site	Not applicable	Not applicable	Quarterly	Contractor's SGO	Under operational cost
Health and safety								
Routine monitoring	• Visual inspection • Photographic documentation • Audit and review	Proper use of PPE, presence of safety signs, first aid kit, spill kit and firefighting equipment, Injury, incident and accident records	At all active working sites and nearby receptors	C	N/A	Monthly	Contractor and PMU Env. Officer	Under construction and operational cost

* Phases: C = Construction, O = Operation, D = Decommissioning

11.6 ENVIRONMENTAL AND SOCIAL REPORTING

11.6.1 Environmental and Social Reporting by the Contractor

The Contractor must establish an ESMS. The Contractor must also develop their C-ESMP for the Project, as well as an OHSP, EPRP, WMP, DMP, and LMP (see Section 11.7).

In order to ensure the effectiveness of the environmental and social monitoring plan, monthly environmental and social monitoring reports will be prepared by the Contractor. These reports will be sent to the PMU for review and approval, and then to UNDP for review.

11.6.2 Environmental and Social Reporting by an Independent Third Party

An independent third party (ITP) consultant, who holds an Environmental Evaluator license from the EPA, will prepare quarterly monitoring reports that will present the results of monitoring activities and assess the adequacy and the needs for improvement of environmental mitigation measures. These quarterly monitoring reports will be reviewed and approved by the PMU Officers and presented to the EPA.

Every year, an integrated environmental, social and health and safety audit should be carried out by an ITP auditor. This Audit will present the results of the monitoring activities carried out throughout the Project, evaluate the adequacy of environmental control measures, and to assess compliance with the Project's environmental permit, C-ESMP and other plans. This report will be reviewed and approved by the PMU and sent to the EPA.

11.6.3 Environmental and Social Reporting by the PMU

The PMU will review and approve the monthly environmental and social monitoring reports issued by the Contractor, the quarterly monitoring reports issued by the ITP consultant, and the yearly audit issued by the ITP auditor.

A compilation of the reports mentioned in Sections 11.6.1 and 11.6.2 must be sent to UNDP every six months (or every year during the decommissioning phase), as part of the overall progress reports.

Each monitoring report submitted to UNDP must contain the following:

- Observations of the visual inspection, the photos, and the documentation of the implementation, of or non-compliance, with all the mitigation measures listed in this ESMP.
- Reports of the interviews held with the professional and technical staff, as well as those held with community members.

- Reports of the environmental monitoring and sampling operations for the various media (air, noise, water quality, etc.). Sampling reports must include sampling locations, conditions, methodologies, equipment, adequate standards, results and analysis.
- Actions that must be undertaken in order to correct non-compliance or events of exceeded standards, when they occur.

In case of complaints, non-compliance and/or relevant EPA and UNDP standards and guidelines being exceeded, notifications will be issued to the Contractor in order to take specific immediate corrective actions.

11.7 ENVIRONMENTAL AND SOCIAL ACTION PLAN AND BUDGET

The main environmental and social actions that must be implemented and documents that must be developed by the PMU and the Contractor are listed in Table 11-4, along with the responsible entity and approximate cost. The PMU must ensure that these are completed or in place before the relevant work can begin.

Costs include one-time costs for development of plans and management systems, cost of environmental reporting per report and cost of environmental monitoring and sampling per year.

Table 11-4 Environmental and social action plan and budget

No.	Item	Responsibility	Approximate cost (USD)
Before activities begin			
1.	Project Environmental and Social Management System (ESMS)	PMU	30,000
2.	Contractor's Environmental and Social Management System (ESMS)	Contractor	30,000
3.	Contractor's Environmental and Social Management Plan (C-ESMP)	Contractor	60,000
4.	Emergency Preparedness and Response Plan (EPRP) (as per guidelines in Appendix L)	Contractor	45,000
5.	Waste Management Plan (WMP)	Contractor	40,000
6.	Waste Management Plan for vessels	Contractor	25,000
7.	Dredging Management Plan (DMP) (as per guidelines in Appendix N)	Contractor	150,000
8.	Occupational Health and Safety Plan (OHSP) (as per guidelines in Appendix M)	Contractor	40,000
9.	Project Grievance Redress Mechanism (GRM)	PMU	Under PMU operational cost
10.	Internal Grievance Redress Mechanism (GRM)	Contractor	Under Contractor operational cost
11.	Labour Management Plan (LMP)	Contractor	30,000
12.	Traffic Management Plan	Contractor	30,000

No.	Item	Responsibility	Approximate cost (USD)
13.	Stakeholder Engagement Plan (SEP)	PMU	Under PMU operational cost
14.	Livelihood Restoration Plan (LRP)	PMU	40,000
Throughout the Project			
15.	Monitoring Equipment Cost – initial set-up (*Includes 2 multiparameter water monitoring probes, 1 noise level meter, 1 handheld gas monitoring device, and 1 weather station. Does not include cost of calibration, sensor or equipment replacement*)	PMU	75,000
16.	Regular environmental sampling for soil and sediment and water quality (*Does not cover contingency cost in case of spill or complaint)*	ITP	25,000 / year
17.	Regular environmental surveys for water flows, sediment drift, erosion and deposition	ITP	*To be determined*
18.	Monthly environmental and social monitoring reports	Contractor	6,000 / report
19.	Quarterly monitoring reports	ITP	7,500 / report
20.	Yearly environmental, social, and health and safety audit	ITP	30,000 / report
21.	Bi-annual progress reports to UNDP	PMU	Under PMU operational cost
Before decommissioning			
22.	Restoration and Rehabilitation Plan	Contractor	50,000

12 REFERENCES

Acorn Intl. and Earthtime Inc., 2014. Environmental and Social Impact Assessment for Block LB-13 Exploratory Drilling Program, Offshore Liberia. ExxonMobil Exploration and Production Liberia.

Anthony, 1991. Beach-ridge plain development: Sherbro Island Sierra Leone. Z. Geomorphologie NF Supplement, 81, 85-98.

Arcelor Mittal Liberia, 2013. Environmental Appraisal of the Transhipment of Iron Ore Offshore from the Port of Buchanan.

Bakun, 1978: Guinea Current Upwelling. *Nature,* 271, 147-150.

Binet and Marchal, 1995. The large marine ecosystem of shelf areas in the Gulf of Guinea: Long-term variability induced by climatic changes. In Larges Marine Ecosystems: stress, mitigation and sustainability. Ed: Sherman K., Alexander L.M., Gold B.D. AAAS Publication.

Binet, 1997. Climate and Pelagic Fisheries in the Canary and Guinea Currents 1964-1993: The Role of Trade Winds and the Southern Oscillation. *Oceanologia Acta,* 20, 177-190.

Bird (ed.), 2010. Liberia. In Encyclopedia of the World's Coastal Landforms, Chapter 13.6. Springer.

BirdLife International, 2014. Country profile: Liberia. http://www.birdlife.org/datazone/country/liberia, retrieved on September 27, 2024.

BirdLife International, 2019. Country profile: Liberia. http://www.birdlife.org/datazone/country/liberia, retrieved on March 07, 2019.

Bolton, De Clerck and John, 2013. Seaweed Species Diversity in Sub-Saharan Africa.

Brandolini and Tigani, 2006. Liberia Environmental Profile. December 2006, Monrovia.

Brighten Development and Lanka Hydraulic Institute LTD (LHI). 2024. Consultant Services to Conduct a Hydro-Engineering Study and Prepare a Detailed Design for a Coastal Protection Structure In West Point, Monrovia, Liberia. Detailed Design Report.

Brighten Development FZE & UNDP, 2023. Consultancy Services to Conduct a Hydro-Engineering Study and Prepare a Detailed Design for a Coastal Protection Structure in West Point, Monrovia Liberia, E5. Construction Plan Report.

Brighten Development, 2023. Consultancy Services to Conduct a Hydro-Engineering Study and Prepare a Detailed Design for a Coastal Protection Structure in West Point, Monrovia Liberia, E2. Data Collection Report.

Castro and Huber, 2005. Marine Biology. 5th Edition, published by McGraw-Hill Co.

CDR International, 2018. Provision of Consultancy Services for Engineering and Safeguards Assessment of Proposed Interventions in the Coastal Areas of the Monrovia Metropolitan Area (MMA) in Liberia, Inception Report.

CDR International, 2019. Provision of Consultancy Services for Engineering and Safeguards Assessment of Proposed Interventions in the Coastal Areas of the Monrovia Metropolitan Area (MMA) in Liberia, Revised Interim Report.

CDR International, 2019b. Provision of Consultancy Services for Engineering and Safeguards Assessment of Proposed Interventions in the Coastal Areas of the Monrovia Metropolitan Area (MMA) in Liberia, Part II: Feasibility Report.

Colin, 1988. Coastal Upwelling Events in Front of Ivory Coast during the FOCAL program. O*ceanologia Acta*, 11, 125-138.

Earthquake Track. (2022). *Recent Earthquakes Near Liberia*. https://earthquaketrack.com/p/liberia/recent.

Earthquakes.Zone. (2022). https://earthquakes.zone/liberia.

Earthtime Inc. and CDR International, 2019. Environmental and Social Assessment Report. Proposed Interventions in the Coastal Areas of the Monrovia Metropolitan Area (MMA) in Liberia.

Earthtime Inc., 2015. Environmental and Social Impact Assessment for Heavy Fuel Oil Transport and Storage, Bushrod Island. Liberia Accelerated Electricity Expansion Project (LACEEP).

Environment Protection Agency of Liberia. (2022). 2021 Revised Environmental and Social Impact Assessment / Strategic Environmental Assessment (ESIA/SEA) Procedural Guidelines. Instrument no. EPA/003/03-22.

Environmental Justice Foundation (EJF), 2012. Liberian Fishing Communities: Problems and Solutions.

Environmental Protection Agency of Liberia (EPA). (2009). *Environment Protection and Management Law- Air Quality & Standards Regulations.*

Environmental Protection Agency of Liberia (EPA). (2017). *Environment Protection and Management Law- Noise Pollution Control & Standards Regulations*.

Environmental Protection Agency of Liberia (EPA). (2018). *Water Quality Regulations of Liberia, DRAFT.*

Front Page Africa, 2017. NHA, UN-Habitat Partner to Improve Living Conditions of Monrovia Slums. https://frontpageafricaonline.com/news/2016news/nha-un-habitat-partner-to-improve-living-conditions-of-monrovia-slums/, retrieved on February 19, 2019.

Gage and Tyler, 1991. Deep Sea Biology. A Natural History of Organisms at the Deep-Sea Floor. Cambridge University Press, 504 pp.

Gatter, 1997. Birds of Liberia. Yale University Press, New Haven, USA.

Government of Liberia (GoL), 2003. Liberia's 1st National Biodiversity Strategy and Action Plan (NBSAP).

Government of Liberia. (2019). Liberia's Second Phase National Action Plan. In *www.gnwp.org*. https://gnwp.org/wp-content/uploads/Liberia-NAP-2-2019-2023.pdf

Green and Short, 2003. World Atlas of Seagrass. Prepared at UNEP World Conservation Monitoring Center. University of California Press, Berkley, USA.

Guilbert, K. (2016) Lack of FGM ban in domestic viwww.reuters.com law fails Liberia's girls, activists say | Reuters, www.reuters.com. Available at: https://www.reuters.com/article/us-liberia-fgm-idUSKCN10728F (Accessed: 24 July 2024).

Gyory, Bischof, Mariano and Ryan, 2008. The Guinea Current - CIMAS. http://oceancurrents.rsmas.miami.edu/atlantic/guinea.html, retrieved on February 20, 2019.

Hawkes, Broderick, Coyne, Godfrey, López-Jurado, López Suarez, Merino, Varo-Cruz and Godley, 2006. Phenotypically Linked Dichotomy in Sea Turtle Foraging Requires Multiple Conservation Approaches. Current Biology, 16: 990-995.

Hoeksema and Cairns, 2019. World List of Scleractinia. Lophelia pertusa (Linnaeus, 1758). Accessed through: World Register of Marine Species. http://www.marinespecies.org/aphia.php?p=taxdetails&id=135161, retrieved on February 25, 2019.

Ingham, 1970. Coastal Upwelling in the Northwestern Gulf of Guinea. Bulletin of Marine Science, 20, 1-34.

Institute for Health Metrics and Evaluation (IHME), 2021. Liberia, What Causes the Most Deaths? http://www.healthdata.org/liberia retrieved on July 24, 2021.

International Finance Corporation (IFC), 2012a. Guidance Note 7: Indigenous Peoples.

International Finance Corporation (IFC), 2012b. Performance Standard 7: Indigenous Peoples.

International Finance Corporation (IFC). (2007). Environmental, Health, and Safety Guidelines for Waste Management Facilities.

Invasive Species Specialist Group., 2024. Global Invasive Species Database. http://www.iucngisd.org/gisd/

IUCN 2024. The IUCN Red List of Threatened Species. Version 2024-1. https://www.iucnredlist.org

Japan International Cooperation Agency (JICA). 2009. The Master Plan Study on Urban Facilities Restoration and Improvement in Monrovia. The Republic of Liberia. Monrovia, Liberia.

Le Loeuff and von Cosel, 1998. Biodiversity patterns of the marine benthic fauna on the Atlantic coast of tropical Africa in relation to hydroclimatic conditions and paleogeographic events.

Liberia COVID: 2,099 Cases and 85 Deaths - Worldometer. (2022). www.worldometers.info. https://www.worldometers.info/coronavirus/country/liberia/

Liberia Institute of Statistics & Geo-Information Services (LISGIS). (2017). *Household Income and Expenditure Survey 2016 Statistical Abstract*.

Liberia Institute of Statistics and Geo-Information Services (LISGIS), 2016, 2014/2015 Household Income and Expenditure Survey.

Liberia Institute of Statistics and Geo-Information Services (LISGIS), 2022. 2022 Population and Housing Census, Results.

Liberia Institute of Statistics and Geo-Information Services (LISGIS), 2021, 2019/2020 Household Income and Expenditure Survey.

Liberia Institute of Statistics and Geo-Information Services, Ministry of Health, & The DHS Program ICF. (2021). Demographic and Health Survey. In *www.dhsprogram.com*. https://dhsprogram.com/pubs/pdf/FR362/FR362.pdf

Longhurst, 1962. A Review of the Oceanography of the Gulf of Guinea. Bulletin of the African Institute of Basic Research, 24, 633-663.

Longhurst, 1963. The Bionomics of the Fisheries Resources of the Eastern Tropical Atlantic. Fish. Publ. Colon. Off. London, (20): 66p.

Martos, Yraola, Peralta and Jimenez, 1991. The Guinea 90 Survey. Food Agriculture Organization of the United Nations. http://www.fao.org/docrep/003/u1509e/U1509E00.htm#TOC, retrieved on February 27, 2019.

Ministerie van Volkshuisvesting, Ruimtelijke Ordening en Milieu (VROM). (2013). Soil Remediation Circular 2013. Netherlands.

Ministry of Gender and Development, & United Nations. (2012). COMBATING SEXUAL AND GENDER BASED VIOLENCE IN LIBERIA. In *www.stoprapenow.org*. http://stoprapenow.org/uploads/features/SGBVemail.pdf

Ministry of Health and Social Welfare. (1987). *Liberian Water Quality Standards/Guide*.

National Oceanic and Atmospheric Administration (NOAA), 2010. Lophelia Biology. http://oceanexplorer.noaa.gov/explorations/10lophelia/background/biology/biology.html, retrieved on February 25, 2019.

Psomadakis, 2013. Important coastal fishery species of Liberia. A pocket Guide. FAO FishFinder Programme. Rome, FAO.

Republic of Liberia, 2017. National Biodiversity Strategy and Action Plan 2017-2025.

Ssentongo, 1987. Marine Fishery Resources of Liberia: A Review of Exploited Fish Stocks. Programme for the Development of Fisheries in the Eastern Central Atlantic. FAO. Fisheries Department, Rome, Italy.

TDI Brooks and InterAct PMTI, 2013. Environmental Conditions Study performed for ExxonMobil by TDI Brooks and InterAct PMTI in Block LB-13, December 2013.

The Carter Center. (2014). Women and the Right of Access to Information in Liberia. In *www.cartercenter.org*. https://www.cartercenter.org/resources/pdfs/peace/ati/women-and-ati-10172014.pdf

The Ramsar Sites Information Service, 2006. https://rsis.ramsar.org/ris/1631, retrieved on September 27, 2024.

The Ramsar Sites Information Service, 2006. https://rsis.ramsar.org/ris/1631, retrieved on February 21, 2019.

Thinkhazard!. (2020). *Liberia: Earthquake*. https://thinkhazard.org/en/report/144-liberia/EQ.

Ukwe, Isabor and Alo, 2001. Improving the quality of coastal waters in the Gulf of Guinee Large Marine ecosystems through mangrove restoration. Proceedings of the 12th biennal coastal zone conference July 15-19, 2001. NOAA/CSC/20120-CD, Cleveland, Ohio, U.S.

UN Women - Liberia. (2021). UN Women Liberia Annual Report 2021. In *www.liberia.un.org*. https://liberia.un.org/en/194697-un-women-liberia-annual-report-2021

United Nations Development Group (UNDG), 2009. Guidelines on Indigenous Peoples' Issues.

United Nations Development Programme (UNDP) - Liberia. (2022). *Multiple global crises reverse human development gains worldwide, UNDP report finds | United Nations Development Programme*. Www.undp.org/. https://www.undp.org/liberia/press-releases/multiple-global-crises-reverse-human-development-gains-worldwide-undp-report-finds

United Nations Development Programme (UNDP), 2006. First State of the Environment Report for Liberia. Monrovia, Liberia.

United Nations Human Rights Council (UN OHCHR), (2013). Report of the Special Rapporteur on violence against women, its causes and consequences, paragraph 70, UN Doc. A/HRC/23/49, 14 May 2013).

United Nations, Department of Economic and Social Affairs, Population Division. (2022). World Population Prospects 2022: Online Edition.

United States Environmental Protection Agency (USEPA). (2018). 2018 Edition of the Drinking Water Standards and Health Advisories Tables.

Villegas and Garcia, 1983. Demersal Fish Assemblages in Liberia, Ghana, Togo, Benin and Cameroon. Rome, FAO, 16 p. + 7 charts, CECAF/ECAF Series 83/26:16 p. plus 7 charts (En).

Weir, 2013. A Review of Marine Mammal and Sea Turtle Occurrence in Liberia and Surrounding Waters. Report to Acorn International. 19 October 2013. 76 pp.

Wiles, 2005. Coastal Zone Vulnerability and Adaptation to Climate Change in Liberia. Environmental Protection Agency. Monrovia, Liberia.

World Bank. (2022a). *Overview*. The World Bank in Liberia. https://www.worldbank.org/en/country/liberia/overview#:~:text=Growth%20is%20expected%20to%20slow

World Bank. (2022b,). *Labor force, female (% of total labor force) - Liberia | Data*. Data.worldbank.org. https://data.worldbank.org/indicator/SL.TLF.TOTL.FE.ZS?locations=LR

World Bank. (2022c). Poverty and Equity Brief - Africa Western and Central. In *https://databankfiles.worldbank.org*. https://databankfiles.worldbank.org/data/download/poverty/987B9C90-CB9F-4D93-AE8C-750588BF00QA/current/Global_POVEQ_LBR.pdf

World Health Organization (WHO) Liberia. (2021). *96,000 Doses of COVID-19 Vaccine Arrives in Liberia*. WHO | Regional Office for Africa. https://www.afro.who.int/news/96000-doses-covid-19-vaccine-arrives-liberia

World Health Organization (WHO), 2021. Statistics, Liberia. https://data.who.int/countries/430#:~:text=In%20Liberia%2C%20life%20expectancy%20at,to%2063.5%20years%20in%202021 retrieved on July 24, 2024

World Health Organization (WHO). (2000). Guidelines for Air Quality.

World Health Organization (WHO). (2019). The WHO Recommended Classification of Pesticides by Hazard and Guidelines to Classification.

World Health Organization (WHO). (2021). WHO Air Quality guideline. Particulate matter (PM2.5 and PM10), ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide.

World Health Organization (WHO). (2022a). Guidelines for drinking-water quality. Fourth edition incorporating the first and second addenda.

World Health Organization (WHO). (2022b). *WHO Liberia Quarterly Bulletin (April - June 2022) - Liberia | ReliefWeb*. Reliefweb.int. https://reliefweb.int/report/liberia/who-liberia-quarterly-bulletin-april-june-2022

World Population Review (WPR), 2019. http://worldpopulationreview.com/countries/liberia-population/ retrieved on February 19, 2019.

APPENDIX A CONSULTANT SERVICES TO CONDUCT A HYDRO-ENGINEERING STUDY AND PREPARE A DETAILED DESIGN FOR A COASTAL PROTECTION STRUCTURE IN WEST POINT, MONROVIA, LIBERIA: FINAL DESIGN DRAWINGS (BRIGHTEN DEVELOPMENT & LHI, 2024)

LANKA HYDRAULIC INSTITUTE LTD.

CONSULTANT SERVICES TO CONDUCT A HYDRO-ENGINEERING STUDY AND PREPARE A DETAILED DESIGN FOR A COASTAL PROTECTION STRUCTURE IN WEST POINT, MONROVIA, LIBERIA

MAY 2024

Prepared for :

MONROVIA METROPOLITAN CLIMATE RESILIENCE PROJECT (MMCRP)
UNITED NATIONS DEVELOPMENT PROGRAM

LIST OF DRAWINGS

NO	TITLE	DRAWING NO
01	GENERAL LAYOUT	LHI/MO/GL/01
02	GENERAL LAYOUT - BATHYMETRIC AND TOPOGRAPHI	LHI/MO/GL/02
03	LIGHT REVETMENT AND TRANSITION DETAILS	LHI/MO/RE/01
04	REVETMENT SECTION	LHI/MO/RE/02
05	REVETMENT SECTION	LHI/MO/RE/03
06	REVETMENT SECTION	LHI/MO/RE/04
07	TYPICAL DETAILS OF THE PROMENADE	LHI/MO/RE/05
08	LAYOUT MAP FOR DRAINS	LHI/MO/DR/01
09	REVETMENT SECTION WITH CROSS DRAINS	LHI/MO/DR/02
10	REVETMENT SECTION WITH CROSS DRAINS	LHI/MO/DR/03
11	REVETMENT SECTION WITH CROSS DRAINS	LHI/MO/DR/04
12	REVETMENT SECTION WITH CROSS DRAINS	LHI/MO/DR/05
13	REINFORCEMENT DETAILS OF DRAINS	LHI/MO/DR/ST/01
14	LAYOUT MAP FOR BEACH ACCESS	LHI/MO/BA/01
15	BEACH ACCESS NO 01	LHI/MO/BA/02
16	BEACH ACCESS NO 02	LHI/MO/BA/03
17	BEACH ACCESS NO 03	LHI/MO/BA/04
18	BEACH ACCESS NO 04	LHI/MO/BA/05
19	BEACH ACCESS NO 05	LHI/MO/BA/06
20	REINFORCEMENT DETAILS - BEACH ACCESS	LHI/MO/BA/ST/01
21	REINFORCEMENT DETAILS - BEACH ACCESS	LHI/MO/BA/ST/02
22	REINFORCEMENT DETAILS OF BEACH ACCESS AND SOLAR LIGHT POLE BASE	LHI/MO/BA/ST/03
23	BREAKWATER SECTIONS	LHI/MO/BW/01
24	BREAKWATER SECTIONS	LHI/MO/BW/02
25	BREAKWATER SECTIONS	LHI/MO/BW/03
26	SOLAR BEACON LIGHT	LHI/MO/BL/01
27	LAYOUT MAP FOR DREDGING	LHI/MO/DG/01

Rev.	Date	Description	CHKD.	APPD.

Client: *Monrovia Metropolitan Climate Resilience Project (MMCRP) United Nations Development Program*

Consultant: *Lanka Hydraulic Institute Ltd.*

PROJECT: CONSULTANT SERVICES TO CONDUCT A HYDRO-ENGINEERING STUDY AND PREPARE A DETAILED DESIGN FOR A COASTAL PROTECTION STRUCTURE IN WEST POINT, MONROVIA, LIBERIA

TITLE: LIST OF DRAWINGS

PROJECT NO.	DRG. NO	REV. NO	SCALE
2304		0	As Shown

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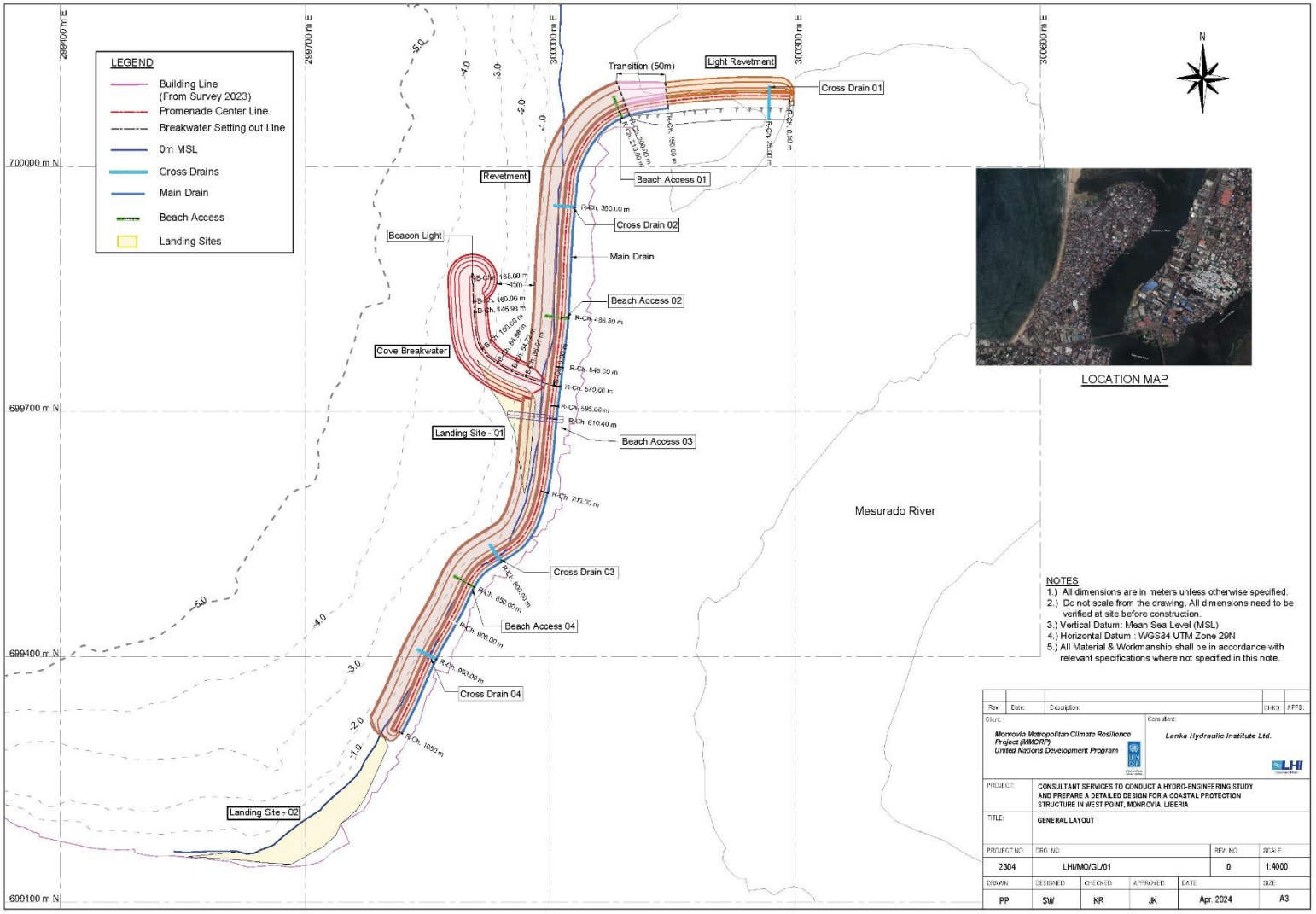
LEGEND
Building Line (From Survey 2023)
Promenade Center Line
Breakwater Setting out Line
0m MSL
Cross Drains
Main Drain
Beach Access
Landing Sites
289900 m E
299700 m E
300300 m E
300900 m E
306600 m E
700000 m N
699700 m N
699400 m N
699100 m N
Transition (50m)
Light Revetment
Cross Drain 01
Revetment
Beach Access 01
Cross Drain 02
Beacon Light
Main Drain
Beach Access 02
Cove Breakwater
Landing Site - 01
Beach Access 03
Cross Drain 03
Beach Access 04
Cross Drain 04
Landing Site - 02
Mesurado River
N
LOCATION MAP
NOTES
1.) All dimensions are in meters unless otherwise specified.
2.) Do not scale from the drawing. All dimensions need to be verified at site before construction.
3.) Vertical Datum: Mean Sea Level (MSL)
4.) Horizontal Datum : WGS84 UTM Zone 29N
5.) All Material & Workmanship shall be in accordance with relevant specifications where not specified in this note.
Monrovia Matropolitan Climate Resilience Project (MMCRP)
United Nations Development Program
Lanka Hydraulic Institute Ltd.
CONSULTANT SERVICES TO CONDUCT A HYDRO-ENGINEERING STUDY AND PREPARE A DETAILED DESIGN FOR A COASTAL PROTECTION STRUCTURE IN WEST POINT, MONROVIA, LIBERIA
GENERAL LAYOUT
2304
LHI/MO/GL/01
0
1:4000
PP
SW
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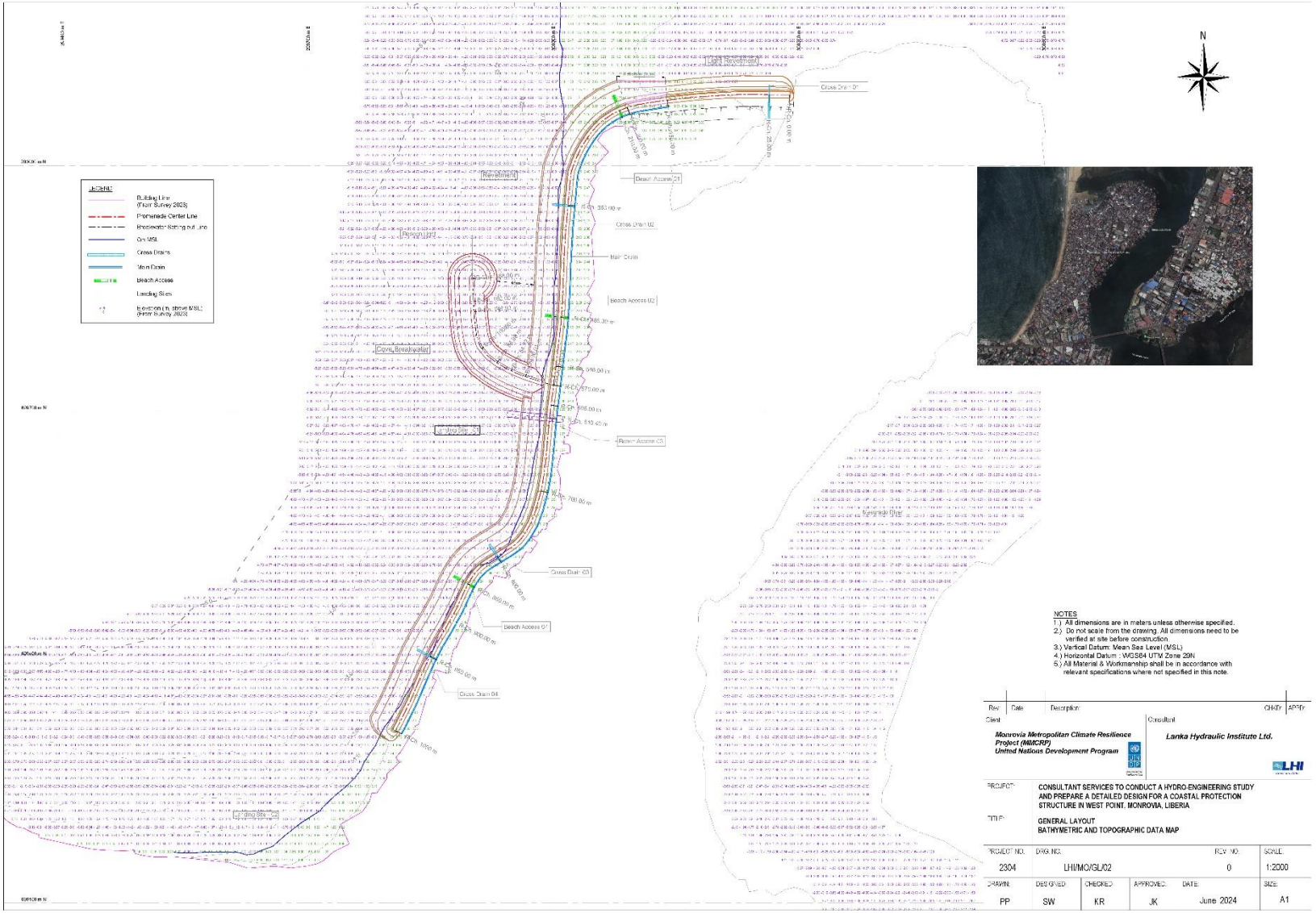
Apr. 2024
A3


N
LEGEND
Building Line (Field Survey 2023)
Promenade Center Line
Breakwater Setting out Line
CH MSL
Cross Drains
Main Drain
Beach Access
Landing Sites
Elevation (m above MSL) (Field Survey 2023)
Revetment
Beach Access 01
Cross Drain 02
Main Drain
Beach Access 02
Cove Breakwater
Beach Access 03
Cross Drain 03
Beach Access 04
Cross Drain 04
Landing Site 02
NOTES
1.) All dimensions are in meters unless otherwise specified.
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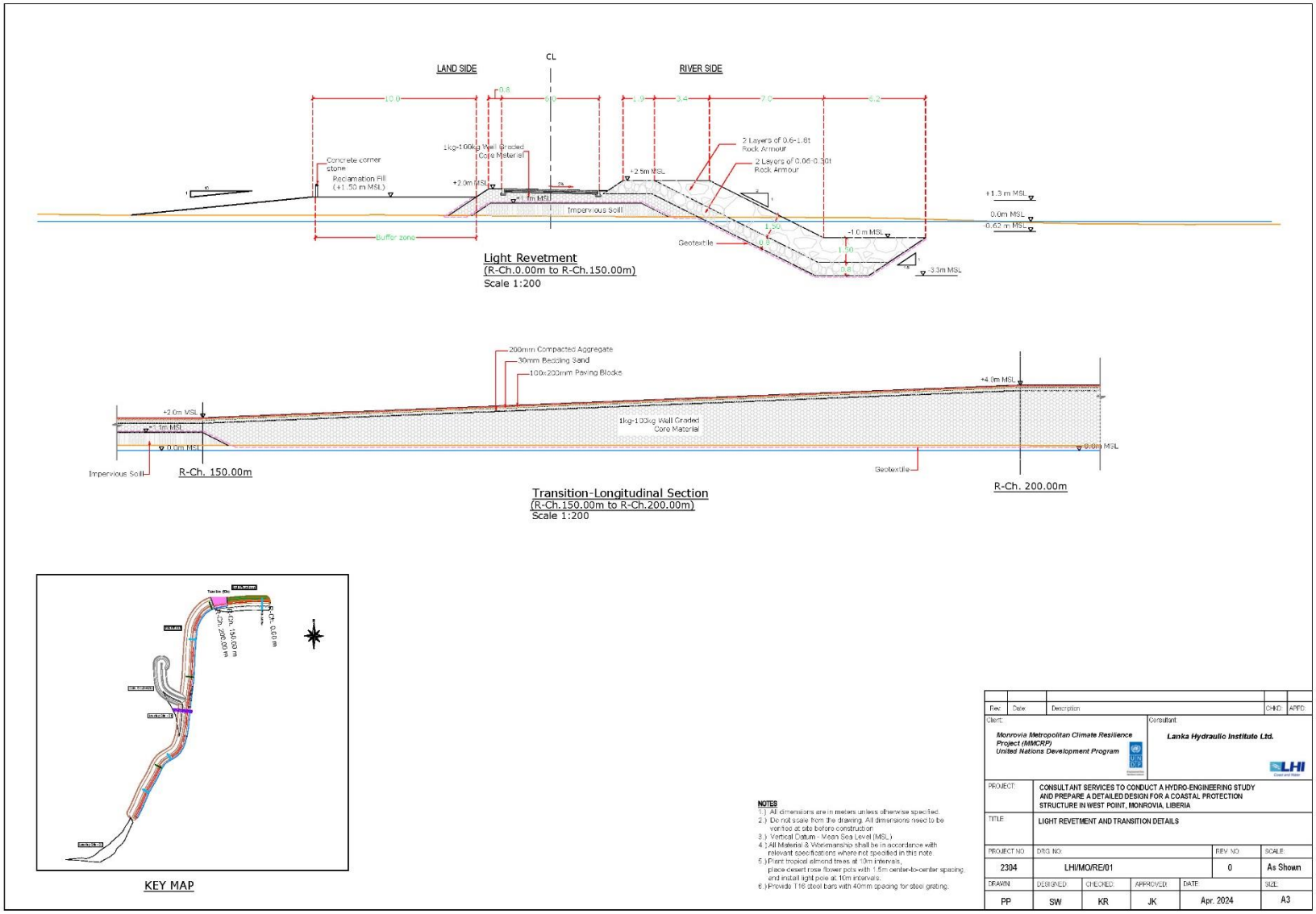
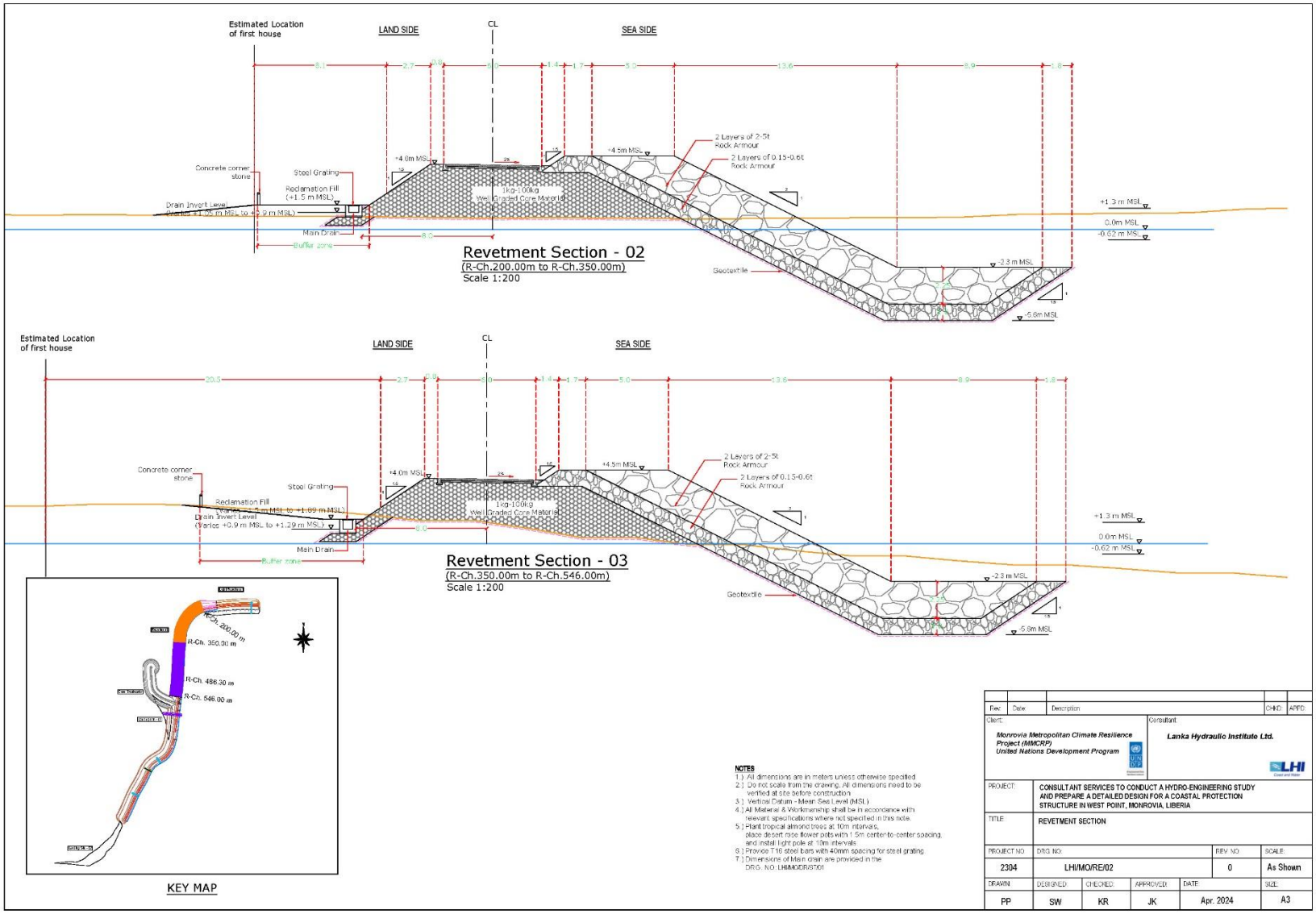
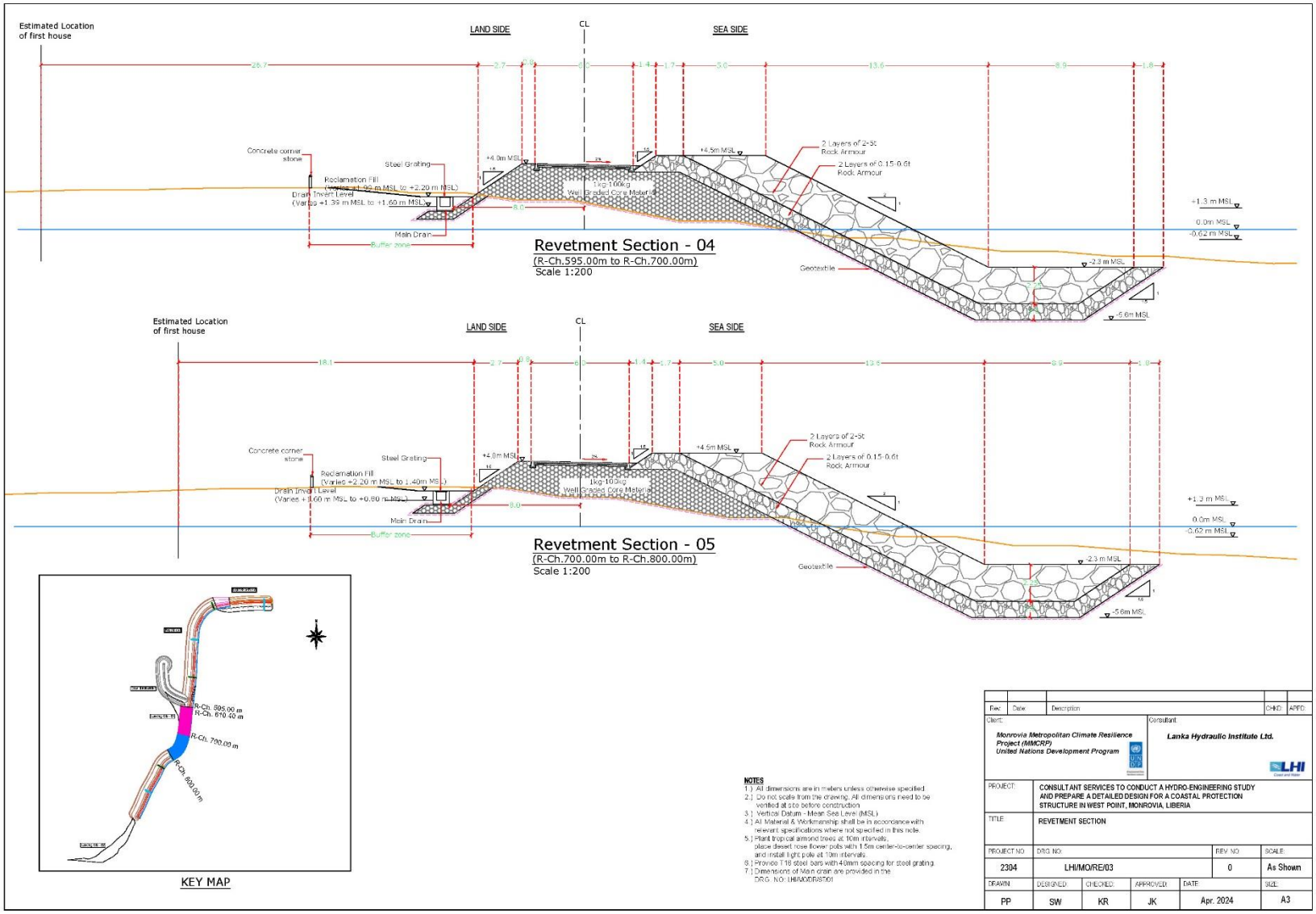
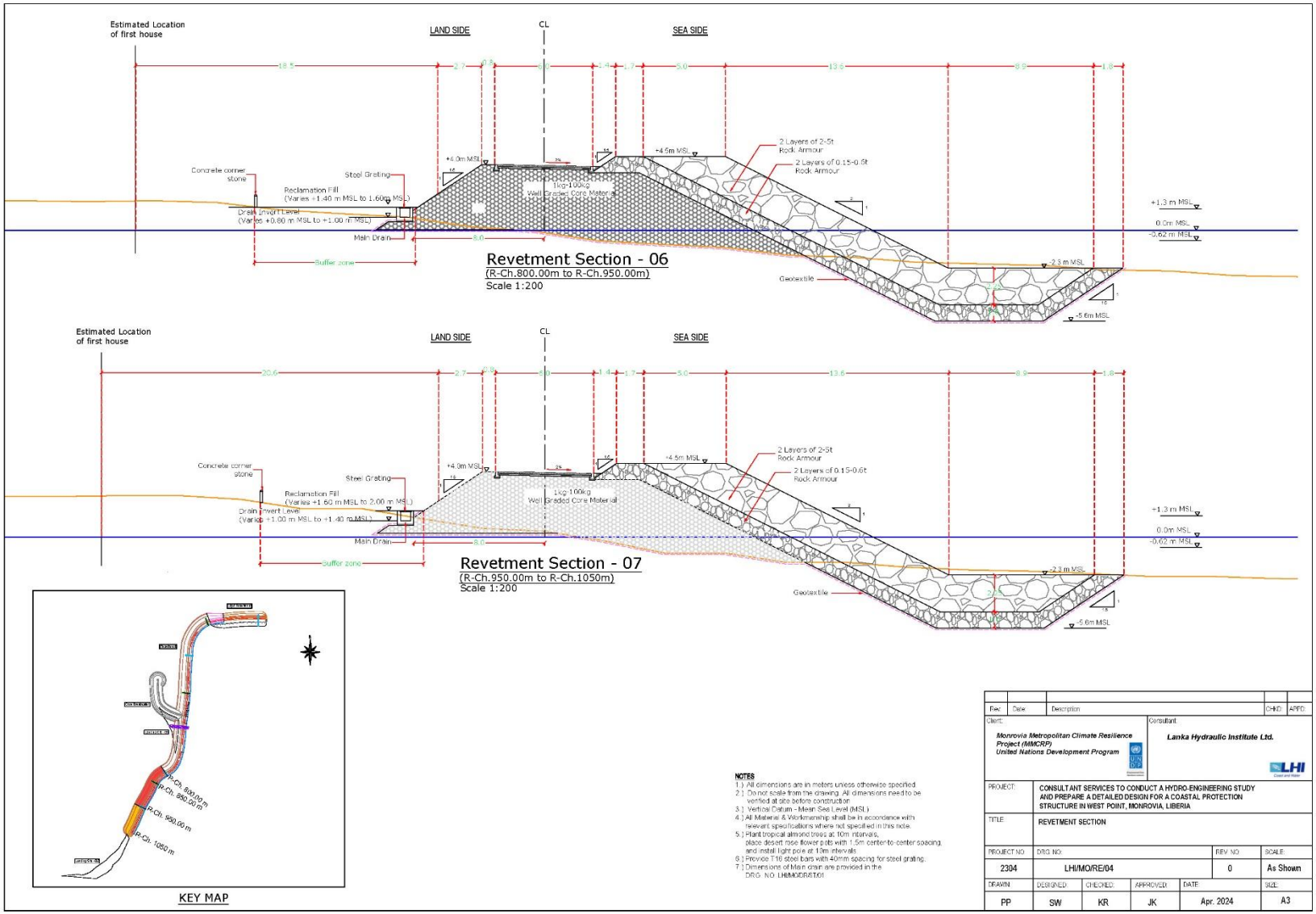
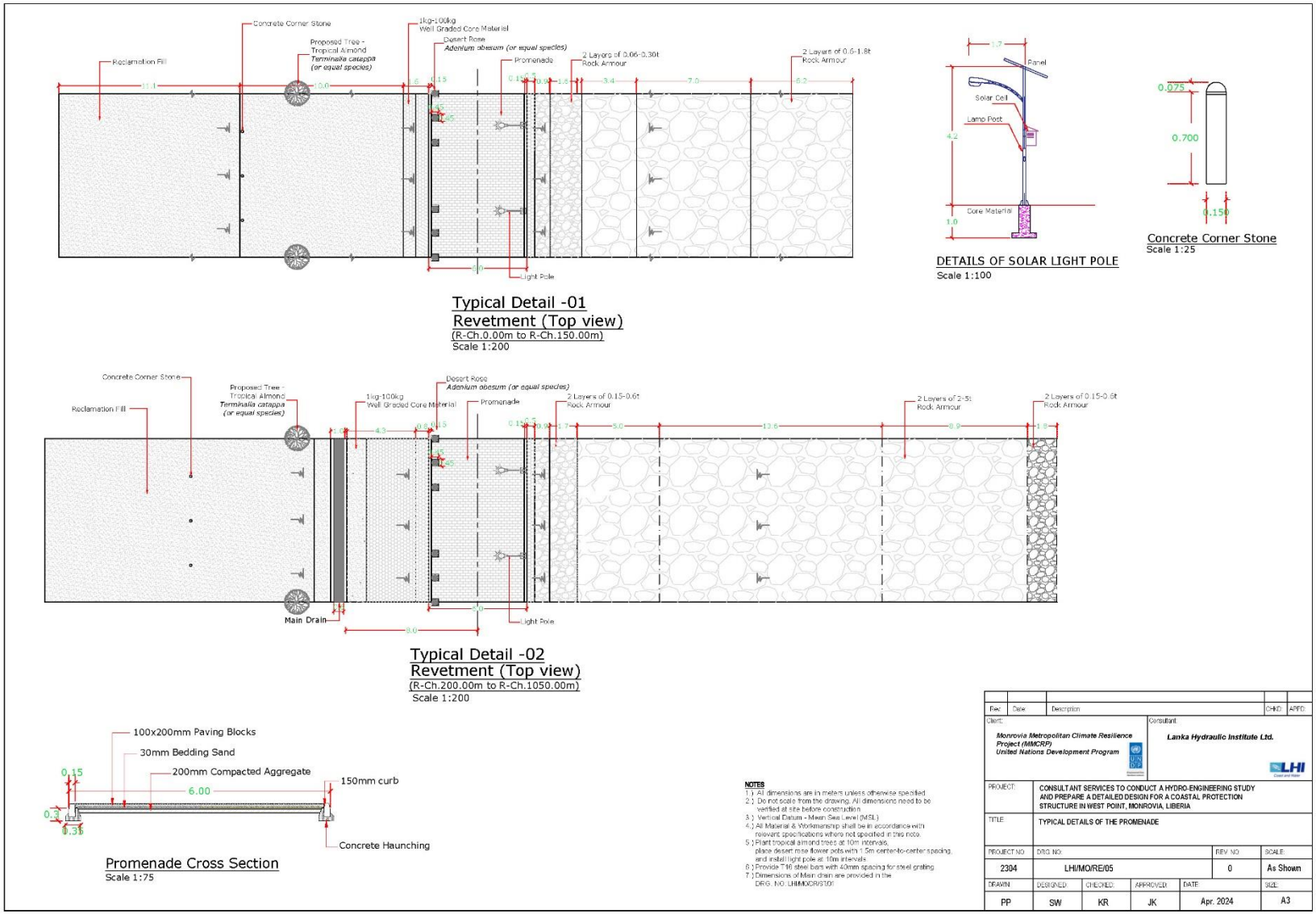
Rev
Date
Description
CHKD
APPD
Client
Monrovia Metropolitan Climate Resilience Project (MMCRP)
United Nations Development Program
Consultant
Lanka Hydraulic Institute Ltd.
LHI
PROJECT:
CONSULTANT SERVICES TO CONDUCT A HYDRO-ENGINEERING STUDY AND PREPARE A DETAILED DESIGN FOR A COASTAL PROTECTION STRUCTURE IN WEST POINT, MONROVIA, LIBERIA
TITLE:
GENERAL LAYOUT
BATHYMETRIC AND TOPOGRAPHIC DATA MAP
PROJECT NO.
2304
DWG NO.
LHI/MO/GL/02
REV NO.
0
SCALE
1:2000
DRAWN
PP
DESIGNED
SW
CHECKED
KR
APPROVED
JK
DATE
June 2024
SIZE
A1

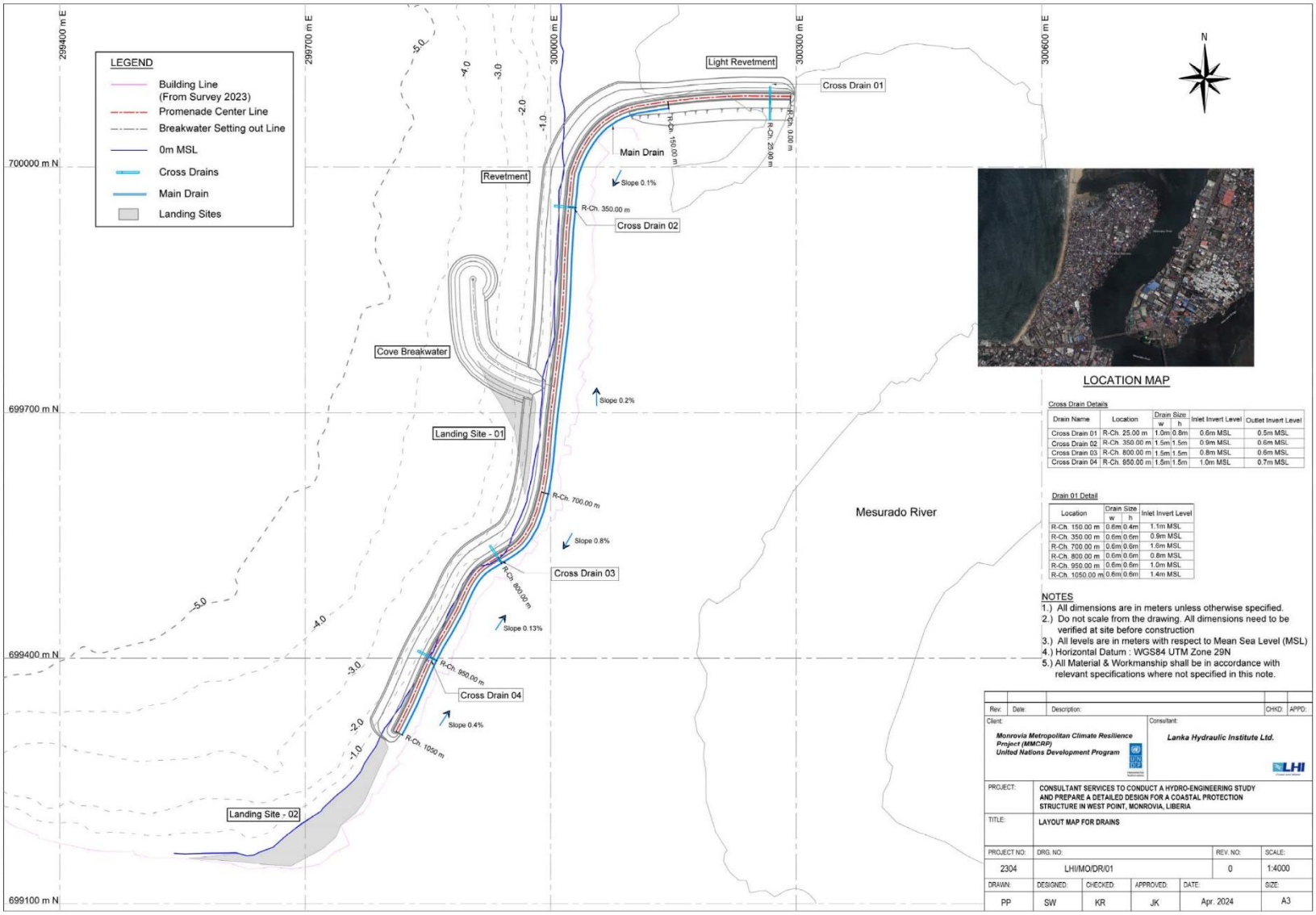

LAND SIDE
CL
RIVER SIDE
Concrete corner stone
Reclamation Fill (+1.50 m MSL)
+2.0m MSL
+1.1m MSL
1kg-100kg Well Graded Core Material
Impervious Soil
Buffer zone
2 Layers of 0.6-1.0t Rock Armour
2 Layers of 0.06-0.30t Rock Armour
+2.5m MSL
Geotextile
-1.0 m MSL
-3.3m MSL
+1.3 m MSL
0.0m MSL
-0.62 m MSL
Light Revetment
(R-Ch.0.00m to R-Ch.150.00m)
Scale 1:200
200mm Compacted Aggregate
30mm Bedding Sand
100x200mm Paving Blocks
+4.0m MSL
+2.0m MSL
+1.1m MSL
0.0m MSL
1kg-100kg Well Graded Core Material
-3.0m MSL
Impervious Soil
R-Ch. 150.00m
Geotextile
R-Ch. 200.00m
Transition-Longitudinal Section
(R-Ch.150.00m to R-Ch.200.00m)
Scale 1:200
KEY MAP
NOTES
1.) All dimensions are in meters unless otherwise specified.
2.) Do not scale from the drawing. All dimensions need to be verified at site before construction
3.) Vertical Datum - Mean Sea Level (MSL).
4.) All Material & Workmanship shall be in accordance with relevant specifications where not specified in this note
5.) Plant tropical almond trees at 10m intervals, place desert rose flower pots with 1.5m center-to-center spacing and install light pole at 10m intervals.
6.) Provide T16 steel bars with 40mm spacing for steel grating.
Rev
Date
Description
CHKD
APPD
Client:
Monrovia Metropolitan Climate Resilience Project (MMCRP)
United Nations Development Program
Consultant:
Lanka Hydraulic Institute Ltd.
PROJECT:
CONSULTANT SERVICES TO CONDUCT A HYDRO-ENGINEERING STUDY AND PREPARE A DETAILED DESIGN FOR A COASTAL PROTECTION STRUCTURE IN WEST POINT, MONROVIA, LIBERIA
TITLE:
LIGHT REVETMENT AND TRANSITION DETAILS
PROJECT NO.
DRG NO:
REV NO
SCALE:
2304
LHI/MO/RE/01
0
As Shown
DRAWN:
DESIGNED:
CHECKED:
APPROVED:
DATE:
SIZE:
PP
SW
KR
JK
Apr. 2024
A3

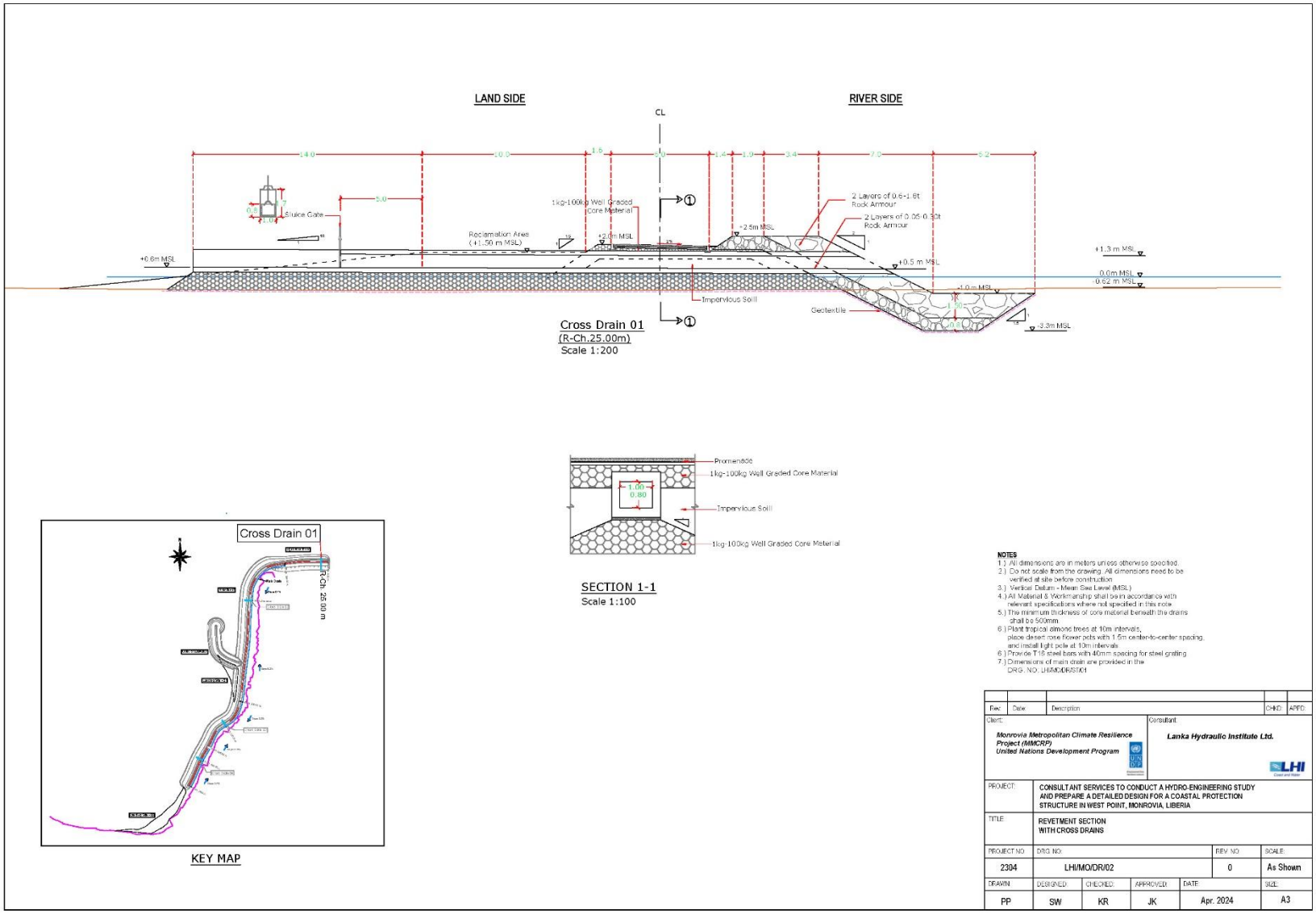

Estimated Location of first house
LAND SIDE
CL
SEA SIDE
Concrete corner stone
Steel Grating
Reclamation Fill (+1.5 m MSL)
Drain Invert Level (Varies +0.9 m MSL to +1.29 m MSL)
Main Drain
Buffer zone
+4.0m MSL
+4.5m MSL
2 Layers of 2-5t Rock Armour
2 Layers of 0.15-0.6t Rock Armour
1kg-100kg Well Graded Core Material
Geotextile
-2.3 m MSL
-5.6m MSL
+1.3 m MSL
0.0m MSL
-0.62 m MSL
Revetment Section - 02
(R-Ch.200.00m to R-Ch.350.00m)
Scale 1:200
Revetment Section - 03
(R-Ch.350.00m to R-Ch.546.00m)
Scale 1:200
R-Ch. 200.00 m
R-Ch. 350.00 m
R-Ch. 486.30 m
R-Ch. 546.00 m
KEY MAP
NOTES
1.) All dimensions are in meters unless otherwise specified.
2.) Do not scale from the drawing. All dimensions need to be verified at site before construction.
3.) Vertical Datum - Mean Sea Level (MSL).
4.) All Material & Workmanship shall be in accordance with relevant specifications where not specified in this note.
5.) Plant tropical almond trees at 10m intervals, place desert rose flower pots with 1.5m center-to-center spacing, and install light pole at 10m intervals.
6.) Provide T16 steel bars with 40mm spacing for steel grating.
7.) Dimensions of Main drain are provided in the DRG. NO. LHI/MO/DR/ST01
Rev. Date Description CHKD APPD.
Client: Monrovia Metropolitan Climate Resilience Project (MMCRP) United Nations Development Program
Consultant: Lanka Hydraulic Institute Ltd.
PROJECT: CONSULTANT SERVICES TO CONDUCT A HYDRO-ENGINEERING STUDY AND PREPARE A DETAILED DESIGN FOR A COASTAL PROTECTION STRUCTURE IN WEST POINT, MONROVIA, LIBERIA
TITLE: REVETMENT SECTION
PROJECT NO. 2304
DRG. NO: LHI/MO/RE/02
REV. NO 0
SCALE: As Shown
DRAWN: PP
DESIGNED: SW
CHECKED: KR
APPROVED: JK
DATE: Apr. 2024
SIZE: A3

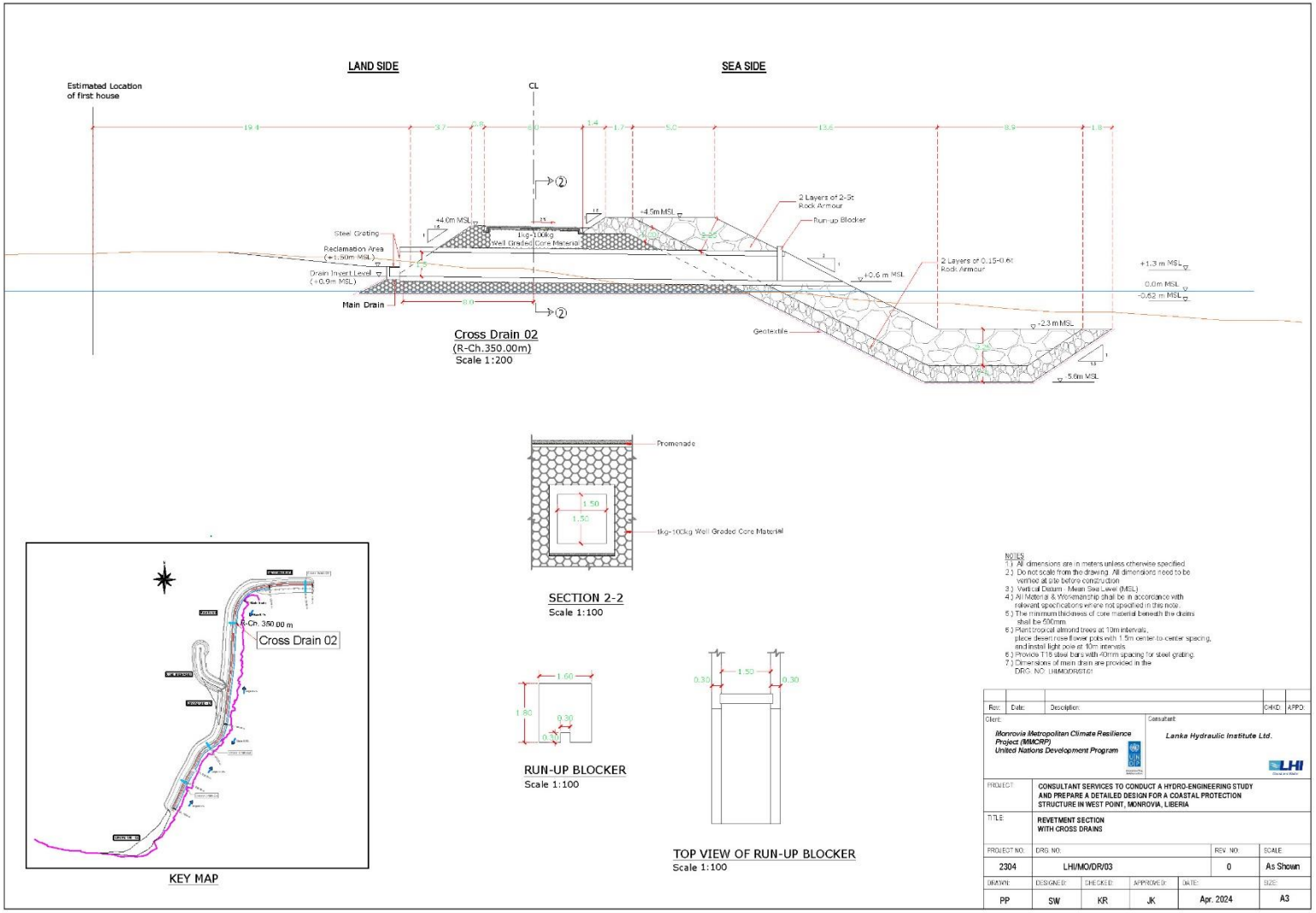

Estimated Location of first house
LAND SIDE
CL
SEA SIDE
Concrete corner stone
Steel Grating
Reclamation Fill
(Varies +1.95 m MSL to +2.20 m MSL)
Drain Invert Level
(Varies +1.39 m MSL to +1.60 m MSL)
Main Drain
Buffer zone
+4.0m MSL
+4.5m MSL
2 Layers of 2-5t Rock Armour
2 Layers of 0.15-0.6t Rock Armour
1kg-100kg
Well Graded Core Material
Geotextile
+1.3 m MSL
0.0m MSL
-0.62 m MSL
-2.3 m MSL
-5.6m MSL
Revetment Section - 04
(R-Ch.595.00m to R-Ch.700.00m)
Scale 1:200
Revetment Section - 05
(R-Ch.700.00m to R-Ch.800.00m)
Scale 1:200
R-Ch. 595.00 m
R-Ch. 670.40 m
R-Ch. 700.00 m
R-Ch. 800.00 m
KEY MAP
NOTES
1.) All dimensions are in meters unless otherwise specified.
2.) Do not scale from the drawing. All dimensions need to be verified at site before construction.
3.) Vertical Datum - Mean Sea Level (MSL).
4.) All Material & Workmanship shall be in accordance with relevant specifications where not specified in this note.
5.) Plant tropical almond trees at 10m intervals, place desert rose flower pots with 1.5m center-to-center spacing, and install light pole at 10m intervals.
6.) Provide T16 steel bars with 40mm spacing for steel grating.
7.) Dimensions of Main drain are provided in the DRG. NO: LHI/MO/DR/S/01
Rev | Date | Description | CHKD | APPD
Client: Monrovia Metropolitan Climate Resilience Project (MMCRP) United Nations Development Program
Consultant: Lanka Hydraulic Institute Ltd.
PROJECT: CONSULTANT SERVICES TO CONDUCT A HYDRO-ENGINEERING STUDY AND PREPARE A DETAILED DESIGN FOR A COASTAL PROTECTION STRUCTURE IN WEST POINT, MONROVIA, LIBERIA
TITLE: REVETMENT SECTION
PROJECT NO: 2304
DRG NO: LHI/MO/RE/03
REV NO: 0
SCALE: As Shown
DRAWN: PP
DESIGNED: SW
CHECKED: KR
APPROVED: JK
DATE: Apr. 2024
SIZE: A3


Estimated Location of first house
LAND SIDE
CL
SEA SIDE
Concrete corner stone
Steel Grating
Reclamation Fill (Varies +1.40 m MSL to 1.60m MSL)
Drain Invert Level (Varies +0.80 m MSL to +1.00 m MSL)
Main Drain
Suffer zone
+4.0m MSL
+4.5m MSL
1kg-100kg Well Graded Core Material
2 Layers of 2-5t Rock Armour
2 Layers of 0.15-0.5t Rock Armour
Geotextile
+1.3 m MSL
0.0m MSL
-0.62 m MSL
-2.3 m MSL
-5.6m MSL
Revetment Section - 06
(R-Ch.800.00m to R-Ch.950.00m)
Scale 1:200
Estimated Location of first house
LAND SIDE
CL
SEA SIDE
Concrete corner stone
Steel Grating
Reclamation Fill (Varies +1.60 m MSL to 2.00 m MSL)
Drain Invert Level (Varies +1.00 m MSL to +1.40 m MSL)
Main Drain
Suffer zone
+4.0m MSL
+4.5m MSL
1kg-100kg Well Graded Core Material
2 Layers of 2-5t Rock Armour
2 Layers of 0.15-0.6t Rock Armour
Geotextile
+1.3 m MSL
0.0m MSL
-0.62 m MSL
-2.3 m MSL
-5.6m MSL
Revetment Section - 07
(R-Ch.950.00m to R-Ch.1050m)
Scale 1:200
R-Ch. 800.00 m
R-Ch. 850.00 m
R-Ch. 950.00 m
R-Ch. 1050 m
KEY MAP
NOTES
1.) All dimensions are in meters unless otherwise specified.
2.) Do not scale from the drawing. All dimensions need to be verified at site before construction.
3.) Vertical Datum - Mean Sea Level (MSL).
4.) All Material & Workmanship shall be in accordance with relevant specifications where not specified in this note.
5.) Plant tropical almond trees at 10m intervals, place desert rose flower pots with 1.5m center-to-center spacing, and install light pole at 10m intervals.
6.) Provide T16 steel bars with 40mm spacing for steel grating.
7.) Dimensions of Main drain are provided in the DRG. NO. LHI/MO/DR/ST/01
Rev | Date | Description | CHKD | APPD
Client: Monrovia Metropolitan Climate Resilience Project (MMCRP) United Nations Development Program
Consultant: Lanka Hydraulic Institute Ltd.
PROJECT: CONSULTANT SERVICES TO CONDUCT A HYDRO-ENGINEERING STUDY AND PREPARE A DETAILED DESIGN FOR A COASTAL PROTECTION STRUCTURE IN WEST POINT, MONROVIA, LIBERIA
TITLE: REVETMENT SECTION
PROJECT NO: 2304
DRG NO: LHI/MO/RE/04
REV NO: 0
SCALE: As Shown
DRAWN: PP
DESIGNED: SW
CHECKED: KR
APPROVED: JK
DATE: Apr. 2024
SIZE: A3


Concrete Corner Stone
Reclamation Fill
Proposed Tree - Tropical Almond Terminalia catappa (or equal species)
1kg-100kg Well Graded Core Material
Desert Rose Adenium obesum (or equal species)
Promenade
2 Layers of 0.06-0.30t Rock Armour
2 Layers of 0.6-1.8t Rock Armour
Light Pole
Typical Detail -01
Revetment (Top view)
(R-Ch.0.00m to R-Ch.150.00m)
Scale 1:200
Panel
Solar Cell
Lamp Post
Core Material
DETAILS OF SOLAR LIGHT POLE
Scale 1:100
Concrete Corner Stone
Scale 1:25
2 Layers of 0.15-0.6t Rock Armour
2 Layers of 2-5t Rock Armour
Main Drain
Typical Detail -02
Revetment (Top view)
(R-Ch.200.00m to R-Ch.1050.00m)
Scale 1:200
100x200mm Paving Blocks
30mm Bedding Sand
200mm Compacted Aggregate
150mm curb
Concrete Haunching
Promenade Cross Section
Scale 1:75
NOTES
1.) All dimensions are in meters unless otherwise specified.
2.) Do not scale from the drawing. All dimensions need to be verified at site before construction.
3.) Vertical Datum - Mean Sea Level (MSL)
4.) All Material & Workmanship shall be in accordance with relevant specifications where not specified in this note.
5.) Plant tropical almond trees at 10m intervals, place desert rose flower pots with 1.5m center-to-center spacing, and install light pole at 10m intervals.
6.) Provide T16 steel bars with 40mm spacing for steel grating.
7.) Dimensions of Main drain are provided in the DRG. NO: LHI/MO/XR/ST01
Rev | Date | Description | CHKD | APPD
Client: Monrovia Metropolitan Climate Resilience Project (MMCRP) United Nations Development Program
Consultant: Lanka Hydraulic Institute Ltd.
PROJECT: CONSULTANT SERVICES TO CONDUCT A HYDRO-ENGINEERING STUDY AND PREPARE A DETAILED DESIGN FOR A COASTAL PROTECTION STRUCTURE IN WEST POINT, MONROVIA, LIBERIA
TITLE: TYPICAL DETAILS OF THE PROMENADE
PROJECT NO: 2304
DRG NO: LHI/MO/RE/05
REV NO: 0
SCALE: As Shown
DRAWN: PP
DESIGNED: SW
CHECKED: KR
APPROVED: JK
DATE: Apr. 2024
SIZE: A3


LEGEND
Building Line (From Survey 2023)
Promenade Center Line
Breakwater Setting out Line
0m MSL
Cross Drains
Main Drain
Landing Sites
299400 m E
299700 m E
300000 m E
300300 m E
300600 m E
700000 m N
699700 m N
699400 m N
699100 m N
N
Light Revetment
Cross Drain 01
Main Drain
Slope 0.1%
Revetment
R-Ch. 350.00 m
Cross Drain 02
Cove Breakwater
Slope 0.2%
Landing Site - 01
R-Ch. 700.00 m
Slope 0.8%
Cross Drain 03
R-Ch. 800.00 m
Slope 0.13%
R-Ch. 950.00 m
Cross Drain 04
Slope 0.4%
R-Ch. 1050 m
Landing Site - 02
Mesurado River
LOCATION MAP
Cross Drain Details
Drain Name | Location | Drain Size w | Drain Size h | Inlet Invert Level | Outlet Invert Level
Cross Drain 01 | R-Ch. 25.00 m | 1.0m | 0.8m | 0.6m MSL | 0.5m MSL
Cross Drain 02 | R-Ch. 350.00 m | 1.5m | 1.5m | 0.9m MSL | 0.6m MSL
Cross Drain 03 | R-Ch. 800.00 m | 1.5m | 1.5m | 0.8m MSL | 0.6m MSL
Cross Drain 04 | R-Ch. 950.00 m | 1.5m | 1.5m | 1.0m MSL | 0.7m MSL
Drain 01 Detail
Location | Drain Size w | Drain Size h | Inlet Invert Level
R-Ch. 150.00 m | 0.6m | 0.4m | 1.1m MSL
R-Ch. 350.00 m | 0.6m | 0.6m | 0.9m MSL
R-Ch. 700.00 m | 0.6m | 0.6m | 1.6m MSL
R-Ch. 800.00 m | 0.6m | 0.6m | 0.8m MSL
R-Ch. 950.00 m | 0.6m | 0.6m | 1.0m MSL
R-Ch. 1050.00 m | 0.6m | 0.6m | 1.4m MSL
NOTES
1.) All dimensions are in meters unless otherwise specified.
2.) Do not scale from the drawing. All dimensions need to be verified at site before construction
3.) All levels are in meters with respect to Mean Sea Level (MSL)
4.) Horizontal Datum : WGS84 UTM Zone 29N
5.) All Material & Workmanship shall be in accordance with relevant specifications where not specified in this note.
Rev: Date: Description: CHKD: APPD:
Client: Monrovia Metropolitan Climate Resilience Project (MMCRP) United Nations Development Program
Consultant: Lanka Hydraulic Institute Ltd.
PROJECT: CONSULTANT SERVICES TO CONDUCT A HYDRO-ENGINEERING STUDY AND PREPARE A DETAILED DESIGN FOR A COASTAL PROTECTION STRUCTURE IN WEST POINT, MONROVIA, LIBERIA
TITLE: LAYOUT MAP FOR DRAINS
PROJECT NO: 2304
DRG. NO: LHI/MO/DR/01
REV. NO: 0
SCALE: 1:4000
DRAWN: PP
DESIGNED: SW
CHECKED: KR
APPROVED: JK
DATE: Apr. 2024
SIZE: A3


LAND SIDE
RIVER SIDE
CL
Sluice Gate
Reclamation Area
(+1.50 m MSL)
+0.6m MSL
+2.0m MSL
+2.5m MSL
+0.5 m MSL
+1.3 m MSL
0.0m MSL
-0.62 m MSL
-1.0 m MSL
-3.0m MSL
1kg-100kg Well Graded Core Material
2 Layers of 0.6-1.6t Rock Armour
2 Layers of 0.05-0.3t Rock Armour
Impervious Soil
Geotextile
Cross Drain 01
(R-Ch.25.00m)
Scale 1:200
Promenade
1kg-100kg Well Graded Core Material
Impervious Soil
SECTION 1-1
Scale 1:100
Cross Drain 01
R-Ch. 25.00 m
KEY MAP
NOTES
1.) All dimensions are in meters unless otherwise specified.
2.) Do not scale from the drawing. All dimensions need to be verified at site before construction
3.) Vertical Datum - Mean Sea Level (MSL)
4.) All Material & Workmanship shall be in accordance with relevant specifications where not specified in this note
5.) The minimum thickness of core material beneath the drains shall be 500mm
6.) Plant tropical almond trees at 10m intervals, place desert rose flower pots with 1.5m center-to-center spacing, and install light pole at 10m intervals
6.) Provide T-10 steel bars with 40mm spacing for steel grating
7.) Dimensions of main drain are provided in the DRG. NO. LHI/MO/DR/ST/01
Rev
Date
Description
CHKD
APPD
Client:
Monrovia Metropolitan Climate Resilience Project (MMCRP)
United Nations Development Program
Consultant:
Lanka Hydraulic Institute Ltd.
PROJECT:
CONSULTANT SERVICES TO CONDUCT A HYDRO-ENGINEERING STUDY AND PREPARE A DETAILED DESIGN FOR A COASTAL PROTECTION STRUCTURE IN WEST POINT, MONROVIA, LIBERIA
TITLE:
REVETMENT SECTION WITH CROSS DRAINS
PROJECT NO.
DRG NO:
REV. NO
SCALE:
2304
LHI/MO/DR/02
0
As Shown
DRAWN:
DESIGNED:
CHECKED:
APPROVED:
DATE:
SIZE:
PP
SW
KR
JK
Apr. 2024
A3


LAND SIDE
SEA SIDE
Estimated Location of first house
CL
+4.0m MSL
-4.5m MSL
Steel Grating
Reclamation Area (+1.50m MSL)
Drain Invert Level (+0.9m MSL)
Main Drain
1kg-100kg Well Graded Core Material
2 Layers of 2-5t Rock Armour
Run-up Blocker
2 Layers of 0.15-0.6t Rock Armour
+0.6 m MSL
Geotextile
-2.3 m MSL
-5.6m MSL
+1.3 m MSL
0.0m MSL
-0.62 m MSL
Cross Drain 02
(R-Ch.350.00m)
Scale 1:200
Promenade
1.50
1.50
1kg-100kg Well Graded Core Material
SECTION 2-2
Scale 1:100
1.60
1.80
0.30
0.30
RUN-UP BLOCKER
Scale 1:100
0.30
1.50
0.30
TOP VIEW OF RUN-UP BLOCKER
Scale 1:100
R-Ch. 350.00 m
Cross Drain 02
KEY MAP
NOTES
1.) All dimensions are in meters unless otherwise specified.
2.) Do not scale from the drawing. All dimensions need to be verified at site before construction.
3.) Vertical Datum : Mean Sea Level (MSL)
4.) All Material & Workmanship shall be in accordance with relevant specifications where not specified in this note.
5.) The minimum thickness of core material beneath the drains shall be 500mm.
6.) Plant tropical almond trees at 10m intervals, place desert rose flower pots with 1.5m center to center spacing, and install light pole at 10m intervals.
6.) Provide T16 steel bars with 40mm spacing for steel grating.
7.) Dimensions of main item are provided in the DRG. NO: LHI/MO/DR/ST01
Rev.
Date:
Description:
CHKD
APPD.
Client:
Monrovia Metropolitan Climate Resilience Project (MMCRP)
United Nations Development Program
Consultant:
Lanka Hydraulic Institute Ltd.
PROJECT:
CONSULTANT SERVICES TO CONDUCT A HYDRO-ENGINEERING STUDY AND PREPARE A DETAILED DESIGN FOR A COASTAL PROTECTION STRUCTURE IN WEST POINT, MONROVIA, LIBERIA
TITLE:
REVETMENT SECTION WITH CROSS DRAINS
PROJECT NO:
DRG NO:
REV. NO:
SCALE
2304
LHI/MO/DR/03
0
As Shown
DRAWN:
DESIGNED:
CHECKED:
APPROVED:
DATE:
SIZE:
PP
SW
KR
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Apr. 2024
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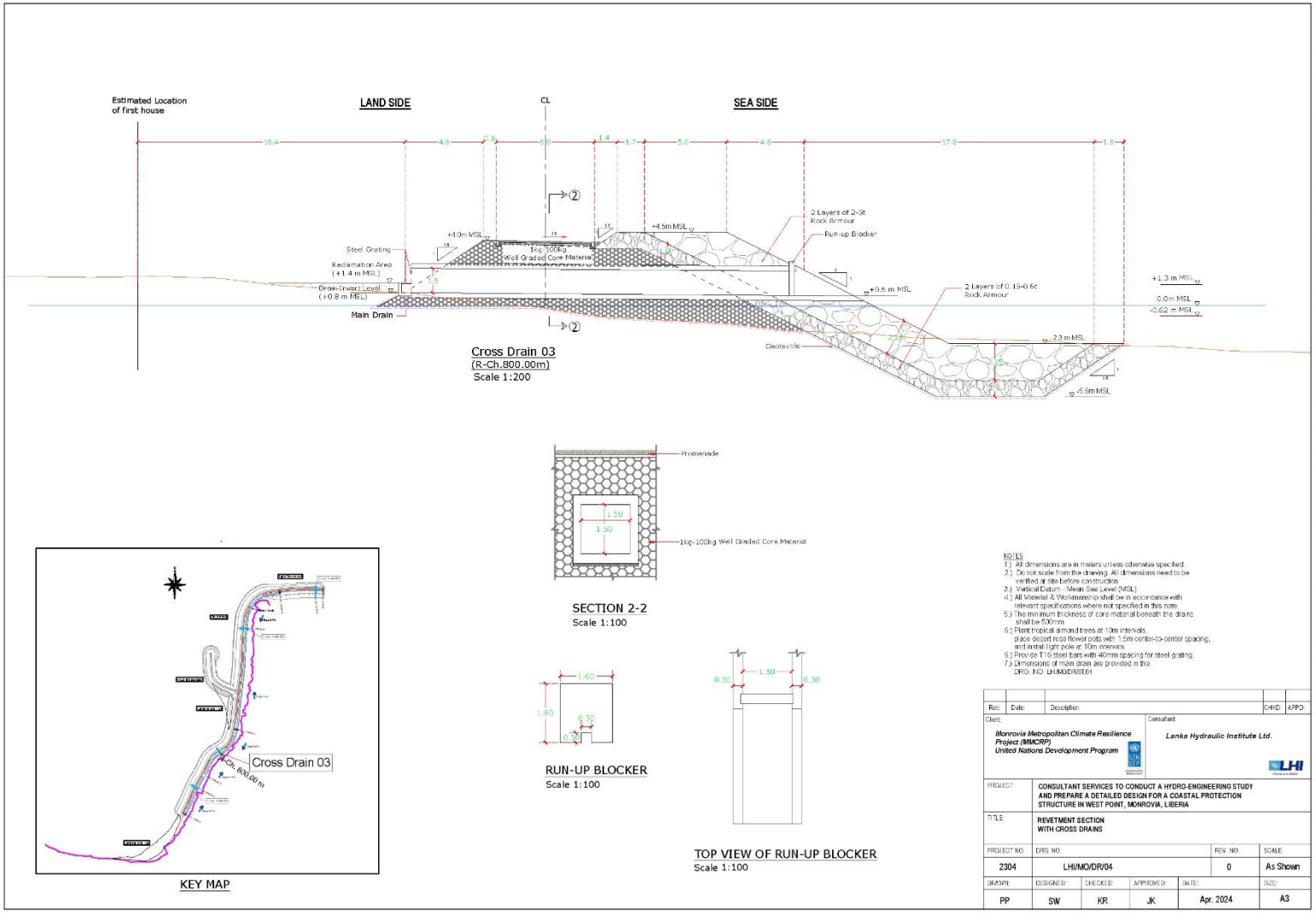
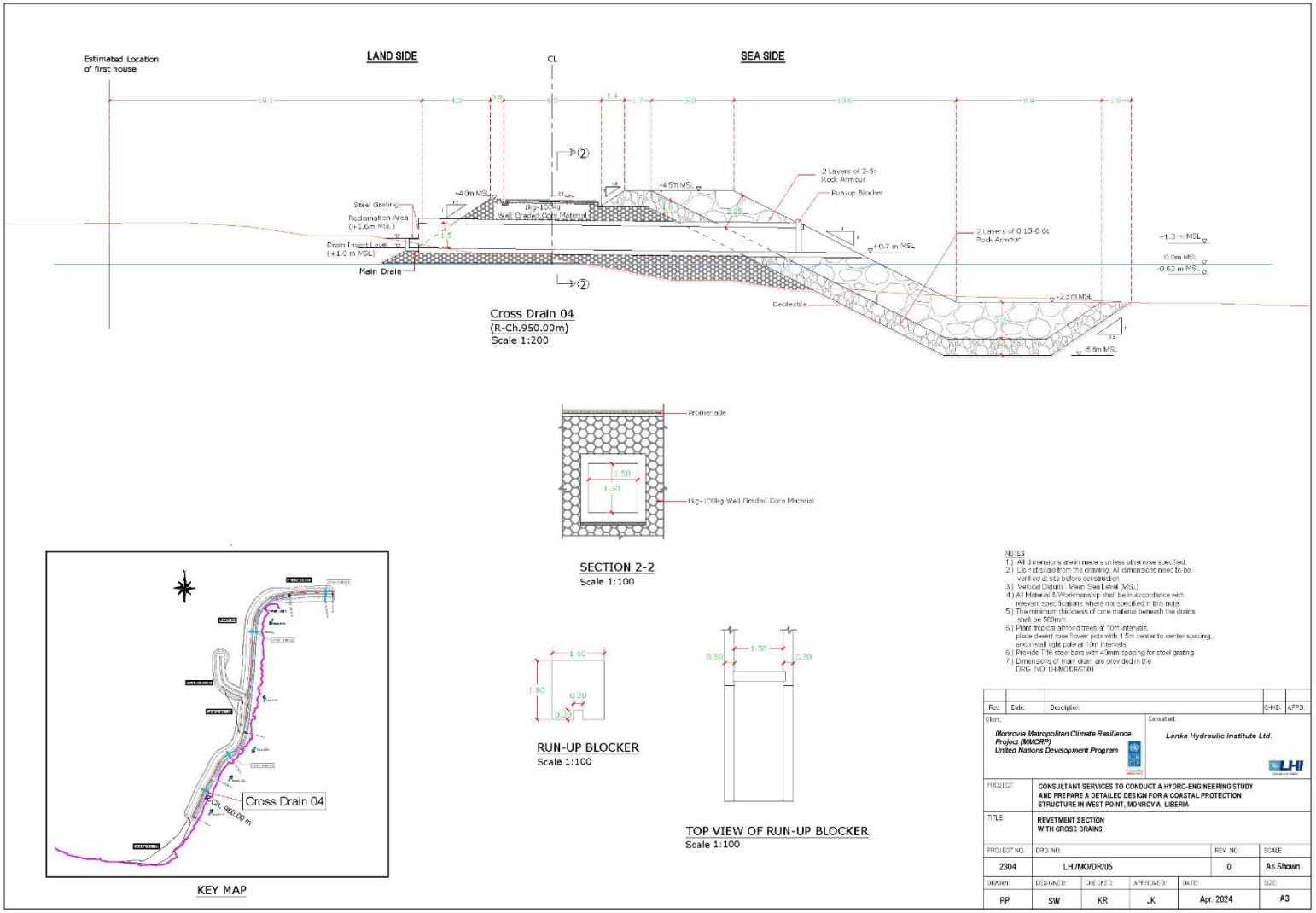
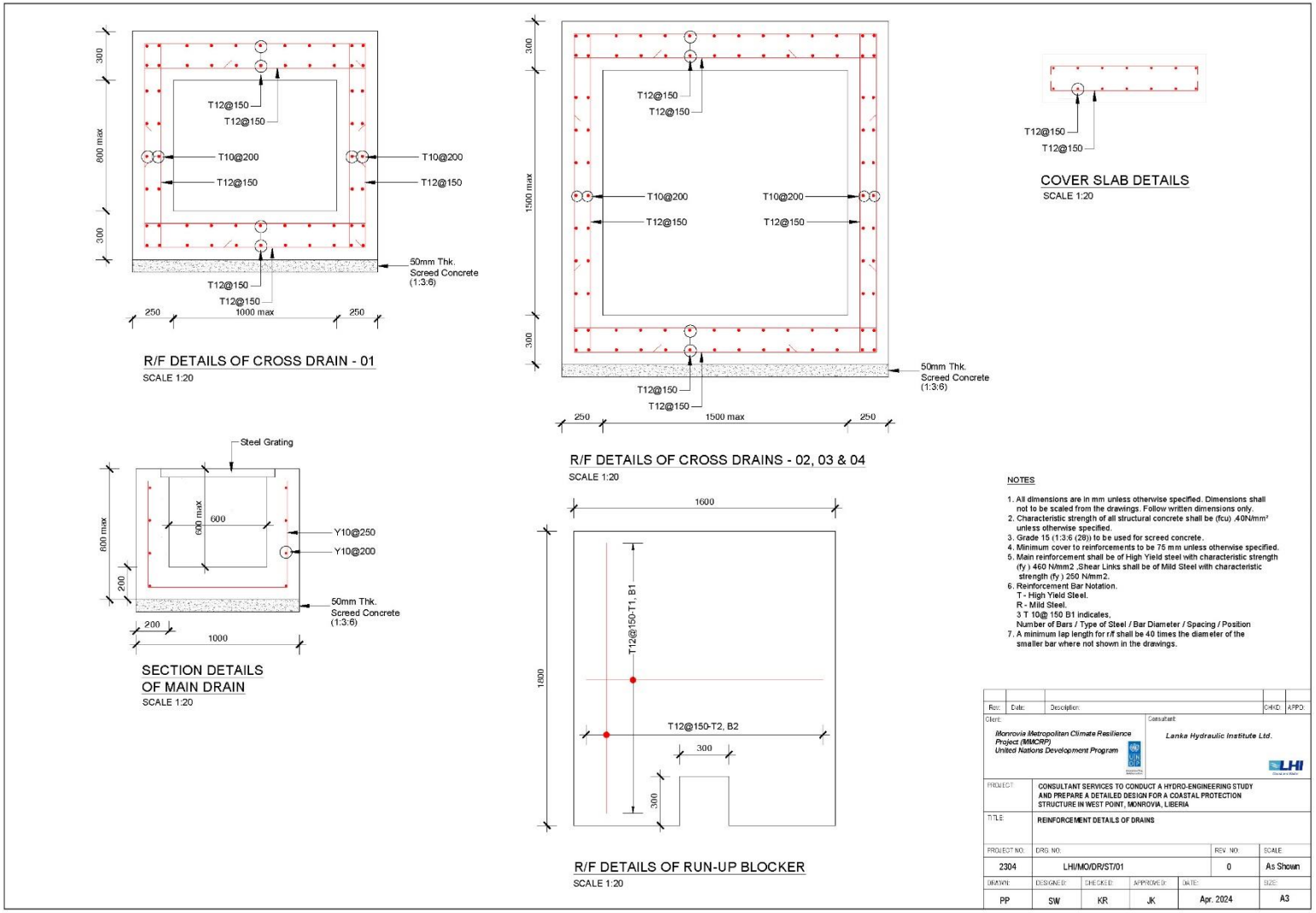
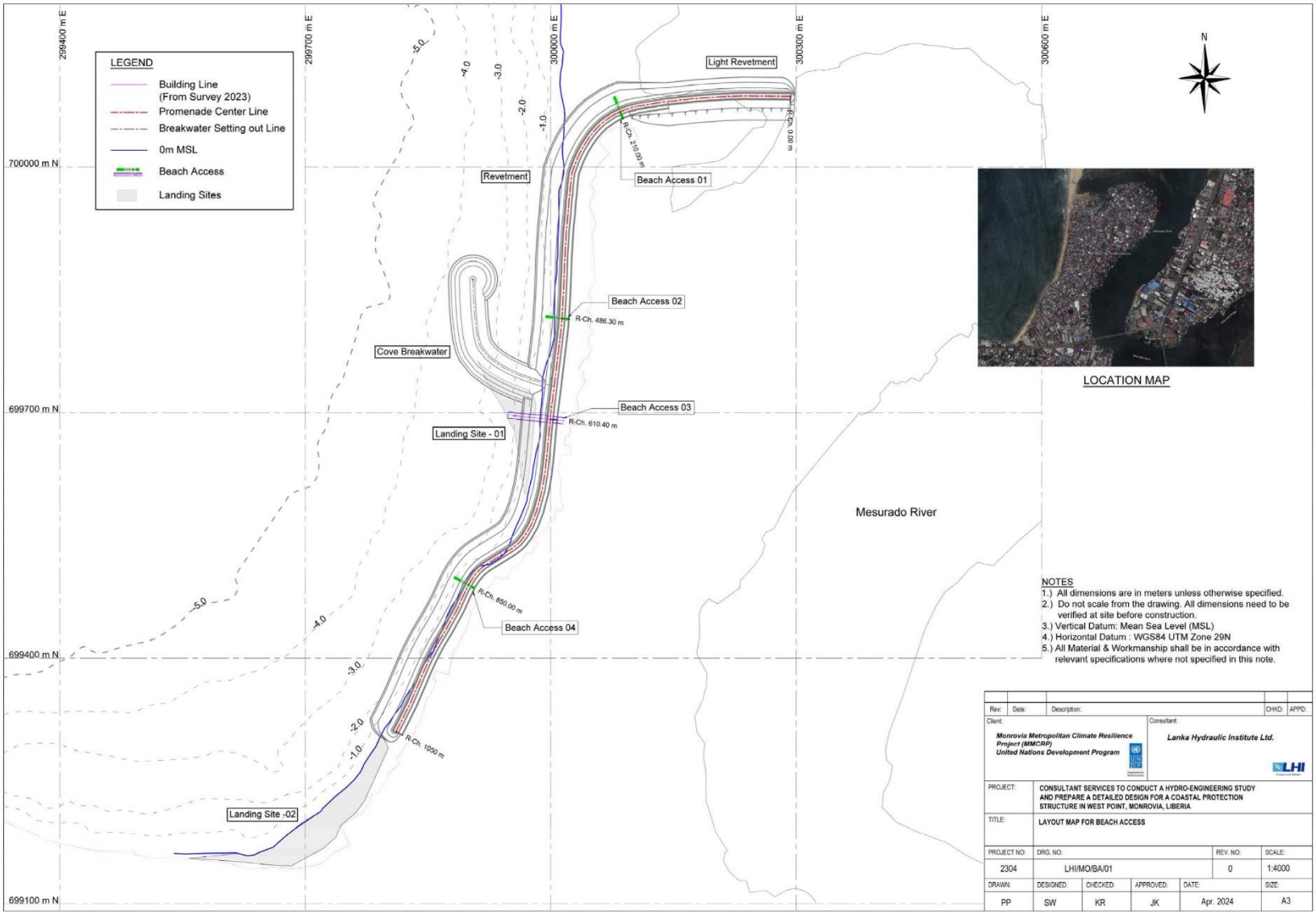
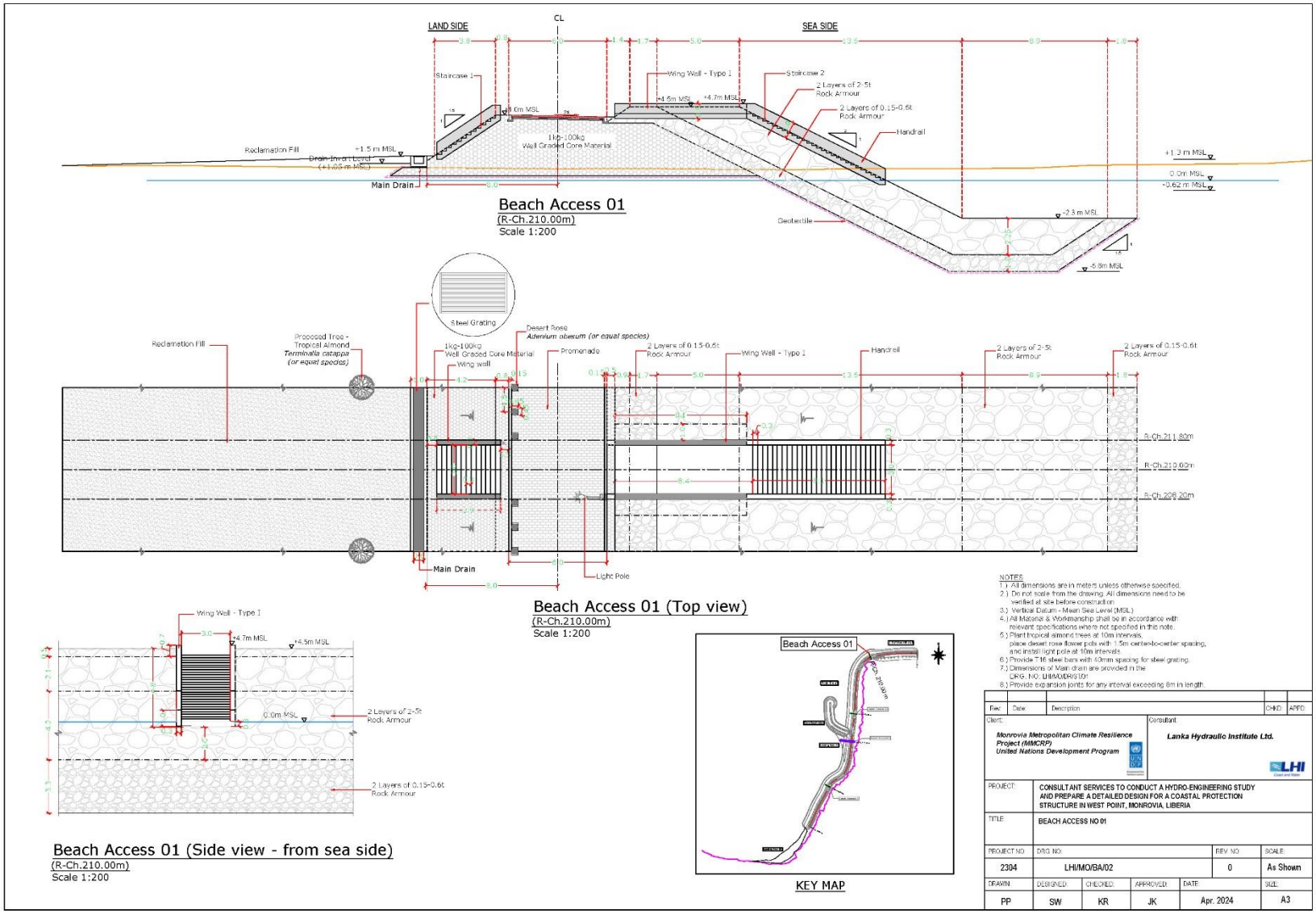
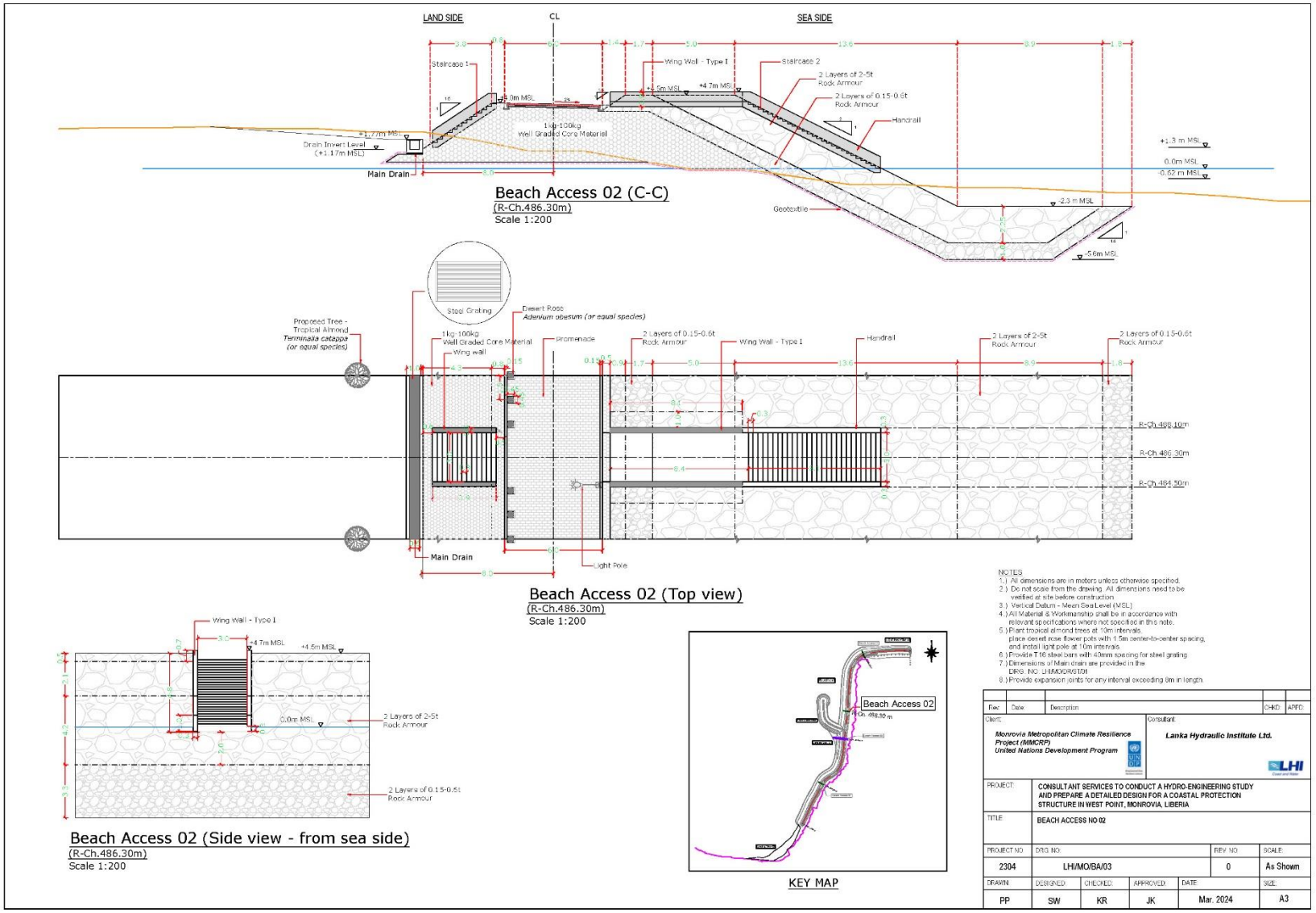

Estimated Location of first house
LAND SIDE
CL
SEA SIDE
Steel Grating
Reclamation Area (+1.4 m MSL)
Drain Invert Level (+0.8 m MSL)
Main Drain
+4.0m MSL
+4.5m MSL
1kg-100kg Well Graded Core Material
2 Layers of 2-5t Rock Armour
Run-up Blocker
2 Layers of 0.15-0.6t Rock Armour
Geotextile
+0.5 m MSL
+1.3 m MSL
0.0m MSL
-0.62 m MSL
2.3 m MSL
-5.6m MSL
Cross Drain 03
(R-Ch.800.00m)
Scale 1:200
Promenade
1kg-100kg Well Graded Core Material
SECTION 2-2
Scale 1:100
RUN-UP BLOCKER
Scale 1:100
TOP VIEW OF RUN-UP BLOCKER
Scale 1:100
Cross Drain 03
Ch. 800.00 m
KEY MAP
NOTES
1.) All dimensions are in meters unless otherwise specified.
2.) Do not scale from the drawing. All dimensions need to be verified at site before construction.
3.) Vertical Datum - Mean Sea Level (MSL)
4.) All Material & Workmanship shall be in accordance with relevant specifications where not specified in this note.
5.) The minimum thickness of core material beneath the drains shall be 500mm
6.) Plant tropical almond trees at 10m intervals. place desert rose flower pots with 1.5m center-to-center spacing, and install light pole at 10m intervals.
6.) Provide T16 steel bars with 40mm spacing for steel grating.
7.) Dimensions of main drain are provided in the DRG. NO: LHI/MO/DR/S01
Rev.
Date:
Description:
CHKD
APPD
Client:
Monrovia Metropolitan Climate Resilience Project (MMCRP)
United Nations Development Program
Consultant:
Lanka Hydraulic Institute Ltd.
PROJECT:
CONSULTANT SERVICES TO CONDUCT A HYDRO-ENGINEERING STUDY AND PREPARE A DETAILED DESIGN FOR A COASTAL PROTECTION STRUCTURE IN WEST POINT, MONROVIA, LIBERIA
TITLE:
REVETMENT SECTION WITH CROSS DRAINS
PROJECT NO:
DRG. NO:
REV. NO:
SCALE:
2304
LHI/MO/DR/04
0
As Shown
DRAWN:
DESIGNED:
CHECKED:
APPROVED:
DATE:
SIZE:
PP
SW
KR
JK
Apr. 2024
A3

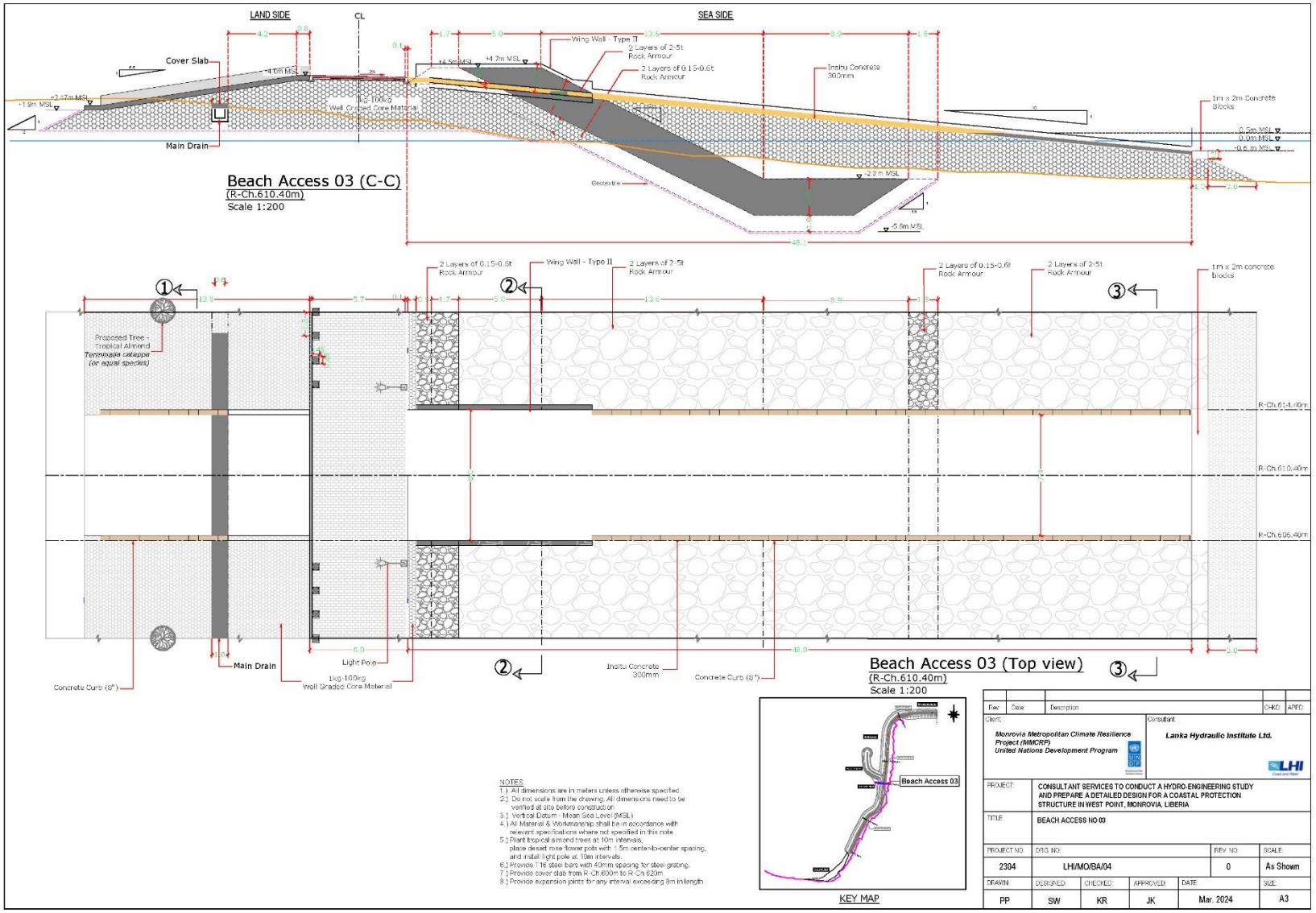

Estimated Location of first house
LAND SIDE
CL
SEA SIDE
Steel Grating
Reclamation Area (+1.6m MSL)
Drain Invert Level (+1.0 m MSL)
Main Drain
+4.0m MSL
+4.5m MSL
1kg-100kg Well Graded Core Material
2 Layers of 2-5t Rock Armour
Run-up Blocker
2 Layers of 0.15-0.6t Rock Armour
+0.7 m MSL
+1.3 m MSL
0.0m MSL
-0.62 m MSL
-2.3 m MSL
-5.8m MSL
Geotextile
Cross Drain 04
(R-Ch.950.00m)
Scale 1:200
Promenade
1kg-100kg Well Graded Core Material
SECTION 2-2
Scale 1:100
RUN-UP BLOCKER
Scale 1:100
TOP VIEW OF RUN-UP BLOCKER
Scale 1:100
Cross Drain 04
Ch. 950.00 m
KEY MAP
NOTES
1) All dimensions are in meters unless otherwise specified.
2) Do not scale from the drawing. All dimensions need to be verified at site before construction.
3) Vertical Datum - Mean Sea Level (MSL).
4) All Material & Workmanship shall be in accordance with relevant specifications where not specified in this note.
5) The minimum thickness of core material beneath the drains shall be 500mm.
6) Plant tropical almond trees at 10m intervals, place desert rose flower pots with 1.5m center to center spacing, and install light pole at 10m intervals.
6) Provide T16 steel bars with 40mm spacing for steel grating.
7) Dimensions of main drain are provided in the DRG. NO: LHI/MO/DR/ST/01
Rev: Date: Description: CHKD: APPD:
Client: Monrovia Metropolitan Climate Resilience Project (MMCRP) United Nations Development Program
Consultant: Lanka Hydraulic Institute Ltd.
PROJECT: CONSULTANT SERVICES TO CONDUCT A HYDRO-ENGINEERING STUDY AND PREPARE A DETAILED DESIGN FOR A COASTAL PROTECTION STRUCTURE IN WEST POINT, MONROVIA, LIBERIA
TITLE: REVETMENT SECTION WITH CROSS DRAINS
PROJECT NO: 2304
DRG NO: LHI/MO/DR/05
REV NO: 0
SCALE: As Shown
DRAWN: PP
DESIGNED: SW
CHECKED: KR
APPROVED: JK
DATE: Apr. 2024
SIZE: A3

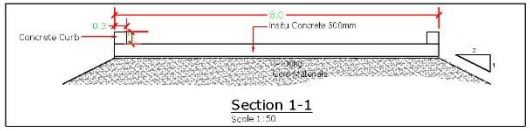

300
600 max
300
T12@150
T12@150
T10@200
T12@150
T10@200
T12@150
50mm Thk.
Screed Concrete
(1:3:6)
T12@150
T12@150
250
1000 max
250
R/F DETAILS OF CROSS DRAIN - 01
SCALE 1:20
300
1500 max
300
T12@150
T12@150
T10@200
T12@150
T10@200
T12@150
50mm Thk.
Screed Concrete
(1:3:6)
T12@150
T12@150
250
1500 max
250
R/F DETAILS OF CROSS DRAINS - 02, 03 & 04
SCALE 1:20
T12@150
T12@150
COVER SLAB DETAILS
SCALE 1:20
Steel Grating
600 max
600 max
600
Y10@250
Y10@200
200
50mm Thk.
Screed Concrete
(1:3:6)
200
1000
SECTION DETAILS
OF MAIN DRAIN
SCALE 1:20
1600
1800
T12@150-T1, B1
T12@150-T2, B2
300
300
R/F DETAILS OF RUN-UP BLOCKER
SCALE 1:20
NOTES
1. All dimensions are in mm unless otherwise specified. Dimensions shall not to be scaled from the drawings. Follow written dimensions only.
2. Characteristic strength of all structural concrete shall be (fcu) 40N/mm² unless otherwise specified.
3. Grade 15 (1:3:6 (28)) to be used for screed concrete.
4. Minimum cover to reinforcements to be 75 mm unless otherwise specified.
5. Main reinforcement shall be of High Yield steel with characteristic strength (fy) 460 N/mm2. Shear Links shall be of Mild Steel with characteristic strength (fy) 250 N/mm2.
6. Reinforcement Bar Notation.
T - High Yield Steel.
R - Mild Steel.
3 T 10@ 150 B1 indicates,
Number of Bars / Type of Steel / Bar Diameter / Spacing / Position
7. A minimum lap length for r/f shall be 40 times the diameter of the smaller bar where not shown in the drawings.
Rev.
Date:
Description:
CHKD
APPD.
Client:
Monrovia Metropolitan Climate Resilience Project (MMCRP)
United Nations Development Program
Consultant:
Lanka Hydraulic Institute Ltd.
PROJECT:
CONSULTANT SERVICES TO CONDUCT A HYDRO-ENGINEERING STUDY AND PREPARE A DETAILED DESIGN FOR A COASTAL PROTECTION STRUCTURE IN WEST POINT, MONROVIA, LIBERIA
TITLE:
REINFORCEMENT DETAILS OF DRAINS
PROJECT NO:
DRG. NO:
REV. NO:
SCALE:
2304
LHI/MO/DR/ST/01
0
As Shown
DRAWN:
DESIGNED:
CHECKED:
APPROVED:
DATE:
SIZE:
PP
SW
KR
JK
Apr. 2024
A3


LEGEND
Building Line (From Survey 2023)
Promenade Center Line
Breakwater Setting out Line
0m MSL
Beach Access
Landing Sites
299400 m E
299700 m E
300000 m E
300300 m E
300600 m E
700000 m N
699700 m N
699400 m N
699100 m N
Light Revetment
Revetment
Beach Access 01
R-Ch. 210.00 m
Beach Access 02
R-Ch. 486.30 m
Cove Breakwater
Beach Access 03
R-Ch. 610.40 m
Landing Site - 01
Mesurado River
R-Ch. 850.00 m
Beach Access 04
R-Ch. 1050 m
Landing Site -02
N
LOCATION MAP
NOTES
1.) All dimensions are in meters unless otherwise specified.
2.) Do not scale from the drawing. All dimensions need to be verified at site before construction.
3.) Vertical Datum: Mean Sea Level (MSL)
4.) Horizontal Datum : WGS84 UTM Zone 29N
5.) All Material & Workmanship shall be in accordance with relevant specifications where not specified in this note.
Client:
Monrovia Metropolitan Climate Resilience Project (MMCRP)
United Nations Development Program
Consultant:
Lanka Hydraulic Institute Ltd.
PROJECT: CONSULTANT SERVICES TO CONDUCT A HYDRO-ENGINEERING STUDY AND PREPARE A DETAILED DESIGN FOR A COASTAL PROTECTION STRUCTURE IN WEST POINT, MONROVIA, LIBERIA
TITLE: LAYOUT MAP FOR BEACH ACCESS
PROJECT NO: 2304
DRG. NO: LHI/MO/BA/01
REV. NO: 0
SCALE: 1:4000
DRAWN: PP
DESIGNED: SW
CHECKED: KR
APPROVED: JK
DATE: Apr. 2024
SIZE: A3


LAND SIDE
SEA SIDE
CL
Staircase 1
Staircase 2
Wing Wall - Type 1
2 Layers of 2-5t Rock Armour
2 Layers of 0.15-0.6t Rock Armour
Handrail
Reclamation Fill
Drain Invert Level (+1.05 m MSL)
Main Drain
1kg-100kg Well Graded Core Material
Geotextile
+1.5 m MSL
+1.3 m MSL
0.0m MSL
-0.62 m MSL
-2.3 m MSL
-5.8m MSL
Beach Access 01
(R-Ch.210.00m)
Scale 1:200
Steel Grating
Processed Tree - Tropical Almond Terminalia catappa (or equal species)
Desert Rose Adenium obesum (or equal species)
Promenade
Wing wall
Light Pole
R-Ch.211.80m
R-Ch.210.00m
R-Ch.208.20m
Beach Access 01 (Top view)
(R-Ch.210.00m)
Scale 1:200
Beach Access 01 (Side view - from sea side)
(R-Ch.210.00m)
Scale 1:200
KEY MAP
NOTES
1.) All dimensions are in meters unless otherwise specified.
2.) Do not scale from the drawing. All dimensions need to be verified at site before construction.
3.) Vertical Datum - Mean Sea Level (MSL).
4.) All Material & Workmanship shall be in accordance with relevant specifications where not specified in this note.
5.) Plant tropical almond trees at 10m intervals, place desert rose flower pots with 1.5m center-to-center spacing, and install light pole at 10m intervals.
6.) Provide T16 steel bars with 40mm spacing for steel grating.
7.) Dimensions of Main drain are provided in the DRG. NO. LHI/MO/BA/01.
8.) Provide expansion joints for any interval exceeding 8m in length.
Rev. Date Description CHKD APPD.
Client: Monrovia Metropolitan Climate Resilience Project (MMCRP) United Nations Development Program
Consultant: Lanka Hydraulic Institute Ltd.
PROJECT: CONSULTANT SERVICES TO CONDUCT A HYDRO-ENGINEERING STUDY AND PREPARE A DETAILED DESIGN FOR A COASTAL PROTECTION STRUCTURE IN WEST POINT, MONROVIA, LIBERIA
TITLE: BEACH ACCESS NO 01
PROJECT NO. 2304
DRG. NO. LHI/MO/BA/02
REV. NO. 0
SCALE: As Shown
DRAWN: PP
DESIGNED: SW
CHECKED: KR
APPROVED: JK
DATE: Apr. 2024
SIZE: A3

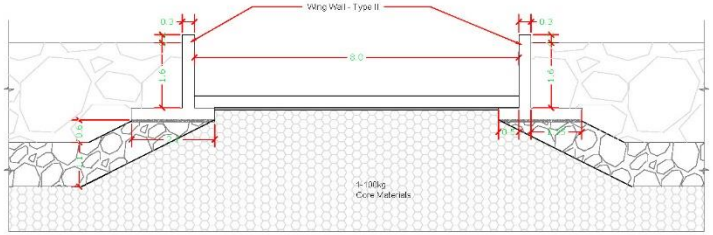

LAND SIDE
CL
SEA SIDE
Staircase 1
Wing Wall - Type I
Staircase 2
2 Layers of 2-5t Rock Armour
2 Layers of 0.15-0.6t Rock Armour
Handrail
+4.7m MSL
+4.5m MSL
+3.9m MSL
+1.77m MSL
Drain Invert Level (+1.17m MSL)
1kg-100kg Well Graded Core Material
Main Drain
+1.3 m MSL
0.0m MSL
-0.62 m MSL
-2.3 m MSL
Geotextile
-5.6m MSL
Beach Access 02 (C-C)
(R-Ch.486.30m)
Scale 1:200
Steel Grating
Desert Rose
Adenium obesum (or equal species)
Proposed Tree - Tropical Almond
Terminalia catappa (or equal species)
Promenade
Light Pole
R-Ch.488.10m
R-Ch.486.30m
R-Ch.484.50m
Beach Access 02 (Top view)
(R-Ch.486.30m)
Scale 1:200
Beach Access 02 (Side view - from sea side)
(R-Ch.486.30m)
Scale 1:200
KEY MAP
Beach Access 02
NOTES
1.) All dimensions are in meters unless otherwise specified.
2.) Do not scale from the drawing. All dimensions need to be verified at site before construction.
3.) Vertical Datum - Mean Sea Level (MSL).
4.) All Material & Workmanship shall be in accordance with relevant specifications where not specified in this note.
5.) Plant tropical almond trees at 10m intervals. place desert rose flower pots with 1.5m center-to-center spacing, and install light pole at 10m intervals.
6.) Provide T 16 steel bars with 40mm spacing for steel grating.
7.) Dimensions of Main drain are provided in the DRG. NO.: LHI/MO/DR/STDI
8.) Provide expansion joints for any interval exceeding 6m in length.
Rev. Date Description CHKD APPD.
Client: Monrovia Metropolitan Climate Resilience Project (MMCRP) United Nations Development Program
Consultant: Lanka Hydraulic Institute Ltd.
PROJECT: CONSULTANT SERVICES TO CONDUCT A HYDRO-ENGINEERING STUDY AND PREPARE A DETAILED DESIGN FOR A COASTAL PROTECTION STRUCTURE IN WEST POINT, MONROVIA, LIBERIA
TITLE: BEACH ACCESS NO 02
PROJECT NO. 2304
DRG NO: LHI/MO/BA/03
REV NO: 0
SCALE: As Shown
DRAWN: PP
DESIGNED: SW
CHECKED: KR
APPROVED: JK
DATE: Mar. 2024
SIZE: A3


LAND SIDE
CL
SEA SIDE
Cover Slab
Main Drain
Well Graded Core Material
Wing Wall - Type II
2 Layers of 2-5t Rock Armour
2 Layers of 0.15-0.6t Rock Armour
Insitu Concrete 300mm
1m x 2m Concrete Blocks
Geotextile
Beach Access 03 (C-C)
(R-Ch.610.40m)
Scale 1:200
Proposed Tree - Tropical Almond
Terminalia catappa
(or equal species)
Light Pole
1kg-100kg
Well Graded Core Material
Concrete Curb (6")
R-Ch.614.40m
R-Ch.610.40m
R-Ch.606.40m
Beach Access 03 (Top view)
(R-Ch.610.40m)
Scale 1:200
NOTES
1.) All dimensions are in meters unless otherwise specified.
2.) Do not scale from the drawing. All dimensions need to be verified at site before construction
3.) Vertical Datum - Mean Sea Level (MSL)
4.) All Material & Workmanship shall be in accordance with relevant specifications where not specified in this note.
5.) Plant tropical almond trees at 10m intervals, place desert rose flower pots with 1.5m center-to-center spacing, and install light pole at 10m intervals.
6.) Provide T16 steel bars with 40mm spacing for steel grating.
7.) Provide cover slab from R-Ch.600m to R-Ch.620m
8.) Provide expansion joints for any interval exceeding 8m in length
Beach Access 03
KEY MAP
Client:
Monrovia Metropolitan Climate Resilience Project (MMCRP)
United Nations Development Program
Consultant:
Lanka Hydraulic Institute Ltd.
PROJECT: CONSULTANT SERVICES TO CONDUCT A HYDRO-ENGINEERING STUDY AND PREPARE A DETAILED DESIGN FOR A COASTAL PROTECTION STRUCTURE IN WEST POINT, MONROVIA, LIBERIA
TITLE: BEACH ACCESS NO 03
PROJECT NO: 2304
DRG NO: LHI/MO/BA/04
REV NO: 0
SCALE: As Shown
DRAWN: PP
DESIGNED: SW
CHECKED: KR
APPROVED: JK
DATE: Mar. 2024
SIZE: A3

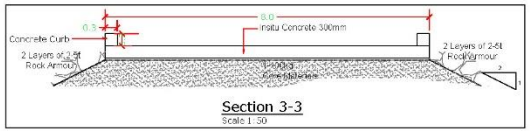


Section 1-1
Scale 1 : 50

DETAILS OF EXPANSION JOINT
Scale 1 : 50



Section 2-2
Scale 1 : 50



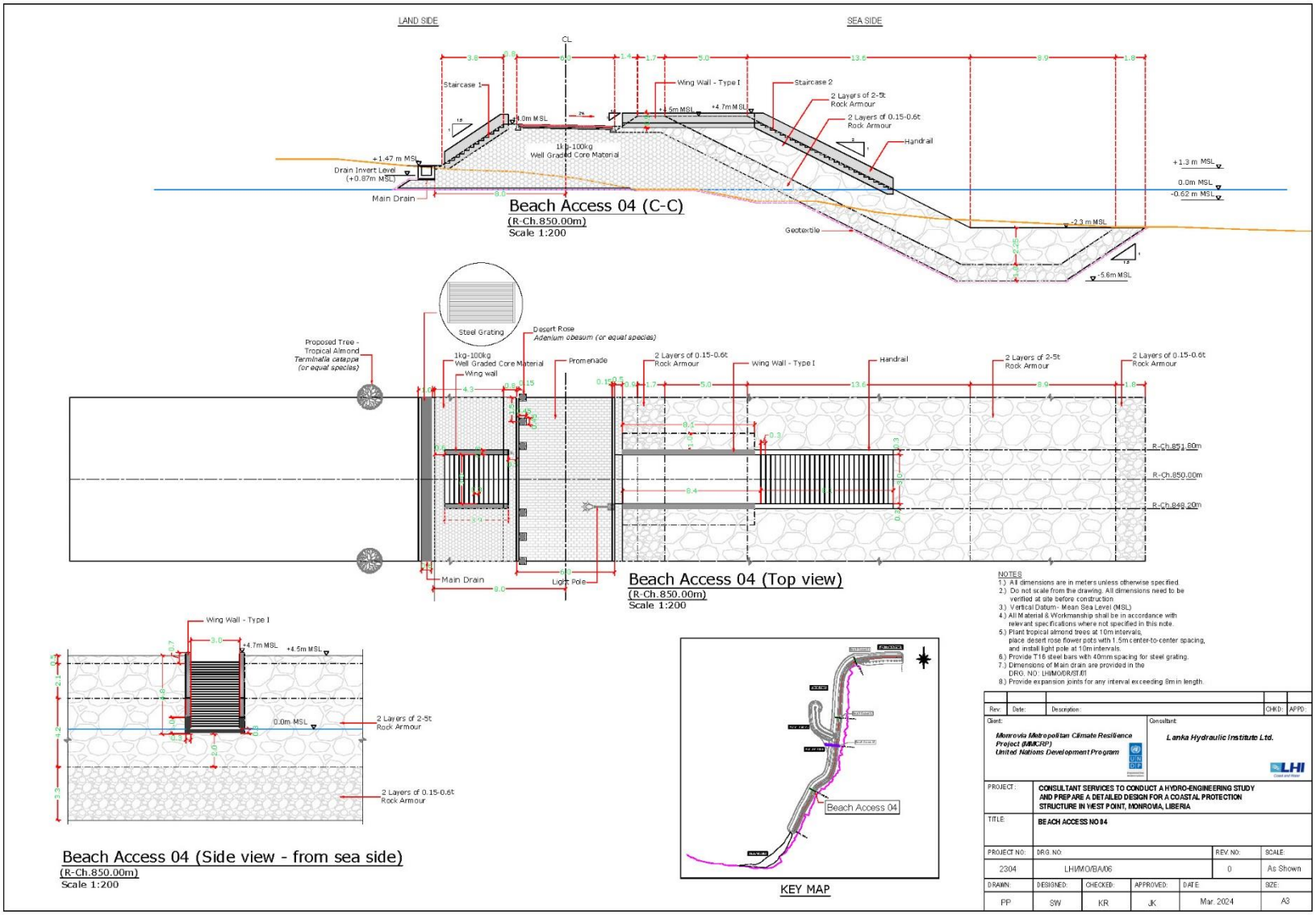
Section 3-3
Scale 1 : 50

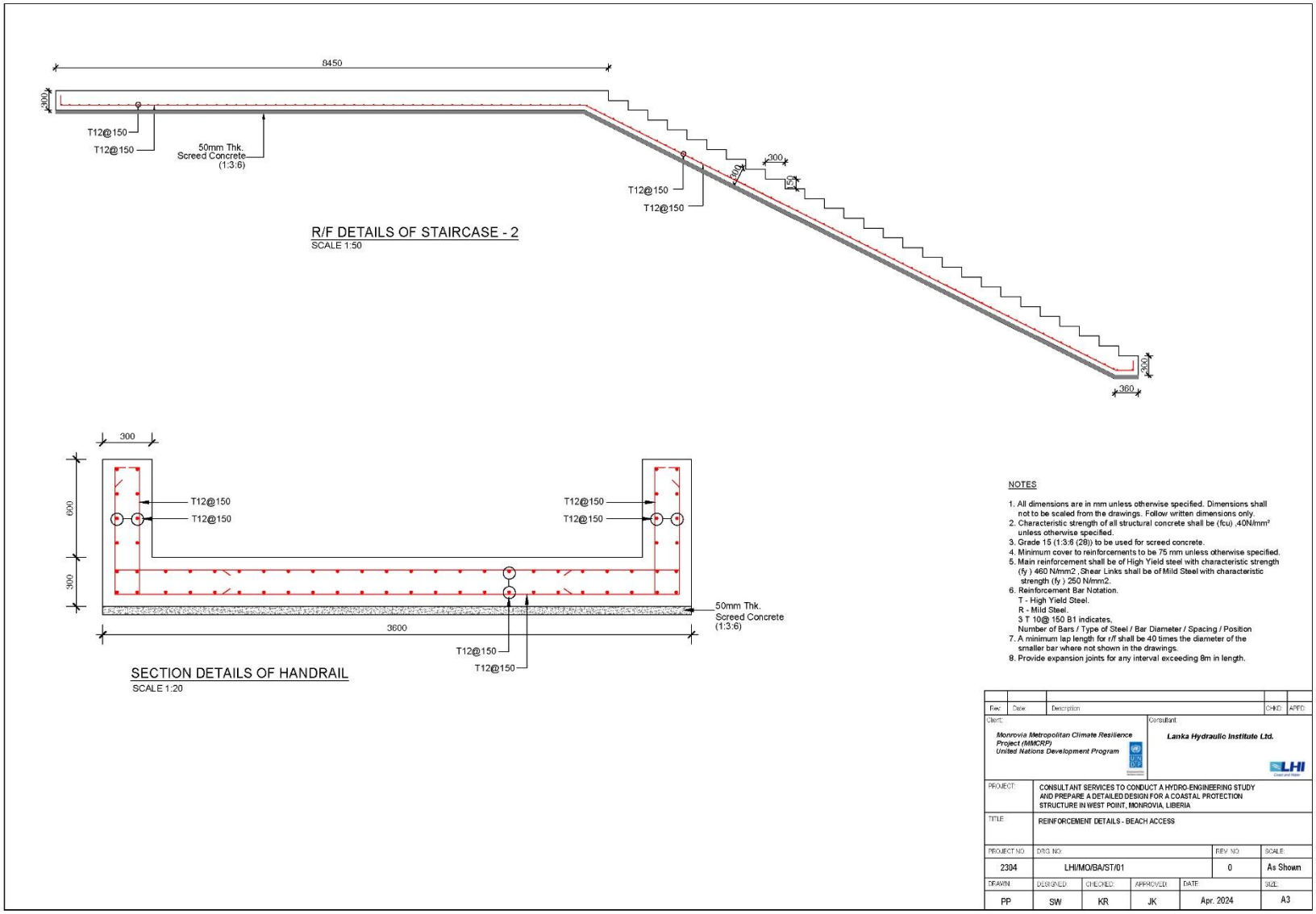
NOTES:
1.) All dimensions are in meters unless otherwise specified.
2.) Do not scale from the drawing. All dimensions need to be verified at site before construction.
3.) Vertical Datum - Mean Sea Level (MSL).
4.) All Materials & Workmanship shall be in accordance with relevant specifications where not specified in this note.
5.) Plant tropical almond trees at 10m intervals, plaze desert rose flower pots with 1.5m center-to-center spacing, and install light pole at 10m intervals.
6.) Provide T16 steel bars with 40mm spacing for steel grating.
7.) Dimensions of Main drain are provided in the DRG. NO. LHI/MO/BS/E101
8.) Provide expansion joints for any interval exceeding 8m in length.

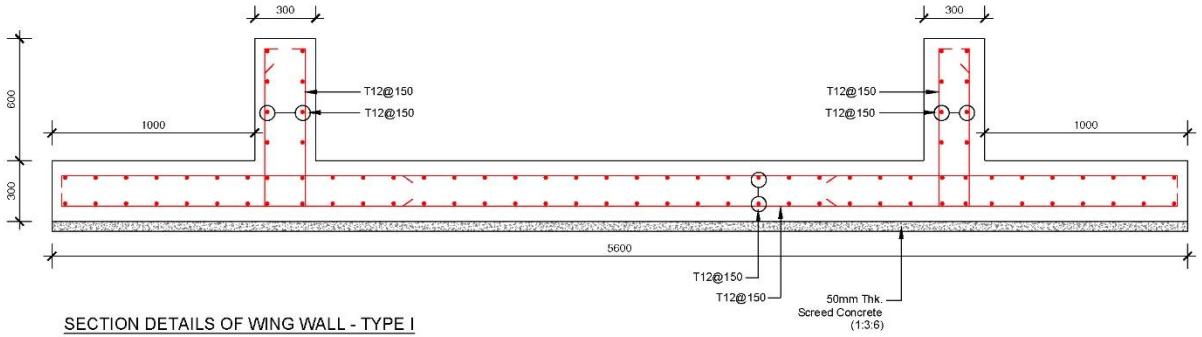
Rev	Date	Description	CHKD	APPD

Client:	Consultant:
Monrovia Metropolitan Climate Resilience Project (MMCRP) *United Nations Development Program*	*Lanka Hydraulic Institute Ltd.*

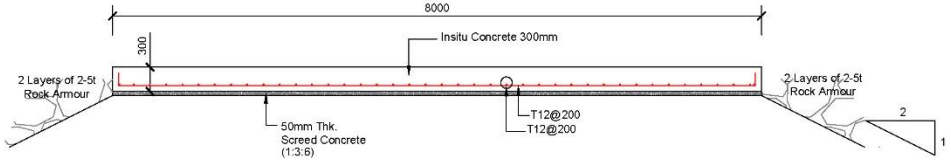
PROJECT:	CONSULTANT SERVICES TO CONDUCT A HYDRO-ENGINEERING STUDY AND PREPARE A DETAILED DESIGN FOR A COASTAL PROTECTION STRUCTURE IN WEST POINT, MONROVIA, LIBERIA				
TITLE:	BEACH ACCESS NO 03				
PROJECT NO.	DRG. NO:			REV. NO	SCALE:
2304	LHI/MO/BA/05			0	As Shown
DRAWN:	DESIGNED:	CHECKED:	APPROVED:	DATE:	SIZE:
PP	SW	KR	JK	Mar. 2024	A3


LAND SIDE
SEA SIDE
CL
Staircase 1
Wing Wall - Type I
Staircase 2
2 Layers of 2-5t Rock Armour
2 Layers of 0.15-0.6t Rock Armour
Handrail
+4.0m MSL
+4.5m MSL
+4.7m MSL
1kg-100kg Well Graded Core Material
+1.47 m MSL
Drain Invert Level (+0.87m MSL)
Main Drain
+1.3 m MSL
0.0m MSL
-0.62 m MSL
-2.3 m MSL
Geotextile
-5.6m MSL
Beach Access 04 (C-C)
(R-Ch.850.00m)
Scale 1:200
Steel Grating
Desert Rose
Adenium obesum (or equal species)
Proposed Tree - Tropical Almond
Terminalia catappa
(or equal species)
Wing wall
Promenade
Light Pole
R-Ch.851.80m
R-Ch.850.00m
R-Ch.848.20m
Beach Access 04 (Top view)
(R-Ch.850.00m)
Scale 1:200
Beach Access 04 (Side view - from sea side)
(R-Ch.850.00m)
Scale 1:200
Beach Access 04
KEY MAP
NOTES
1.) All dimensions are in meters unless otherwise specified.
2.) Do not scale from the drawing. All dimensions need to be verified at site before construction.
3.) Vertical Datum - Mean Sea Level (MSL)
4.) All Material & Workmanship shall be in accordance with relevant specifications where not specified in this note.
5.) Plant tropical almond trees at 10m intervals, place desert rose flower pots with 1.5m center-to-center spacing, and install light pole at 10m intervals.
6.) Provide T16 steel bars with 40mm spacing for steel grating.
7.) Dimensions of Main drain are provided in the DRG. NO.: LHI/MO/DR/ST/01
8.) Provide expansion joints for any interval exceeding 8m in length.
Rev: Date: Description: CHKD: APPD:
Client: Monrovia Metropolitan Climate Resilience Project (MMCRP) United Nations Development Program
Consultant: Lanka Hydraulic Institute Ltd.
PROJECT: CONSULTANT SERVICES TO CONDUCT A HYDRO-ENGINEERING STUDY AND PREPARE A DETAILED DESIGN FOR A COASTAL PROTECTION STRUCTURE IN WEST POINT, MONROVIA, LIBERIA
TITLE: BEACH ACCESS NO 04
PROJECT NO: 2304
DRG. NO: LHI/MO/BA/06
REV. NO: 0
SCALE: As Shown
DRAWN: PP
DESIGNED: SW
CHECKED: KR
APPROVED: JK
DATE: Mar. 2024
SIZE: A3

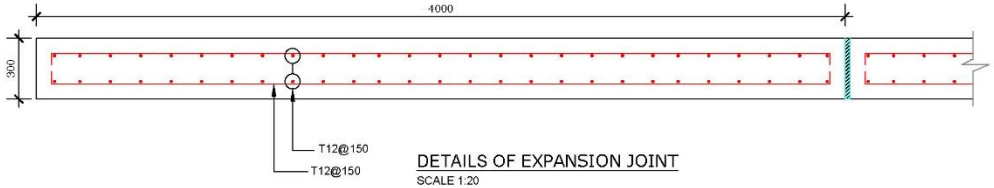

8450
300
T12@150
T12@150
50mm Thk.
Screed Concrete
(1:3:6)
300
300
150
T12@150
T12@150
300
360
R/F DETAILS OF STAIRCASE - 2
SCALE 1:50
300
600
300
T12@150
T12@150
T12@150
T12@150
50mm Thk.
Screed Concrete
(1:3:6)
3600
T12@150
T12@150
SECTION DETAILS OF HANDRAIL
SCALE 1:20
NOTES
1. All dimensions are in mm unless otherwise specified. Dimensions shall not to be scaled from the drawings. Follow written dimensions only.
2. Characteristic strength of all structural concrete shall be (fcu) ,40N/mm² unless otherwise specified.
3. Grade 15 (1:3:6 (28)) to be used for screed concrete.
4. Minimum cover to reinforcements to be 75 mm unless otherwise specified.
5. Main reinforcement shall be of High Yield steel with characteristic strength (fy) 460 N/mm2 , Shear Links shall be of Mild Steel with characteristic strength (fy) 250 N/mm2.
6. Reinforcement Bar Notation.
T - High Yield Steel.
R - Mild Steel.
3 T 10@ 150 B1 indicates,
Number of Bars / Type of Steel / Bar Diameter / Spacing / Position
7. A minimum lap length for r/f shall be 40 times the diameter of the smaller bar where not shown in the drawings.
8. Provide expansion joints for any interval exceeding 8m in length.
Rev
Date
Description
CHKD
APPD
Client:
Monrovia Metropolitan Climate Resilience Project (MMCRP)
United Nations Development Program
Consultant:
Lanka Hydraulic Institute Ltd.
LHI
PROJECT:
CONSULTANT SERVICES TO CONDUCT A HYDRO-ENGINEERING STUDY AND PREPARE A DETAILED DESIGN FOR A COASTAL PROTECTION STRUCTURE IN WEST POINT, MONROVIA, LIBERIA
TITLE:
REINFORCEMENT DETAILS - BEACH ACCESS
PROJECT NO.
DRG. NO:
REV. NO
SCALE:
2304
LHI/MO/BA/ST/01
0
As Shown
DRAWN:
DESIGNED:
CHECKED:
APPROVED:
DATE:
SIZE:
PP
SW
KR
JK
Apr. 2024
A3



SECTION DETAILS OF WING WALL - TYPE I
SCALE 1:20



R/F DETAILS OF BEACH ACCESS 03
SCALE 1:50



DETAILS OF EXPANSION JOINT
SCALE 1:20

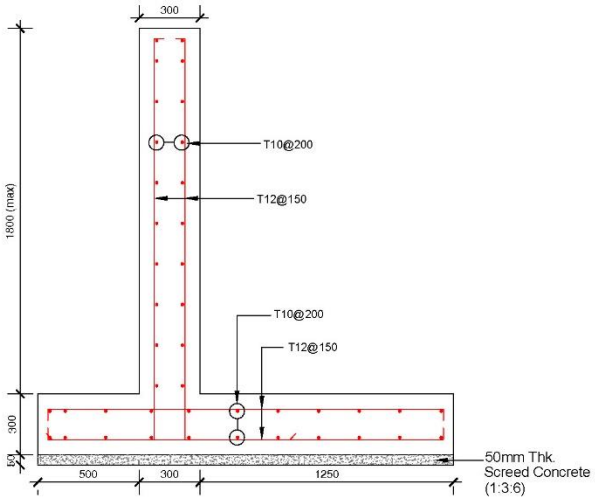
NOTES

1. All dimensions are in mm unless otherwise specified. Dimensions shall not to be scaled from the drawings. Follow written dimensions only.
2. Characteristic strength of all structural concrete shall be (fcu) ;40N/mm² unless otherwise specified.
3. Grade 15 (1:3:6 (28)) to be used for screed concrete.
4. Minimum cover to reinforcements to be 75 mm unless otherwise specified.
5. Main reinforcement shall be of High Yield steel with characteristic strength (fy) 460 N/mm2 ,Shear Links shall be of Mild Steel with characteristic strength (fy) 250 N/mm2.
6. Reinforcement Bar Notation.
   T - High Yield Steel.
   R - Mild Steel.
   3 T 10@ 150 B1 indicates,
   Number of Bars / Type of Steel / Bar Diameter / Spacing / Position
7. A minimum lap length for /f shall be 40 times the diameter of the smaller bar where not shown in the drawings.
8. Provide expansion joints for any interval exceeding 8m in length.

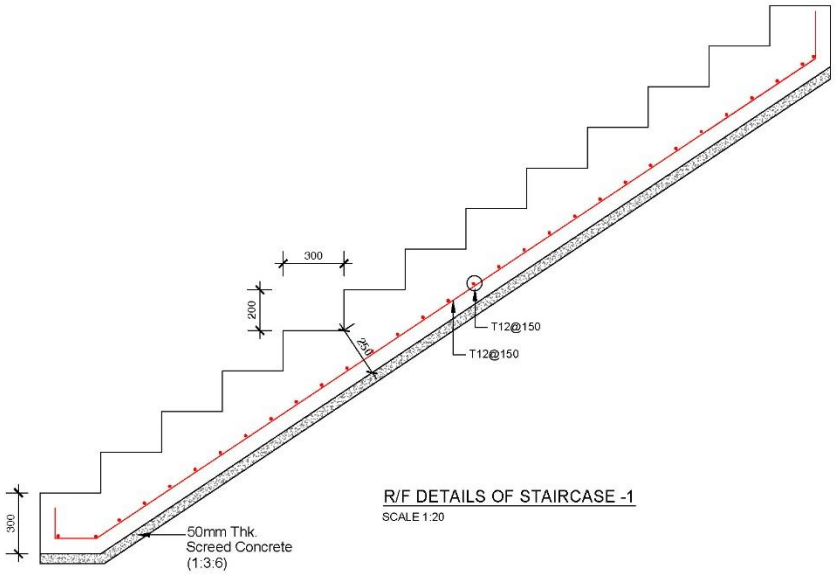
Rev.	Date	Description	CHKD	APPD

Client:	Consultant:
Monrovia Metropolitan Climate Resilience Project (MMCRP) *United Nations Development Program*	*Lanka Hydraulic Institute Ltd.*

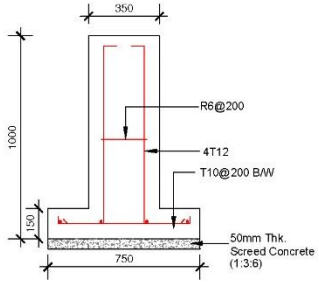
PROJECT:	CONSULTANT SERVICES TO CONDUCT A HYDRO-ENGINEERING STUDY AND PREPARE A DETAILED DESIGN FOR A COASTAL PROTECTION STRUCTURE IN WEST POINT, MONROVIA, LIBERIA				
TITLE:	REINFORCEMENT DETAILS - BEACH ACCESS				
PROJECT NO.	DRG. NO:			REV. NO	SCALE:
2304	LHI/MO/BA/ST/02			0	As Shown
DRAWN:	DESIGNED:	CHECKED:	APPROVED:	DATE:	SIZE:
PP	SW	KR	JK	Apr. 2024	A3



R/F DETAILS OF WING WALL - TYPE II
SCALE 1:20



R/F DETAILS OF STAIRCASE -1
SCALE 1:20



DETAILS OF SOLAR LIGHT POLE BASE
SCALE 1:20

NOTES

1. All dimensions are in mm unless otherwise specified. Dimensions shall not to be scaled from the drawings. Follow written dimensions only.
2. Characteristic strength of all structural concrete shall be (fcu) ,40N/mm² unless otherwise specified.
3. Grade 15 (1:3:6 (28)) to be used for screed concrete.
4. Minimum cover to reinforcements to be 75 mm unless otherwise specified.
5. Main reinforcement shall be of High Yield steel with characteristic strength (fy) 460 N/mm2 .Shear Links shall be of Mild Steel with characteristic strength (fy) 250 N/mm2.
6. Reinforcement Bar Notation.
   T - High Yield Steel.
   R - Mild Steel.
   3 T 10@ 150 B1 indicates,
   Number of Bars / Type of Steel / Bar Diameter / Spacing / Position
7. A minimum lap length for r/f shall be 40 times the diameter of the smaller bar where not shown in the drawings.
8. Provide expansion joints for any interval exceeding 8m in length.

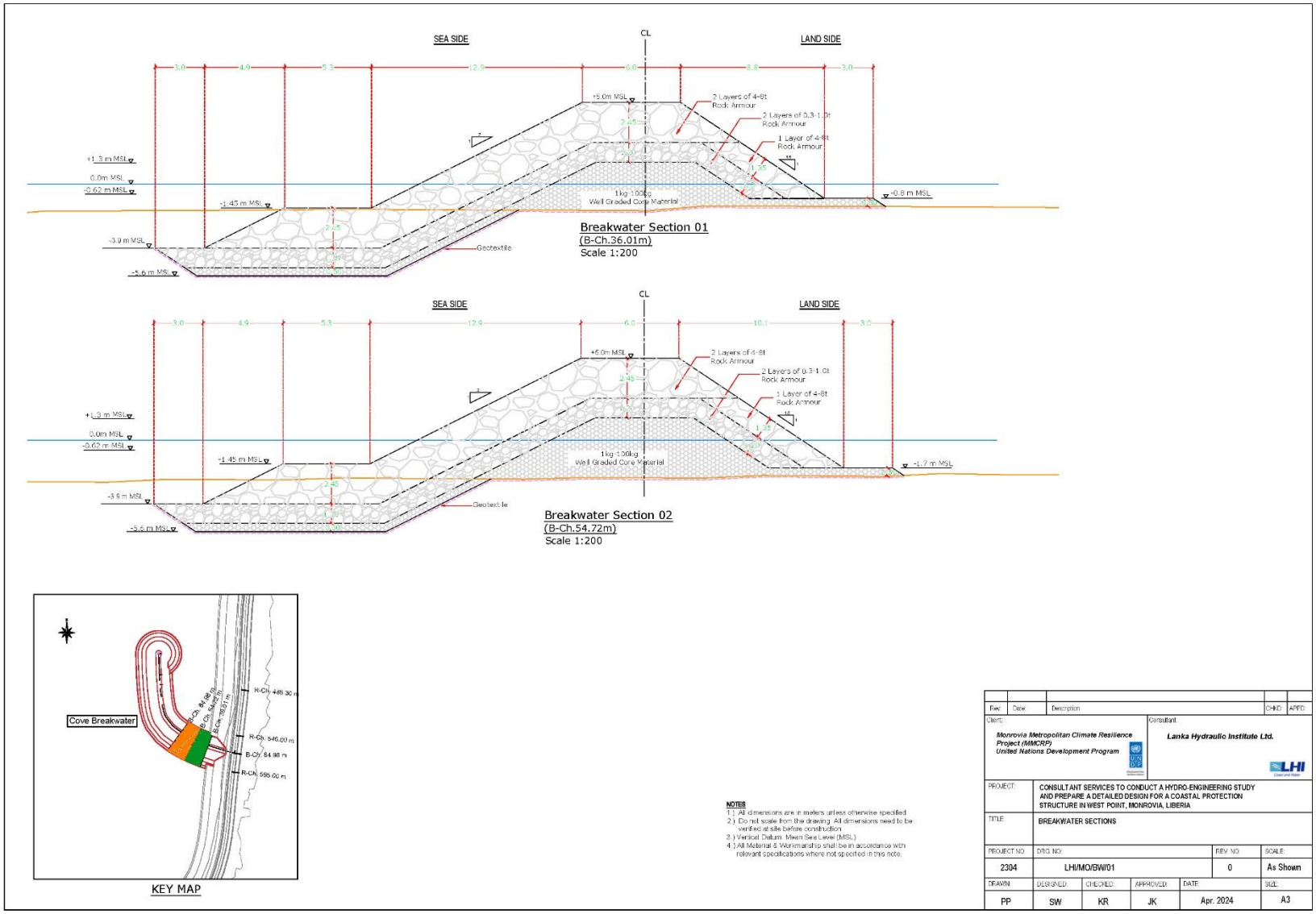
Rev	Date	Description	CHKD	APPD

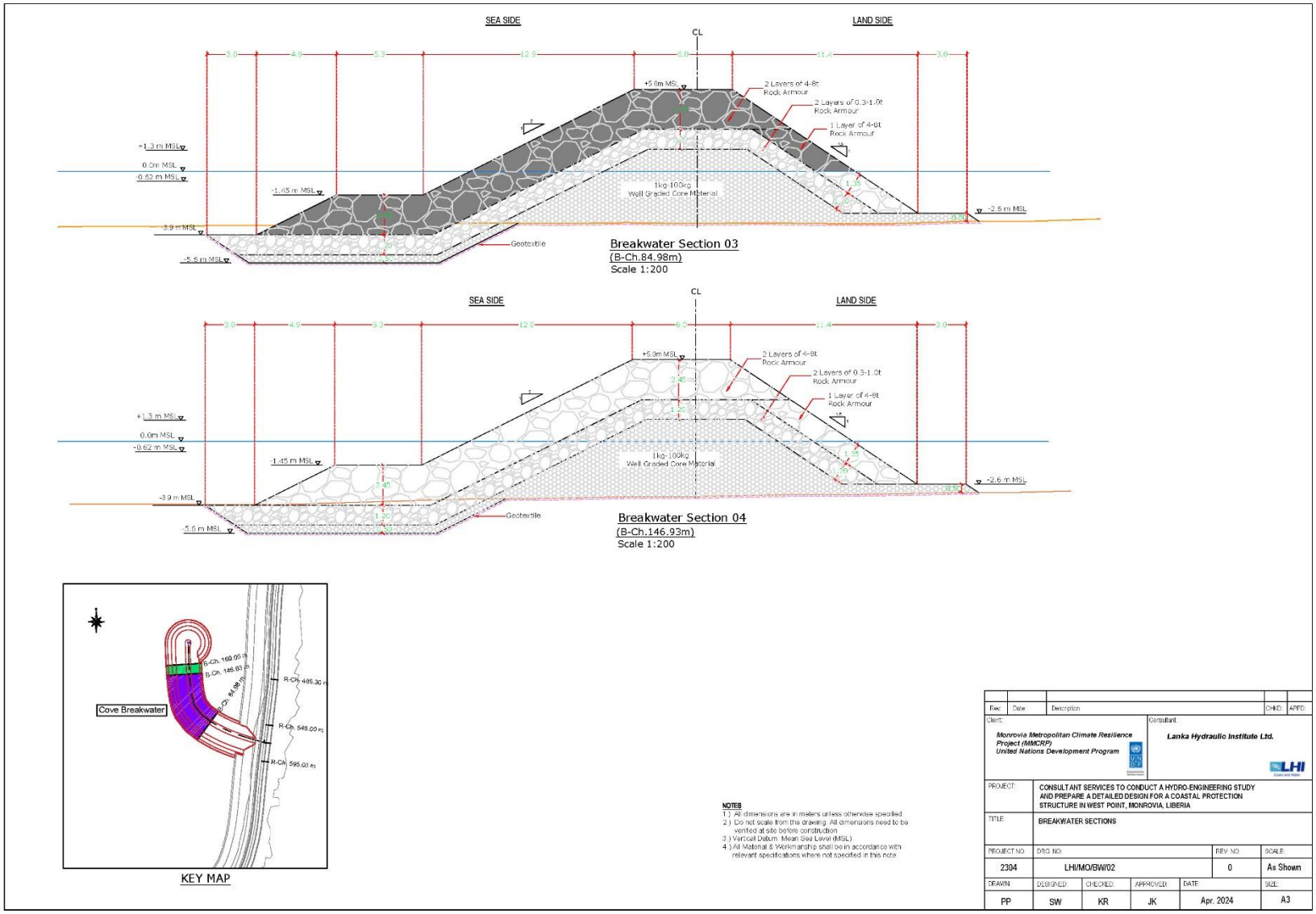
Client:	Consultant:
Monrovia Metropolitan Climate Resilience Project (MMCRP) *United Nations Development Program*	*Lanka Hydraulic Institute Ltd.*

PROJECT:	CONSULTANT SERVICES TO CONDUCT A HYDRO-ENGINEERING STUDY AND PREPARE A DETAILED DESIGN FOR A COASTAL PROTECTION STRUCTURE IN WEST POINT, MONROVIA, LIBERIA
TITLE:	REINFORCEMENT DETAILS OF BEACH ACCESS AND SOLAR LIGHT POLE BASE

PROJECT NO.	DRG. NO:	REV. NO	SCALE:
2304	LHI/MO/BA/ST/03	0	As Shown

DRAWN:	DESIGNED:	CHECKED:	APPROVED:	DATE:	SIZE:
PP	SW	KR	JK	Apr. 2024	A3


SEA SIDE
CL
LAND SIDE
+5.0m MSL
2 Layers of 4-8t Rock Armour
2 Layers of 0.3-1.0t Rock Armour
1 Layer of 4-8t Rock Armour
+1.3 m MSL
0.0m MSL
-0.62 m MSL
-1.45 m MSL
-0.8 m MSL
1kg-100kg Well Graded Core Material
-3.9 m MSL
-5.6 m MSL
Geotextile
Breakwater Section 01
(B-Ch.36.01m)
Scale 1:200
SEA SIDE
CL
LAND SIDE
+5.0m MSL
2 Layers of 4-8t Rock Armour
2 Layers of 0.3-1.0t Rock Armour
1 Layer of 4-8t Rock Armour
+1.3 m MSL
0.0m MSL
-0.62 m MSL
-1.45 m MSL
-1.7 m MSL
1kg-100kg Well Graded Core Material
-3.9 m MSL
-5.6 m MSL
Geotextile
Breakwater Section 02
(B-Ch.54.72m)
Scale 1:200
Cove Breakwater
R-Ch. 485.30 m
B-Ch. 84.98 m
R-Ch. 546.00 m
B-Ch. 54.72 m
R-Ch. 595.00 m
KEY MAP
NOTES
1.) All dimensions are in meters unless otherwise specified
2.) Do not scale from the drawing. All dimensions need to be verified at site before construction
3.) Vertical Datum: Mean Sea Level (MSL)
4.) All Material & Workmanship shall be in accordance with relevant specifications where not specified in this note.
Rev. Date Description CHKD APPD
Client: Monrovia Metropolitan Climate Resilience Project (MMCRP) United Nations Development Program
Consultant: Lanka Hydraulic Institute Ltd.
PROJECT: CONSULTANT SERVICES TO CONDUCT A HYDRO-ENGINEERING STUDY AND PREPARE A DETAILED DESIGN FOR A COASTAL PROTECTION STRUCTURE IN WEST POINT, MONROVIA, LIBERIA
TITLE: BREAKWATER SECTIONS
PROJECT NO. 2304
DRG NO: LHI/MO/BW/01
REV NO. 0
SCALE: As Shown
DRAWN: PP
DESIGNED: SW
CHECKED: KR
APPROVED: JK
DATE: Apr. 2024
SIZE: A3


SEA SIDE
LAND SIDE
CL
+5.0m MSL
2 Layers of 4-8t Rock Armour
2 Layers of 0.3-1.0t Rock Armour
1 Layer of 4-8t Rock Armour
+1.3 m MSL
0.0m MSL
-0.62 m MSL
-1.45 m MSL
-3.9 m MSL
-5.6 m MSL
-2.6 m MSL
1kg-100kg Well Graded Core Material
Geotextile
Breakwater Section 03
(B-Ch.84.98m)
Scale 1:200
Breakwater Section 04
(B-Ch.146.93m)
Scale 1:200
Cove Breakwater
R-Ch. 160.00 m
R-Ch. 146.93 m
R-Ch. 84.98 m
R-Ch. 446.30 m
R-Ch. 549.00 m
R-Ch. 595.00 m
KEY MAP
NOTES
1.) All dimensions are in meters unless otherwise specified
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3.) Vertical Datum: Mean Sea Level (MSL)
4.) All Material & Workmanship shall be in accordance with relevant specifications where not specified in this note.
Rev
Date
Description
CHKD
APPD
Client:
Monrovia Metropolitan Climate Resilience Project (MMCRP)
United Nations Development Program
Consultant:
Lanka Hydraulic Institute Ltd.
PROJECT:
CONSULTANT SERVICES TO CONDUCT A HYDRO-ENGINEERING STUDY AND PREPARE A DETAILED DESIGN FOR A COASTAL PROTECTION STRUCTURE IN WEST POINT, MONROVIA, LIBERIA
TITLE:
BREAKWATER SECTIONS
PROJECT NO.
DRG NO:
REV NO
SCALE:
2304
LHI/MO/BW/02
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As Shown
DRAWN:
DESIGNED:
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Apr. 2024
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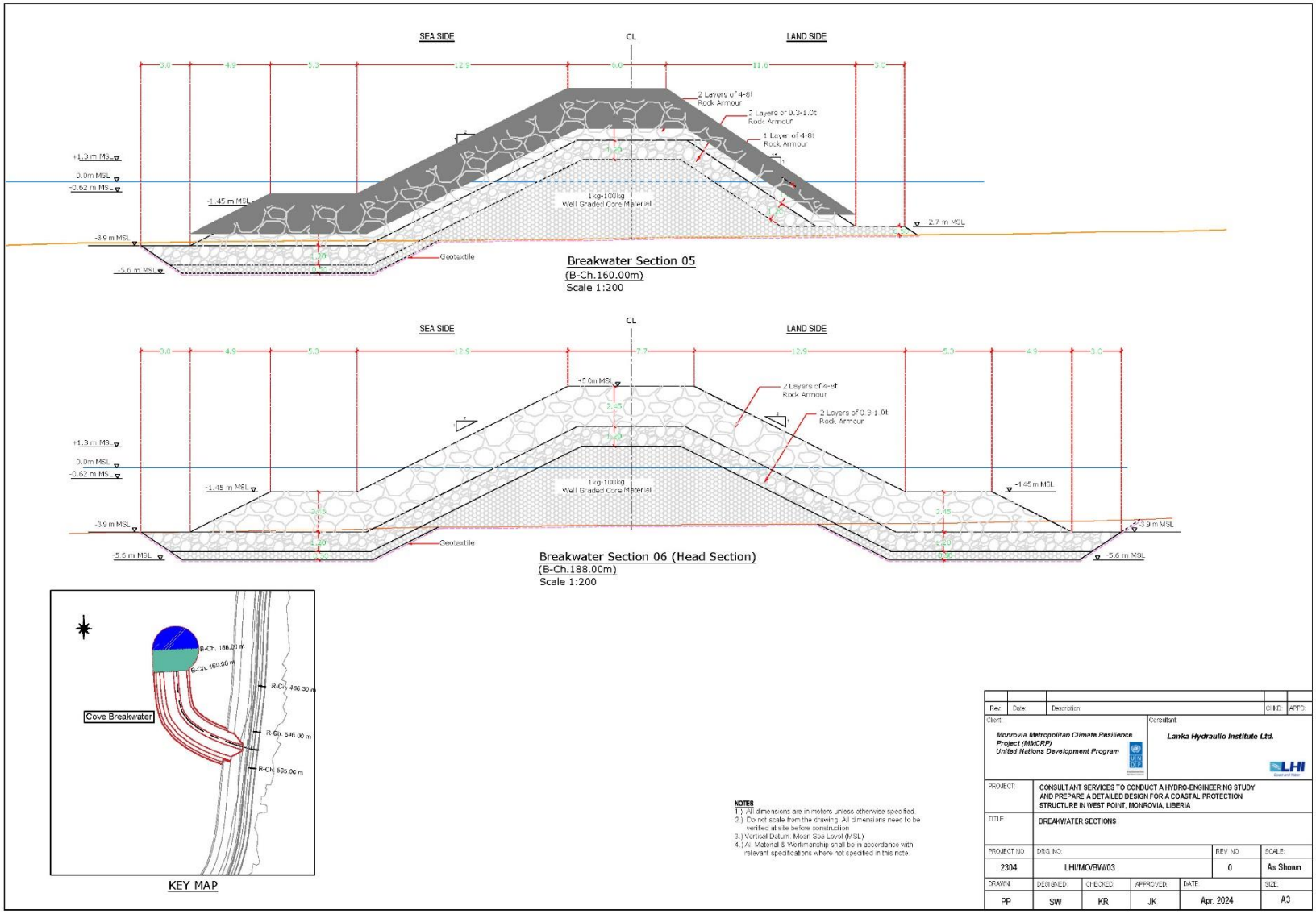
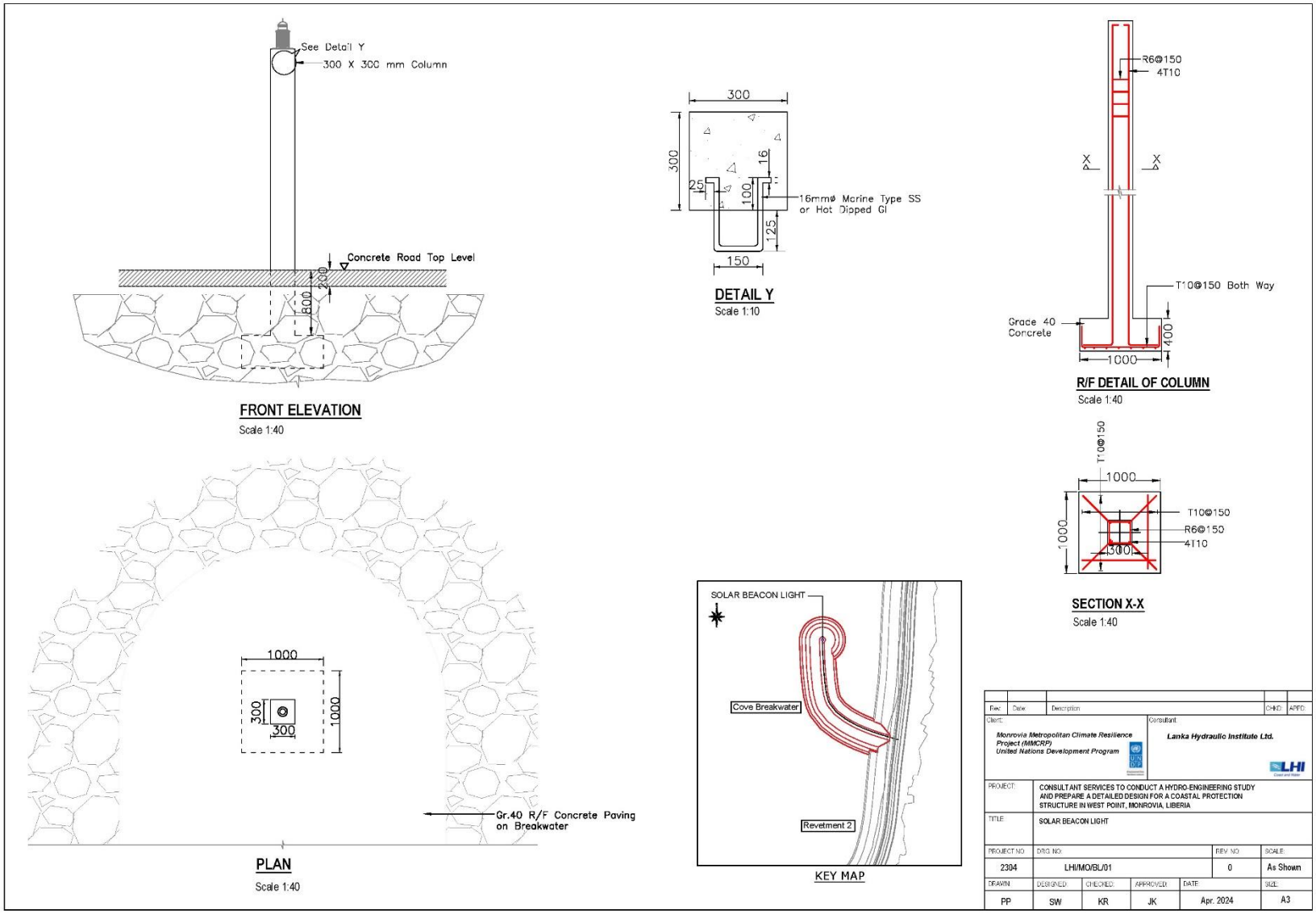
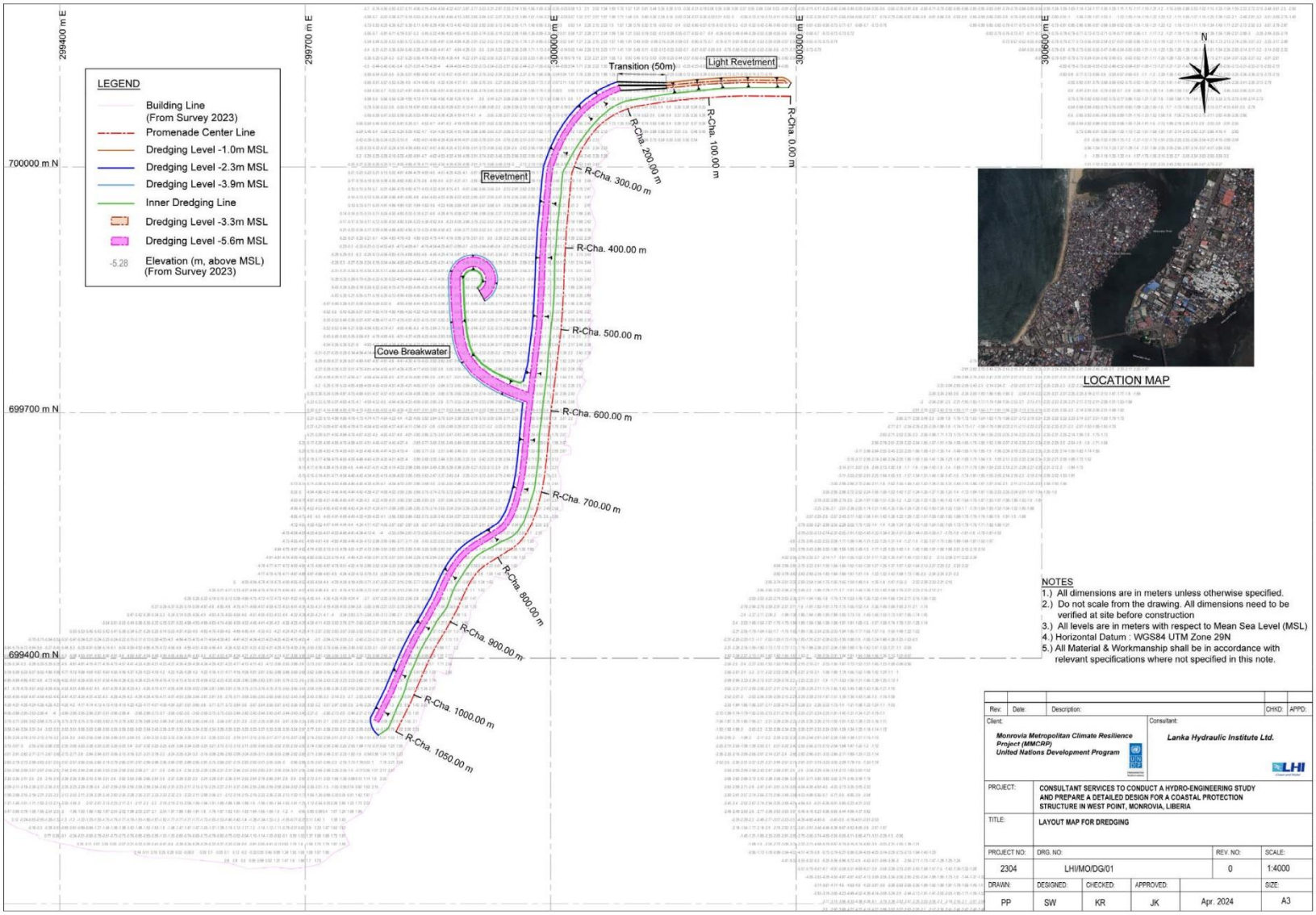
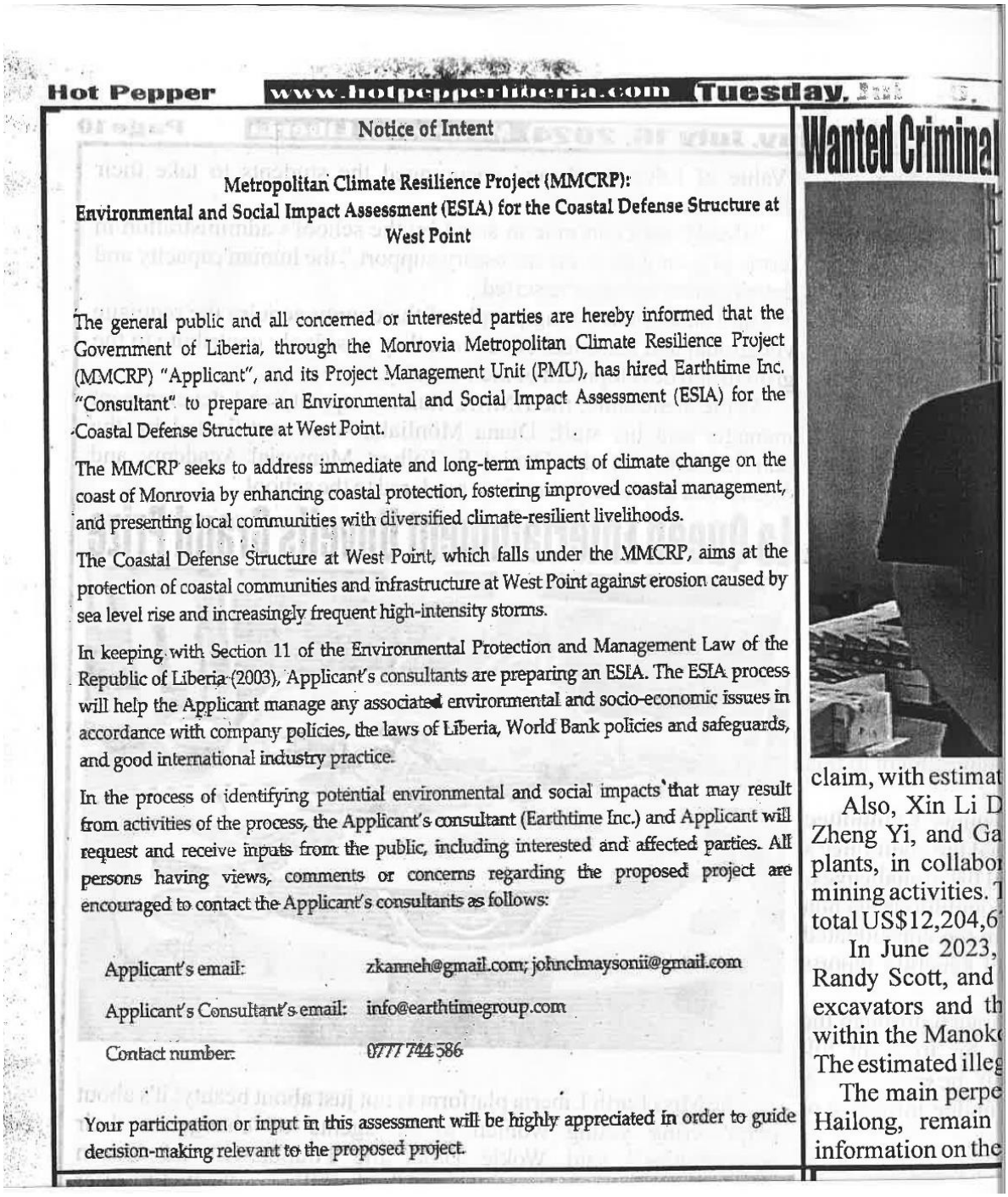

SEA SIDE
CL
LAND SIDE
2 Layers of 4-8t Rock Armour
2 Layers of 0.3-1.0t Rock Armour
1 Layer of 4-8t Rock Armour
+1.3 m MSL
0.0m MSL
-0.62 m MSL
-1.45 m MSL
1kg-100kg Well Graded Core Material
-2.7 m MSL
-3.9 m MSL
-5.6 m MSL
Geotextile
Breakwater Section 05
(B-Ch.160.00m)
Scale 1:200
SEA SIDE
CL
LAND SIDE
+5.6m MSL
2 Layers of 4-8t Rock Armour
2 Layers of 0.3-1.0t Rock Armour
+1.3 m MSL
0.0m MSL
-0.62 m MSL
-1.45 m MSL
1kg-100kg Well Graded Core Material
-3.9 m MSL
-5.5 m MSL
Geotextile
Breakwater Section 06 (Head Section)
(B-Ch.188.00m)
Scale 1:200
B-Ch. 188.00 m
B-Ch. 160.00 m
R-Ch. 486.30 m
R-Ch. 546.00 m
R-Ch. 595.00 m
Cove Breakwater
KEY MAP
NOTES
1.) All dimensions are in meters unless otherwise specified.
2.) Do not scale from the drawing. All dimensions need to be verified at site before construction.
3.) Vertical Datum: Mean Sea Level (MSL).
4.) All Material & Workmanship shall be in accordance with relevant specifications where not specified in this note.
Rev. Date Description CHKD APPD
Client: Monrovia Metropolitan Climate Resilience Project (MMCRP) United Nations Development Program
Consultant: Lanka Hydraulic Institute Ltd.
PROJECT: CONSULTANT SERVICES TO CONDUCT A HYDRO-ENGINEERING STUDY AND PREPARE A DETAILED DESIGN FOR A COASTAL PROTECTION STRUCTURE IN WEST POINT, MONROVIA, LIBERIA
TITLE: BREAKWATER SECTIONS
PROJECT NO. 2304
DRG NO: LHI/MO/BW/03
REV NO 0
SCALE: As Shown
DRAWN: PP
DESIGNED: SW
CHECKED: KR
APPROVED: JK
DATE: Apr. 2024
SIZE: A3


See Detail Y
300 X 300 mm Column
Concrete Road Top Level
200
800
FRONT ELEVATION
Scale 1:40
300
300
25
16
100
125
150
16mmø Marine Type SS or Hot Dipped GI
DETAIL Y
Scale 1:10
R6@150
4T10
X
X
T10@150 Both Way
Grace 40 Concrete
400
1000
R/F DETAIL OF COLUMN
Scale 1:40
T10@150
1000
1000
T10@150
R6@150
4T10
300
SECTION X-X
Scale 1:40
1000
300
300
1000
Gr.40 R/F Concrete Paving on Breakwater
PLAN
Scale 1:40
SOLAR BEACON LIGHT
Cove Breakwater
Revetment 2
KEY MAP
Rev. Date Description CHKD APPD
Client:
Monrovia Metropolitan Climate Resilience Project (MMCRP)
United Nations Development Program
Consultant:
Lanka Hydraulic Institute Ltd.
LHI
PROJECT: CONSULTANT SERVICES TO CONDUCT A HYDRO-ENGINEERING STUDY AND PREPARE A DETAILED DESIGN FOR A COASTAL PROTECTION STRUCTURE IN WEST POINT, MONROVIA, LIBERIA
TITLE: SOLAR BEACON LIGHT
PROJECT NO. 2304
DRG NO: LHI/MO/BL/01
REV NO: 0
SCALE: As Shown
DRAWN: PP
DESIGNED: SW
CHECKED: KR
APPROVED: JK
DATE: Apr. 2024
SIZE: A3


299400 m E
297700 m E
300000 m E
300600 m E
700000 m N
699700 m N
699400 m N
LEGEND
Building Line (From Survey 2023)
Promenade Center Line
Dredging Level -1.0m MSL
Dredging Level -2.3m MSL
Dredging Level -3.9m MSL
Inner Dredging Line
Dredging Level -3.3m MSL
Dredging Level -5.6m MSL
-5.28 Elevation (m, above MSL) (From Survey 2023)
Transition (50m)
Light Revetment
Revetment
Cove Breakwater
R-Cha. 0.00 m
R-Cha. 100.00 m
R-Cha. 200.00 m
R-Cha. 300.00 m
R-Cha. 400.00 m
R-Cha. 500.00 m
R-Cha. 600.00 m
R-Cha. 700.00 m
R-Cha. 800.00 m
R-Cha. 900.00 m
R-Cha. 1000.00 m
R-Cha. 1050.00 m
N
LOCATION MAP
NOTES
1.) All dimensions are in meters unless otherwise specified.
2.) Do not scale from the drawing. All dimensions need to be verified at site before construction
3.) All levels are in meters with respect to Mean Sea Level (MSL)
4.) Horizontal Datum : WGS84 UTM Zone 29N
5.) All Material & Workmanship shall be in accordance with relevant specifications where not specified in this note.
Rev: Date: Description: CHKD: APPD:
Client: Monrovia Metropolitan Climate Resilience Project (MMCRP) United Nations Development Program
Consultant: Lanka Hydraulic Institute Ltd.
PROJECT: CONSULTANT SERVICES TO CONDUCT A HYDRO-ENGINEERING STUDY AND PREPARE A DETAILED DESIGN FOR A COASTAL PROTECTION STRUCTURE IN WEST POINT, MONROVIA, LIBERIA
TITLE: LAYOUT MAP FOR DREDGING
PROJECT NO: 2304
DRG. NO: LHI/MO/DG/01
REV. NO: 0
SCALE: 1:4000
DRAWN: PP
DESIGNED: SW
CHECKED: KR
APPROVED: JK
Apr. 2024
SIZE: A3

APPENDIX B NOTICE OF INTENT



Hot Pepper www.hotpepperliberia.com Tuesday,

Notice of Intent

Metropolitan Climate Resilience Project (MMCRP):
Environmental and Social Impact Assessment (ESIA) for the Coastal Defense Structure at West Point

The general public and all concerned or interested parties are hereby informed that the Government of Liberia, through the Monrovia Metropolitan Climate Resilience Project (MMCRP) "Applicant", and its Project Management Unit (PMU), has hired Earthtime Inc. "Consultant" to prepare an Environmental and Social Impact Assessment (ESIA) for the Coastal Defense Structure at West Point.

The MMCRP seeks to address immediate and long-term impacts of climate change on the coast of Monrovia by enhancing coastal protection, fostering improved coastal management, and presenting local communities with diversified climate-resilient livelihoods.

The Coastal Defense Structure at West Point, which falls under the MMCRP, aims at the protection of coastal communities and infrastructure at West Point against erosion caused by sea level rise and increasingly frequent high-intensity storms.

In keeping with Section 11 of the Environmental Protection and Management Law of the Republic of Liberia (2003), Applicant's consultants are preparing an ESIA. The ESIA process will help the Applicant manage any associated environmental and socio-economic issues in accordance with company policies, the laws of Liberia, World Bank policies and safeguards, and good international industry practice.

In the process of identifying potential environmental and social impacts that may result from activities of the process, the Applicant's consultant (Earthtime Inc.) and Applicant will request and receive inputs from the public, including interested and affected parties. All persons having views, comments or concerns regarding the proposed project are encouraged to contact the Applicant's consultants as follows:

Applicant's email:	zkanneh@gmail.com; johnclmaysonii@gmail.com
Applicant's Consultant's email:	info@earthtimegroup.com
Contact number:	0777 744 586

Your participation or input in this assessment will be highly appreciated in order to guide decision-making relevant to the proposed project.

Wanted Criminal

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INVITATION FOR BID
BONG COUNTY TECHNICAL COLLEGE
GBOVAH HILL, GBARNGA, BONG COUNTY, LIBERIA

June 22, 2024

The Bong County Technical College has received a budgetary allotment from the Government of Liberia and intends to apply portion of said fund for the procurement of the following:

NO	LOT	IFB REFERENCE	DESCRIPTION OF REQUIREMENT
1	A	IFB No. BCTC/SBA/NCB/002/24	STATIONERY & SUPPLIES
2	B	IFB No. BCTC/SBA/NCB/004/24	EDUCATIONAL MATERIALS & SUPPLIES
3	C	IFB No. BCTC/NCB/006/24	LABORATORY & CONSUMABLES
4	D	IFB No. BCTC/RB/001/24	PETROLEUM PRODUCTS
5	E	IFB No. BCTC/NCB/003/24	REPAIR & MAINT-CIVIL
6	F	IFB No. BCTC/SS/RB/001/24	ELECTRICITY
7	G	IFB No. BCTC/SBA/NCB/001/24	CLEANING MATERIALS
8	H	IFB No. BCTC/SBA/NCB/005/24	DRUG & MEDICAL SUPPLIES
9	I	IFB No. BCTC/SBA/NCB/006/24	PRINTING & BINDING
10	J	IFB No. BCTC/NCB/008/24	TRANSPORT EQUIPMENT
11	K	IFB No. BCTC/NCB/007/24	INTERNET SERVICE PROVIDER

Bidding will be conducted through the National Competitive Bidding (NCB) procedures as specified in the public procurement and concessions Act (PPCA) and approved by the Public Procurement Concessions Commission (PPCC), and is opened to all qualified and eligible Businesses in Liberia.

Interested and eligible bidders may obtain copy of any LOT from the BUSINESS STARTUP CENTER (BSC) on the main Campus of the University of Liberia and/or the main campus of the Bong County Technical College located on Gbovah Hill, Gbarnga City, Bong County.

Qualification requirements:
a. Valid Business Registration and Tax Clearance Certificate,
b. Bid Security Declaration,

Notice of Intent

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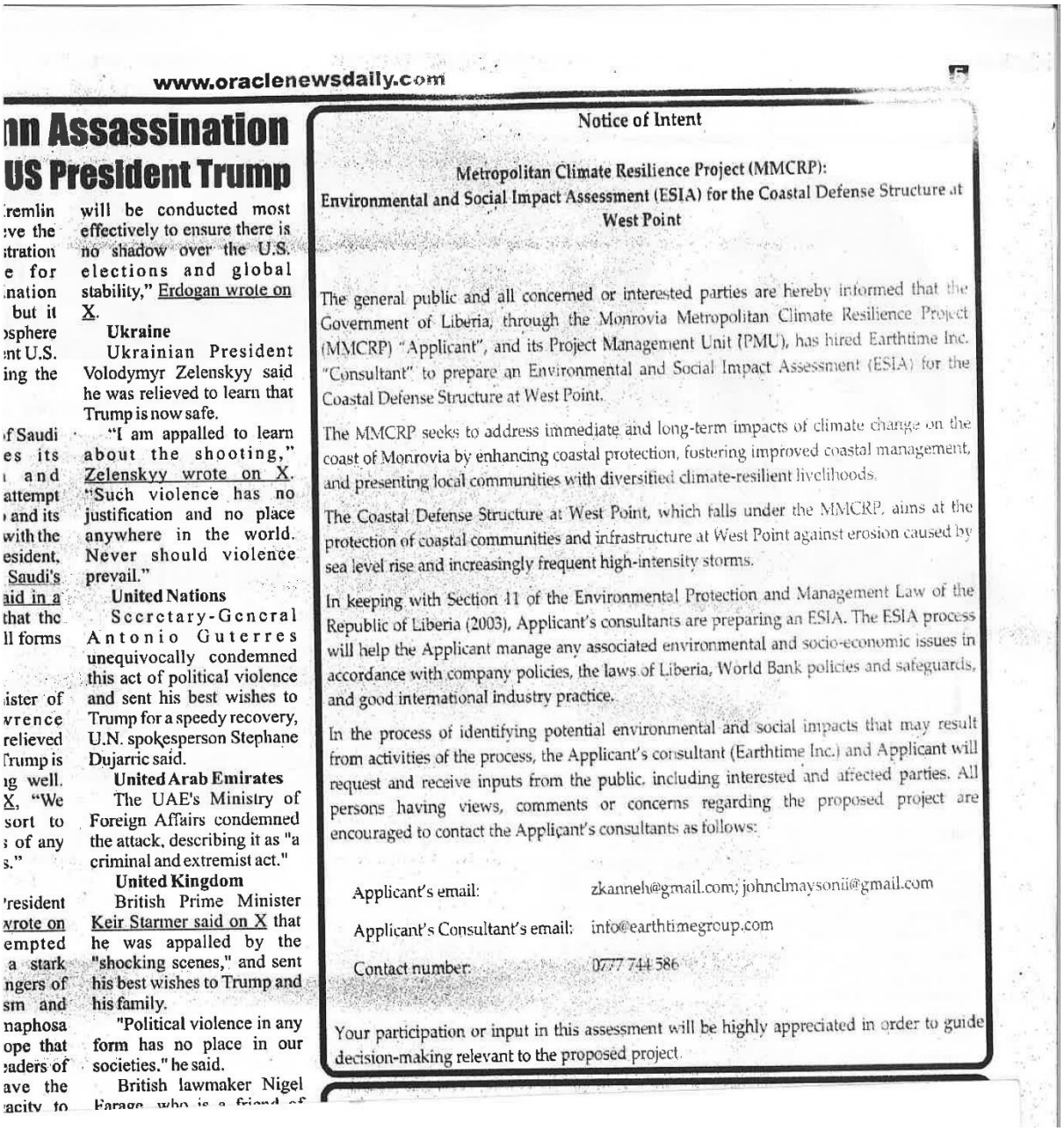
Applicant's email: zkamneh@gmail.com; johnclmaysonii@gmail.com
Applicant's Consultant's email: info@earthtimegroup.com
Contact number: 0777 744 586

Your participation or input in this assessment will be highly appreciated in order to guide decision-making relevant to the proposed project.



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US President Trump

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will be conducted most effectively to ensure there is no shadow over the U.S. elections and global stability," Erdogan wrote on X.

Ukraine

Ukrainian President Volodymyr Zelenskyy said he was relieved to learn that Trump is now safe.

"I am appalled to learn about the shooting," Zelenskyy wrote on X. "Such violence has no justification and no place anywhere in the world. Never should violence prevail."

United Nations

Secretary-General Antonio Guterres unequivocally condemned this act of political violence and sent his best wishes to Trump for a speedy recovery, U.N. spokesperson Stephane Dujarric said.

United Arab Emirates

The UAE's Ministry of Foreign Affairs condemned the attack, describing it as "a criminal and extremist act."

United Kingdom

British Prime Minister Keir Starmer said on X that he was appalled by the "shocking scenes," and sent his best wishes to Trump and his family.

"Political violence in any form has no place in our societies," he said.

British lawmaker Nigel Farage, who is a friend of

Notice of Intent

Metropolitan Climate Resilience Project (MMCRP):
Environmental and Social Impact Assessment (ESIA) for the Coastal Defense Structure at West Point

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Applicant's email:	zkanneh@gmail.com; johnclmaysonii@gmail.com
Applicant's Consultant's email:	info@earthtimegroup.com
Contact number:	0777 744 586

Your participation or input in this assessment will be highly appreciated in order to guide decision-making relevant to the proposed project.

Date: July 15, 2024

SURVEY NOTICE

SURVEY NOTICE

The general public is hereby informed that the undersigned registered land surveyor has been authorized by the Intestate of the late James F. Cooper represented by Elsie N. Cooper and Sangai H. Brisbane Administratress of the said estate to conduct a survey of Eight Hundred and Eighty (880) acres of land a portion of 2520 acres all within the Cooper's Estate.

The land to be surveyed is located and situated in Fahnsh Clan, Todee District, Montserrado County. The survey will take place on of July 23, 2024 at hour of 10:00am

Therefore, all those having property (ies) within the surrounding area are requested to be present on the date and time of the survey with their deed (s) diagram(s) or any other relevant document(s) to verify their claims.

This notice should claim the attention of the following persons:

1. Emmanuel Dewz (District Superintendent Todee District)
2. Daniel S.K. Pawey (District Commission Todee District)
3. Stephen Goba (Paramount Chief)
4. Morris S. Mulbah (General Town Chief)
5. Joseph Youateh (Fahn Sahn Clan)
6. Liberia Land Authority Office
7. Zinc Camp – Town Chief
8. James Fallah (Town Chief Cooper Farm)
9. John Kpoyon – Lord Prayer Ministry
10. Lawrence Mcgill
11. Kpassay K. Gizzie
12. Alvin Jones
13. Shelton Freeman
14. Comfort Wea
15. Patrick Washington
16. Kerkulah Family
17. Martin Family
18. Mable Kromah
19. David Yamah
20. Emmanuel Lomax
21. Patrick Kerkulah
22. Botoe Family
23. The Local Authority (Security)
24. Robert Telewilliam
25. Mr. Siaffa
26. Boyan Town Family
27. Kaka Farm
28. J.K. Nyumah
29. Mr. Albert Nyugoi
30. Joseph Fallah Masseh

Page 11

Notice of Intent

Metropolitan Climate Resilience Project (MMCRP):
Environmental and Social Impact Assessment (ESIA) for the Coastal Defense Structure at West Point

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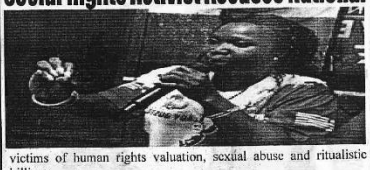
Applicant's email:	zkanneh@gmail.com; johnclmayson@gmail.com
Applicant's Consultant's email:	info@earthtimegroup.com
Contact number:	0777 744 586

Your participation or input in this assessment will be highly appreciated in order to guide decision-making relevant to the proposed project.

Social Rights Activist Accuses National



victims of human rights valuation, sexual abuse and ritualistic killings.

Further, the Executive Director has said there is need that background checks are done on the security apparatus in the country that are responsible for fighting illegal substances in the country.

ON 2ND THOUGHTS

with Othello B. Garblah

Boakai's "Yellow Machines" letter to the Legislature proves conflict of interest

President Joseph Nyumah Boakai's letter to the Legislature concerning the acquisition of some 285 earthmoving equipment has opened another Pandora's box, raising issues about the acquisition procedures and conflicts of interest.

In his letter dated July 9, 2024, President Boakai informed members of both Houses that the government's effort to acquire what is now known as "yellow machines" came out of a conversation with a long-time friend (relationship) who believes in his political agenda and has expressed his willingness to help.

President Boakai's letter states: "The initiative originated from a conversation between me and a long-time friend who shares a commitment to the ARREST Agenda. This friend was moved by the spirit of solidarity and a strong desire to participate in the implementation, in the shortest possible time, of our development agenda. He offered to provide equipment in good faith and on a gentleman's agreement."

The above statement connotes nothing more than a conflict of interest. This demonstrates why President Boakai initially ignored all laws governing procurement and purchase and failed to disclose full agreement details due to his relationship with the supplier.

Chapter 11 Article 90 of the 1986 Constitution states: (a) No person, whether elected or appointed to any public office, shall engage in any other activity which shall be against public policy or constitute a conflict of interest. (b) No person holding office shall demand and receive any other perquisites, emoluments or benefits, directly or indirectly, on account of any duty required by Government.

The Liberian Code of Conduct, which is premised on Articles 90 (a) &(b), explains that "a conflict of interest occurs when a public servant's private affairs or financial interest are or could be in conflict or believed to be in conflict with the public servant's duties or responsibilities in such a way that (a) his or her ability to act in the public (interest),could be impaire ' (b) His or her action or conduct has undermined or compromised or could undermine or compromise the public confidence in his/her ability to discharge the responsibilities or trust that is placed in him or her.(c) His or her action leads or could lead to the possibility or personal financial benefits or gains."

Start from page 7

Keeping the peace is on me

Notice of Intent

Metropolitan Climate Resilience Project (MMCRP):
Environmental and Social Impact Assessment (ESIA) for the Coastal Defense Structure at West Point

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UNIVERSITY OF LIBERIA PRESIDENTIAL SEARCH COMMITTEE

UNIVERSITY OF LIBERIA
MONROVIA, LIBERIA

VACANCY ANNOUNCEMENT FOR PRESIDENT

The University of Liberia, Liberia's flagship institution of higher learning, is accepting applications or nominations for the position of president. Founded in 1862 as Liberia College, the institution became the University of Liberia in 1951 by an Act of the National Legislature. Currently, there are approximately 22,000 students from all parts of the country, as well as foreign students from diverse educational and cultural backgrounds. The President of the Republic of Liberia is Visitor of the University of Liberia and the authority for the governance over the University is vested in the Board of Trustees.

The University seeks a dynamic, energetic, and visionary leader in higher education, and women are particularly encouraged to apply. The successful candidate must possess notable professional standards, integrity, and demonstrate a commitment to work with faculty, students, staff and the Board of Trustees to promote the development of the University. He or she will serve as Chief Executive Officer and work closely with the Board of Trustees to ensure that the University implements its strategic goals and promote its broad range of academic programs. Those programs are situated on four campuses (Fendall, Medical, Capitol Hill, and Straz-Sinje) within nine (9) undergraduate colleges, three (3) professional schools, seven (7) graduate programs, and five (5) institutes.

The nine undergraduate colleges include Amos C. Sawyer College of Social Sciences and Humanity, the W.V.S. Tubman College of Education, the A. Romeo Horton College of Business and Public Administration, the T.J.R. Faulkner College of Science, Technology, Environment and Climate Change, the William R. Tolbert, Jr. College of Agriculture and Forestry, the School of Continuing Education and Professional Studies for adult and part-time students, the College of Engineering, the School of Nursing and Midwifery, and a junior college, the David A. Straz-Sinje Technical and Vocational College. Also, the seven graduate programs (MBA/MPA, Education, International Studies, Regional Planning, Peace Studies, Environmental Science and Public Health) have been consolidated and formalized into the UL Graduate School. The three professional schools include the Louis Arthur Grimes School of Law, the A.M. Dogliotti School of Medicine, and the School of Pharmacy. Institutes at UL include the Confucius Institute, the Research Institute, the Kofi Annan Institute of Conflict Transformation, the Institute for Population Studies, and the Institute for Policy Studies and Research.

Shortlisted applicants will be required to appear in person for an interview and participate in Community forums. Further information about the University can be found on its website: www.ul.edu.lr

QUALIFICATIONS

Specifically, the successful candidate should possess and demonstrate broad leadership qualities and experience, including the following:

- At least 5-10 years of proven leadership and management experience in a senior position in higher education;
- An earned doctorate from an accredited institution or its equivalent;

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Contact number:	0777 744 586

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ILLEGE
NTY, LIBERIA

rment from the Government of Liberia and following:

DESCRIPTION OF REQUIREMENT
STATIONERY & SUPPLIES
EDUCATIONAL MATERIALS & SUPPLIES
LABORATORY & CONSUMABLES
PETROLEUM PRODUCTS
REPAIR & MAINT-CIVIL
ELECTRICITY
CLEANING MATERIALS
DRUG & MEDICAL SUPPLIES
PRINTING & BINDING
TRANSPORT EQUIPMENT
INTERNET SERVICE PROVIDER

tive Bidding (NCB) procedures as specified in and approved by the Public Procurement lified and eligible Businesses in Liberia.

)T from the BUSINESS STARTUP CENTER (BSC) f/or the main campus of the Bong County long County.

ertificate,

h PPCC Vendors Registration,
t least two clients.

be purchased by interested bidder(s) for ars from--- 9:00 AM-4:00 PM daily.

SS STARTUP CENTER on the main Campus of Bong County Technical College, Gboveh Hill, at 12:00AM. Late bid will be rejected and

r their representatives who choose to attend

Notice of Intent

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LIBERIA LAND AUTHORITY
Old Ministry of Commerce Building
Asylum and Gurley Intersection
Monrovia.

July 15, 2024

Investigative Survey

By the directive of the Resident/Assigned Judge, Sixth Judicial Circuit, Civil Law Court, Montserrado County, the general public is hereby informed that the undersigned Registered Licensed Land Surveyor have being duly authorized to conduct an investigative survey in the case mentioned below on, Thursday 18 July 2024 beginning at 1:00 pm.

IN CASE REF: The Intestate Estate of the J.C.Tetteh by & thru its Administrator Christian Tetteh of the Township of Louisiana, Montserrado County , RL..... Plaintiff
Versus
Garpue Moore, and those under his control illegally occupying the subject property, Augustine Dennis, Momo, to be identified identified of the Township of Louisiana, Republic of Liberia.....Defendant

The Said parcel of land is lying and situated at Louisiana main road, Lower Louisiana Township, Monrovia, Mont., County, Republic of Liberia

Therefore, all adjoining property owners, disputants and interested parties are requested to be present at the site on the day of the survey with their deed(s), diagram(s), map(s), technical representatives/surveyors and other relevant document to substantiate their claims.

Please let this survey notice and announcement claim the attention of the following individuals:

1. The Coleman family
2. Mr. Boy Dennis

15.7.2024

LIBERIA
Authority
Monrovia
Liberia

July 8, 2024

Y NOTICE

Elliott, Assigned Circuit
Civil Law Court, the
r assigned at the Liberia
of July, 2024 at the hour
estigative survey involving
nd thru her Attorney-In-
s Morris K. Togbah as

aynesville, near the Effort

e present and on time
documents to verify their

July 13, 2024

TICE

the undersigned Registered
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n to conduct a resurvey of a
2) lots in favor of the said

situated in Duazon, Margibi
perty.

on Saturday the 20th day of

asked to be present and on
eir Technical Representatives

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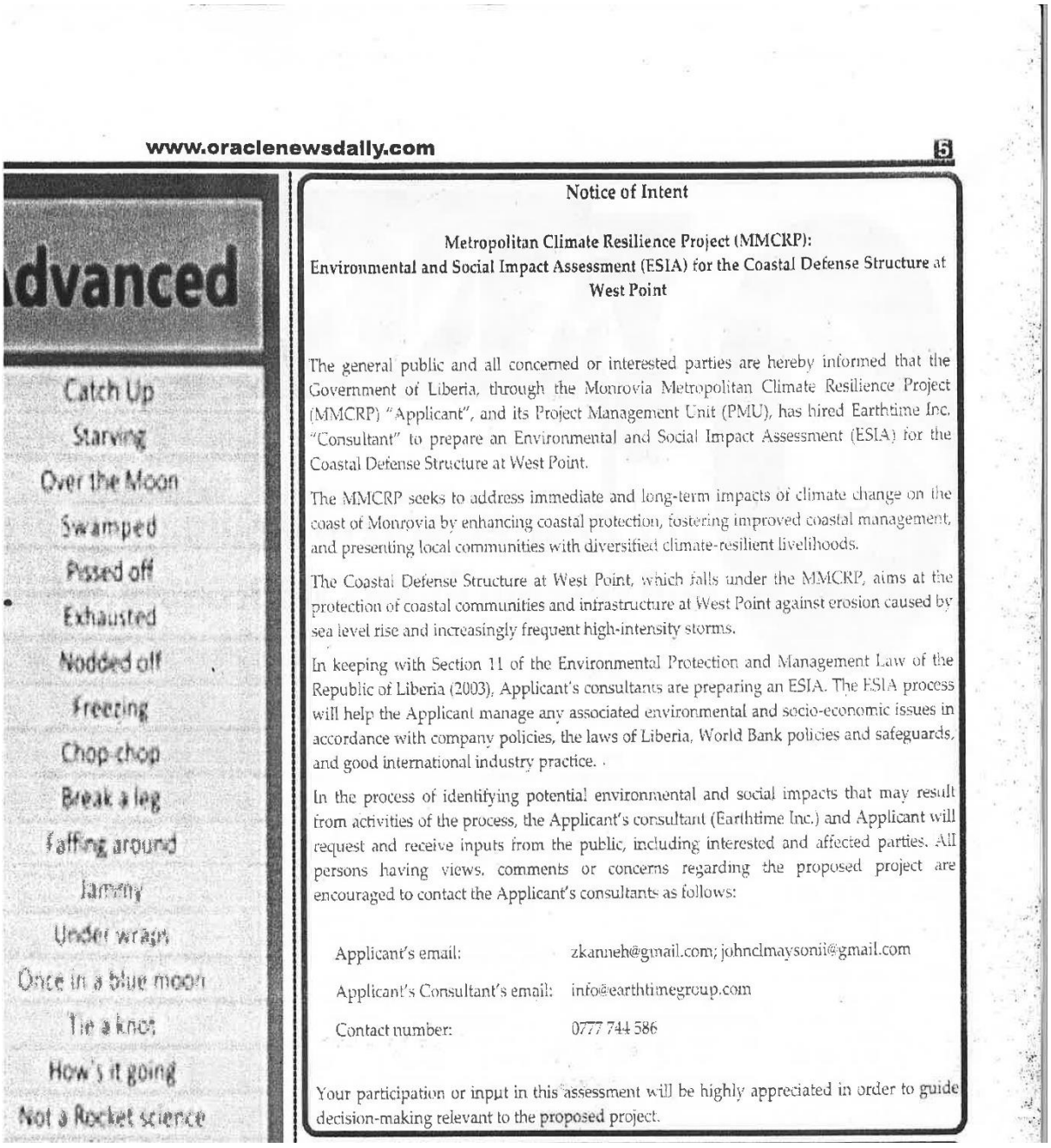
Construction, Architectual, Surveying & Engineering
CASE Inc.
Carey & Johnson Streets, 1st Floor, Caesar's Architects Building
Monrovia, Liberia
Cell No: 0886-492-365/0775-843-987-0880-826-999/0770-118-209
Email:case2016@gmail.com

July 10, 2024

SURVEY NOTICE

The public is hereby notified that the Construction Architectural Surveying & Engineering Inc. (CASE) has been duly authorized by **Dennis Musa Sr, and Joe Dennis Jr.**, Administrators of the Intestate Estate of the Late Fahn Musa to conduct a survey of Ten (10) Acres from its Original quantity of 232.65 Acres lying & situated at Knekpor, Brewerville, Montserrado County, In favor of Siah Duopo and Gersham



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dvanced

Catch Up
Starving
Over the Moon
Swamped
Pissed off
Exhausted
Nodded off
Freezing
Chop-chop
Break a leg
Faffing around
Jammy
Under wraps
Once in a blue moon
Tie a knot
How's it going
Not a Rocket science

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APPENDIX C STAKEHOLDER CONSULTATION

Appendix C.1 Attendance Sheets

C.1.1 High Level Stakeholder Consultation

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High Level Stakeholder Consultation Meeting
ESIA for the Coastal Defense Structure at West Point – Monrovia Metropolitan Climate Resilience Project (MMCRP)

(1)

Date: 23 July 2024

Attendance Sheet

№	Name	Organization	Position	Phone No./Email	Signature
1.	Augustine Kwew	FDA	Assist. ESIA Manager	0770242055 s22nkwsw augustine@gmail.com	[signature]
2.	Gehnyea Yâ Gbeanqui	MPW	Environmental Eng. Focal Person	0886-544401 gbeanquigehnyea@gmail.com	[signature]
3.	Selekie L. Kanneh	NDMA	Deputy Proj. Director	skanneh150@gmail	[signature]
4.	Mulbah G. Gweso, Sr.	NPA	Executive Director Ports & Harbor	gwess2tech@gmail.com 0880986449	[signature]
5.	Abayomi Grant	MMCRP/EPA	Environmental Safeguard Officer	0886531903	[signature]
6.	Zienu V. Kanneh	MMCRP/EPA	Project Coordinator	0777927655	[signature]
7.	Gabriel H. Jasper	EPA	ESIA Compliance Officer	0775574641	[signature]
8.	Gregory R. Morris	EPA	Compliance Analyst-C&E		

earthtime

№	Name	Organization	Position	Phone No./Email	Signature
9.	Otis Deah	LIMA	Environmentalist	Otiscdeah@gmail.com 0886494490	
10.	Benjamin Dennis	Organization Community		0770474711	[signature]
11.	Comfort K. Scere	MPW	Adm. Assits	Comfortscere09@gmail.com 0886519172	[signature]
12.	Rejoyce D. Karmo	MPW	RIA Officer	rejoycedkarmo@gmail.com 0880939192/0778527539	[signature]
13.	Joshua E. Yawson	Community		0776228173	[signature]
14.	Jenet M. Chikawn	WP Chairlady	Chairlady	0777119954	[signature]
15.	John S. Mbayoh	Comm-Leader	Chairmen	0881377607	[signature]
16.	ZOGBAE P. DOLO		Eler.	0776609260	[signature]
17.	Henry S.	Sibollie	Elder wp	0776303095	[signature]
18.	Alfred F. Borbor	Cuncil	Elder	0777468490	[signature]
19.	William T. Doe	Township	Cheif Security	0770912639	[signature]

2

earthtime

№	Name	Organization	Position	Phone No./Email	Signature
20.	Weisne Barnes	404	Youth Chair	0775001720	
21.	Terance Q. Dezz	zonal Head 404	ZONAL HEAD	0770166726	
22.	John McCarlay	Chief	Chief	0776098943	J.M
23.	Mary S. Welch	WWPHDO	Chaplain	0776575622	
24.	Maine N. Dennue	WWPHDO	Member	0777861222	
25.	Martina G Wilson	WWPHDO	Member	0777730859	M G Wilson
26.	Isah a Nah	CSC	Member	0777878412	
27.	Helena A. Kollie	Plumtor Comm.	KSG	0770187556/0886504298	
28.	Daniel L. Cooper	plumtor community	KSG	0770769723	
29.	Veronica Wilson	Plumtor comm	CSC	0777765562	V. W
30.	Michael S. Joe	W/Point	Elder	0770-658-982	M. S. Joe

3

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№	Name	Organization	Position	Phone No./Email	Signature
31.	Francis Soletti	West Point	Elder	0776881876	
32.	Chris Kappa	West point	Elder	0770547715	
33.	Morris J. Siassay	Shine W. point Liberia	President	0778-703494	
34.	J.T. Max Hinneh	Jacob Town	Focal Person	0770065509	
35.	Joseph O. Clinton	Jacob Town	CSC	0776554348	
36.	Angel V. Tracoalley	N.D.M.A	Assistant	0775074426	
37.	Nowomu D. Sondah	N.V. Massaquoi School	VPA	0777269571	
38.	D. Nimely Tennie	Chief Fishing chief		0776157876	
39.	Mary N. Toe	West Point	K.S.G	0777567273	M. Toe
40.	Alice Ashabi	west point	CSC	0886580887	Alice
	Yah Gontee	West point	CSC	0775118919	

4

earthtime

High Level Stakeholder Consultation Meeting
ESIA for the Coastal Defense Structure at West Point – Monrovia Metropolitan Climate Resilience Project (MMCRP)

(2)

Date: 23 July 2024

Attendance Sheet

№	Name	Organization	Position	Phone No./Email	Signature
1.	James Bangura	Township observer	Communication officer	0886733083 0775875609	
2.	Chea B. Sangs	K.S.G	Member	0778042114	
3.	Bella mabu	CSC	member	0770032718	B.M
4.	Regina T. pajibo	K S G	member	077535689	
5.	Marcus Mithaus	MME	Director	0778948014	
6.	Kuotin Walkie	MME	Driver	0779015??	
7.	JOSIAH B. TOE	TOWNSHIP OF WEST POINT	ZONAL COUNCIL CHAIRMAN	0776697614	
8.	Francis. Doe	K S G	Member	0770474720	

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№	Name	Organization	Position	Phone No./Email	Signature
9.	Amos M. Constance	Comm. Staff	Dr. Sanitation	0778088282	
10.					
11.					
12.					
13.					
14.					
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№	Name	Organization	Position	Phone No./Email	Signature
31.	James Bangura				
32.					
33.					
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36.					
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39.					
40.					

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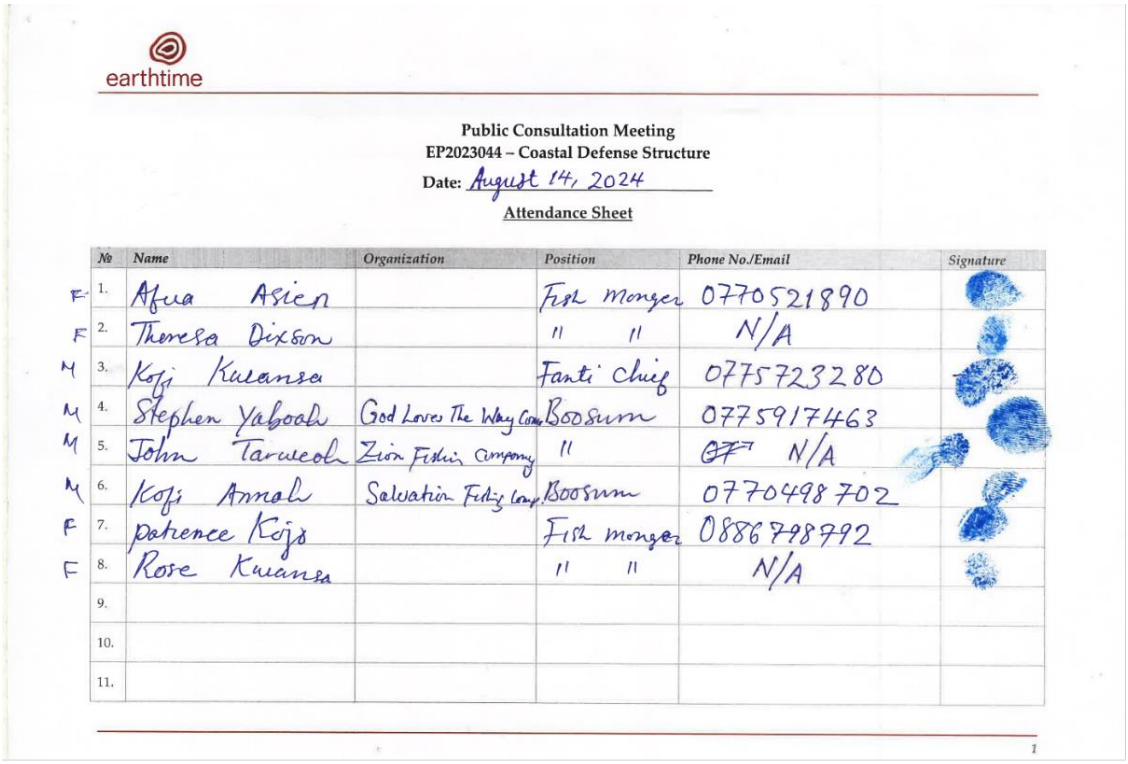
C.1.2 Community Consultations



earthtime

Public Consultation Meeting
EP2023044 – Coastal Defense Structure
Date: August 14, 2024
Attendance Sheet

	№	Name	Organization	Position	Phone No./Email	Signature
F	1.	Afua Asien		Fish Monger	0770521890	
F	2.	Theresa Dixson		11 11	N/A	
M	3.	Koji Kwansa		Fanti Chief	0775723280	
M	4.	Stephen Yaboah	God Loves The Way Com	Boosum	0775917463	
M	5.	John Tarweah	Zion Fishin Company	11	~~07~~ N/A	
M	6.	Koji Arnah	Salvation Fishy Comp	Boosum	0770498702	
F	7.	patience Koji		Fish Monger	0886798792	
F	8.	Rose Kwansa		11 11	N/A	
	9.					
	10.					
	11.					

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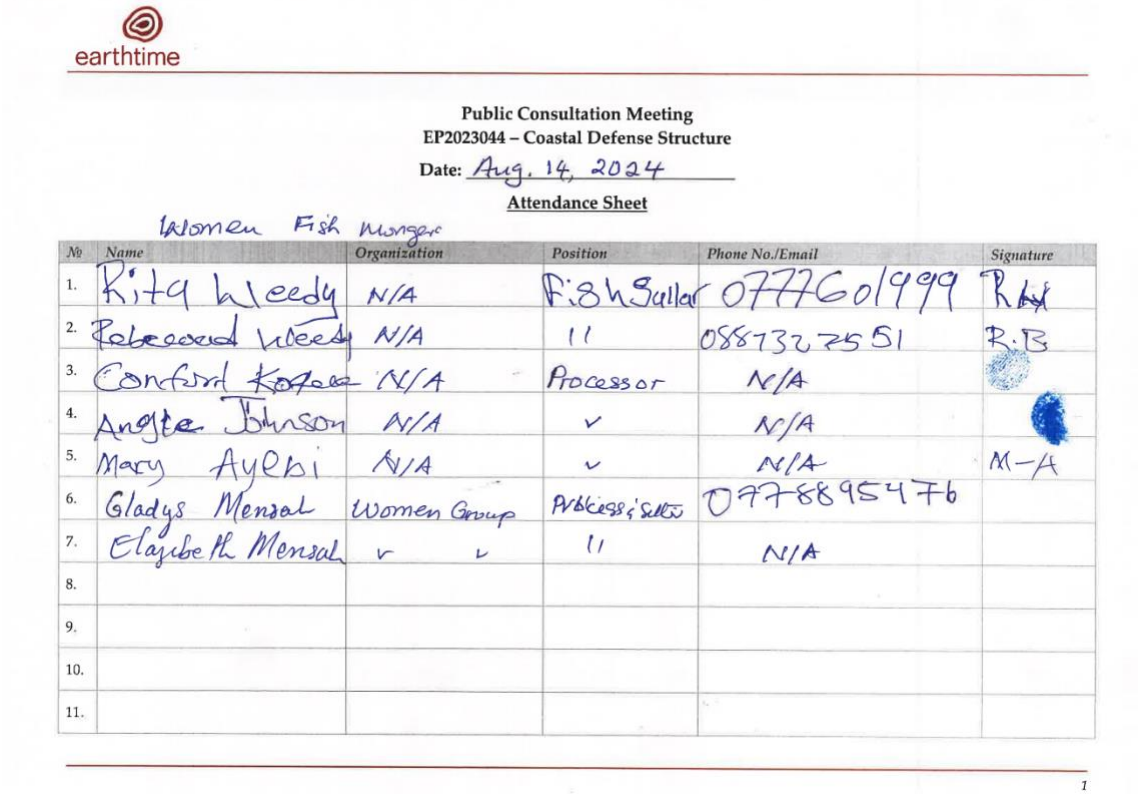


earthtime

Public Consultation Meeting
EP2023044 – Coastal Defense Structure
Date: Aug. 14, 2024
Attendance Sheet

Women Fish Monger

№	Name	Organization	Position	Phone No./Email	Signature
1.	Rita Wleedy	N/A	Fish Seller	0777601999	R.W
2.	Rebecca Wleedy	N/A	11	0887327551	R.B
3.	Comfort Kofoe	N/A	Processor	N/A	
4.	Angela Johnson	N/A	v	N/A	
5.	Mary Ayebi	N/A	v	N/A	M-A
6.	Gladys Mensal	Women Group	Fish Seller	0778895476	
7.	Elizabeth Mensal	v v	11	N/A	
8.					
9.					
10.					
11.					

1

Appendix C.2 Presentation

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) FOR THE COASTAL DEFENSE STRUCTURE AT WEST POINT – MONROVIA METROPOLITAN CLIMATE RESILIENCE PROJECT (MMCRP)

High Level Stakeholder Consultation, July 2024

earthtime

EPA

UNDP

earthtime

Agenda

- Introduction
- Project Location
- Project Description
- Baseline Data Collection
- Potential Impacts
- Concerns

Agenda | Introduction | Project Location | Project Description | Data Collection | Impacts | Concerns 2

Introduction

- The Monrovia Metropolitan Climate Resilience Project (MMCRP):
  - Funded by: Green Climate Fund (GCF)
  - Supported by: The United Nations Development Programme (UNDP)
  - Implementers:
    - Government of Liberia
    - EPA
    - In collaboration with MME, MPW and MFDP

Project Management Unit (PMU)

Agenda | Introduction | Project Location | Project Description | Data Collection | Impacts | Concerns 3

Introduction

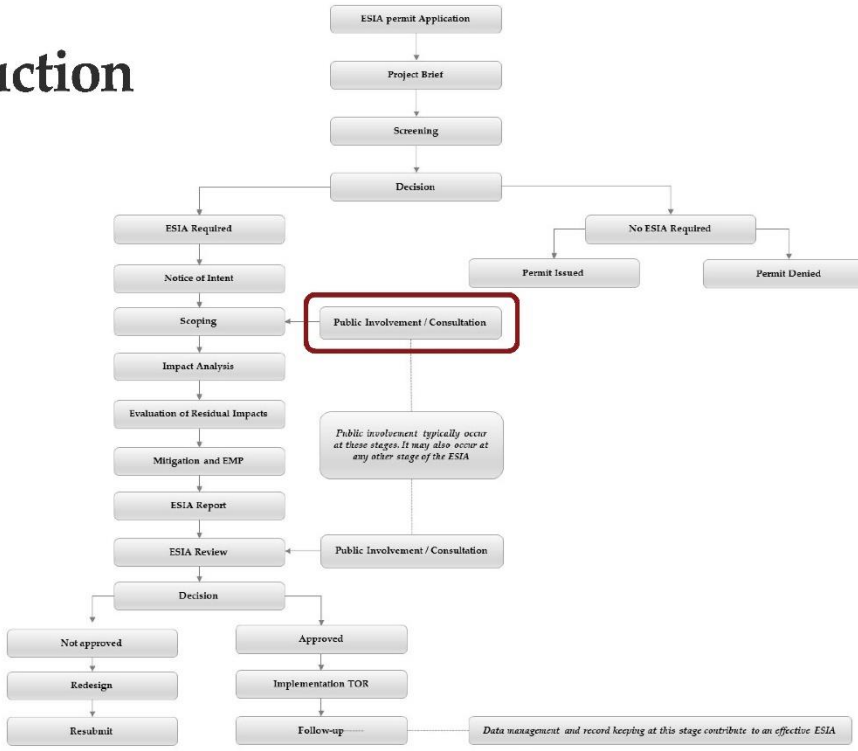
Project aim: address immediate and long-term impacts of climate change on the coast of Monrovia through three outputs

- **Output 1**: Protection of coastal communities and infrastructure at West Point against erosion → Building a coastal revetment on 1,050 m of coastline at West Point
- **Output 2**: Implementation of Integrated Coastal Zone Management (ICZM) across Liberia → Building institutional capacity and policy support
- **Output 3**: Build local climate resilience in Monrovia → Protecting mangroves and strengthening gender- and climate-sensitive livelihoods

PMU commissioned Earthtime Inc. to prepare the Environmental and Social Impact Assessment (ESIA) for the Project

Agenda | Introduction | Project Location | Project Description | Data Collection | Impacts | Concerns 4

Introduction



Agenda | **Introduction** | Project Location | Project Description | Data Collection | Impacts | Concerns 5

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Project Location

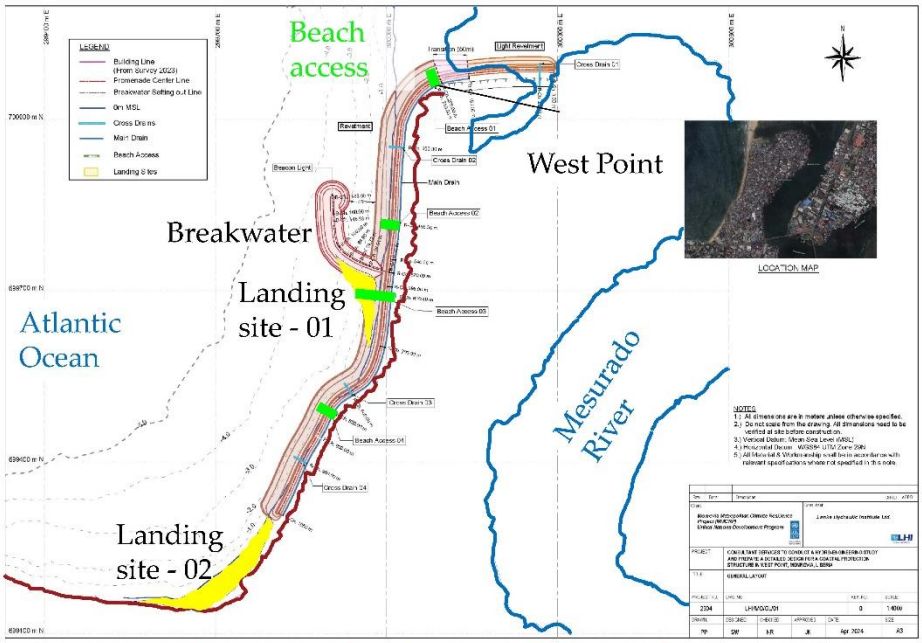
Agenda | Introduction | **Project Location** | Project Description | Data Collection | Impacts | Concerns 6

Project Description

- Construction of a coastal protection structure in West Point:
  - Light revetment, main revetement and breakwater
  - Promenade deck
  - Surface water drainages (1 main longitudinal drain and 4 cross drains)
  - 4 Beach access points
  - 2 Landing sites
- Project activities include:
  - Site clearance and preparations
  - Setting up camps, ramps, pads and other ancillary facilities to support mobilization and construction
  - Sourcing, transporting and stockpiling materials on site
  - Use of excavators, dumpers, loaders, cranes, trucks and other heavy machineries and vehicles
  - Earthworks including dredging, excavation and backfilling
  - Handling of excavated / dredged materials

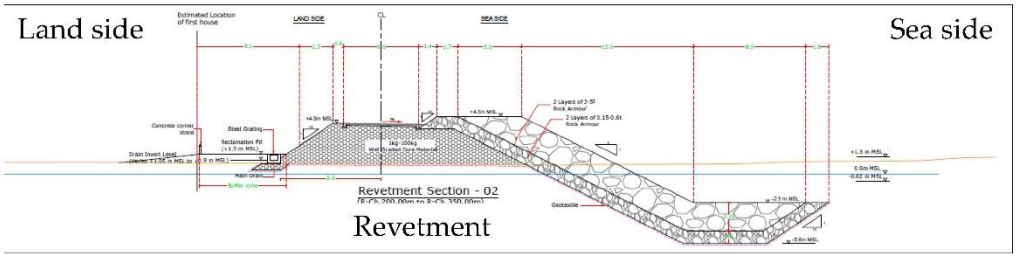
Agenda | Introduction | Project Location | **Project Description** | Data Collection | Impacts | Concerns 7

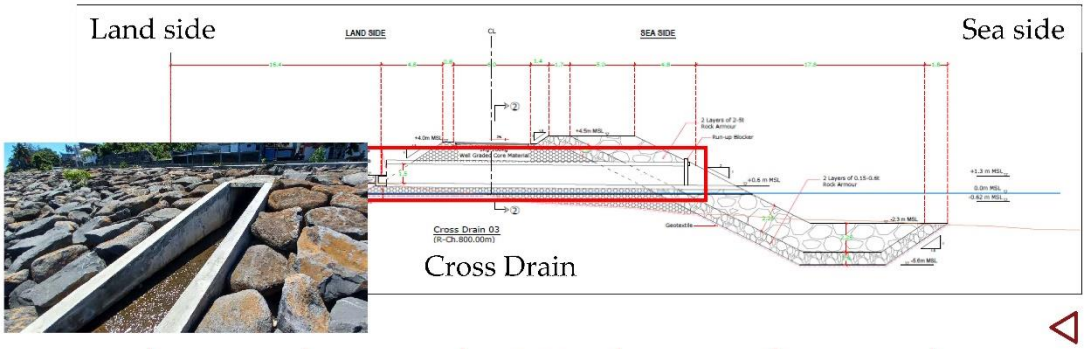
Project Description



Agenda | Introduction | Project Location | **Project Description** | Data Collection | Impacts | Concerns 8

Project Description





Agenda | Introduction | Project Location | **Project Description** | Data Collection | Impacts | Concerns 9

Project Description

Agenda | Introduction | Project Location | **Project Description** | Data Collection | Impacts | Concerns 10

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Project Description

- ESIA will be carried out in accordance with:
  - EPA standards and regulations
  - UNDP's and GCF's Social and Environmental Standards
  - Good international industry practice

Agenda | Introduction | Project Location | **Project Description** | Data Collection | Impacts | Concerns 11

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Baseline Data Collection

- Biophysical environment
  - Soil/Sediment quality
  - Water quality
  - Air quality
  - Noise
  - Biodiversity assessment
- Socio-economic environment
  - Key informant interview
  - Focus group discussions
  - Community consultations






Agenda | Introduction | Project Location | Project Description | **Data Collection** | Impacts | Concerns 12

Potential Impacts

- Positive Impacts
  - Protection of the shoreline against erosion and climate change
  - Recreational area (promenade) for the community
  - Improved business opportunities
  - Employment opportunities

Potential Impacts

- Negative Impacts - Environmental
  - Reduction of beach area
  - Limiting access to the beach
  - Soil / sediment loss and pollution
  - Water pollution
  - Air pollution
  - Noise and vibration
  - Biodiversity impacts
  - Impacts from construction materials
  - Impacts from waste and hazardous materials
- Negative Impacts – Social
  - Health and safety impacts
  - Increased traffic
  - Worker behavior
  - Employment issues and grievances

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Concerns

Agenda | Introduction | Project Location | Project Description | Data Collection | Impacts | Concerns 15

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Concerns

For additional input, please communicate with us on:
info@earthtimegroup.com

Agenda | Introduction | Project Location | Project Description | Data Collection | Impacts | Concerns 16

Appendix C.3 Meeting Minutes

C.3.1 High Level Stakeholder Consultation

The contents of this Appendix are presented as a separate soft copy PDF file.

C.3.2 Community Consultations

The contents of this Appendix are presented as a separate soft copy PDF file.

APPENDIX D COMMUNITY CONSULTATION GROUP QUESTIONNAIRE

1 COMMUNITY CONSULTATION GROUP (CCG)

Name of Community: _____

Location: Study Area _____Ward _____

Attendance Disaggregated

Elders _____ Women _____ Youth _____ Disabled _____ Total _____

Interview conducted by: _____ and _____

Date of Interview: _____

1.1 INTRODUCTION:

I am _____ and my colleague is _____. We are conducting a study to get feedback from people in coastal communities Montserrado County on what would be your reaction to a proposed coastal protection project in this community.

1.2 SOCIO-ECONOMIC ACTIVITIES

1. How has the coastal erosion affected your community?
2. What are the activities that people do here to earn a living?
3. From which of these activities do you earn cash income?
4. What do you spend your money on mainly?
5. Where do you sell your products/ fish and how far is it from here?
6. Do you do any other business in this community beside fish business?
7. What are the major needs of this community and why do you consider them major?
8. Which of these needs come first, second, third?

1.3 POLITICAL ECONOMY

9. Who makes decisions in this community? Why?

10. How often do you meet to discuss Town/community matters?

11. Who are those invited to the discussion?

12. Who make decision on land issues in this community?

13. Is there anyone who owns private/ deeded land in this community?

14. How would you feel/react if you were told to leave this community/relocated?

15. What would be good about this project?

16. What would you fear or see happening if this project is implemented?

17. What would you expect from this project?

APPENDIX E WOMEN'S FGD QUESTIONNAIRE

Focus Group Discussion Questionnaire – Women

Name of interviewer……..	Date of interview……

Words between { } are notes to the interviewer

{To be filled by reviewer only}
Name of reviewer…… *Date of review ……*

SOCIAL IMPACT ASSESSMENT

FOCUS GROUP QUESTIONNAIRE / *WOMEN*

Location of interview: _____

Date of Interview: _____

Interview conducted by: _____ and _____

Total number of attendees: _____ {*Fill attendance sheet at the end of the document*}

Introduction:

I am _____ and my colleague is _____. We are conducting a study to get feedback from people in fishing communities in coastal communities Montserrado County on how you undertake fishing, where and how and how that gives you a livelihood. We will also talk to the fish sellers/ mongers to learn more about how they make a livelihood. We would also like to know what your reaction to a proposed coastal protection project in this community would be.

A. Women's livelihoods

1. How do you earn your living?

2. Which activities do you do to earn yourself cash income?

3. What are the daily tasks/activities outside of your house?

B. Women's participation in the community

4. Do you the women participate in community meetings?

5. Are there difficulties about women participation in community meetings? If yes, please describe.

C. Women rights, sexual harassment, sexual exploitation and abuse, and gender-based violence (GBV)

6. In general, do you feel equal to men with regards to your rights? If not, please describe why you don't feel equal to men.

7. What (actions do you consider as) constitutes gender-based violence, sexual harassment and sexual exploitation and abuse to you? Please, explain.

8. What factors allow gender-based violence, sexual harassment and sexual exploitation and abuse to occur? (What are some reasons why women experience gender-based violence, sexual harassment and sexual exploitation and abuse?)

9. Have any of you faced any kind of violence at home? If yes, what was the cause? What happened? please describe.

10. Have any of you faced sexual harassment, gender-based violence or sexual exploitation and abuse away from home? If yes, Where? By whom? At day or at night? Frequently or once in a while? Please describe your experiences.

11. How does your community handle case of rape, sexual harassment, gender-based violence or sexual exploitation and abuse?
    - 11.1. Do they report such cases?
    - 11.2. Is the victim usually blamed for what happened?
    - 11.3. Do the abusers get punishment? Please describe.

12. Do victims of sexual harassment, gender-based violence or sexual exploitation and abuse receive help?
    - 12.1. Is there a specific reporting mechanism?
    - 12.2. Are the police usually involved in the reporting?

13. What are some excuses/causes usually given by the community for the crimes of gender-based violence, sexual harassment and sexual exploitation and abuse? What reasons/ excuses do abusers give?

14. Do you think that the implementation of this project could increase the risk of gender-based violence, sexual harassment or sexual exploitation and abuse?
    - 14.1. If so, how?
    - 14.2. And what can be done to reduce these risks?

15. What are the major needs of women in your community
    - 15.1. _____
    - 15.2. _____
    - 15.3. _____
    - 15.4. and why?
16. Which of these needs you would say is first, second, third …….?

D. Project-related discussion

17. Do you think that the project and its ancillary (related) facilities will affect your livelihood or daily activities?
    17.1. If yes, how will you be affected?

18. What would be good about this project?

19. What would you fear or see happening if this project is implemented?

20. What are your expectations about this project?

21. Do you think that this project could increase job opportunities for you?

ATTENDANCE SHEET

	Name of attendant	Function of attendant (Housewife, farmer, head loader, market, business owner, salaried job, etc.)	Address of attendant (Town)	Tel number	Signature (or fingerprint)
1.					
2.					
3.					
4.					
5.					

APPENDIX F ECOSYSTEM SERVICES QUESTIONNAIRES

Appendix F.1 Fishermen Questionnaire

1 FOCUS GROUP QUESTIONNAIRE FOR FISHERMEN

Name of Community: _____

Location: Study Area _____Ward _____

Attendance Disaggregated

Elders _____ Women _____ Youth _____ Disabled _____ Total _____

Interview conducted by: _____ and _____

Date of Interview: _____

1.1 INTRODUCTION

I am _____ and my colleague is _____. We are conducting a study to get feedback from people in fishing communities in coastal communities Montserrado County on how you undertake fishing, where and how and how that gives you a livelihood. We will also talk to the fish sellers/ mongers to learn more about how they make a livelihood. We would also like to know what your reaction to a proposed coastal protection project in this community would be.

1.2 FISHING ACTIVITIES

1. Name of fishing community – are there several names?

2. Name of landing site GPS location – where do fishermen and crews live? How close is it needed to be to where you live

3. Boat specs: Numbers/ type; length; material; where constructed; propulsion type: motorized, sail, oars

4. Fishing gear used (we need to know the local names of gear) Use photos

5. Number of fishermen on boat at sea/ boat

6. Number of days spent at sea on each trip
    a. If answer to (6) is one day, number of hours/day
    b. If answer to (6) is one day, time of the day (AM, PM, in between)

Earthtime *1*

18. What are the major needs of this community and why?

    a. Which of these needs you would say is first, second, third …….?

1.3 ECONOMIC DATA

19. Growth in number of fishermen in last 3 years Discuss with fishing chairmen changes in numbers

20. Sales of fish per day (in dollars)/ average earnings of fisherman per day this will be seasonal – ask for a diary?

21. Number of days per year fishing variation in season?

22. Change in sales in last 3 years (% growth or decline)

23. Values (dollars) of boats and any other fisheries production materials (nets, fish storage assets) changes over time, survey of maintenance expenditure/ owner

1.4 POLITICAL ECONOMY

24. Who makes decision for the community?

25. Why?

26. How many times do you meet to discuss town matters?

27. Who are those invited to the discussion?

28. Who decides on land issues?

29. Is there anyone who owns private/deeded land in this community?

30. How would you react if you were told to leave this community/relocated?

31. What would be good about this project?

32. What would you fear or see happening because of this project?

33. What would you expect?

Appendix F.2 Fishmongers Questionnaire

1 FOCUS GROUP QUESTIONNAIRE FOR FISHMONGERS

Name of Community: _____

Location: Study Area _____Ward _____

Attendance Disaggregated

Elders _____ Women _____ Youth _____ Disabled _____ Total _____

Interview conducted by: _____ and _____

Date of Interview: _____

1.1 INTRODUCTION:

I am _____ and my colleague is _____. We are conducting a study to get feedback from people in fishing communities in coastal communities Montserrado County on how you undertake fishing, where and how and how that gives you a livelihood. We will also talk to the fish sellers/ mongers to learn more about how they make a livelihood. We would also like to know what your reaction to a proposed coastal protection project in this community would be.

1.2 FISHING ACTIVITIES

1. Name of fishing community – are there other names for this community?

2. What is the name of landing site? GPS location – where do (fish sellers) mongers live? How close does this landing site need to be to where you live?

3. How many crews/groups/canoes do you buy from?

4. Are you a family member of or otherwise related to the crew(s)/fishermen you buy from?

5. Which kind/type of fish do you buy?

a. Can you choose? Photos/ price discussion

6. How many people are in your team if you operate in teams/groups? How do you process the fish?

7. Do you smoke/dry the fish yourselves – if not who do you have to do this?

8. How do you know when to come to the beach to buy fish?

9. How do you as fish sellers manage when the supply of fish is at a season high? When supply is Low season months; when there is no fishing months

10. How do you sell – carry fish to other places??

11. Average number of monthly sales of each of the following fish:

Use pictures – are these sold? Put back? Any endangered? What do they know about endangered species?

- sea turtles
- dolphins
- sharks
- rays

12. Arrangements for processing and marketing the catch beaches/ other – is there a cooperative or fish selling union in this community or nearby?

13. Number of people involved in processing and marketing the catch. How many persons are involved in the processing and marketing of the fish that are caught?

14. How often there are accidents or fatalities like drownings/ deaths/ knife injuries/ tackle injuries/ chronic problems caused by the work/ gang problems

15. What are the major needs of this community and why?

a. Which of these needs you would say is first, second, third …….?

1.3 ECONOMIC DATA

16. Growth in number of fishermen crews in last 3 years. Has there been any increase in the number of fishermen/crews over the last 3 years? By how much estimately?

17. Sales of fish per day (in dollars)/ average earnings of fishmonger per day this will be seasonal
18. Number of days per year fish selling - variation in season?

19. Change in sales in last 3 years (% growth or decline)

20. Values (dollars) of fish sales and any other fisheries processing materials - changes over time.

1.4 POLITICAL ECONOMY

21. Who makes decision for the community?

22. Why?

23. How many times do you meet to discuss town matters?

24. Who are those mainly invited to the discussions?

25. Who decides on land issues?

26. Is there anyone who owns private/deeded land in this community?

27. How would you react/feel if you were told to leave this community and be relocated elsewhere?

28. What would be good about this project?

29. What would you fear or see happening as a result of this project?

30. What would you expect?

APPENDIX G SAMPLING METHODOLOGY

The sampling methodology for groundwater, surface and marine water is presented below. All samples are managed according to the sample management procedure described in Appendix G.5.

Appendix G.1 Groundwater Sampling Methodology

Groundwater samples were collected as per the following procedure.

1. Wear sterile gloves to keep your hands safe and to make sure the sampling bottles are not contaminated.
2. If sampling from an actively used well or hand pump: pump the water or remove water using a bucket and fill the bottles to the rim, while avoiding overflowing and trapped air bubbles.
3. If sampling from a well/ hand pump that was not used for a significant time:
    a. Purge the well/ hand pump by removing at least 1 volume of the well before collecting the sample.
    b. Collect a sample by filling the bottles to the rim, while avoiding overflowing and trapped air bubbles.
4. If the parameters to be tested require filtering: use the syringe provided by the laboratory to withdraw water from a filled bottle that does not contain any preserve, then attach the filter to the syringe and empty the syringe into the bottle that requires a filtered sample.
5. Carefully label the sample bottle using a permanent marker, noting the date, time and monitoring location ID.
6. Store the sample in cool and dark conditions by placing the sample bottles in a cool box containing ice.

Appendix G.2 Surface and Marine Water Sampling Methodology

Surface and marine water samples were collected as per the following procedure.

1. Choose sampling locations: Sampling should be undertaken at a location representative of the general flow in the watercourse.
2. Wear sterile gloves to keep your hands safe and to make sure the sampling bottles are not contaminated.

3. Collecting the sample (for bottles that do not contain any preserve liquid):
    a. Immerse the container in the water on its side before opening it.
    b. Open the container in the water.
    c. Fill the container by moving it up and down in the water column, slightly tilting the opening upwards and trying to fill the container as slowly as possible to get a depth-integrated sample.
    d. Put the cap back on under water and try to avoid trapped air bubbles.
4. Collecting the sample (for bottles that contain a preserve liquid):
    a. Collect a sample using a bottle that does not contain any preserve as per the method described in point 3.
    b. Pour water into the bottles containing a preserve liquid and be careful not to overflow the bottle.
    c. Put the cap back on and try to avoid trapped air bubbles.
    d. If the parameters to be tested require filtering: use the syringe provided by the laboratory to withdraw water from a filled bottle that does not contain any preserve, then attach the filter to the syringe and empty the syringe into the bottle that requires a filtered sample.
5. Carefully label the sample bottle using a permanent marker, noting the date, time and monitoring location ID.

Store the sample in cool and dark conditions by placing the sample bottles in a cool box containing ice.

Appendix G.3 Water Sampling Methodology for eDNA Analysis

Water samples for eDNA analysis were collected as per the following procedure.

1. Choose sampling locations: Sampling should be undertaken at a location representative of the general flow in the watercourse.
2. Wear gloves.
3. Place the rigid inlet pipe in the fishing rod's rings, let protrude about 10 to 20 cm at the end of the rod and attach the other end to the inlet of the pump (on the connecting hose).
4. Attach the silicone tube to the pump outlet, after the flowmeter.

5. Reset the flowmeter to 30 L.
6. Remove the parafilm from the end of the silicone pipe without touching it with the hands.
7. Remove the filtration capsule from its bag and insert the rigid tube located at the end of the rod at the capsule outlet, with the 'flow' arrow pointing upwards (scheme A).
8. Place or hold the fishing rod in a way that the filtration capsule is in the water without touching the bottom of the water body.
9. Plug in the connector inside the pump and switch on the pump.
10. Filter 30 L or until the capsule clogs.
11. When the flow meter indicates "0" or the capsule is clogged, remove the capsule from the water. Turn the capsule upside down without stopping the pump, to draw in air for one or two minutes to empty the remaining water in the capsule.
12. Stop the pump and try not to touch the filtration capsule with your hands to avoid contaminating the sample.
13. For other samples, keep the end of the rigid tube away from contamination.
14. Place one blue cap on the exit of the filtration capsule and return the capsule to its plastic packaging.
15. To inject the buffer, place the syringe with the small 5 cm silicone tube at the capsule inlet. Gently transfer the buffer into the capsule.
16. Close the capsule inlet with an orange cap and then with the second blue cap on top.
17. Shake vigorously the full filtration capsule for 30 seconds.
18. Add the corresponding sample identification label to guarantee traceability.
19. Store the capsule in a cool place, or at room temperature for as short a time as possible before sending it to the laboratory.

Appendix G.4 Soil / Sediment Sampling Methodology

Soil samples were collected as per the following procedure.

1. Wear sterile gloves to keep your hands safe and to ensure that the sampling bottles are not contaminated.
2. If using a soil auger:

a. Push and turn the auger into the soil.

b. Lift the auger to remove the core.

c. Place the core in the clean container.

3. If using a shovel:

d. Push the shovel into the soil.

e. Cut out a triangular wedge of soil and set it aside (to be replaced after sampling).

f. Collect sample from the hole.

g. Place the sample in the container.

h. Return the top layer that was removed to the hole.

4. Using a permanent marker, carefully label the sample bottle, with sample ID, date, and time.

5. Store the sample in cool and dark conditions by placing the sample bottles in a cool box containing ice.

Appendix G.5 Sample Management

After collecting the samples, the following steps were followed to deliver the samples to the laboratory.

- Ensure all samples are carefully labelled with identifying sample information, including location, date, time, and monitoring location ID.
- Fill in the Chain of Custody and documents provided by the laboratory.
- Pack the samples in the cool boxes containing ice packs, seal the containers and attach the chain of custody to each container.
- Deliver the containers to the assigned laboratory.

APPENDIX H LABORATORY RESULTS

Appendix H.1 Laboratory Results for Water and Soil Samples

Earthtime Building,
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Clara Town,
Bushrod Island,
Monrovia, Liberia
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www.liberlab.com

Liberlab

Company Name	Earthtime Inc.
Agreement number	EP2023044
Earthtime's Contact	Basma Shamas Environmental consultant bshamas@earthtimegroup.com
Laboratory Name	Liberlab
Quote No	LBQ2024013
Liberlab's Contact	Wafaa Alhalabi Lab manager wafaa.alhalabi@liberlab.com
Analyzed by	Fatima Elhajj Mousa
Report No	033-01
Report Issue Date	23 September 24

Certificate of Analysis

Liberlab received 5 water samples and 2 sediment samples on Thursday August 22nd, 2024. These samples were scheduled for analysis which was completed on Monday September 23rd, 2024.

Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside our scope.

The client is not permitted to reproduce this report except in full without the approval of the laboratory.

Approved by

Wafaa Alhalabi
Lab manager

Page 1 of 5

Earthtime Building,
U.N. Drive,
Clara Town,
Bushrod Island,
Monrovia, Liberia
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www.liberlab.com

			Sample Description	S01	S02
			Sample Type	Sediment	Sediment
			Date Sampled	21/08/2024	21/08/2024
Method	LoD	Unit	Parameter		
		No units	Colour	Light Brown	Light Brown
		No units	Description	Sand	Sand
		No units	Inclusion 1)	None	Stones
		No units	Inclusion 2)	None	None
PM024		%	Moisture Content Ratio (% of as received sample)	17	9.7
TM094	<20	mg/kg	Acidity as HCl	<20	<20
TM230	<10	mg/kg	Alkalinity, Total as CaCO3	135	52.7
TM234	<0.014	mS/cm	Conductivity @ 20 deg.C	1.99	2.95
TM024	<15	mg/kg	Exchangeable Ammonia as NH4	<15	<15
TM243	<1	mg/kg	Nitrate as NO3, 2:1 water soluble	<1	1.18
TM243	<0.1	mg/kg	Nitrite as NO2, 2:1 water soluble	<0.1	<0.1
TM133	1	pH Units	pH	9.15	8.7
TM243	<1	mg/kg	Phosphate (ortho) as PO4	<1	<1
TM243	<0.004	g/l	Water Soluble Sulphate as SO4 2:1 Extract	<0.004	0.0788
TM181	<11	mg/kg	Aluminum	3030	1030
TM181	<0.6	mg/kg	Arsenic	41	13.9
TM181	<0.02	mg/kg	Cadmium	<0.02	<0.02
TM181	<0.9	mg/kg	Chromium	8.84	12.6
TM181	<1.4	mg/kg	Copper	<1.4	3.21
TM181	<1000	mg/kg	Iron	19600	12800
TM181	<0.7	mg/kg	Lead	6.07	7.14
TM181	<0.13	mg/kg	Manganese	165	79.9
TM181	<0.1	mg/kg	Mercury	<0.1	<0.1
TM224	<8	mg/kg	Magnesium	2180	585
TM181	<1.9	mg/kg	Zinc	37.3	38.3
TM089	<20	µg/kg	GRO >C5-C10	<20	<20
TM415	35	mg/kg	EPH >C10-C40	<35	<35
TM415	35	mg/kg	EPH (C5-C40)	<35	<35
TM116	<1	µg/kg	Benzene	<1	<1
TM116	<1	µg/kg	Ethylbenzene	<1	<1
TM116	<0.5	µg/kg	Methyl Tertiary Butyl Ether	<0.5	<0.5
TM116	<2	µg/kg	o-Xylene	<2	<2
TM116	<2	µg/kg	p/m-Xylene	<2	<2
TM116	<7	µg/kg	Sum of BTEX	<7	<7
TM116	<1	µg/kg	Toluene	<1	<1
SUB		meq/100g	Cation Exchange Capacity*	<1.5	<1.5

Earthtime Building,
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			Sample Description	M01	M02	E01	R01	GW01
			Sample Type	Marine	Marine	Brackish	Brackish	GW
			Date Sampled	22/08/2024	22/08/2024	22/08/2024	22/08/2024	21/08/2024
Method	LoD	Unit	Parameter					
TM099	<0.2	mg/l	Ammoniacal Nitrogen as N	<0.2	<0.2	<0.2	<0.2	0.433
TM107	<7	mg/l	COD, unfiltered (low level)	<175	153	<28	<28	<7
TM256	<0.02	mS/cm	Conductivity @ 20 deg.C	21.6	18.1	4.22	3.97	0.121
TM021	<40	mg/l	Dissolved solids, Total (gravimetric)	16500	14100	2470	2430	73
TM184	<0.05	mg/l	Nitrite as NO2	<0.05	<0.05	<0.05	<0.05	0.132
TM256	<1	pH Units	pH	7.94	7.85	7.24	7.35	7.71
TM281	<0.3	mg/l	Saline Nitrate as NO3	0.348	0.334	5.51	0.697	2.3
TM281	<0.3	mg/l	Saline TON as NO3	0.348	0.334	5.51	0.697	2.48
TM281	<0.07	mg/l	Saline Total Oxidised Nitrogen as N	0.0786	0.0754	1.24	0.157	0.56
TM256	<2	No units	Salinity	14.9	12.3	2.6	2.4	<2
TM022	<2	mg/l	Suspended solids, Total	15.8	15.1	11.3	10.7	<2
TM195	<0.1	ntu	Turbidity	2.26	2.14	9.94	7.91	1.9
TM184	<0.05	mg/l	Phosphate (Ortho as PO4)	<0.05	<0.05	<0.05	<0.05	0.623
TM245	<100	µg/l	EPH (C6-C10)	<100	<100	<100	<100	<100
TM245	<10	µg/l	GRO >C5-C10	12	<10	<10	13	10
TM172	<100	µg/l	EPH Range >C10 - C40 (aq)	<100	<100	104	<100	178
TM245	<10	µg/l	Aliphatics >C10-C12	<10	<10	<10	<10	<10
TM439	<10	µg/l	Aliphatics >C12-C16 (aq)	<10	<10	<10	<10	<10
TM439	<10	µg/l	Aliphatics >C16-C21 (aq)	<10	<10	<10	<10	<10
TM439	<10	µg/l	Aliphatics >C21-C35 (aq)	<10	<10	<10	<10	<10
TM245	<10	µg/l	Aliphatics >C5-C6	<10	<10	<10	<10	<10
TM245	<10	µg/l	Aliphatics >C6-C8	<10	<10	<10	<10	<10

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			Sample Description	M01	M02	E01	R01	GW01
			Sample Type	Marine	Marine	Brackish	Brackish	GW
			Date Sampled	22/08/2024	22/08/2024	22/08/2024	22/08/2024	21/08/2024
Method	LoD	Unit	Parameter					
TM245	<10	µg/l	Aliphatics >C8-C10	<10	<10	<10	<10	<10
TM245	<10	µg/l	Aromatics >EC10-EC12	<10	<10	<10	<10	<10
TM439	<10	µg/l	Aromatics >EC12-EC16 (aq)	<10	<10	<10	<10	<10
TM439	<10	µg/l	Aromatics >EC16-EC21 (aq)	<10	<10	<10	<10	<10
TM439	<10	µg/l	Aromatics >EC21-EC35 (aq)	<10	<10	<10	<10	<10
TM245	<10	µg/l	Aromatics >EC5-EC7	<10	<10	<10	<10	<10
TM245	<10	µg/l	Aromatics >EC7-EC8	<10	<10	<10	<10	<10
TM245	<10	µg/l	Aromatics >EC8-EC10	<10	<10	<10	<10	<10
TM245	<50	µg/l	GRO >C5-C12	<50	<50	<50	<50	<50
TM439	<10	µg/l	Total Aliphatics & Aromatics >C5-35 (aq)	<10	<10	<10	<10	<10
TM439	<10	µg/l	Total Aliphatics >C12-C35 (aq)	<10	<10	<10	<10	<10
TM439	<10	µg/l	Total Aromatics >EC12-EC35 (aq)	<10	<10	<10	<10	<10
TM172	<100	µg/l	Total EPH (C6-C40) (aq)	<100	<100	104	<100	178
TM208	<1	µg/l	Benzene	<1	<1	<1	<1	<1
TM208	<1	µg/l	Ethylbenzene	<1	<1	<1	<1	<1
TM208	<1	µg/l	m,p-Xylene	<1	<1	<1	<1	<1
TM208	<1	µg/l	Methyl tertiary butyl ether (MTBE)	<1	<1	<1	<1	<1
TM208	<1	µg/l	o-Xylene	<1	<1	<1	<1	<1
TM208	<5	µg/l	Sum of BTEX	<5	<5	<5	<5	<5
TM208	<2	µg/l	Sum of detected Xylenes	<2	<2	<2	<2	<2
TM208	<1	µg/l	Toluene	<1	<1	<1	<1	<1
TM227	<0.05	mg/l	Cyanide, Total	<0.05	<0.05	<0.05	<0.05	<0.05

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					Sample Description	M01	M02	E01	R01	GW01
					Sample Type	Marine	Marine	Brackish	Brackish	GW
					Date Sampled	22/08/2024	22/08/2024	22/08/2024	22/08/2024	21/08/2024
Method	LoD			Unit	Parameter					
TM227	<0.05			mg/l	Cyanide, Complex	<0.05	<0.05	<0.05	<0.05	<0.05
TM227	<0.05			mg/l	Cyanide, Free	<0.05	<0.05	<0.05	<0.05	<0.05
W-TOC-IR	0.5			mg/l	Saline Total Organic Carbon (TOC)	4.84	4.38	5.49	5.63	2.52
Method	LoD/ Saline Water	Method	LoD/ GW							
W-SFMS-5C	0.7	W-SFMS-5D	2	µg/l	Aluminum, Dissolved	138	29.1	44.4	<0.7	28.6
W-SFMS-5C	0.5	W-SFMS-5D	0.5	µg/l	Arsenic, Dissolved	0.659	<0.5	<0.5	<0.5	7.08
W-SFMS-5C	0.05	W-SFMS-5D	0.05	µg/l	Cadmium, Dissolved	<0.05	<0.05	<0.05	<0.05	<0.05
W-SFMS-5C	0.1	W-SFMS-5D	0.5	µg/l	Chromium, Dissolved	1.81	1.23	0.712	0.708	<0.5
W-SFMS-5C	0.5	W-SFMS-5D	1	µg/l	Copper, Dissolved	1.8	<0.5	0.844	<0.5	<1
W-SFMS-5C	0.004	W-SFMS-5D	0.004	mg/l	Iron, Dissolved	0.0792	0.0161	0.0622	0.0338	0.0316
W-SFMS-5C	0.3	W-SFMS-5D	0.2	µg/l	Lead, Dissolved	0.711	<0.3	<0.3	<0.3	0.212
W-SFMS-5C	0.1	W-SFMS-5D	0.2	µg/l	Manganese, Dissolved	23.5	3.06	19	13.7	31.4
W-AFS-17V2	0.002	W-AFS-17V3a	0.02	µg/l	Mercury, Dissolved	0.00495	0.00847	0.00495	0.00512	<0.02
W-AES-1A	0.09	W-AES-1B	0.09	mg/l	Magnesium, Dissolved	467	393	83.1	78.2	0.987
W-SFMS-5C	2	W-SFMS-5D	2	µg/l	Zinc, Dissolved	29.5	28.5	8.23	4.02	7.64

Appendix H.2 Laboratory Results for eDNA Samples

This Appendix is presented in a soft copy in excel and pdf formats.

APPENDIX I ENVIRONMENTAL MONITORING EQUIPMENT DETAILS

Appendix I.1 Portable Air Quality Monitoring Device

The Aeroqual Series 500 Portable Air Quality Monitor is a handheld device that gathers real-time information on the surrounding air in outdoor and indoor environments (see figure below). It can be fitted with different sensor heads to monitor different parameters. The parameters that were measured are CH_4, CO, CO_2, NO_2, SO_2, VOCs, PM_{10} and $PM_{2.5}$.

(a)

(b)

(a) Series 500 - portable air quality monitor; (b) Portable air quality monitor mounted on a tripod

The detection limit of each sensor head is presented in the table below.

Detection limit of each sensor head

Sensor head	Lower detection limit (ppm)
Methane (CH4)	10 ppm
Carbon monoxide (CO)	0.2 ppm
Carbon dioxide (CO_2)	10 ppm
Nitrogen dioxide (NO_2)	0.04 ppm
Sulfur dioxide (SO_2)	0.4 ppm
Volatile organic compounds (VOCs)	0.1 ppm
Particulate matter (PM_{10} and $PM_{2.5}$)	0.005 ppm

Appendix I.2 Sound Level Meter

The Casella digital sound level meter is used for environmental noise monitoring, as shown in the figure below (a). The instrument is a hand-held precision integrating octave band sound level meter (class 1), which can measure workplace noise parameters: LXY, LXYmax, LXYmin, LXeq, LXpeak, Lavg, LC-LA, LXleq, LTM3, LTM5 and LAE. The instrument is part of a kit (part number CEL-633C) shown in the figure below (b). The kit includes an acoustic calibrator and a windshield, among others. During the collection of measurement, the sound-level meter is mounted on a tripod, as shown in the figure below (c).

(a) (b) (c)

(a) Hand-held sound level meter; (b) Sound level meter kit; (c) Sound level meter mounted on a tripod

Results of LAImax, LAImin and LAeq are presented in this report. These are A-weighted parameters that reflect the response of the human ear to noise.

LAImax is the maximum A-weighted noise level measured with impulse time weighting. LAImin is the minimum A-weighted noise level measured with impulse time weighting. LAeq is the A-weighted equivalent continuous noise level measured.

Appendix I.3 Handheld Weather Station and Compass

The Brunton Atmospheric Data Center (ADC) Wind is a handheld weather station that provides instantaneous wind speed and temperature (see figure below, (a)). Three different wind speeds were recorded and averaged. The Suunto MC-2 compass was used to determine wind direction (see figure below, (b)).

(a) (b)

(a) ADC Wind; (b) Compass

APPENDIX J ENVIRONMENTAL AND SOCIAL STANDARDS AND GUIDELINES

Appendix J.1 Formally Issued Environmental Standards

J.1.1 Air Pollution Prevention and Control

J.1.1.1 Control Measures

The following prevention and control measures shall be adopted in order to reduce fugitive dust emissions.

To control fugitive dust emission from drilling, wet drilling shall be used. Where there is a scarcity of water, a suitably designed dust extractor may instead be provided for dry drilling along with a dust collection hood at the mouth of the drill hole collar.

Where possible, blasting sites shall be pre-wetted before blasting during the dry season.

The time of blasting shall be planned to suit local conditions, avoiding blasting during temperature inversions and strong winds blowing towards residential areas.

Dust suppression and dust extraction systems shall be provided at crusher hoppers, crushing, screening, transfer points, loading points and other handling areas where dust may be generated. Appropriate transfer chutes shall be provided at discharge and loading points to minimise the drop height and spread of air borne dust.

Where appropriate, enclosures shall be provided to crushing and screening plants, conveyors, transfer points in order to reduce the fugitive dust emissions. At stockpile areas, water sprays shall be used wherever possible to prevent dust from getting air borne at times of dry weather and strong winds.

All haul roads and other heavily used roads shall be sprayed with water as necessary to suppress dust.

During dry weather and strong winds, when dust generated from operations may spread beyond the site, ancillary facilities, and other working areas. These shall be sprayed with water from mobile water tankers as necessary according to conditions.

Appropriate vegetation shall be maintained alongside roads to help trap fugitive dust caused by the movement of vehicles and plant.

An appropriate vegetation green belt of a minimum width of two hundred meters shall be maintained around the perimeter of crushing and screening plants, batching plants, stockpile and loading areas, quarry working areas and so on. Green belts should be maintained particularly if these sites are located in close proximity to villages and residential areas.

Operators' cabins in all mobile and fixed plant shall be provided with dust proof enclosures. Persons working in dust prone areas shall be provided with suitable dust masks.

J.1.1.2 Ambient Air Quality Tolerance Limits

Operations involving any dust- or gaseous-generating activity must not exceed the standards given in the tables below. These limits apply to all machinery, vehicle and power generation emissions, as well as to the generation of dust from earthworks, ore and rock crushing, and vehicle movements.

The tables below present both international and national standards. The most stringent of the two should be achieved. Both are given in this standard because measurement techniques vary, and the differences of averaging periods may mean that one table can be used for interpretation rather than the other.

In practice, emission fluctuations, meteorological conditions and baseline concentrations mean that in many cases compliance with the standard for 90 percent of the time can be accepted except where sensitive receptors are within the influence zone.

International ambient air quality standards

Pollutant	Averaging period	Standard	Standard derivation	Sources
Dust deposition	30 days	600 mg/m^2/day *(Not to be exceeded more than three times per year, no two sequential months)*	South African action level for residential areas (SANS 1929, 2004)	Earthworks and quarry operations, roads, agriculture and various non-anthropogenic sources
PM_{10}	24 hours	150 µg/m^3 (99th percentile)	IFC *(adopted from WHO Guidelines, Interim Target 1)*	Earthworks and quarry operations, vehicle exhausts, power generation
	Annual mean	70 µg/m^3		
$PM_{2.5}$	24 hours	75 µg/m^3 (99th percentile)		
	Annual mean	35 µg/m^3		
Nitrogen dioxide (NO_2)	1 hour	200 µg/m^3	IFC *(adopted from WHO Guidelines)*	Vehicle exhausts, power generation
	Annual mean	40 µg/m^3		
Sulphur dioxide	10 min mean	500 µg/m^3	IFC *(adopted from WHO Guidelines)*	Heavy plant
	24 hours	125 µg/m^3	IFC *(adopted from WHO Guidelines, Interim Target 1)*	
Carbon monoxide	8 hours	10 mg/m^3	IFC *(adopted from WHO Guidelines)*	Vehicle exhausts, power generation

National ambient air quality tolerance limits (EPA, 2009)

Pollutant	Time weighted average	Industrial area	Residential, rural and other area	Controlled areas***
Sulphur oxides (SOx)	Annual average*	80 µg/m³	60 µg/m³	15 µg/m³
	24 hours**	120 µg/m³	80 µg/m³	30 µg/m³
	Annual average		0.019 ppm/50 µg/m³	
	Monthly average			
	24 hours		0.048 ppm /125 µg/m³	
	One hour			
	Instant peak		500 µg/m³	
	Instant peak (10 min)		0.191 ppm	
Nitrogen oxides (NOx)	Annual average*	80 µg/m³	60 µg/m³	15 µg/m³
	24 hours**	120 µg/m³	80 µg/m³	30 µg/m³
	8 hours			
	Annual average		0.2 ppm	
	Monthly average		0.3 ppm	
	24 hours		0.4 ppm	
	One hour		0.8 ppm	
	Instant peak		1.4 ppm	
Nitrogen dioxide	Annual average		0.05 ppm	
	Monthly average		0.08 ppm	
	24 hours		0.1 ppm	
	One hour		0.2 ppm	
	Instant peak		0.5 ppm	
Suspended particulate matter (SPM)	Annual average*	360 µg/m³	140 µg/m³	70 µg/m³
	24 hours**	500 µg/m³	200 µg/m³	100 µg/m³
	Annual Average****		100 µg/m³	
	24 hours***		180 µg/m³	
Respirable particulate matter (<10 µm) (RPM)	Annual average*	120 µg/m³	60 µg/m³	50 µg/m³
	24 hours**	150 µg/m³	100 µg/m³	75 µg/m³
Lead (Pb)	Annual average*	1.0 µg/m³	0.75 µg/m³	0.50 µg/m³
	24 hours**	1.5 µg/m³	1.00 µg/m³	0.75 µg/m³
	Monthly average		2.5	
Carbon monoxide (CO)/ carbon dioxide (CO_2)	8 hours**	5.0 mg/m³	2.0 mg/m³	1.0 mg/m³
	1 hour	10.0 mg/m³	4.0 mg/m³	2.0 mg/m³
Hydrocarbons (HC)	24 hours**			
Volatile organic compounds (VOC)	24 hours**			
Ozone	One hour		0.12 ppm	
	Instant peak		1.25 ppm	

* Annual arithmetic mean of minimum 104 measurements in a year taken twice a week 24 hourly at uniform interval.

** 24 hourly/8 hourly values should be met 98% of the time in a year. However, 2% of the time, it may exceed but not on two consecutive days. The 24-hour limit may not be exceeded more than three times in one year.

*** Not to be exceeded more than once per year average concentration

Whenever and wherever two consecutive values exceed the limit specified above for the respective category, it would be considered adequate reason to institute regular/continuous monitoring and further investigations.

J.1.2 Water Quality

The Contractor's Environmental Officer is to ensure that the standards in the table below are maintained as far as is possible in any water flows affected by the Project's operations. Where the ambient water quality is lower than the standard, then the water shall be restored to the ambient quality.

Liberian water quality standards for domestic water (EPA, 2018)

Parameter (Unit)	Maximum allowable limit
pH	6.5 -8.5
Sodium (mg/L)	20
Total Dissolved Solids (mg/L)	1000
Total alkalinity as CaCO3 (mg/L)	400
Nitrate (mg/L)	45
Sulfate (mg/L)	250
Chloride (mg/L)	250
Hardness (mg/L)	150
Nitrate-Nitrogen (mg/L)	10
Nitrite (mg/L)	3.0
Nickel (mg/L)	0.1
Arsenic (mg/L)	0.01
Selenium (mg/L)	0.05
Chromium total (mg/L)	0.10
Fluoride (mg/L)	2.0
Copper	1.0
Mercury	0.002
Free cyanide	Nil
Barium	2.0
Cadmium	0.005
Lead	0.01
Beryllium	0.004
Zinc	2.0
Manganese	0.05
Iron	0.3
Phosphorus	5
Ammonia	0.5
Aluminum	0.2
Chromium Hexavalent	0.1
Magnesium	30
Calcium	75
Arsenic	0.01
Total suspended solids	30
E. coli	Nil/100ml
Phenols	Nil
Permanganate value	1.0

Liberian standards for effluents discharged into the environment (EPA, 2018)

Parameter (unit)	Maximum allowable limit
Alkyl mercury compounds (mg/L)	ND
Arsenic (mg/L)	0.02
Arsenic and its compounds (mg/L)	0.1
Benzene (mg/L)	0.1
Biochemical oxygen demand (BOD 5days at 20°C) (mg/L)	30
Boron (mg/L)	1.0
Cadmium (mg/L)	0.01
Sulfate (mg/L)	250
Chemical oxygen demand (COD (mg/L)	50
Chromium VI (mg/L)	0.05
Chloride (mg/L)	250
Chlorine free residual (mg/L)	0.1
Chromium total (mg/L)	2.0
Copper (mg/L)	1.0
Dissolved iron (mg/L)	10
Dissolved Manganese (mg/L)	10
E. Coli (counts/100mL)	Nil
Fluoride (mg/L)	2.0
Lead (mg/L)	0.01
n-Hexane extracts (animal and vegetable fats) (mg/L)	30
n-Hexane extracts (mineral oil) (mg/L)	5.0
Oil and Grease	Nil
Polychlorinated biphenyls, PCBs (mg/L)	Nil
pH (Hydrogen ion activity----marine) (mg/L)	5.0 -9.0
pH (Hydrogen ion activity----non-marine) (mg/L)	6.5 -8.5
Phenols (mg/L)	0.001
Selenium (mg/L)	0.01
Sulfide (mg/L)	0.1
Total suspended solids	30
Temperature (in degrees Celsius) based on ambient temperature	±3
Total Coliform (counts/100mL)	30
Total cyanide(mg/L)	0.5
Free cyanide (mg/L)	ND
Total nickel (mg/L)	0.3
Total dissolved solids (mg/L)	1000
Color in Hazen Unit (H.U.)	15
Detergents	Nil
Phosphate	5.0
Total nitrogen	10
Ammonia	0.4

Liberian water quality standards for recreational water (EPA, 2018)

Parameter (Unit)	Maximum allowable limit
Fecal coliform (Counts/100 mL)	Nil
Total coliform (Counts/100 mL)	500
Arsenic (mg/L)	0.05
Color (True Color Units)	100
Cadmium	0.01
Chromium	0.`1
Light Penetration (meters)	1.2
Mercury (mg/L)	0.001
Odor (Threshold Odor Number, TON)	16
Oil and Grease (mg/L)	5
pH	6 – 9
Radiation, Total (Bq/L)	0.37
Surfactant, MBAs (mg/L)	2
Temperature (°C)	30
Turbidity (NTU)	50

The Ministry of Health Water Testing Laboratory has defined three categories of water use:

- Class I: Drinking water; water supply for industry requiring drinking water.
- Class II: Natural and cultivated fisheries, public bathing places, recreational water sports.
- Class III: Industrial supplies (other than for drinking); irrigation of agricultural land.

The Liberian water quality standard table below gives guidelines for each of these classes, as well as the World Health Organization (WHO) guideline standard where it is available. The absence of a WHO guideline value usually suggests that there is not considered to be a health risk.

Liberian water quality standards (Ministry of Health and Social Welfare, 1987)

Parameter	Unit	WHO	Class I	Class II	Class III
pH	-logH	-	6.5-8.0	6.0-9.0	5.5-9.0
Chloride	Cl mg/l	350	≤ 250.0	≤ 350.0	≤ 450.0
Sulphate	SO_4 mg/l		≤ 150.0	≤ 200.0	≤ 250.0
Hardness	$CaCO_3$ mg/l	100-500	≤ 190.0	≤300.0	≤ 600.0
Total iron	Fe mg/l	0.1	≤ 0.1	≤ 1.5	≤ 2.0
Manganese	Mn mg/l	0.1	≤ 0.1	≤ 0.3	≤ 0.8
Total zinc	Zn mg/l	5	≤ 1.0	≤ 2.0	≤ 5.0
Coliform bacteria	n/ml	0	0	0	≤ 5
Total bacteria	n/ml	0	0	≤ 10	≤ 50
Dissolved substances	mg/l	500	≤ 500.0	≤ 1000.0	≤ 1200.0
Suspended solids	mg/l	-	≤ 10.0	≤ 30.0	≤ 50.0

Parameter	Unit	WHO	Class I	Class II	Class III
Ammonia	NH_4 mg/l	0.5	≤ 1.0	≤ 3.0	≤ 6.0
Nitrate	NO_3 mg/l	50	≤ 40.0	≤ 60.0	≤ 80.0
Nitrite	NO_2 mg/l	-	≤ 0.1	≤ 0.5	≤ 1.0
Phosphate	PO_4 mg/l	-	≤ 0.01	≤ 0.02	≤ 0.05
Phenols	mg/l	0.001	≤ 0.001	≤ 0.02	≤ 0.05
Detergents	mg/l	-	≤ 1.0	≤ 2.0	≤ 3.0
Fluoride	F mg/l	1.5	≤ 1.5	≤ 1.5	≤ 2.0
Cyanide	Cn mg/l	0.05	n.d.	≤ 0.02	≤ 0.05
Lead	Pb mg/l	0.1	≤ 0.1	≤ 0.1	≤ 0.1
Mercury	Hg mg/l	0.01	n.d.	≤ 0.005	≤ 0.01
Copper	Cu mg/l	0.05	≤ 0.01	≤ 0.01	≤ 0.2
Cadmium	Cd mg/l	0.01	n.d.	≤ 0.001	≤ 0.01
Chromium trivalent	Cr mg/l	-	≤ 0.5	≤ 0.5	≤ 0.8
Chromium hexavalent	Cr mg/l	0.05	≤ 0.05	≤ 0.1	≤ 0.1
Nickel	Ni mg/l	-	≤ 1.0	≤ 1.0	≤ 1.0
Silver	Ag mg/l	0.05	≤ 0.01	≤ 0.01	≤ 0.01
Vanadium	V mg/l	-	≤ 1.0	≤ 1.0	≤ 1.0
Boron	B mg/l	-	≤ 1.0	≤ 1.0	≤ 1.0
Arsenic	As mg/l	0.05	≤ 0.05	≤ 0.05	≤ 0.2

J.1.3 Limitation of Noise Emissions

J.1.3.1 Introduction and Measurement

Between the quietest audible sound and the loudest tolerable sound there is a million-to-one ratio in sound pressure (measured in Pascals or Pa). Because of this wide range, a noise level scale based on logarithms is used in noise measurement, called the decibel (dB) scale. Audibility of sound covers a range of approximately 0 to 140 dB.

The human ear system does not respond uniformly to sound across the detectable frequency range and consequently instrumentation used to measure noise is weighted to represent the performance of the ear. This is known as the 'A weighting' and annotated as dB(A). The table below lists the sound pressure level in dB(A) for common situations.

Sound pressure levels for a range of situations

Typical noise levels dB(A)	Example
0	Threshold of hearing
30	Rural area at night, still air
40	Public library; refrigerator humming at 2 meters
50	Quiet office, no machinery; boiling kettle at 0.5 meter
60	Normal conversation
70	Telephone ringing at 2 meters; vacuum cleaner at 3 meters
80	General factory noise level
100	Pneumatic drill at 5 meters

Typical noise levels dB(A)	Example
120	Discotheque – 1 meter in front of loudspeaker
140	Threshold of pain

The noise level at a measurement point is rarely steady, even in rural areas, and varies over a range dependent upon the effects of local noise sources. Close to a busy road, the noise level may vary over a range of 5 dB(A), whereas in a suburban area this may increase up to 40 dB(A) and more due to the multitude of noise sources in such areas (cars, dogs, aircraft etc.) and their variable operation. Furthermore, the range of night-time noise levels will often be smaller and the levels significantly reduced compared to daytime levels.

The equivalent continuous A-weighted sound pressure level, LAeq, is the single number that represents the average sound energy measured over that period. The LAeq is the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period.

Human subjects are generally only capable of noticing changes in noise levels of no less than 3 dB(A). It is generally accepted that a change of 10 dB(A) in an overall, steady noise level is perceived to the human ear as a doubling (or halving) of the noise level.

A parameter that is widely accepted as reflecting human perception of the ambient noise is the background noise level, LA90. This is the noise level exceeded for 90% of the measurement period and generally reflects the noise level in the lulls between individual noise events. Over a one hour period the LA90 will be the noise level exceeded for 54 minutes.

The parameter LA10 is used to describe road traffic noise. This is the noise level exceeded for 10% of the measurement period. Over a one hour period, the LA10 will be the noise level exceeded for 6 minutes.

J.1.3.2 Acceptable Noise Levels

No operations of the PMU, its contractors or sub-contractors should exceed the levels of, or exposures to, noise as given in the tables below.

Where it is not feasible to reduce noise levels to those given below, suitable earth bunds or other barriers to the lateral spreading of noise shall be designed and installed to ensure compliance.

Noise impacts should not exceed the levels given in the tables below. These are given as façade levels at the wall of a property (e.g. just outside a window). Façade level is 3 dB(A) higher than the free-field level due to reflection from the façade.

Maximum permissible noise levels for general environment (EPA, 2017)

Facility	Noise Limits dB(A) (Leq)	
	Day	Night
Any building used as hospital, convalescence home, home for the aged, sanatorium and institutes of higher learning, conference rooms, public library, environmental or recreational sites	45	35
Residential buildings	50	35
Mixed residential (with some commercial and entertainment)	55	45
Residential + industry or small-scale production + commerce	60	50
Industrial	70	60
Time Frame: *Day: 6.00 a.m. to 10.00 p.m.* *Night: 10.00 p.m. to 6.00 a.m.* *The time frame takes into consideration human activity*		

Maximum permissible noise levels (continuous or intermittent noise) from a factory or workshop (EPA, 2017)

Leq dB(A)	Duration (daily)	Duration (weekly)
85	8 hours	40 hours
88	4 hours	20 hours
91	2 hours	10 hours
94	1 hour	5 hours
97	30 minutes	2.5 hours
100	15 minutes	1.25 hours
103	7.5 minutes	37.5 minutes
106	3.75 minutes	18.75 minutes
109	1.875 minutes	9.375 minutes
Noise Levels shall not exceed a Leq of - *(i) Factory/Workshops 85 dB(A)* *(ii) Offices 50 dB(A)* *(iii) Factory/Workshop Compound 75 dB(A)*		

Maximum permissible noise levels for impact or impulsive noise (EPA, 2017)

Sound Level dB(A) (Lmax)	Permitted number of Impulses or Impacts per Day
140	100
130	1,000
120	10,000

Maximum permissible noise levels for construction sites (EPA, 2017)

Noise Control Zone	Sound Level dB(A) (Leq)	
	Day	Night
Residential Area	60	40
Commercial Area	75	50
Industrial Area	85	65
Time Frame: *Day: 6.00 a.m. to 10.00 p.m.* *Night: 10.00 p.m. to 6.00 a.m.* *The time frame takes into consideration human activity*		

Maximum permissible noise levels for accelerating vehicles (adapted from EPA, 2017)

Vehicle type		Sound Level dB(A) (Leq)
Vehicles intended for carriage of passengers and equipped with not more than nine seats, including the driver's seat		78
Vehicles intended for carriage of passengers, and equipped with not more than nine seats, including the driver's seat and having maximum permissible mass of more than 3.5 tonnes	a) - with an engine power of more than 150 KW	80
	b) - with an engine power of less than 150 KW	83
Vehicles intended for carriage of passengers and equipped with more than nine seats including the driver's seat: vehicles intended for carriage of goods	a) - with a maximum permissible mass not exceeding 2 tonnes	79
	b) - with a maximum permissible mass exceeding 2 tonnes but not exceeding 3.5 tonnes	80
Vehicles intended for the carriage of goods and having a maximum permissible mass exceeding 3.5 tonnes	a) -with an engine power of less than 75 KW	81
	b) -with an engine power of not less than 75 KW but less than 150KW	83
	c) -with an engine power of not less than 150 KW	84

Maximum permissible noise levels for residential and commercial areas (EPA, 2017)

Facility	Limit Value in dB(C)
For any building used as a hospital, school, convalescent home, old age home or residential building.	109 dB(C)
For any building in an area used for residential and one or more of the following purposes: Commerce, small-scale production, entertainment, or any residential apartment in an area that is used for purposes of industry, commerce or small-scale production, or any building used for the purpose of industry, commerce or small-scale production.	114 dB(C)

J.1.4 Limitation of Vibrations and Air Overpressure

J.1.4.1 Ground Vibrations: Introduction and Measurement

When an object is in contact with a vibrating surface it is displaced about its reference (stationary) position. Displacement (in mm) is therefore one parameter that can be used to describe the magnitude of a vibration. For sinusoidal signals, displacement, velocity (mm s^{-1}) and acceleration (mm s^{-2}) amplitudes are related mathematically by a function of frequency and time. If phase is neglected (as is always the case when making time-average measurements), then the velocity can be obtained by dividing the acceleration signal by a factor proportional to frequency (measured in Hertz, Hz) and the displacement can be obtained by dividing the acceleration signal by a factor proportional to the square of frequency. Modern electronic integrating meters are capable of providing a wide range of measurement parameters during any single vibration measurement.

For a complex acceleration signal giving rise to a complicated time history, there are several additional quantities which can be used to describe the vibration:

- The root mean square value (rms) is obtained by taking the square root of the means of the sum of the squares of the instantaneous acceleration measured during the total measurement time.
- The peak value is the maximum instantaneous acceleration measured during the measurement time, T. It is a useful indicator of the magnitude of short duration shocks.
- The peak particle velocity (ppv) is the maximum instantaneous velocity of a particle at a point during a given time interval.

J.1.4.2 Context

In general, buildings are reasonably resilient to ground-borne vibration and vibration-induced damage is rare. Vibration-induced damage can arise in different ways, making it difficult to arrive at universal criteria that will adequately and simply indicate damage risk. Damage can occur directly due to high dynamic stresses, due to accelerated ageing or indirectly, when high quasi-static stresses are induced by, for example, soil compaction.

Given the construction of many of the residential properties in rural Liberia (sun-dried clay blocks, with a very thin concrete skim direct on to the clay) and the likely levels of ground borne vibration, it is considered that these types of properties will not suffer from cosmetic damage due to vibration. Measurements are therefore recommended only for short duration vibrations (such as from blasting) or for particular, very sensitive receptors.

The British Standard BS 7385-2:1993 (Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from ground borne vibration) provides guidance on vibration levels likely to result in cosmetic damage (e.g. plaster cracks). Limits for transient vibration, above which cosmetic damage could occur, are given in the table below, taken directly from that standard.

J.1.4.3 Transient Vibration Levels for Cosmetic Damage

The vibration velocities given in the table below must be adhered to in relation to Project activities.

Type of Building	Peak component particle velocity in frequency range of predominant pulse	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures Industrial and heavy commercial buildings	50 mm s^{-1} at 4 Hz and above	
Un-reinforced or light framed structure Residential or light commercial buildings	15 mm s^{-1} at 4 Hz increasing to 20 mm s^{-1} at 15 Hz	20 mm s^{-1} at 15 Hz increasing to 50 mm s^{-1} at 40 Hz and above
Notes. *1. Values referred to are at the base of the building.* *2. For un-reinforced or light framed structures and residential or light commercial buildings, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded.*		

The guide values relate predominantly to transient vibration which does not give rise to resonant responses in structures. Where the dynamic loading caused by continuous vibration is such as to give rise to dynamic magnification due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values in the table may need to be reduced by up to 50%.

J.1.4.4 Air Overpressure Limits

Air overpressure (or blast overpressure) is the pressure or high energy impulse noise caused by a shock wave over and above normal atmospheric pressure.

Based on a review of international standards, the figure of 133 dB (L) is adopted at 500 meters from the blast site (the standard evacuation zone) or at the nearest non-quarry-related structure if closer.

J.1.4.5 Standard Measures to Reduce Ground Vibrations and Air Overpressure in Blasting

The following standard measures shall be used in all blasting operations by or on behalf of the PMU, to reduce ground vibrations and air overpressure. It is recognised that these are difficult to predict owing to the many factors involved in ground conditions, distance to receptor, atmospheric conditions, and the intention of individual blasting operations.

- Explosive quantities shall be minimised to the least amount required to accomplish the required task.
- The spacing of blast holes shall be optimised so as to accomplish the required task with the least amount of explosive possible.
- Detonator timings shall be optimised to minimise ground vibrations. Normally the standard 8 millisecond rule between blast holes shall apply, unless the use of electronic timers allows for better patterns.
- Burden depth and blast hole diameter shall be optimised to obtain the best balance between reduced ground vibrations and reduced air overpressure.

It is expected that the quarry operator will undertake a series of trials to reach the optimal reduced ground vibration and air overpressure impacts over the first five blasts at a particular site.

J.1.5 Protected Animals of Liberia

Under the National Wildlife Conservation and Protected Area Management Law (2016) mandate, the FDA has established a list of protected wildlife in Liberia. The animals listed in the Table below are fully protected in Liberia. Hunting, dealing in, transporting and using these animals or any products associated with them is strictly prohibited.

Protected wildlife of Liberia

Scientific name	Common name	Local (Liberian) name
Primates		
Pan troglodyte verus	Western Chimpanzee	Baboon
Colobus polykomos	Black and white colobus	King monkey
Poliocolobus badius	Red colobus	Red monkey
Procolobus verus	Olive colobus	n.g.
Cercopithecus diana Diana	Diana monkey	n.g.
Cercopithecus mona cambelli	Mona monkey	n.g.
Cercopithecus(cephus)petaurista	Lesser spot-nosed monkey	n.g.
Cercocebus atys atys	Sooty mangabey	n.g.
Galago senegalensis senegalensis	Lesser galago	n.g.
Proboscidea		
Loxodonta africana cyclotis	Forest elephant	Elephant
Artiodactyla		
Tragelaphus euryceros	Bongo	Elk deer
Syncerus caffer nanus	Forest buffalo	Bush cow
Cephalophus ogilbyi	Ogilby's duiker	Black back
Cephalophus jentinki	Jentink's duiker	White antelope
Cephalophus silvicultor	Yellow backed duiker	Yellow back
Cephalophus zebra	Zebra duiker	Marking deer
Neotragus pygmaeus	Royal antelope	Tricky jack
Hyamoschus aquaticus	Water chevrotain	Water deer
Potamochoerus porcus	Red river hog	Red hog
Hylochoerus meinertzhageni	Giant forest hog	Black hog
Choeropsis liberiensis	Pygmy hippopotamus	Water cow
Carnivora		
Panthera pardus	Leopard	Leopard
Liberiitis kuhni	Liberian mongoose	
Felis aurata	Golden cat	Bush cat
Pholidota		
Smutsia gigantean	Giant pangolin	Big ant bear
Uromanis temmickii	Long tailed pangolin	Ant bear
Phataginus tricuspis	Tree pangolin	Ant bear
Sirenia		
Trichechus senegalensis	West African manatee	Sea cow
Reptiles		
Crocodylus niloticus	Nile crocodile	Alligator

Scientific name	Common name	Local (Liberian) name
Mecistops cataphractus	African slender snouted nose crocodile	Alligator
Osteolaemus tetraspis	African dwarf crocodile	Crocodile
Suatamala		
Python sebae	Rock python	Boa constrictor
Python ragius	Ball python	Boa constrictor
Chelonia		
Chelonia mydas	Green sea turtle	Green turtle
Caretta caretta	Loggerhead sea turtle	Sea turtle
Birds		
Accipitridae (osprey, falcons, buzzards, etc.)	n.g.	n.g.
Falconidae (kestrels, falcons, etc.)	n.g.	n.g.
All birds of prey, e.g. eagles, hawks, etc.	n.g.	n.g.
Bucerotidae	n.g.	n.g.
All hornbills	n.g.	n.g.
Musiphagidae	n.g.	n.g.
All turacos	n.g.	n.g.
Picathartidae		
n.g.	Bare-headed rockfowl	n.g.
n.g.	Grey-necked rockfowl	n.g.
n.g.	White-necked rockfowl	n.g.
Psittacidae		
All parrots	n.g.	n.g.
Phasianidae		
Agelastes meleagrides	White-breasted guinea fowl	n.g.
Selachimorpha		
All sharks	n.g.	n.g.
Chondrichthyes		
All rays	n.g.	n.g.
Note: n.g. = not given		

Appendix J.2 Environmental and Social Guidelines

J.2.1 Code of Practice for Staff, Worker, and Visitor Behavior

All managers at the PMU and all contractors' and sub-contractors' managers must ensure that their staff uphold this Code of Practice at all times.

Employees of the PMU, its contractors and sub-contractors are guests of the communities in which they are living and working. They must fit with local customs and laws. Many staff are from other parts of Liberia and from other countries, and some will be in the PMU's facilities for only short periods. Cultural differences and poor behavior of workers can lead to tension between local communities and workers. This Code of Practice demands moderate and tolerant behavior of all people associated with the Project.

All staff, the employees of contractors and sub-contractors, and visitors, must abide by the following rules to ensure harmonious co-existence.

- Adhere to Liberian laws and regulations.
- Respect local communities, religions and customs.
- Respect all groups within the towns.
- Behave in a moderate, modest and tolerant manner.
- Avoid causing disturbance or undertaking any unruly or anti-social behavior at any time.
- Do not hunt, fish, keep animals or gather forest products, except in line with the law and the rules of local communities.
- Bring no firearms, ammunition, dangerous weapons or fireworks in the towns or work sites.
- Use vehicles safely at all times.
- Use security passes as required for different areas.

All employers shall maintain a zero tolerance policy towards the following.

- Infringement of any Liberian law.
- Bribery, fraud or attempts at these.
- Racist, discriminatory, or anti-religious behavior.

- Involvement in prostitution on project property or in project vehicles.
- Any form of sexual exploitation or abuse.
- Involvement in violence of any sort.
- Repeated excessive consumption of alcohol.
- Intoxication on any work site.
- Dealing with proscribed bush meat.
- The use of any non-prescribed or illegal narcotic substance.

The EPA has the right to require intoxication or controlled substance testing at any time.

J.2.2 Safeguarding of Local People's Livelihoods

This guideline provides the procedure for ensuring that the mostly negative project impacts on local people's livelihoods during construction are recognized and appropriately mitigated as soon as possible. This guideline does not cover restoration of livelihoods caused by formal resettlement and displacement of economic activities as this is covered in the Resettlement and Relocation guideline (see Section J.2.8). This guideline provides a brief overview of the Project's approach to all forms of impact on livelihoods by the project, the PMU, its specialists, contractors, and sub-contractors.

Any action by the PMU or the Contractor that competes for space in these communities or which affects employment opportunities risks increased impoverishment of the affected persons, risks project reputation and increases the likelihood of negative attention by the media and politicians.

Each entity must have a Social Officer to manage community and stakeholder impacts. Each entity may employ a Community Liaison Officer (CLO) to undertake this activity. In smaller organizations, the CLO may also have the safeguarding responsibilities. The Social Officer / CLO must have experience in community consultation and resettlement in Liberia. Social Officers and CLOs of contracting bodies must be aware of and use the same processes to organize and record/ report community impacts to the PMU Stakeholder Engagement Plan.

J.2.2.1 Principles

People have the right to have the potential impact of project activities on their livelihoods considered at all stages of the project, to have negative impacts mitigated effectively and for potential positive impacts to be promoted through project implementation.

J.2.2.2 Scope

This guideline is to assist all project actors to undertake impact assessment and mitigation outside of the formal Resettlement Action Plan process which is the correct protocol for dealing with identifiable in advance, major, temporary, or permanent economic displacement issues. This guideline applies to all aspects of daily work by contractors and sub-contractors in relation to the Project.

J.2.2.3 Background

Economic survival in the SAI is mainly dependent on fishing activities. Thus, any changes or lack of access to the beach can affect the community's economic stability and the individual's livelihood. The Project must therefore work hard to prevent negative impacts by clear planning, effective communication with communities and placing real emphasis on understanding how daily activities impinge on local people.

- All entities must have a delegated Social Officer and/or CLO responsible for community interaction and remit to understand the complexities of economic life around the project site.
- There must be an effective Grievance Redress Mechanism in place.
- Each entity must review the job card protocol for each activity and conduct an appraisal of how the activity may affect local people and implement procedures to mitigate negative impacts by:
    - Rescheduling deliveries to non-peak times.
    - Considering the livelihood activities around the site and revisiting this analysis over time.
    - Discussing with communities.
    - Regularly reviewing the work plan and discussing ways of reducing impacts.
    - Looking for positive ways of assisting local livelihoods:
        - Employing youth especially as unskilled labour.
        - Purchasing supplies locally from local sellers.
        - Contributing to community initiatives.
- All actions responding to mitigating negative and enhancing positive impacts must be recorded and reported weekly to the PMU and monthly to the UNDP.

J.2.2.4 Procedure

Step	Action	Notes
1	Develop a livelihood restoration plan, implementation plan, and livelihood impact review protocol monthly.	PMU to require such feedback from Contractors and relate against complaints in the Grievance Redress Mechanism.
2	Each Social Officer shall review the job cards and work plans weekly to identify potential negative impacts and propose alternative less damaging methods/ locations.	Review all job cards weekly, relate to grievances received.
3	Social Officer to have regular contact and feedback from communities about impacts and efforts to mitigate.	All feedback to be recorded and reported.
4	Document positive impacts intended and delivered.	PMU to set out recording formats.
5	Report community attitudes and suggestions and difficulties weekly to the PMU and monthly to the UNDP.	Management to review weekly, maintain awareness of impacts issues.

J.2.3 Employment of Young People on Site

This guideline provides the procedure for ensuring that all workers on site employed by the PMU, its contractors or sub-contractors are aged 16 or over years. The employment of Liberians is subject to a series of labour laws enacted from 1956 to the latest in 2015, the Decent Work Act. This act specifically states that no one under the age of 16 years maybe employed, the preference is for young people to stay in school and reach the School Leaving Certificate standard.

No young person under the age of 16 may be employed. Recruiting and employing local youth to work on the Project is an important benefit that will create community participation and so should be encouraged.

This guideline provides suggestions on the approach to ensuring employment of those 16 or older by the PMU, its contractors and sub-contractors.

J.2.3.1 Principles of Liberian Labour Law

1. There cannot be discrimination for employment based on age, race, sex, tribal origins.

2. Working hours, conditions, pay and benefits are regulated by law.

3. Labour Offices are available to assist in the recruitment of workers should this be needed and can help with vetting for age and names.

The PMU must:

1. Verify the name and age of the employee using the national identity card, social security and welfare registration card, voter's registration card etc. with a photograph incorporated.

2. In the absence of such a card – which can be an indicator of being under 16, the employee can be asked to produce a birth certificate and school reports from which age can be estimated.

3. Photographic identity cards are most useful as the photograph can possibly verify the identity of the applicant.

4. Employees whose ages or identity are in doubt can be referred to the Labour Office for verification.

Children are not allowed on site for any reason – bringing food, selling food and drinks, playing, passing through, carrying messages. The prevention of such activity is rightly the concern of the Health and Safety requirements for working.

Children aged between 16 and 18 years should not be employed in hazardous work, which is defined as work that pose a risk to their health and safety; this means that children between 16 and 18 years should not be employed in construction and lifting works, in quarry, crusher, hot mix or cement plants, and in any job that they are not trained to perform or that can pose risks to their health, safety and wellbeing.

J.2.4 Procedure for Preventing Unfair Conditions of Worker Contract

The Contractor must present their employment contract for Labour to the PMU after signing the contract and prior to commencing work. The PMU will check the conditions of contract to ensure that conditions are fair and that the employment contracts conform to the Liberian Law on Employment and Labour and offer equal and fair pay and conditions for equal work regardless of gender, ethnicity, or nationality. The PMU is responsible for checking employment contract records.

The following practices must be prevented:

- The charging of large and (usually) illegal recruitment fees, which place workers in a situation of debt and therefore essentially bind them to the workplace even when they are not physically restricted from leaving.
- Changing terms of employment illegally once work has started, often when the employee is physically removed from their home area.
- Low or unequal pay for equal work.
- Withholding payments.
- Removal of identity documents including passports as hostage for work.

- Charging excessive amounts for food and employee services.
- Forcing extra (often unpaid) overtime work.
- Employing child labour.
- Not permitting rest days or not honoring festivals and religious observance.
- Physical and verbal abuse.
- Not having a written employment contract with each worker.
- Not having a Worker Code of Conduct which sets out expectations of behavior and punishments for infringement.
- Not having a formal grievance system internal to the PMU for employees to make complaints, particularly for allegations of sexual harassment and gender-based violence.

The mechanism for preventing these impacts occurring comes through requiring all contractors to have written conditions of employment, signed and copy given to each employee. The PMU team is responsible for checking employment contract records.

The PMU has the right to require intoxication or controlled substance testing at any time.

J.2.5 Community Consultation

This guideline provides the procedure for the ways in which communities of affected persons including project near neighbors, that must be followed to ensure compliance with UNDP and GCF policies, Liberian law, current socially acceptable practice in Liberia as well as international best-practice. It provides a brief overview of the Project's approach to all forms of community consultation by the PMU, its officers, contractors, and sub-contractors.

The UNDP SES and the GCF ESS require adequate, effective, and recorded consultation and information exchanges with community stakeholders interested in the Project. The PMU is required to have a Stakeholder Engagement Plan which contains plans for managing and recording contacts with communities, grievances and a plan for regular community consultation and information over the project life.

Each entity must have a Social Officer to manage the community and stakeholder engagement process. Each entity may employ a Community Liaison Officer (CLO) to undertake this activity, in smaller organizations the CLO may also have the safeguarding responsibilities. The Social Officer / CLO must have experience in community consultation in Liberia. Social Officers and CLOs of contracting bodies must be aware of and use the same processes to

organize, record and report community interactions as set out in the PMU Stakeholder Engagement Plan.

J.2.5.1 Principles

Communities have the right to clear, timely information about project activities which will affect their community in some way. Relations between project components and communities are most positive when there is a Stakeholder Engagement Plan defining actions and process.

J.2.5.2 Scope

This guideline is to assist all project actors to undertake community consultation. It applies to all aspects of work by contractors and sub-contractors in relation to the Project.

J.2.5.3 Background

If communities are informed about project activities in advance and are offered the opportunity to raise issues and offer suggestions to mitigate negative impacts, relationships are less tense, accommodations negotiated more easily, international and national NGO scrutiny is easier to manage and the recording requirement allows for proof of consultation and participation.

- Communities have the right to be informed and consulted about asset acquisition and to be treated fairly and considerately.
- Information must be made available at the right times, in the right languages and media to be effective.
- All entities must have a delegated Social Officer and/or CLO responsible for community interaction and a budget for community meetings, information materials, radio announcements, etc.
- There must be an effective Grievance Redress Mechanism in place.
- Each entity must take on board the need for a Social Officer or CLO to front community contact whilst training all staff on community awareness and the protocols mandated for community contact.
- All community interactions must be recorded and reported monthly to the PMU and UNDP.
- The PMU will make the Stakeholder Engagement Plan available to all contractors and sub-contractors, and monitor compliance on a weekly basis.

J.2.5.4 Procedure

Step	Action	Notes
1	Develop and share a Stakeholder Engagement Plan, grievance redress mechanism and protocols for recording community interaction.	PMU to produce copies of the plan, meeting and other forms of contact recording and reporting procedures and train other bodies to use the system.
2	Each Social Officer shall inform the local authority of the start of community consultation, identify the Town Chiefs and meet the town chiefs, their Elders and local key individuals.	Personal contacts and the use of cell phones is the best way of making contact.
3	Plan how issues will be discussed over time and whether meetings with community representatives is needed or whether an open community meeting is required at each point.	It is important to include local administration and to maintain inclusion and consultation. Contractor to provide information for and participate in all media information programs and Local Consultative Forums (LCFs), as required.
4	Conduct meetings and contacts using the protocols established in the SEP.	PMU to set out recording formats.
5	Report community attitudes, needs and priorities, suggestions, and difficulties weekly.	Management to review weekly, maintain awareness of community issues and participate in the project management of stakeholder interests.

J.2.6 Grievance Redress

A grievance is any actual or perceived problem that might give grounds for a complaint. A grievance mechanism allows internal and external stakeholders to ask questions and raise issues, with the knowledge that they will be handled properly. As such it is clear proof of the commitment to deal quickly and carefully with all reasonable concerns and queries that people bring.

The grievance procedure must be:

- Legitimate in that it should be managed in a way that is credible to stakeholders, and immune from interference or undue influence.
- Accessible: it must be well publicized, and open to all, regardless of language, literacy, financial means, or physical location.
- Consistent: there must be absolute clarity about how the process works, how long it takes, and what it can (and cannot) achieve.
- Equitable: everyone must be able to engage in the process on fair and equal terms. People must also be confident that there will be no adverse consequences or reprisals.
- Sensitive to international standards: both the mechanism and the results should conform to internationally recognized standards for engaging with stakeholders.
- Transparent: every aspect of the process should be as open and as candid as possible.

J.2.6.1 The Mechanism

The process for responding to a complaint is described in the table below.

Managing a complaint

Step	Responsibility	Timeframe	Action
1. Receiving a complaint: Complaints can be delivered verbally, by written letter, email, in a newspaper, on radio or on the internet.	Any site supervisor or staff manager A supervisor or staff manager from the PMU should check that this step is implemented.	Day of receipt	The recipient of the complaint must record the following in a complaint form: • Complainant(s), group, body name • Details of the complaint • Accompanying papers if any • Date and place of complaint delivery
2. Forwarding the complaint	The recipient of the complaint	Day of receipt	The complaint materials and complaint details form should be forwarded to the Site Manager or the Social Officer depending on site and nature of the complaint
3. Allocating responsibility for investigation	Site Manager or Social Officer	Within 24 hours of receipt	The Site Manager or Social Officer will allocate responsibility to the Community Liaison Officer (CLO) for leading the investigation, setting the time frame for response and analyzing the facts
4. Recording the Process	CLO	Within 24 hours of receipt	An office for recording complaints should be designated. The designated investigator will record all actions, requests for information from other departments and units on the stakeholder engagement grievance matrix and be responsible for recording all actions by all parties. In resettlement issues, the CLO is responsible for keeping records of such complaints on the grievance matrix and including details in monthly reports.
5. Contacting the complainant	CLO	Within 48 hours of receipt by CLO	The CLO will contact the complainant and inform them that their complaint is being investigated, that there is a process and how the complaint will be dealt with. The CLO can lead or assist.
6. Determination of the facts	CLO	Within 14 days	The CLO must conduct a balanced inquiry into the allegations bearing in mind the rights, responsibilities and obligations of all parties. The CLO shall record the facts and outline appropriate lines of action and report to the Site Manager and Social Officer.
7. Agreeing on action	Site Manager and Social Officer	7 days of receipt of report	The Site Manager and Social Officer will determine the response required, agree actions to be taken and assign responsibility for implementation and for communication of the result to the complainant.

Step	Responsibility	Timeframe	Action
8. Informing the complainant	CLO	Within 48 hours of instruction from the Site Manager and Social Officer	The CLO will contact the complainant and inform them of the outcome of the complaint. Where action is required to mitigate valid impacts the nominated implementation officer will liaise with the team responsible for the agreed outcome work.
9. Dealing with disagreements over response and outcome	CLO	14 days	In the event that the complainant is unsatisfied with the analysis or outcome, the complaint should be referred to the CLO to assist in negotiations.
10. Implementing action	CLO	14 days from agreement by Site Manager and HSE Superintendent	The officer, supervisor or sub-contractor designated to perform remedial actions where these are appropriate and justified shall arrange for a budget and materials and labour for the remedial works or actions to be carried out.
11. Researching complainant satisfaction	CLO	7 days from implementing action	The CLO is responsible for following up with the complainant to ascertain satisfaction with the works and for informing the Site Manager and Social Officer if the remedial action is unacceptable.
12. Monitoring and evaluating the outcome	CLO	After follow-up	Responsibility for monitoring and evaluating the outcome of the Grievance Process is by the CLO and recorded in the Stakeholder Engagement Matrix by the CLO and included in that Department's reporting.
13. Ensuring transparency through the Stakeholder Engagement Policy	CLO	Monthly report	The CLO will ensure transparency in making the process and outcome of the complaint investigation transparent and making public the findings using appropriate media.

J.2.6.2 Recording

All grievances must be recorded in a grievance matrix which logs all contacts and decisions/ assessments/ estimates etc. required to deal with each complaint. Every time activity related to each complaint is undertaken this must be recorded in the matrix and the outcome reported in writing to the complainant, to the relevant Town Chief and the County Superintendent's Office. Action must be seen to have been taken, investigation must be proven to have been undertaken, decisions proved to be fairly made and reported. A letter and verbal communication of the outcome must be made to the complainant in their preferred dialect. An individual grievance register form and a grievance register matrix template containing all project grievances are suggested in the tables below.

Suggested individual grievance register form

Grievance reference number:			
Date of complaint:	**Complainant's name:**		
Type of complaint:	**Complainant's phone number:**		
Description of the complaint			
Actions to be completed	**Due date**	**Responsible department**	**Responsible person**
1.			
2.			
3.			
4.			
5.			
6.			
Results of interventions			
1.			
2.			
3.			
4.			
Closing date:			
Follow-up measures (if applicable)			
1.			
2.			
3.			
4.			
Measures to avoid recurrence of grievance			
1.			
2.			
3.			
4.			
Comments (if applicable)			
1.			
2.			
3.			
4.			

Grievance register matrix template

Grievance reference number	Date of complaint	Type of complaint	Complainant's name	Complainant's phone number	Description of the complaint	Actions to be completed	Due date	Responsible department	Responsible person	Results of interventions	Closing date	Follow-up measures (if applicable)	Measures to avoid recurrence of grievance	Comments (if applicable)

J.2.7 Procedure for Managing Complaints of Sexual Harassment or Gender-Based Violence

J.2.7.1 Introduction

Sexual harassment and gender-based violence at work is not uncommon in Liberia but has been difficult to manage because of traditional attitudes towards behavior and the lack of social sanctions on violence. The UNDP SES and GCF ESS and policy require that positive action is taken to address such abuses in their projects.

The Contractor is required to state zero tolerance of these behavior in the Worker Code of Conduct and to extend the internal worker grievance mechanism to have additional processes to deal with investigations into allegations of sexual harassment and gender-based violence.

J.2.7.2 Procedure

1. The internal GRM must make all employees aware of complete confidentiality of investigations into allegations of sexual harassment and gender-based violence.
2. The Contractor must have made contact with one or more Liberian NGO's experienced in the fields of sexual harassment and gender based violence and have a contract available for the hire of an experienced investigator to lead the investigation.
3. The Contractor's investigation procedure for such allegations requires additional actions to enable a full and fair investigation. These are:
    a. The complaint must be made through the official Contractor's process.
    b. The Contractor's Social and Gender Officer must be informed immediately.
    c. The Contractor's Social Officer must ensure the complainant is safe and if they are in need of support.
    d. The Contractor's Social Officer will meet the Contractor's GRM investigation team and implement the deployment of the expert Liberian NGO lead investigator.
    e. The Contractor's Social Officer will invite the support of the PMU's Social and Gender Officer to take part in the investigation.
    f. At the conclusion of the investigation, if the allegation is proven, the Contractor will inform the Police if it is likely that a Liberian law has been broken. If the allegation is proven the guilty party must be instantly dismissed and leave the site immediately.

g. The Contractor's Social Officer must ensure the complainant is safe and if they are in need of further support.

4. The complaint and outcome must be recorded in the GRM matrix.

J.2.8 Resettlement and Relocation

This guideline provides the procedure for the displacement of any person, property or livelihood that must be followed to ensure compliance with UNDP standards and Liberian laws, current socially acceptable practice as well as international best-practice. It provides a brief overview of the Project's approach to all forms of resettlement. The UNDP standard on Displacement and Resettlement requires a Resettlement Action Plan (RAP) to ensure adequate consultation, information exchanges and adherence to due process through the planning and implementation of any resettlement to ensure that the affected persons are not disadvantaged by the relocation of their houses and displacement of their livelihoods.

In this project, there is a possibility for an economic resettlement since the project exceeds 6 months, and it is not temporary displacement. Thus, an LRP should be developed to mitigate the economic resettlement that could occur because of the project.

J.2.8.1 Principles

Land potentially used or owned by communities cannot be accessed until ownership and use has been researched and clarified, a RAP produced, and full and fair compensation has been made for losses and livelihood restoration commenced. The payment and livelihood restoration must be verified by a third-party organization with resettlement verification experience.

J.2.8.2 Scope

This guideline is to assist the PMU to hire a competent resettlement consultancy or similar body with Liberian resettlement experience to research and write a RAP. The PMU can then use the RAP to negotiate for and make payment or other forms of compensation to communities and individuals for loss of land, assets, usage rights or access routes, and to design and implement mitigation measures for loss of livelihoods. It applies to all work in relation to the project.

J.2.8.3 Background

Under all international agency policies on resettlement and in Liberian law:

- Communities have the right to be informed and consulted about asset acquisition and to be treated fairly and considerately.

- There must be an effective Grievance Redress Mechanism in place.
- Community and household interviews are required to assess losses and impacts on livelihoods, and these take some time to undertake. The internationally recognized process for researching impacts and losses must be adhered to.

Under Liberian law, acquisition and payment of compensation can be made by the project or can be delegated to an agent, but land ownership is devolved back to the government. The procedures below are required to be followed.

Appropriate mitigation measures i.e. house construction, livelihood programs etc., with income support during the changeover, need to be in place, agreed and funded by the Project before contracts can be agreed for work in areas where people are adversely affected.

J.2.8.4 Procedure for Acquisition and Occupation

Step	Action	Notes
1	Contractor asset requirements are identified.	Produce precise map data for all activities and locations.
2	Contractor identifies the resettlement needed and writes Terms of Reference for an experienced local organization to a research and write a RAP to UNDP social and environmental standards.	An experienced local organization is needed as they can mobilize quickly, are familiar with the Monrovia slum locations and can communicate easily with affected persons.
3	The RAP process is discussed with all relevant urban local authority's compensation, government stakeholders are engaged, and the compensation process discussed and agreed with County / City / Borough and Township Land Commissioner and delegates.	It is important to include local administration and to maintain inclusion and consultation.
4	The RAP consultants draw up a community consultation and information plan. Community sensitization is undertaken to make communities aware of potential land and asset needs. A public information campaign is activated in relevant areas. Local Consultative Fora (LCFs) are set up.	The PMU's Social and Gender Specialist to initiate and to use the standardized processes. Contractor to provide information for and participate in all media information programs and LCFs, as required.
5	Community and household surveys of asset loss and livelihood sources are undertaken – the needs and rights of men and women are assessed individually within households; the needs of the elderly and disabled are also to be addressed individually.	Household interviews and community surveys to be undertaken as defined by the Project's RAP. This activity must be sub-contracted to the contracted RAP consultants / NGO. Loss of assets affect men and women separately, therefore interviews at household level require multiple approaches.
6	Compensation values are negotiated through community meetings with local Community Chairmen and Elders and affected persons, and appropriate mitigation programs are agreed.	Entitlement matrix is provided. Any individual negotiations outside of this which change the provisions in the matrix must be agreed with the Social Specialist / CLA and the affected person.

Step	Action	Notes
7	A RAP report is drawn up and must be agreed by both the PMU, UNDP and concerned local Authorities and EPA.	The RAP report lists the procedures to be followed, the list of affected persons and their losses, the entitlement to compensation or other programs, costs and implementation methodology and partners, and monitoring and evaluation procedures.
8	Agreement through the environmental permitting process to continue with land, asset and resource acquisition.	Project to apply and inform contractor and CLA.
9	Payment of cash compensation or implementation of replacement land for land taken etc.	Payments to be made in public at open meetings and recorded in writing with signatures, and the recipient photographed with the compensation or meeting record confirming alternative compensation. Sufficient time has to be allowed for rebuilding houses, finding land etc. – the time to do this must be recompensed to the affected persons as undertaking this activity deprives the person of income earning opportunities.
10	Livelihood restoration activities are implemented.	Ongoing programs of income and livelihood restoration are required to be in place. An NGO can be hired to undertake any such work.
11	Access to land and resources is permitted **only after** payment has been made and relocation achieved and verified by a third party.	Contracts can be let for work after all compensation is verified as paid and alternatives are in place and that new livelihoods are effective. The Program Manager must sign to certify that this has been done.
12	Monitoring of contractor activity and of compensation management by local people.	At its discretion, the project may hire and deploy monitors to oversee impact mitigation and to assist CLA.

J.2.9 Procedure for Unexpected Cultural Sites and Archaeological Finds

J.2.9.1 Introduction

This guideline describes the actions required when project work for or by the Project encounters sites of cultural heritage value, archaeological remains, graves and human remains. The purpose of this chance find procedure is to ensure that a protocol is in place for identification, data collection, reporting; and, if necessary, salvage of significant chance finds. The National Museum of Liberia, in consultation with the EPA will determine the level of significance for purposes of salvage.

In its ESIA studies, the EPA's consultants have encouraged communities to identify and map sacred sites – forests, groves, bushes, stones and rocks, caves, sites of archaeological or ancestral history and graves, and areas for African Traditional Religions. It is possible that some sites have been forgotten, missed or are important to people still displaced. It is also possible that there may be the discovery of human remains left from the civil war or more recent incidents.

J.2.9.2 Possible Sites

A site of importance is defined as any of the following.

- Any physical place or geographical feature identified by local people as culturally important – usually these will be identified by local people working on the site as they are found.
- Any archaeologically significant structure or artefact. These may be difficult to identify but may be, for example, stone circles or unusual mounds that only appear as brush is cut back.
- Graves – these may be stone markers only revealed on cutting back brush.
- Exposed human remains – these may be recent, related to civil war incidents or much older.

Cultural sites may be difficult to identify without explanation by local people. Features to look out for include signs of human activity or artefacts around large or unusual trees, bushes and rocks, particularly in remote locations. Contractors must be sensitive to comments by Liberian staff regarding cultural sites. Sometimes these may sound derogatory because of differences between Liberia's ethic cultures; but all cultural sites are valuable to someone.

An archaeological site is a place in which evidence of past human activities is preserved. Sites that are buried or not identified by prior surveys may be discovered during project land clearing and in the first few meters of excavation. They may exhibit features such as scatters of broken pottery, flakes of worked stone, bones, discarded shellfish, walls of former buildings, or iron smelting works. These artefacts usually have no commercial value but are of value in defining a history of human occupation.

J.2.9.3 Action Required

The Community Liaison Unit will include physical cultural resource awareness training for all staff and contractors during site induction and follow-up with reminder information on responsibility and respect for such resources in the event of a chance find, and the appropriate procedure to follow. In order to prevent vandalism, the Contractor, the Contractor's staff and the PMU staff must keep confidential the location of the suspected find.

The procedure below states the steps that must be undertaken to report, investigate and deal with chance finds in the project area and associated works.

J.2.9.4 Procedure

Step		Responsibility	Action
1.	**Realization**	Worker	Report find to supervisor.
2.	**Halt action**	Supervisor/ Engineer	1. Assess find.
			2. Report to PMU's representative.
			3. Stop any action by workers or machinery that may affect the integrity of the find within at least 10 meters of the find.
			4. Post a guard.
			5. Record his inspection in the responsible Contractor's daybook.
3	**Investigate nature of find**	Supervising Engineer	Require the designated Community Liaison Officer (CLO) to visit the find, check and report back on the type of find.
4	**Site Visit**	Community Liaison Officer	Visit, inspect, and locate the site by GPS, and report to the Supervising Engineer.
			Report the find in the cultural heritage database and Community Engagement Matrix.
5.	**Action**	Supervising Engineer	
	a) In the case of human remains		Call in the Liberian National Police (LNP) to investigate the cause of death and determine whether this is a crime scene. The LNP will then take charge and manage removal of the remains.
	b) In the case of a clearly identifiable grave	Community Liaison Officer	The CLO must try to identify relatives through community leaders and arrange for relocation of the body by the nearest relatives. Removal costs and rituals associated with grave relocation will be paid from the Project's resettlement compensation budget.
	c) In the case of a feature that may be archaeologically significant	Supervising Engineer	1. Contact the University of Liberia, Liberia College of Social Science and Humanities, Anthropology Department.
			2. Request rapid appraisal visit to site by a competent specialist.
			3. Commission specialist investigation with a view to researching, preserving, or relocating the find if it is of archaeological significance.
			4. Liaise with the project design team to avoid the site either temporarily or permanently.
			5. Costs of the specialist visit, appraisal and any conservation or relocation activities will be met from the Project's resettlement compensation budget.
	d) In the case of a site of cultural value	Community Liaison Officer	1. Contact the local community, elders, Poro and Sande leaders, and the Leader of the Animals to investigate claims to cultural significance.
			2. Liaise with the project design team to avoid the site either temporarily or permanently.
			3. If not possible to avoid, agree a relocation package and timetable with costs met from the Project's resettlement compensation budget.
			4. Oversee and monitor the relocation to the agreed timetable and cost.
6	**Reporting** At each level of report, the responsible officers will report appropriate information on the site	All involved officers and specialists	Enter appropriate information into the cultural heritage database and Community Engagement Matrix: a) Location – GPS coordinates. b) Conditions in which the discovery occurred. c) Type – principal evidence for suspected archaeological sites, or informant declaration in the case of cultural sites. d) Area – horizontal and vertical. e) Work stopped – task and schedule.

J.2.10 Personal Protective Equipment Provision to Site Staff and Workers

The PMU or the Contractor shall supply high quality personal protective equipment (PPE) meeting international standards, as appropriate to the needs for each work site and worker's task. The necessary equipment is to be provided for all staff and workers entering the site, irrespective of rank and level of seniority. The equipment is to be comfortable for prolonged use, and is to be replaced as soon as it loses its effectiveness.

The PMU or the contractor is responsible for ensuring that all staff and workers use appropriate safety gear during all hours of work on each site.

Fluorescent jackets shall be worn when on any construction or operational site, or in the proximity of other workers operating machines or tools, or engaged in potentially dangerous activities such as erecting structures.

Helmets shall be worn when on any construction or operational site, or whenever there is a danger of head injury from falling or moving items, such as loose formwork, unsecured overhead structures and the tools of other workers.

Goggles shall be worn whenever there is a risk of flying debris, from the use of hammers, drills or other fast-moving or impact-creating tools and machines.

Gloves shall be worn whenever there is a risk of hand injury from hard or sharp materials such as wood or metal, or sparks; they shall also be worn when handling caustic materials such as cement.

Boots with steel toe and side protection shall be worn when on any construction or operational site, or whenever there is a risk of foot injury from fast-moving or impact-creating tools and machines, such as drills, sledge hammers and pick axes.

Ear protection shall be worn whenever a person is within 20 meters of any machine making a loud noise, including generators, drills, compressors, power saws, grinders, or earth-moving and compacting machines. No individual shall be exposed to noise levels in excess of 85 dB without wearing ear protection. Environmental Department staff can measure site noise on request.

J.2.11 Control of Water Pollution

J.2.11.1 General

No person shall discharge or apply any poisonous, toxic, noxious or obstructing matter, radioactive waste or other pollutants unless the discharge of such material is treated to permissible standards as defined in the Project's environmental permit.

No person shall:

- Generate and discharge any form of effluent on to land or into any water resource without compliance with an approved Environmental Management Plan and a valid Environmental Certificate.
- Discharge wastewater or effluent off an operational site, which does not meet the water quality requirements stipulated in the appropriate license for effluent discharge.
- Discharge into any water resource effluent from a sewage treatment plant, trade or industrial facility without both treatment and a valid effluent discharge license.

In rural Liberia, all surface water courses are used for drinking water supplies at some point during the agricultural year.

J.2.11.2 Prevention of Water Pollution

Surface run-off from earthworks, stockpiles and other areas shall be properly controlled, collected, and treated before discharging into natural water courses. Silt traps and check dams of appropriate sizes shall be constructed at all strategic points to control surface run-off. All run-off water shall be diverted through a series of sedimentation basins to remove suspended particles and chemicals as necessary.

Entrained sediment shall be collected as close to the source as possible. In particular, coarse sediment (sand- and coarse silt-sized particles) should be removed from water courses at the point where they leave the source of supply. Coarse sediment can destroy riverine biotic systems that can otherwise thrive close to earthworks sites.

Sedimentation ponds and check dams shall be de-silted at regular intervals, as required to maintain effectiveness.

Revegetation of exposed surfaces shall be done as far as possible in the earthworks and other operational sites, and around all ancillary infrastructure and access tracks. A separate series of guidelines covers these works.

All efforts shall be made to reuse and recycle treated effluents to the maximum possible extent in order to achieve zero effluent discharge.

Domestic effluents shall be treated in properly designed oxidation ponds or by any other suitable sewage treatment method. Outfalls should be allowed to discharge into the environment only where the quality standards are met. The Contractor's Environmental Officer shall be responsible for monitoring this, but may require a contractor to undertake monitoring on its behalf.

Workshops, fuelling stations and other areas handling fuels, lubricants and other hazardous substances shall be subject to special provisions. These are covered in detail by separate guidelines.

J.2.11.3 Protection and Conservation of Riparian and Estuarine Peripheral Areas

Riparian land is the area along the banks of rivers and creeks, and edges of swamps, where there is a dynamic complex of plant, animal and micro-organism communities and their non-living environment adjacent to and associated with a watercourse. Estuarine peripheral areas are around the edges of tidal inlets, immediately outside the zone of saline water intrusion, and where there are also particular ecosystems. Although both of these bands of land vary, a practical guideline is to take them as occupying 50 meters on each side of a watercourse for riparian zones, and 50 meters from the highest point of tidal water ingress in the case of estuarine areas. In specific conditions, where there is a strong case for a narrower width, this may be reduced to a minimum of 15 meters.

The following activities shall not be permitted on riparian or estuarine peripheral land except as provided in the following two paragraphs:

- Tillage or cultivation;
- Clearing of trees or other vegetation;
- Building of permanent or temporary structures;
- Disposal of any form of waste;
- Excavation of soil or development of borrow pits or quarries; or
- Any other activity that may degrade the water resource.

If any of the above activities must take place within a 50-meter riparian or estuarine peripheral zone, a full environmental management plan must be prepared that demonstrates how any impacts will be mitigated, with control measures put in place before any other site works start.

Where it is essential that tracks or roads must cross a riparian zone, they shall be aligned to cross at right angles, thereby minimizing disruption to this valuable habitat. The area cleared for them shall be kept as narrow as possible and special provision shall be made for soil erosion control measures. Culverts shall be installed so that vehicles do not drive through the water.

Riparian and estuarine peripheral zones should be considered as key areas in all work site environmental monitoring. Water quality assessment or the health and diversity of indicator

insect species such as dragonflies shall be used to judge the effectiveness of mitigation measures.

J.2.11.4 Spillage

No person shall willfully and deliberately allow any substance to spill out into any water resource (fresh or saline) or on to land where such spillage may contaminate either soil or a body of surface or groundwater, or the sea.

In the event of accidental spillage where such spillage may contaminate either soil or a body of surface or groundwater, the following actions shall be taken.

- The person responsible for or causing or finding the spilt substance shall immediately inform the Contractor's Environmental Officer of the accident.
- The Contractor's Environmental Officer shall take immediate and adequate measures to prevent spread of the spillage and its likely adverse effects to soil and water resources.
- The Contractor's Environmental Officer shall take measures to notify the public of the spillage and also to cause action to be taken to deal with the spillage.

J.2.12 Storage, Dispensing and Disposal of Hazardous Materials

The PMU shall take full responsibility for the use and effects of any hazardous materials that are required for project operations. The PMU is further responsible to ensure that all aspects of the spill clean-up plan are followed in the event of a spill (see Guideline J.2.13).

All materials that are potentially hazardous to the environment must be stored or disposed of in accordance with this guideline. Hazardous materials include, but are not limited to, substances such as fuels, lubricants, preservatives, herbicides, pesticides, explosives, cement, lime, slurry clays, bentonite, catalysts, or other chemicals, in solid or liquid form, or sewage and foul wastewater.

Approval by the Supervising Engineer's Environmental Specialist for the use, storage and disposal of hazardous materials shall not reduce the Contractor's responsibility to prevent all leaks and spillages, nor his liability to remedy the damages which may be caused should such incidents occur.

Prevention: Every effort will be made to prevent spills and leaks of any kind. All hazardous materials will be stored in appropriate ways, in line with international safety practices. All operators and supervisors will be trained in appropriate inspection procedures and checks.

All problems detected during inspection must be passed on to the relevant superior officer. Appropriate repairs will be made immediately.

Storage: Hazardous materials shall be stored at least 400 meters from the sea, a water course, spring, swamp, drain or well, and at least 400 meters from a dwelling. Storage areas shall have barriers and impervious surfaces preventing leakages of spilt material outside the storage area or into the underlying soils. They shall be protected from rainfall and secure against intrusion by people other than the PMU's, the Contractor's or sub-contractor's personnel.

Fueling operations: Fuel tanks will be bunded: i.e. there must be secondary containment for the full capacity of the tank in the event of a leak from the tank. A trained attendant will always be in control of fueling nozzles during refueling operations. Designated fueling areas will be bunded (diked) and lined to capture any unexpected releases of fuel. Oil and lubricant dispensing drums will have spill containment trays and liners, or both, to catch and contain material.

Disposal: All used oils, lubricants, solvents, and filters will be recycled whenever possible. Where excess quantities of a hazardous material need to be disposed of, then the PMU shall prepare a disposal plan. In general, hazardous solids that need to be disposed of shall be collected by an EPA-certified collector for hazardous waste.

Sewage disposal: Sewage and foul wastewater shall be disposed into a covered underground septic tank. If this is a permanent feature, then it shall have an underground soakaway so that water does not seep on to the surface. All parts of the system shall be at least 100 meters from a water body or water course.

Fuel contamination of water: Where there is a significant risk of water becoming contaminated with any form of fuel, such as in port areas, then appropriate containment equipment (e.g. floating bunds or barriers, absorbent pads etc.) will be kept in readiness at fuel dispensing areas to assist in cleaning up any spills that may occur.

Cleaning up spills: In the event of a spill or release of any material, the spill will be stopped and the incident reported to the Contractor's Environmental Officer. The substance will then be cleaned up immediately, disposed of in an approved manner and the contaminated environment cleaned to the satisfaction of the Contractor's Environmental Officer. A separate guideline covers this in detail.

J.2.13 Cleaning-up of Pollution by Hazardous Materials

This guideline covers the action to be taken in the event of the leakage or spillage of any environmentally hazardous material, such as fuel, oil, chemicals of any kind, or drilling slurry, into either a water course or standing water body, or into soil. It contains the minimum details

that must be included in spill clean-up plans of the PMU, all contractors and any sub-contractors that may be engaged by the contractors.

The purpose of a spill clean-up plan is to provide guidelines to prevent environmental contamination, and the procedures to be followed should hazardous materials enter the environment. It applies to all working areas of the Project.

The PMU must require the Contractor to prepare on-site spill clean-up plans for all hazardous materials to be used on the site. This is a regulatory requirement of the Government of Liberia, and the minimum details that must be in the plan are as follows: (a) how incidents will be contained and controlled so as to minimize the effects and to limit danger to persons, the environment and property; (b) how the necessary measures will be implemented to protect people and the environment; (c) a description of the actions that will be taken to control the conditions and to limit their consequences, including a description of the safety equipment and resources available; and (d) arrangements for training staff in the duties they will be expected to perform. The emergency plan shall be simple and straightforward.

The following principles must apply in the plan: (a) the source of the leak or spill must be stopped immediately it is discovered; (b) the alarm must be raised throughout the site; (c) work on the site must be stopped and all available resources directed into resolving the problem; (d) emergency measures must be taken to contain all remaining material; (e) where appropriate, measures must be taken to neutralize hazardous substances; (e) the Contractor's Environmental Officer shall be informed immediately; and (f) site-specific and material-specific details will be given for the disposal of contaminated soil and water, and mitigation of the damage caused.

The PMU shall ensure that all site supervision staff are aware of the plan and capable of implementing it. In the event of a leak or spillage, the PMU shall bear all liability whether the plan is implemented or not.

Spill response procedure: Every spill clean-up plan must contain, as a minimum, details of the following emergency procedures:

The person who discovers any spill must notify fellow workers and inform the supervisor that a spill has occurred. If anyone is injured or in danger, they must be rescued if it is safe to do so, and appropriate rescue and medical assistance called if required. All site staff must be informed if there is a risk of fire or explosion, or of a collapse of infrastructure, and in these cases all unnecessary personnel must be evacuated to a safe location.

All staff will react promptly to all spills, no matter how insignificant they may appear. Whatever resources are available will be diverted immediately to assist in resolving the spill.

The Contractor's Environmental Officer will be notified immediately if any spill or release occurs, however small. As much information as possible should be provided about the spill location, type of material, approximate quantity, and extent of damage.

The area surrounding the spill will be secured and contained to minimize additional contamination, for example by building an earth bund or the deployment of floating bunds. Emergency containment should be started as soon as possible. This will give time for a full pollution-control strategy to be designed, agreed and implemented.

J.2.14 Prevention of Pollution from Refuelling Facilities

J.2.14.1 General

Oil is the most common water pollutant, with the potential to harm watercourses and groundwater. In addition, certain fuels, such as petrol, are highly flammable and are tightly regulated for safety reasons. This guidance is applicable to all refuelling facilities and should be consulted regardless of the type of facility.

J.2.14.2 Types of Drainage System

Clean water. All clean, uncontaminated rainwater should be channelled to:

- a surface water drainage system;
- a combined drainage system downstream of the oil separator;
- directly to a local watercourse or soak-away.

This includes roof water and uncontaminated drainage from those areas of the site where vehicles are not stored, repaired, refuelled or washed. Such discharges may require prior permission from the EPA or the local sewer provider.

Contaminated water. The entire area where fuel is delivered, stored and dispensed should be isolated from the surface water drainage system, open ground or other porous surfaces. This can be achieved using drainage grids, gullies or kerbs in conjunction with surfaces impermeable to the products used. Potentially contaminated water and spills should be directed through an oil separator and prevented from seeping into the soil and groundwater below the site. The separator should be of an adequate size to serve the surface area catchment of the site.

Sustainable drainage systems. The use of sustainable drainage systems (SUDS) should be considered. SUDS such as constructed wetlands or reed beds may offer an environmentally sound alternative to traditional methods of treating drainage effluent. Wetland or equivalent

technology can be used for a variety of wastewater treatment purposes at refuelling facilities. It may also be suitable as a replacement for on-site separators for oily water run-off, provided the system is compatible with local groundwater conditions. Wetland systems can offer an acceptable level of environmental protection provided they are properly designed, installed and maintained. In some situations, they may provide better environmental protection than conventional drainage systems.

Washing activities. All washing and cleaning operations, including the washing of all vehicles or plant, should be carried out in a designated area clearly marked on the ground and in any plans. The cleaning area should be isolated from both the surface water drainage system and unmade ground or porous surfaces (e.g. using drainage grids, gullies or kerbs). Wash water should be re-circulated whenever possible. Otherwise, it should drain to, or be disposed of, via the foul sewer (where available).

Cleaning agents such as detergents (including biodegradable ones) should never be allowed to enter the surface water system or to soak into groundwater unless specifically permitted after appropriate treatment. They should not enter oil separators because they reduce their effectiveness (the oil will be dispersed and washed through).

Training in dealing with emergencies. Staff should be trained to deal with an environmental incident. Set up a system of written training records and make these available for inspection. Training should include a background to environmental sensitivities around the site and a formal emergency procedure that details actions to be taken in the event of:

- a spillage.
- a fire.
- a collision with equipment.
- odors being detected off-site.
- a suspected leak being identified.

Make this procedure available on-site in case an emergency arises.

Waste management. To avoid pollution, all waste (including separator waste and oil spill adsorbent materials) must be handled, stored and disposed of correctly. Waste producers and holders must ensure that waste:

- does not escape from their control;
- is passed only to a registered waste carrier for recycling or disposal at a suitably licensed facility;

- is accompanied by a transfer note with a full written description of the waste.

J.2.14.3 Fuel Tank Bund Rainwater Discharge Procedure

Diesel fuel is a hazardous substance which can cause extensive pollution to soil and water. Fuel tanks must be bunded to ensure that if a tank leaks, the fuel does not escape into the environment. However, if the bunded area is not roofed, rainwater will accumulate in the bund. This needs to be drained out under controlled conditions.

The supervisor is responsible for ensuring that no leaked fuel within the bund is allowed to get out of the bund. Should there be an accidental spill or leakage, then the supervisor is responsible for ensuring that it is cleaned up immediately and the matter reported to his manager. In any event, the fuel must be cleaned before any water is drained from the bund.

The following procedure shall be followed.

1. The supervisor shall be present throughout the process of draining the bund.

2. The valve on the bund outlet must be kept closed at all times except when it is being drained.

3. At a designated time on each working day, the supervisor must inspect the bund and assess: (a) whether there has been any spillage or leakage of water from any tank; and (b) whether any rainwater has accumulated and needs to be drained off.

4. If any fuel has leaked, then the cause of the leak must be investigated immediately and the leak stopped if possible. This might be done using a tank repair compound such as “Plug Pattie”, which is contained in the re-fueling station’s fuel and oil spill kit. After this it must be reported to the manager. The leaked fuel must then be mopped up using appropriate pads from the spill kit. Once used, these must be placed in the polythene bags provided in the spill kit and disposed of correctly.

5. If there is water in the bund that appears uncontaminated with fuel, it may be drained off. This is done by opening the valve at the outlet, and allowing the water to flow out through the filter or water-oil separator. The supervisor must watch this process carefully, and must ensure that the flow from the valve is adjusted so that it does not flood the filter. Normally the filter will not cope with the full flow from a valve opened completely.

6. Once the bund has been drained, the valve must be screwed shut again.

7. All other staff, including security guards, are to be instructed that it is forbidden for them to drain water from the bund except when the supervisor is present.

J.2.14.4 Re-fueling Spill Prevention Procedure

Diesel fuel is a hazardous substance which can cause extensive pollution to soil and water. It is also a valuable asset.

The supervisor is responsible for ensuring that no fuel is spilt. Should there be an accidental spill, then the supervisor is responsible for ensuring that it is cleaned up immediately and the matter reported to his manager.

Only a trained pump operator may use a fuel pump. Drivers are not permitted to do this.

The following procedure shall be followed.

1. The hard standing in front of the fuel pump must be kept clean at all times. It must be swept at least once per working day.
2. Vehicles must be positioned on the hard standing, with the fuel filling location between one and two meters from the pump.
3. The fuel filler cap must be removed from the vehicle before the hose is taken from the pump.
4. When moving the hose from the pump, the nozzle must be kept upright at all times.
5. The nozzle is to be inserted carefully into the vehicle filler pipe, and pushed in as far as it will go.
6. Only when the nozzle is fully inserted may the pump be started.
7. While filling the vehicle, the pump operator must watch the nozzle and reduce the pump speed if there is any splashing from the filler pipe.
8. If the nozzle does not have an automatic shut-off valve, the filling must be done slowly and the filler pipe watched carefully to ensure that the pump is stopped well before the tank overflows.
9. Once filling is complete, the pump must be switched off before the nozzle is moved.
10. The nozzle must be removed slowly and carefully, and held in an upright position as it is moved back to its cradle on the pump. The hose must then be stowed neatly beside the pump.
11. The filler cap is then to be replaced on the vehicle, and screwed down firmly.
12. If any fuel has been spilt, it must be mopped up immediately using appropriate pads

from the re-fueling station's fuel and oil spill kit. Once used, these must be placed in the polythene bags provided in the spill kit and disposed of correctly.

J.2.15 Specification for Bunding Fuel Tanks

1. All fuel tanks shall be fully bunded. This means that they will be provided with secondary containment in the event of a leak or rupture in the primary containment structure. The secondary containment shall have a capacity adequate to contain the entire contents of the tank, i.e., at least 150% the volume of the total capacity.

2. When storing fuel for use in the Project, the Contractor is responsible for installing and maintaining the storage tank and bunding arrangement. The Contractor will ensure that tanks are bunded. In the event of a spillage, the Contractor is responsible for taking all action as described in the approved spill clean-up plan.

3. Bunding shall consist of a strong structure that is well founded and built without joints, around the entire tank. This might typically be a masonry wall of 150 mm minimum thickness around the tank being bunded. The ground inside the tank needs to be cleared of topsoil or other loose material, and given a thick concrete screed. The bunded area must be lined throughout, floor and sides, with waterproof cement plaster or a similar coating to contain liquids. The bunding must be completely sealed and no openings should be installed for dewatering rainwater. Instead, all bundings should be covered with a large roof that prevents all rainwater from reaching the bunded area.

4. Fuel tanks placed below ground shall have a secondary heavy duty impervious structure, lining or membrane separate from the primary structure of the tank. This secondary arrangement shall be capable of the indefinite retention of fuel leaking through the primary tank structure. A sampling pipe should be inserted at the time of construction, from the ground surface to the lowest sump point of the secondary containment, to allow sampling to check for fuel leaking out of the primary structure. The sampling pipe should be checked during regular inspections. Should there be evidence of fuel leaking out of the primary tank, then it should be emptied and replaced as soon as possible.

J.2.16 Pollution Prevention in Vehicle and Plant Workshops

J.2.16.1 Introduction

Workshops and service centers carry out a number of operations and processes that have the potential to damage the environment. These include the cleaning of vehicles, the storage, use and disposal of polluting liquids such as oils, paints, solvents, coolant additives, brake fluids

and solid waste such as oil filters, exhaust systems, batteries and tires. Unless the site drainage is correct, waste is properly managed and spillage control procedures are in place, environmental harm could occur.

J.2.16.2 Vehicle and Plant Maintenance Areas

Internal gullies or grids must not drain to the surface water system. If the workshop pit is subject to water infiltration, and is served by a gully and pump, then this should be directed to the foul sewer. Areas where maintenance or dismantling activities are carried out must have an impermeable surface and a raised edge with drainage to a sealed sump or via an oil separator to the foul sewer.

Disposal of waste liquids. Used liquids, such as lubricating oil, hydraulic fluid, coolant and solvents from degreasing activities, must not be disposed of into surface water systems. They should be collected in a suitably bunded tank. This oil can be taken for use in the furnaces of rubber factories until such time as Liberia has recycling facilities.

Batteries. Batteries containing acid should be stored intact and upright in an acid resistant bunded compound or purpose-built bin. Both the lead and the plastic cases can be recycled, so they should be collected for sale to an authorized contractor. Storage can be minimized by the use of one-for-one exchange schemes, whereby old batteries are collected when new ones are delivered.

Tires and other discarded dry parts. Tires must never be burnt on site. They can be treated as a dry material for storage, but if burnt, release compounds that are extremely polluting. Tires should be disposed of by a suitably licensed tire incinerating or recycling company.

Oil filters and other oil contaminated components. There are certified contractors for used oil filters, and so these should be stored. Alternatively, discarded oil filters can be crushed on site and the oil and metal recovered. Intact or crushed filters and other oil contaminated parts such as engines, gearboxes and axles should be stored either in a sealed container or within an impermeable bunded area, preferably roofed to prevent the entry of rain.

Other waste. Skips should have a designated use and be clearly marked to indicate what materials they may be used for. Material stored in skips should be drained or dry and the skips covered to prevent the entry of rainwater and kept watertight to prevent leakage. If any contaminated liquid does accumulate, it should be removed and suitably disposed of. Note that scrap metal is a potential asset.

J.2.16.3 Oil, Fuel and Chemical Storage

Above ground storage tanks. All oil storage tanks and drums, including waste oil, must be sited on an impermeable base within an oil-tight bund wall. Any fill and draw pipes, valves and sight gauges should be enclosed within its curtilage and tank vent pipes should be directed downwards into the bund, so that in the event of overfilling the discharge is contained. Bunds should be examined on a regular basis and any rainfall that accumulates removed by bailing or by pumping under a manually controlled system. This water may be contaminated and should be disposed of with care.

Internal storage tanks should also be bunded as above and, if served by a remote fill point, the drainage from the area should pass through a suitably sized oil separator. A high-level alarm, which provides an additional safeguard against overfilling, is recommended for all storage tanks.

Underground storage tanks. Underground tanks and pipelines are susceptible to damage and corrosion, and above ground facilities are preferred. In areas of high groundwater vulnerability, the EPA may object to the installation of underground storage tanks. Where underground storage is necessary, a number of protective measures, such as double skinned tanks and piping, and leak detection, may be required. Regular inspection, stock reconciliation and pressure testing are essential, especially where groundwater pollution could occur. The location of underground piping should be identified and clearly marked in order to avoid damage through excessive surface loading.

Chemical storage. Chemicals such as detergents, degreasers, solvents and hydraulic fluids should be securely stored with storage vessels labelled to show their contents and should be kept as close to the point of use and as far from surface water drains as possible.

Refuelling facilities. These are covered by a separate guideline. The risk of pollution from refuelling areas is especially high. Such areas should be isolated from general yard drainage, (for example by using a raised kerb or roll-over bund). Particular care should be taken in the cleaning of such areas.

J.2.16.4 Degreasing and Cleaning

The cleaning and degreasing of vehicles and components must be carried out in a designated wash-bay and not on unmade ground or in areas which discharge to surface water drains, watercourses or soak-away. A wash water recycling system will reduce water use and associated costs. The wash-bay should be impermeable and isolated from the surrounding area by a raised kerb or roll-over bund, with the effluent directed to foul sewer. Particular care should be taken when using hydrocarbons such as paraffin and white spirit as degreasers, as

these substances are toxic to river life. In no circumstances should these substances be discharged to surface water drains.

J.2.17 Oil Separators in Surface Water Drainage Systems

J.2.17.1 Introduction and Oil Separator Sizing

This guideline is to assist in deciding what size and type of oil separator is appropriate. In this guideline, the word oil means liquid hydrocarbons that float on water such as diesel, petrol and engine oil.

Oil separators can be fitted to surface water drainage systems to protect the environment from pollution by oils. They separate the oil from the water, and then retain the oil safely until it is removed. They are installed to contain oil leaks from vehicles and plant, and accidental spillages. To be effective, oil separators need to be correctly designed, installed and maintained.

Surface water may be contaminated by oil at a number of different sites. These sites need to have measures in place to prevent this oil from polluting the environment. Sites include:

- car parks and areas where goods vehicles are parked or maneuvered.
- vehicle maintenance areas.
- vehicle washing areas.
- industrial sites where oil is stored or used.
- refuelling facilities.
- any other site with a risk of oil contamination.

Trapped gully pots can provide adequate protection for car parks that are too small to justify the installation of a separator, but they must be properly maintained.

Usually, a full retention separator should be used. These treat the full flow that can be delivered by the drainage system. The 'full flow' is normally equivalent to the flow generated by a rainfall intensity of 65 mm/hour. Full retention separators are used where there is a risk of regular contamination with oil and a foreseeable risk of significant spillages, such as vehicle maintenance areas and fuelling forecourts.

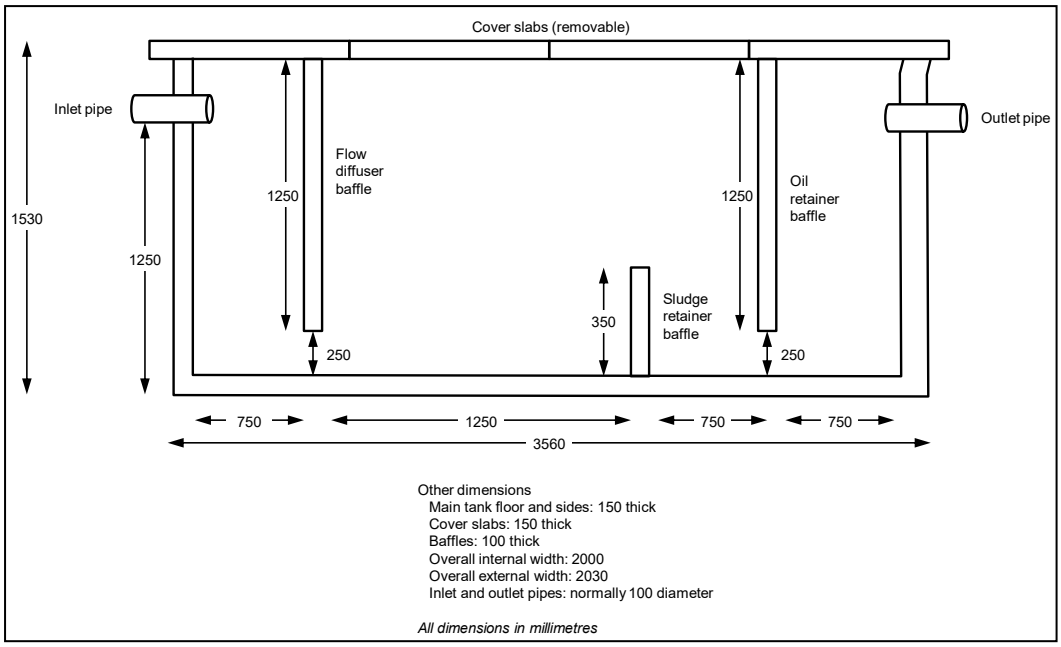
The nominal size (NS) of a full retention separator that is required for a catchment area (A) is obtained using the following formula: NS = 0.018 x A (in m^2).

The oil storage capacity is defined as the volume of separated oil that can be stored in the separator without any of the stored oil entering the inlet or outlet of the separator. The oil storage volume (V) is given by the following: V (in liters) = NS x 10.

On sites where significant oil spillages are foreseeable, make sure the oil storage capacity is sufficient to retain any such spillage and select a separator of adequate size.

J.2.17.2 Simple Oil Separator Design

Where the optimal size of an oil separator cannot be determined, then the simple design shown below should be used. This can be achieved using *in situ* cast concrete.



Simple oil separator (elevation)

J.2.17.3 Maintenance and Use

To prevent pollution and minimize costs, you need to manage your separator effectively. To make this easy, all parts of the separator that have to be regularly maintained must be accessible at all times.

Every six months, or in accordance with manufacturer's instructions, experienced personnel should:

- Physically inspect the integrity of the separator and all mechanical parts.
- Assess the depth of accumulated oil and silt.
- Service any electrical equipment such as alarms and separator management systems.

- Check the condition of any coalescing device and replace it if necessary.
- Some heavily used or high-risk sites might require more frequent inspections.

All sites should empty their separator as soon as a significant quantity of oil or silt has built up. The retained waste, including the silt, must be removed and the separator must be refilled with clean water before being put back into service to prevent damage and to prevent oil passing through it. In addition to normal emptying of the separator, it will also need to be emptied right away if oil or silt levels exceed 90 per cent of the storage volume of the separator and the alarm is activated. When the oil or silt reaches this level or after a spillage, employ a registered waste removal company to empty the separator. For all waste removal operations you must make sure that the waste removal company has experience in emptying separators and that they do not allow any of the contents to escape from the outlet during emptying.

Every five years it is recommended that separators be emptied and given a general inspection to test the integrity and performance of the system. The separator must be refilled with clean water following such an inspection.

J.2.18 Waste Management

This guideline explains how to manage the different types of waste that may result from any project. Not all types of waste discussed herein are expected to result from the project. The latter will mainly produce general waste, organic waste, recyclables (paper, plastic, wood) and hazardous waste (used containers (e.g. paint tins), oil drums, filters, batteries, used personal protective equipment (PPE, used oil, etc.). The other types of wastes are included in this guideline in case minor quantities of such wastes are produced by the project activities.

The company and its contractor should ensure that the waste resulting from the project is managed properly in order to avoid damage to the environment.

J.2.18.1 Waste Management in General

The principles of pollution prevention include the following key messages.

- Everyone should minimise waste production to save money and resources.
- A review of the options for minimising waste will usually help to find ways to save money on raw materials and waste disposal costs.
- Reuse your waste or buy in products that can be reused many times – it will save money in the long term.
- Recycle as much waste as possible.

A waste management strategy is to be managed on the principles of reduction, recovery, recycle and reuse. Recycling and waste reduction campaigns shall be conducted whenever there is evidence of unnecessary waste generation.

A distinction will be made between waste materials that have a potential commercial value – which shall be classed as assets – and those with no value – which shall be considered non-assets.

Waste materials shall be collected and segregated at the source. Care shall be taken to avoid spills during storage and handling. Workers must use appropriate personal protective equipment when handling all forms of waste.

Full records shall be maintained of the types and quantities of waste generation, storage, transfers and disposals.

Discharge methods should be selected with care and the waste collectors, and the disposal locations should be approved by the EPA or performed by an EPA certified waste collector. They should be in areas that are not prone to slippage, cannot leach to surface water and groundwater, and are a suitable distance (at least 400 metres) from settlement. They should be located down gradient of any water supply boreholes. The base of a landfill site should be lined with an impermeable membrane and seepage water piped to a sewage treatment plant. As it is filled, the site should be progressively compacted and buried with soil. Always ensure that landfill sites are in secure compounds.

J.2.18.2 Waste Materials that are Assets

Scrap metals. Metallic objects and components should be re-used as far as it is practicable and safe to do so. Scrap items shall be segregated and kept in safe, dry locations, such as shipping containers. Aluminium items, especially used drink cans, shall be crushed to reduce storage volume. Once accumulated, batches of scrap metals shall be sold to an authorised dealer.

Used commercial and industrial machines (vehicles, trucks, vessels, generators etc.). Wastage should be reduced by using machines for their full design life and repairing rather than replacing them. Once defunct, they should be stripped of re-usable parts and stored securely, in a bunded and covered area. Machines shall be decommissioned thoroughly, all fuel and lubricants removed, moving parts degreased and components with valuable materials such as copper and lead removed for separate disposal as described above. Remaining usable scrap shall then be sold as an asset, as described above.

Under no circumstances shall machines be placed into landfill sites, allowed to be stolen by informal scrappers or sold to unauthorised companies, uncertified small enterprises or individuals who might re-use their components without proper disposal of unwanted parts.

Used oil drums. Used oil drums shall be stored securely, in a bunded and covered storage area. They shall be recycled for waste oil or other appropriate uses. They are not to be sold to unauthorised companies or uncertified small enterprises. If they need to be cleaned, they shall be washed in an area with a full oil separator drainage system.

J.2.18.3 Non-asset Waste

Contaminated soils. The contamination of soil will be avoided by adhering to the hazardous materials storage and handling guidelines. Any soil that has become contaminated will be excavated and removed to a level and secure area, surrounded by an earth bund. The contaminated soil shall be treated fully using an approved bioremediation agent. The area affected will be fully rehabilitated, either using appropriate topsoil from a stockpile, or by replacing the remediated soil as soon as it has been decontaminated. This process will be used in every case where there has been any spill of hydrocarbons or other chemicals. Under no circumstances will contaminated soils be dumped untreated.

Used lubricants. Waste from excessive used oils shall be reduced by using lubricants for their full design life. Used lubricants shall be stored securely, in strong, leak-proof drums in either a double-walled container or in a bunded and covered storage area. Spill kits will be maintained ready and serviceable in all storage and handling areas, and carried in transporting vehicles. Used oil may be sold to large rubber factories for use in the boilers, or to disposal companies with valid certification from the Environmental Protection Agency. Under no circumstances may any form of used lubricant be poured away, either into the soil or into water, or sold to chain saw operators.

Oily water. Industrial oil/water separators shall be installed at every vessel, mechanical workshop and every fuelling station. Drainage shall be arranged such that all spillages and rainwater drain through the separator. All separators shall be maintained according to the manufacturer's instructions.

Used grease. Waste from excessive used grease shall be reduced by using it for its full design life. Used grease shall be stored securely, in strong, leak-proof drums in a bunded and covered storage area. Grease shall be incinerated at a high temperature in a proper industrial incinerator.

Used engine filters (fuel and oil filters). Waste from excessive used filters shall be reduced by using them for their full design life, and if possible ensuring this is reached by appropriate cleaning. Used filters shall be stored securely, in strong, leak-proof drums in a bunded and covered storage area. Used filters may be sold to disposal companies with valid certification from the Environmental Protection Agency. Alternatively, filters may be crushed to remove residual fuel or oil, and incinerated at a high temperature in a proper industrial incinerator.

Used hazardous containers (paint tins, pesticide containers, etc.). Used containers shall be stored securely, in strong, leak-proof drums in a bunded and covered storage area. Used paint tins and pesticide containers shall be crushed as far as possible and sent to an approved landfill site. Under no circumstances shall containers or any parts of them be sold to unauthorised companies or uncertified small enterprises. Containers must not be washed in the ocean or any open water course or areas that do not drain to a proper sewage treatment plant.

Used tyres. Wastage shall be reduced by using tyres for their full design life (usually until the tread is less than 1.2 mm for road vehicles). Used tyres shall be stored securely, in a recognised storage area. They may be sold to companies that will recycle them for non-road uses. Where there is doubt about the future use of tyres, they should be slashed before sale to make them useless for road vehicles. Tyres should also not be sold to people who will use them for quarrying, since this involves air pollution from low temperature burning. Tyres may also be chipped and sent to approved companies that can burn them in furnaces at high temperatures or sent to an approved landfill site.

Used batteries (12-volt lead-acid and gel-filled batteries). Where possible, batteries should be purchased under a buy-back policy from the suppliers to avoid the storage and handling of waste batteries. Wastage should be minimised by using batteries for their full design life, servicing and recharging them where feasible. Used batteries shall be stored securely, in strong, leak-proof containers in a bunded and covered storage area. Batteries containing lead shall be sold for recycling by companies with valid certification from the Environmental Protection Agency. Under no circumstances shall batteries be sold to unauthorised companies, uncertified small enterprises or individuals who might re-use their components without proper disposal of acid or other unwanted parts.

Used personal protective equipment (PPE). Wastage should be reduced by using PPE for its full design life. Used PPE should be stored securely, in strong, leak-proof containers in a bunded and covered storage area. PPE shall be sorted into chemically contaminated (e.g. overalls and gloves stained with creosote from handling rail ties) and non-contaminated items. Chemically contaminated PPE shall be incinerated at high temperature in an industrial incinerator or, if this is not possible, in a purpose-dug pit. Residues shall be placed into an approved landfill site. Non-contaminated PPE shall be placed into an approved landfill site.

Used clothing and rags (i.e. oily waste). Wastage should be reduced by using clothing and rags for as long as it is safe to do so. Oily waste should be stored securely, in strong, leak-proof containers in a bunded and covered storage area. It shall be incinerated at high temperature in an industrial incinerator or, if this is not possible, in a purpose-dug pit. Residues shall be placed into an approved landfill site.

Household waste. Awareness programmes shall be undertaken to encourage waste minimisation. Vessels and barges shall carry the necessary waste bins to segregate their waste into aluminium (e.g. foil and drink cans), steel (e.g. food tins), glass, plastics, cardboard, compostable and other waste. The segregated waste shall be collected for disposal as follows.

- Aluminium, steel, glass, plastics and cardboard shall be sold for recycling by companies with valid certification from the EPA.
- Compostable waste shall be composted and, once fully decomposed and sterile, spread to land as fertiliser or mulch.
- The remaining waste shall be sent to an approved landfill.

Food waste. Wastage shall be minimised. Arrangements shall be made for farmers of domesticated animals to collect food waste for feeding to their stock. Any unused vegetable material shall be composted, and unused animal products sent to an approved landfill site. All food waste shall be stored and transported in containers that are proof against dogs, crows and rodents.

Medical waste. All medical waste shall be stored in appropriate sealed containers. Waste shall be segregated into different categories, in the appropriate colour bins; it is important to ensure staff involved in the handling of waste are equipped with appropriate PPE. Biomedical waste shall be incinerated at a temperature of 800 to 1600°C in an approved specialist incinerator. Incinerator ash and residues shall be placed into an approved landfill site. Only appropriately trained staff shall handle hospital waste and operate incinerators.

Used Domestic Machines (refrigerators, air conditioners, washing machines etc.) and IT Equipment (computers, printers, UPS etc.). Wastage shall be reduced by using machines for their full design life and repairing rather than replacing them. Used machines shall be stored securely, in a bunded and covered storage area. Re-usable parts should be stripped out for repairing other equipment. Machines shall be sold for recycling by companies with valid certification from the Environmental Protection Agency. Under no circumstances shall machines be sold to unauthorised companies, uncertified small enterprises or individuals who might re-use their components without proper disposal of unwanted parts.

J.2.18.4 Recording Hazardous Waste Management and Disposal

The contractor is required to record the accumulation, storage and transfer of potentially hazardous waste (including materials that may be used for environmentally unsound purposes after transfer). This shall include, but not necessarily be limited to, the following:

- Used commercial and industrial machines (vehicles, trucks, vessels, generators, etc.);

- Used lubricants;
- Oily water of any kind;
- Used engine filters (fuel and oil filters);
- Used hazardous containers (paint tins, pesticide containers, etc.);
- Used tyres;
- Used batteries (12-volt lead-acid and gel-filled batteries); and
- Hospital waste (biomedical and clinical).

The unit generating the waste must keep a Waste Materials Record Book. This must contain as a minimum, full records of the following:

- Weekly or monthly estimate of the quantities of each type of hazardous waste;
- The location of storage and any special storage measures employed;
- Each disposal of waste, including the type, quantity, date and location of each transfer;
- The destination of all disposed waste, including the details of any waste management contractor, the method of transport and the point of transfer of responsibility;
- Where a waste contractor is involved, a copy or details of the contractor's Environmental Permit for waste handling and disposal; and
- Any accident or loss involving hazardous or potentially hazardous waste materials.

Waste Materials Record Books may be inspected at any time by the project's environmental team.

J.2.19 Sanitation and Sewage Disposal

J.2.19.1 Pit Latrines

Where temporary toilets are required on site, earth pit latrines are the preferred option. These shall consist of a simple pit with a well-ventilated shelter over the top.

Pit latrines shall be sited in locations that meet the following criteria:

- Within the right of way of the road.
- At least 50 meters from a water course or water body of any description.

- At least 100 meters from a drinking water source. This shall be determined by asking members of local communities to show their sources of drinking water before siting a latrine.
- At least 50 meters from a house.
- Where neither surface nor ground water is likely to collect in the pit.

Holes should be around 1.5 meters deep, and certainly not less than 1 meter, and approximately 1 meter in diameter. They shall be completely enclosed by a sound wooden platform over the top, apart from:

- A small, hinged cover that allows use of the latrine but can be closed when not in use.
- A vertical vent pipe at least two meters long, with mosquito mesh over the top, made of bamboo or plastic.

A short burst (10 seconds) of disinfectant or insecticide should be sprayed, or a small amount of lime thrown into the latrine every two to three days, to stop mosquitoes from breeding in water collected in the pit.

The latrine shall be moved to a new location if it becomes unpleasant to use due to excessive smell, becomes full, or a month of use time elapses. When this is done, the pit must be carefully backfilled and the soil compacted. The ground surface over and around the pit shall be regraded and made good, and if necessary revegetated.

J.2.19.2 Septic Tanks

Outlying housing areas and camps should use appropriately-sized septic tank systems, with the liquids drawn off into an underground soakaway (see below). For temporary purposes, liquids from septic tanks may be drawn off by tanker and discharged into a sewage treatment plant.

The following guidelines are to be followed to provide for the underground soaking away of liquids emanating from septic tanks.

- Select an area for the soakaway that is at least 50 m down gradient, at least 250 m laterally and at least 500 m up gradient of any boreholes or water supplies.
- Excavate a trench for the underground soakaway (2 m deep by 1.5 m wide by 50 m long).
- Line the large trench for the soakaway with permeable geotextile.

- Place a layer of clean stone of 50 to 100 mm size to 100 mm that is 600 mm thick throughout the trench.
- Lay a UPVC pipe of 150 mm diameter perforated with at least 100 holes of 8 mm diameter per meter of pipe. The upper end shall be connected to the outlet from the septic tank and the lower end shall be covered over with permeable geotextile.
- Fill the trench with clean stone of 50 to 100 mm size to 1 m below ground level.
- Place a sheet of permeable geotextile over the stone and then backfill the trench to ground level with 1 meter thickness of soil. This shall be lightly compacted by running an excavator track over the backfilled trench.

Other designs and sizes are permitted if supported by appropriate civil engineering calculations and design.

J.2.19.3 Soakaway for "Grey" Water Only

"Grey" water is used water derived from kitchens, showers, laundries, and other washing areas, but not from toilets. It should normally be sent to a sewage treatment plant or septic tank. If no sewerage system is available or the soil has low permeability (making it difficult to dispose of large volumes of water in a soakaway), then a reed bed system may be used.

A reed bed system uses a minimum of three and preferably five separate ponds in series, for the biological treatment of water. Water should be resident in the system for at least 7 days. This usually requires 3 m^2 of reed bed surface area per person using the system, with an outlet pipe height of 0.5 m.

When the pond series is constructed, local swamp reeds should be transplanted into the ponds. During use, it must be ensured that the reeds are healthy and growing vigorously. If the reeds are dead, the system must be stopped until new reeds have been established.

Discharge from the final pond may go into an open water course. Samples should be tested regularly for bacterial quality if there is a water supply known to exist downstream.

J.2.19.4 Chemical Toilets

The use of chemical toilets is strongly discouraged. They may only be used at project sites where it is proven that neither a standard water closet and septic tank system, nor a pit latrine, are practical. There are two main risks involved in chemical toilets: (a) damage to soils, plants, animals and water from the chemicals used in the toilets; and (b) health dangers to people in the vicinity from the sewage being disposed.

Waste from chemical toilets shall not be poured into a foul drain leading into a sewage treatment plant that relies on biological aerobic digestion, since the bacteria would be killed by the discharge from chemical toilets; and this would ruin the treatment process. Chemical toilets should also not be discharged into septic tanks, since the chemical used in toilets can have an adverse effect on the sewage digestion process in this situation as well.

A disposal hole must be excavated to receive waste from chemical toilets. A suitable hole must be situated at least 100 m from any dwelling and at least 100 m from a water course, spring or well. Wherever possible, it should be on a permeable but not sandy soil. Holes shall be two meters deep when first excavated.

When full or nearly full, chemical toilets shall be transported to the approved emptying point for careful disposal under proper supervision. Once emptied, the toilet shall be sluiced down with plenty of water. The toilet receptacle shall also be well washed out with water and disinfectant, all of which shall also be discharged into the disposal hole.

Each time a toilet is emptied into the hole, the waste shall be covered with 100 mm of soil. When the hole has only 0.5 m of depth remaining, it shall be completely filled and a new hole started.

J.2.20 Prevention of Pollution from Ships: Implementation of the Relevant MARPOL Provisions

J.2.20.1 Introduction

Definition of ship: In this standard, the word "ship" means a vessel of any type whatsoever operating in the marine environment including barges.

Applicability. These guidelines shall apply to all ships operating on behalf of the project through any charter or contract arrangement, either while in Liberian territorial waters (i.e. within 12 nautical miles of the shore of Liberia) or at any other time while engaged on a voyage in connection with project business. It shall be applied irrespective of the port of registration of the vessel concerned, and irrespective of whether the Authority of the ship's flag is a signatory to MARPOL or the London Dumping Convention.

Framework. At all times, ships operating on behalf of the project through any charter or contract arrangement shall abide by the provisions of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocols of 1978 relating thereto ("MARPOL" or "MARPOL 73/78") and its Annexes. In all cases the latest modification of an Annex by the International Maritime Organization (IMO) or the Maritime Environment Protection Committee (MEPC) shall apply unless otherwise stated.

The dumping of materials at sea shall be as stipulated in the 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972, as amended in 2006 (the "London Dumping Convention"). Only the inert materials listed in Annex I of this Protocol may be dumped at sea, and only in places where the ship has the appropriate authorisation to do so.

In addition, while in Liberian territorial waters, some further obligations are required as listed in these guidelines, to comply with the Liberian Maritime Regulations (2002). These obligations shall also apply to all ships operating on behalf of the project through any charter or contract arrangement, irrespective of the port of registration of the ship concerned.

Reporting of incidents. The Master of a ship shall report any of the following incidents to the project within 24 hours while in Liberian territorial waters or within 50 nautical miles of the Liberian coast, in line with Protocol I of MARPOL 73/78.

- Any discharge or probable discharge of oil or any other noxious liquid.
- Any discharge or probable discharge of harmful substances in packaged form.
- Damage, failure or breakdown of the ship, including grounding, collision, fire, explosion, structural failure, mechanical, hydraulic or electrical failure of any sort, flooding.

Non-compliance. Failure to comply with the provisions of these guidelines will be dealt with by the project on a case-by-case basis. Infringements of Liberian or international law will be reported to the appropriate authorities.

J.2.20.2 Prevention of Pollution by Oil – General

Definition of oil. In this standard, the word "oil" means petroleum in any form, including crude oil, fuel oil, lubricating oil, sludge, oil refuse, refined products and petrochemicals.

Discharges. Except in cases of emergency, and then only under the circumstances and conditions set forth in Regulation 11 of MARPOL 73/78 Annex I, no ship shall discharge into the sea any oil or oily mixture.

Oil record book. All ships shall have a full and up to date Oil Record Book. It must contain as a minimum, full records of the following: the ship oil tanks and their capacities; the taking on board of oil, including source, volume and timing; ballasting or cleaning of oil tanks; discharge of dirty ballast or cleaning water from oil fuel tanks; collection and disposal of sludge and other oil residues; discharge overboard or other disposal of bilge water which has accumulated in machinery spaces, including location, volume and timing; bunkering of fuel

or bulk lubricating oil; condition of oil filtering equipment; and any accidental or exceptional incidents involving oil.

Ship-board oil pollution emergency plan. All ships shall have a ship-board oil pollution emergency plan. This shall contain as a minimum: a procedure to be followed by the master, officers and crew in the event of an oil pollution incident; a detailed description of the actions to be taken by persons on board the ship to reduce or control the discharge of oil following the incident; the procedure and actions to be taken to clean up the pollution or as much of the pollution as can be safely cleaned up in the prevailing sea and weather conditions. All oil pollution incidents occurring within 50 nautical miles of the coast of Liberia shall be reported to the project within 24 hours. When berthed at the Port of Buchanan or in Liberian territorial waters, the project's environmental staff may board the ship to inspect the plan.

Ship-board oil spill clean-up equipment. All ships shall carry on board the necessary equipment to clean up an oil spill of the volume of its stored oil. A designated officer and crew members shall be trained in its use.

Disposal and reception facilities. The project will not provide onshore reception facilities for oil or oily waste of any kind at the Port of Buchanan. Should a ship need to discharge such waste, then the contractor shall provide the project with proof that both the handling mechanism and the disposal facility used are authorised by the EPA for reception of such materials. This proof is to be provided before any such waste is off-loaded from the ship.

J.2.20.3 Prevention of Pollution by Oil – Refuelling in Port

Refuelling of diesel, marine gas oil (MGO) or a similar grade of fuel, and of lubricants, may be undertaken for ships in port. This will occur at the Port of Buchanan.

The receiving ship will be made ready for the refuelling operation. The Ship Master shall ensure that the crew is fully trained in the procedures. The crew shall check and test all necessary equipment. Any damaged, faulty or suspect equipment shall be replaced. Once this has been done, the Ship Master shall ensure that all appropriate checks are completed and signed off before the operation is started. These should be in compliance with MARPOL 73/78Annex I and following the guidelines given in the IMO's Manual on Oil Pollution (Section I – Prevention). The appropriate bunkering checklist will be completed. Good communications will be established between the crew of the ship and the refuelling team on the quay.

An emergency shutdown procedure and signals to trigger this will be in place and agreed between the Ship Master and the refuelling officer on the quay before starting the operation. Any spillage must trigger a shutdown of the operation until the problem has been rectified and the spill fully cleaned up. A staffed facility that has an activated foam fire-fighting

capacity and oil dispersant capability, as well as onshore spill clean-up abilities, must be present and on standby.

Hoses will be passed between the shore and the ship and, once all the safety checks are complete, refuelling will begin. The tanker's nozzles will have automatic shutoffs in case of disconnection or loss of pressure. During refuelling, a number of vigilance activities are to happen continuously: (a) a lookout watches for signs of spills or slicks of oil around the ship; (b) the pumps, hoses, other pipework and nozzles are monitored by appropriate crew members; (c) the levels of the tanks are monitored to ensure that refuelling is stopped on schedule and there is no overflow.

As the tanks become filled, the topping off will be done by notifying the supplying pump operator, reducing flow and finally closing the valves of the supply tank before the valves on the ship. Hoses and nozzles will be returned, and checks made to ensure that all valves are secured and no spillages made.

J.2.20.4 Prevention of Pollution by Noxious and Harmful Substances

Discharge. No ship may discharge into the sea any quantities of noxious liquid substances as defined in MARPOL 73/78Annex II or harmful substances as defined in MARPOL 73/78 Annex III other than in emergencies as permitted by MARPOL. In the event of such as discharge being made, whether deliberate or accidental, within 50 nautical miles of the shore of Liberia, the Ship Master shall report the incident in full to the project.

Oily water. In general, ships should process oily water through a separator before discharge in international waters in accordance with MARPOL 73/78.

Recording. All ships shall maintain an up-to-date record book at all times, in which any loading or discharges of noxious liquid substances and harmful substances are recorded. When berthed at the Port of Buchanan or in Liberian territorial waters, the project's environmental staff may board the ships to inspect the book.

J.2.20.5 Prevention of Pollution by Sewage

Discharge of sewage into the sea. No ship shall discharge sewage into the sea while it is in Liberian territorial waters.

ISPP Certificate. All ships which are equipped with a water closet and certified to carry more than 15 persons shall be in possession of a valid International Sewage Pollution Prevention (ISPP) Certificate issued in accordance with MARPOL 73/78 Annex IV. When berthed at the Port of Buchanan or in Liberian territorial waters, the project's environmental staff may board the ship to inspect the ship's ISPP Certificate.

Shore reception facilities. Sewage from ships may be transferred to any onshore sewage treatment facility that has full EPA certification to accept marine sewage, provided that the sewage is transferred via a suitably designed truck operated under a valid Environmental Permit issued by the EPA. The pipes used for discharge from the ship to the truck, and the receiving flange on the truck, shall comply with the specifications given in MARPOL 73/78 Annex IV. The contractor is to provide proof of both the certificate and the compliance of the equipment before any sewage is discharged from the ship.

On-board sewage treatment systems. Ships may treat sewage with a sewage treatment system which also has a steriliser unit to discharge effluent into the sea. This must be certified by a recognised and competent national or international authority and the effluent must comply with the quality given in the relevant guideline above.

J.2.20.6 Prevention of Pollution by Garbage

Discharge of garbage at sea. No ship shall discharge garbage other than food waste into the sea.

Discharge of food waste at sea. No ship shall discharge food waste into the sea within Liberian territorial waters. Outside territorial waters, ships shall follow the provisions of MARPOL 73/78 Annex V.

Placards. All ships shall display placards which notify the crew and passengers that they may not discharge garbage and waste as stated above.

Ship-board waste management plan. All ships shall carry a Waste Management Plan and the equipment required to implement it. The plan shall contain as a minimum: procedures for collecting, storing, processing, sorting and disposing of garbage; a list of the on-board equipment for these operations; the identity of the individual responsible for carrying out the plan; the actions required by the officers and crew to implement the plan. For the ships that are certified to carry more than 15 passengers, the plan shall be in compliance with the requirements of such plans in MARPOL 73/78 Annex V. When berthed at the Port of Buchanan or in Liberian territorial waters, the project's environmental staff may board the ship to inspect the ship's Waste Management Plan.

Garbage record book. All ships shall have a full and up to date Garbage Record Book. The book must contain as a minimum, full records of the following: each discharge or incineration of garbage; the date, time and location of each operation; the nature of the garbage involved; any accident or loss involving garbage. When berthed at the Port of Buchanan or in Liberian territorial waters, the project's environmental staff may board the ship to inspect the ship's Garbage Record Book.

Shore reception facilities. Garbage shall be separated by the ship's crew, and discharge arrangements shall be agreed with the project's environmental staff before it is discharged from the ship. Garbage shall be transported to an agreed, EPA-certified reception facility and disposed of according to the directions of the project's environmental staff. The project may refuse to accept excessive quantities or particular types of garbage if they cannot be disposed of safely in Liberian reception facilities. The ship may dispose of garbage elsewhere in Liberia only if the operator of such a facility has a valid Environmental Certificate issued by the EPA for reception of that material, and proof of this is provided to the project before the garbage is discharged from the ship.

Hazardous garbage. The project reserves the right to refuse the landing of any garbage that cannot be disposed of safely at the facilities available in Liberia. This will include all garbage containing radioactive isotopes.

J.2.20.7 Prevention of Pollution by Polyisobutylene Disposal

Polyisobutylenes (PIB) are chemicals mainly used for thickening lubricants such as gear oils, engine oils, transmission oils, hydraulic fluids and metal working fluids. In the past it has been legal to dump PIBs in the sea outside coastal waters.

No ship chartered by or under any contractual obligation in connection with the project may dispose of PIBs at sea, whether within territorial waters of Liberia or any other country, or in international waters. PIB residues may only be landed onshore when a ship is berthed in port, and sent for appropriate disposal at facilities certified to handle it. If in Liberia, the handling facility must have a current certificate issued by the EPA.

J.2.20.8 Prevention of Air Pollution

Use of engines. The use of engines shall be minimised while ships are in port to that required for manoeuvring the ship, and for maintaining power for loading or discharging equipment and material and for other ship-running purposes. Engines shall not be run on greater than half power while within the port basin or within two kilometres of the outer breakwaters, except where it is essential for manoeuvring the ship and avoiding collisions. Engines that have been serviced while berthed at the Port of Buchanan may be subjected to short test runs.

Ship-board incinerators. Ship-board incinerators shall not be operated on any ship while berthed at the Port of Buchanan because of the proximity of the city. Ships may use approved high temperature incinerators (i.e. those with a combustion temperature greater than 900 degrees centigrade) when at least 2 km offshore. Under these geographical restrictions, incineration may be undertaken in accordance with the provisions of MARPOL 73/78.

Ozone-depleting substances. No ship shall discharge ozone-depleting substances into the atmosphere when it is berthed at the Port of Buchanan, anywhere within Liberian territorial waters or while it is operating on behalf of the project through any charter or contract arrangement. The ship may dispose of ozone-depleting substances in Liberia only if the operator of such a facility has a valid Environmental Certificate issued by the EPA for reception of those substances, and proof of this is provided to the project before the substances are discharged from the ship.

Emission of nitrogen oxides. All ships shall adhere to the provisions of the Technical Code on Control of Emission of Nitrogen Oxides from Marine Diesel Engines of the MARPOL 73/78 Revised Annex VI as amended by resolution MEPC 176(58) in 2008 (the NO_x Technical Code 2008). All diesel engines with a power output of more than 130 kW shall comply with the emissions limits specified in the NO_x Technical Code 2008 and for each engine the ship shall carry a valid Engine International Air Pollution Prevention (EIAPP) Certificate issued in accordance with Chapter 2 of the NO_x Technical Code 2008. When berthed at the Port of Buchanan or in Liberian territorial waters, the project's environmental staff may board the ship to inspect the ship's EIAPP Certificate.

J.2.21 Bilge Water and Oil/Water Separators

Bilge water is the wastewater found low down in the machinery spaces of most ships and vessels and is generated by various activities involved in keeping a ship or vessel running while at sea.

Bilge water must be treated with care as it can contain concentrations of various industrial fluids from the ship's machinery spaces such as coolant, lubricants, and fuel. Before bilge water is pumped out of the ship or vessel, it must be treated. For this, an oil/water separator must be installed in the ship or vessel. The primary purpose of a shipboard oily water separator is to separate oil and other contaminants that could be harmful for the oceans and produce clean water for discharge overboard.

As per the IMO Marine Environment Protection Committee (MEPC) 107(49) resolution containing guidelines and specifications for pollution prevention equipment for machinery space bilges of ships, the oil/water separator must be able to achieve clean bilge water under 15 ppm of type C oil or heavily emulsified oil, and any other contaminants that may be found. The oil/water separator shall be equipped with a monitoring system that detects oil concentrations above 15 ppm and activates an alarm system if such concentrations are detected. If such concentrations are detected, the discharge of water overboard must be halted.

As per MARPOL 73/78 Annex III, the location, volume and timing of discharge of bilge water into the ocean must be recorded in the Oil Record Book (see Guideline J.2.20.2).

Regulations also require that all oil or oil residues that cannot be discharged in compliance with these regulations be retained onboard or discharged to a reception facility.

J.2.22 Ships' Ballast Water Management

J.2.22.1 Introduction

While ballast water is essential for safe and efficient shipping operations, it may pose serious ecological, economic and health problems due to the multitude of marine species carried in ships' ballast water. These include bacteria, microbes, small invertebrates, eggs, cysts and larvae of various species. The transferred species may survive to establish a reproductive population in the host environment, becoming invasive, out-competing native species and multiplying into pest proportions.

To safeguard the marine environment, all ships entering Liberian territorial waters for any purpose connected to the project shall be required to manage ballast water in a responsible and planned manner. This shall be in accordance with the International Convention for the Control and Management of Ships' Ballast Water and Sediment, 2004 ("BWM Convention"). All shipping contractors and agents shall follow the regulations, guidelines and other provisions of the International Maritime Organization (IMO) or the Maritime Environment Protection Committee (MEPC) in connection with this Convention, irrespective of whether their flag of registry is or is not a signatory to the BWM Convention.

The Monrovia Freeport does not have an onshore reception and treatment facility for ballast water. Therefore all incoming ships will be required to discharge their ballast water into the sea.

The Monrovia Freeport is a largely enclosed area with limited currents and tidal flow. It is situated in the midst of a relatively pristine coastal environment. For these reasons, the project is obliged to make every effort to ensure that its shipping operators abide by the highest environmental standards.

J.2.22.2 Systems and Safeguards

Shipboard ballast water management system. All ships shall have a ballast water management system of a type approved by the International Maritime Organization and in good working order. This shall comply with Guidelines for Approval of Ballast Water Management Systems (G8) of Resolution MEPC.174(58), 10 October 2008.

Certificate of ballast water management. All ships shall have a valid International Ballast Water Management Certificate, issued under the provisions of the BWM Convention. When

berthed at the Monrovia Freeport or in Liberian territorial waters, the project's environmental staff may board the ship to inspect the ship's certificate.

Ballast water record book. All ships shall have a full and up to date Ballast Water Record Book. This shall comply with the stipulations of Appendix II to the BWM Convention. It must contain as a minimum, full records of the following: the ship and its ballast water capacity; the taking on board of ballast water, including source, volume and timing; circulation or treatment of ballast water; the discharge of ballast water, including location, volume and timing; any accidental or exceptional ballast water incidents. When berthed at the Monrovia Freeport or in Liberian territorial waters, the project's environmental staff may board the ship to inspect the ship's Ballast Water Record Book.

Ballast water management plan. All ships shall have a full and up to date Ballast Water Management Plan. This shall comply with Guidelines for Ballast Water Management and Development of Ballast Water Management Plans (G4) of Resolution MEPC.127(53), 22 July 2005. It must contain as a minimum, full details of the following: the ship and its ballast water capacity; the name of the officer responsible for administration of the plan; details of the arrangements of ballast water tanks, pumps, treatment systems and other facilities, and their layout on the ship; a description of the ballast system; the locations of sampling points; ship and crew safety procedures; operational or safety restrictions; a description of the methods used for on-board water management and sediment control; procedures for the disposal of sediment; duties of the officers and crew; recording requirements; training provisions; and exemptions. If the plan is in another language, a full English translation will be provided. When berthed at the Port of Buchanan or in Liberian territorial waters, the project's environmental staff may board the ship to inspect the ship's Ballast Water Management Plan.

Over-riding safety provisions. The exchange or discharge of ballast water when a ship is at sea may be avoided when the weather or sea conditions are such that the safety of the ship and its crew will be prejudiced. Such conditions will be recorded and the lack of action will be reported to the project's environmental staff on arrival in Liberian territorial waters, and before any water is discharged.

J.2.22.3 Procedures

Minimisation. Ships shall minimise the use, uptake and discharge of ballast water to the greatest extent possible within the requirement for safe operation of the ship and handling of cargo.

Taking on ballast water. When taking on ballast water, every effort shall be made to avoid the uptake of potentially harmful organisms, pathogens and sediments. The uptake of ballast water shall be avoided in the following situations:

- areas identified by a port authority as being potentially polluted;
- in estuarine or turbid coastal waters;
- within 5 nautical miles of large coastal or riverine cities;
- in darkness (when organisms may rise up the water column);
- in very shallow water;
- where propellers may stir up sediments; or
- where dredging is active or has recently been carried out.

Exchange of ballast water. Since ships entering Liberian territorial waters for the purpose of working with the project will have travelled from a completely different environment, they are required to exchange ballast water on the voyage. The voyage from the port of origin to Monrovia will therefore be planned in such a way as to ensure suitable ballast water exchange. The exchange of ballast water must comply with Guidelines for Ballast Water Exchange (G6) of Resolution MEPC.124(53), 22 July 2005. The exchange of ballast water should follow these guidelines:

- there shall be at least 95 percent volumetric exchange of ballast water;
- where the pumping-through method of exchange is used, the water pumped through will be at least three times the volume of each ballast tank.

Locations for the exchange of ballast water. All exchange of water should be undertaken at least 200 nautical miles from the nearest land. If the voyage does not take the ship so far from land at a suitable latitude (see below) then the exchange of water must be undertaken in depths exceeding 200 metres and at least 50 nautical miles from the nearest land where that land is part of the African continent. In any event, all exchanges of water are to be undertaken between the Equator and the latitude of 15 degrees north. The locations for the exchange of ballast water shall otherwise comply with Guidelines on Designation of Areas for Ballast Water Exchange (G14) of Resolution MEPC.151(55), 13 October 2006.

Discharging of ballast water. Every ship will discharge the maximum amount of ballast water that it is safe to offload before entering the Monrovia Freeport. Wherever possible, this should be before entering water with a depth of less than 200 metres.

Sediment management. Ships will not undertake any sediment management operations within 200 nautical miles of the coast of Liberia.

J.2.22.4 Monitoring and Assessment

Failure to follow procedures. In the event of a ship failing to follow any of the procedures given above, for example through reasons of safety or equipment failure, the fact and circumstances shall be reported to the project's environmental staff before any water is discharged. The project staff will then agree suitable mitigation actions with the ship's master.

Monitoring by the project. On the ship entering Liberian territorial waters or berthing at the Port of Buchanan, the project's environmental staff may board the ship to inspect any of the ship's ballast water management documents. The ship's master or designated officer may be required to provide a list of the potentially harmful organisms found at the port of origin ("target species" under the BWM Convention, G7, which are those species of concern that may impair or damage the environment, human health or resources). The project staff shall also be permitted to sample the ship's ballast water tanks and to undertake analyses of the water and sediment found there. This will be done in accordance with Guidelines for Ballast Water Sampling (G2) of Resolution MEPC.173(58), 10 October 2008.

Risk assessment. The project is to undertake a risk assessment of the threats posed by potentially harmful organisms from areas that are the points of origin in the event that a significant number of vessels enter the Monrovia Freeport from the same origin. This shall follow the Guidelines for Risk Assessment under Regulation A-4 of the BWM Convention (G7) of Resolution MEPC.162(56), 13 July 2007.

APPENDIX K KEY INFORMANT INTERVIEW QUESTIONNAIRE

TOWN SURVEY / KEY INFORMANT QUESTIONNAIRE

Name of interviewer…….. Date of interview…….

Words between { } are notes to the interviewer

{To be filled by reviewer only}

Name of reviewer……. *Date of review* ……

TOWN SURVEY / KEY INFORMANT QUESTIONNAIRE

Town/ Village/ Hamlet name……..

Date reviewed …….

Number of Participants: Female…… Male……. Total……..

Key informants' information short description of participants, age, vulnerabilities (disabilities and any other observations).

Name	Sex	Organisation/position	Telephone number

A. **General Information**

1. **Demography**

1.1 Location – County …….

1.2 District ……

1.3 Paramount Chief Name if any ……

1.4 Clan Chief Name ……

1.5 Town Chief Name……

1.6 Number of quarters (if town has many quarters) ……

1.7 Number of household heads……

1.8 What is the estimated population of this town/community?

1.9 Number Meeting Attendance Female…… Male……

1.10 Which tribal origin – country does your father hail from? ……..

1.11 Which tribal origin – does your father speak?.....

1.12 Which major dialects do you speak in this town/community?

i. ……

ii. …….

iii. …….

iv. Others (specify) ……

1.13 What is the number of people in this community (how many people live in this town?) ……

1.14 What is the number of houses/structures in your community?

……

1.15 How old is this community/town?

……

1.16 What are the different types of community action groups you have in this community for example – women's groups, youth groups, etc.?

……

1.17 Describe if there is any observation in the participants (age, vulnerability or disability, etc.)

……

B. **Facilities and Services**

1. Education

1.1 Elementary school

i. Name of Elementary school ……

ii. Location…….

iii. Distance from town expressed in _____ Kilometres/minutes/

iv. Number of Elementary Schools in the Town/community _____

1.2 Secondary school

i. Name of Secondary school …….

ii. Location…….

iii. Distance from the Town/community in ……Km/minutes

iv. Number of secondary Schools in the community/Town……..

1.3 College

i. Name of college …….

ii. Location ……

iii. Distance from community/town in _____km/minutes……..

1.4 Vocational school

i. Name of Vocational school ……

ii. Location……..

iii. Distance / Kilometres from the Town……

iv. Number of vocational Schools in the Town/community……..

v. Types of skill Training……

2. Healthcare facilities

2.1 Nearest Health post

i. Name and ……..

ii. Location…….

2.2 Nearest Hospital

i. Name of hospital ……..

ii. Location ……..

2.3 Are there GBV cases occurring here? ……

2.4 How are GBV cases handled here? referred to clinic, health post. hospital?

……

2.5 Is the road to your Health facilities in a good condition?

2.5.1 If yes

i. number of Kilometre……

ii. If no, number of kilometres ……

3. Religious and cultural facilities

3.1. How many religions do you have here?_____

3.2. What are they?

i. ……..

ii. ……..

iii. ……..

iv. ……..

3.3. Number of churches _____

3.4. Number of mosques in town? ……..

4. **Social/Culture Norms:**

4.1 Are there any cultural organisations/societies in this community? _____ If yes, which ones? ……

4.1.1 Poro/ Sande ……..

4.1.2 Others ……

4.2 Is there any shrine/place of worship besides churches and mosques that people of this town/community go there to worship/pray? Yes ( ) No ( )

4.3 .If yes, where is it located? _____

5. **Social exclusion:**

5.1 Do you women feel included or excluded from all major decisions?

5.1.1 Included _____

5.1.2 Excluded _____

5.2 How do you and the community define exclusion? (Please be brief)

……

5.3 Do you think women are given equal opportunities compared to men? (If yes, in what areas/?

……

5.4 Do you women and people with disabilities participate in decision making?.....

6. **Economic facilities:**

6.1 Do you and the community feel that entrepreneurship is appropriate for women?

.....

.....

6.2 What is the size and structure of networks linkages in which women operate and make use of?

.....

.....

6.3 By what interactional processes are the network/linkages created? Through what means do you people create social networks/linkages?

.....

.....

6.4 What is the networking behaviour, skills, and influences you experience?

.....

.....

6.5 Do women have established savings and loan associations/clubs here?

.....

.....

6.6 What are the number of saving and loan associations/clubs here ?

.....

.....

6.7 Location of nearest Bank if any.....

6.7.1 Which markets do people attend?

i. ……day …….

ii. ……day ……..

iii. .....day .....

6.8 Is there a Liberian Marketing Association/ market hall/ ground here? [Yes / No]

……

……

6.9 Are there any marketing cooperatives in this town?

i. ……..

ii. ……..

7. **Other facilities /services**

7.1. Are there official offices here? …….

i. Which offices are available? ……...……

7.2. Is there a Police Post (station) here or near? Location

……

7.3. Are there any NGOs/ CBOs operating in community/town? Which ones?

i. ……..

ii. ……..

7.4. Is there mobile Phone coverage in this town? If Yes

i. Which network(s) ……

ii. How do people charge their phones? ……

iii. Are there generators in town? ……...

7.5. What services and facilities are there in this town?

i. Fuel supply (gas station) ……..

ii. Transport union? ……

1. Bus parking ……

2. Taxi parking ……

iii. Tyre repair shop……..

iv. Hardware (Building materials store ……

v. Cook shops, restaurant etc. ……..

vi. Daily market stalls all week ……

vii. Tailor/ Seamstress ……..

viii. Shoe repairers ……

7.6. Where do people get or go for:

i. Firewood ……

ii. Kerosene ……

iii. Building materials…….

iv. Drinking water……..

v. Bathing……..

vi. Clothes washing……

vii. Washing dishes ……

viii. Hunting ……...

ix. Fishing ……

x. Honey or medicinal herbs/ non timber forest products

7.7. Where do you go for basic social services that are not in your town? (Paperwork, photocopying, typing, printing, hospital, bank, etc.)

……

8. **Political**

8.1. Have the committee been Trained in leadership skills? If yes, by whom? ……

8.2. Do you have Community Development committee established for the implementation of developmental activities? ……..

..……..……

8.3. How many members are in the committee? ……..……..……

8.4. Are women part of the CDC leadership?.....

8.5. Does the committee have bye laws and constitutions that is governing the community?

……..

8.6. What are the CDC roles in terms of developmental project implementation?.....

8.7. Do the CDC mobilize community to provide local materials, workforce/ unskilled workers?.....

8.8. Do the committee have a schedule meeting as committee and with the community? (If YES/No) Please indicate:

i. Date……..

ii. Day……

iii. time.) ……..

8.9. Does the committee have a financial system put in place? (Revolving fund for community projects)

8.10. Who makes decision for the community?.....

8.11. Why?.....

8.12. How many times does the community/town meet to discuss town matters?.....

8.13. Who are those invited to the discussion?.....

8.14. Who is responsible for making decision on land issues?.....

8.15. Is there anyone who owns private/deeded land in this community?.....

C. **Project-Related Questions**

1. How close is your community to the project? Please, describe.

.....

.....

.....

.....

2. What are the expected impacts on your community? Will people need to relocate their business / houses/ farms/ trees etc? Please, describe.

.....

.....

.....

.....

.....

3. How will the project positively impact your community? Please, describe.

.....

.....

.....

.....

.....

4. Do you as a community have any concerns for your community during the construction of the project? Please, describe.

.....

.....

.....

.....

.....

5. Does your community have concern for work gangs nearby – introducing prostitution/ sex work, drinking, gambling/ illegal drugs?

.....

.....

.....

.....

.....

6. Are there any planned development projects in the area that you are aware of? If yes, what type of development? Where? Who is the developer? Have they started yet? Describe.

.....

.....

.....

.....

.....

D. **Women's Related Issues**

1. What are attitudes towards women in the town? is there a women's representative?

E. **Problems**

1. What are some of the problems/issues for this community – please write as much detail as possible.
2. Have women been force into marriages in this community? IF yes please state the reasons

.....

.....

3. How can Rape cases be handle in your community? Please indicate the steps of community intervention

……

……

4. What are the issues that are affecting the women in your community?

……

……

……

……

APPENDIX L GUIDELINES FOR THE EMERGENCY PREPAREDNESS AND RESPONSE PLAN

The components of the Emergency Preparedness and Response Plan (EPRP) must be as follows.

1. Basis of the EPRP
    a. Summary of the project
    b. Emergencies that may occur
        i. Grounding
        ii. Collision
        iii. Capsizing
        iv. Structural failure
        v. Mechanical, hydraulic, or electrical failure of any sort
        vi. Spill
        vii. Fire
        viii. Explosion
        ix. Natural hazard, including flooding
        x. Drowning
        xi. Work accident and injury
        xii. Dispute
        xiii. Illness
        xiv. Outbreak of a contagious or infectious disease
    c. Emergency risk assessment criteria
    d. Assessment of potential emergencies
2. Emergency preparedness
    a. Emergency management team organisation
    b. Requirements for preparedness
        i. Documents
        ii. Equipment
        iii. Arrangements and procedures
        iv. Trainings

c. Emergency response manual

d. Trial exercises

3. Emergency response

a. What to do when you detect an emergency

b. Emergency action plan for Officers and Manager

APPENDIX M GUIDELINES FOR THE OCCUPATIONAL HEALTH AND SAFETY PLAN

The Contractor must develop an Occupational Health and Safety Plan (OHSP) prior to the start of the construction. The Contractor must present the Plan to the PMU for approval. The Plan must be reviewed and updated every six months.

The Occupational Health and Safety Plan must at least cover the following topics.

- Standard operating procedures for equipment and work activities (potential hazards, safety precautions, emergency procedures, responsibilities, etc.)
- PPE
- Training to be provided to workers
- Housekeeping and maintenance
- Workers' hygiene
- Emergency and medical assistance (which must be developed in more detail in the Emergency Preparedness and Response Plan, see Appendix K)

APPENDIX N GUIDELINES FOR THE DREDGING MANAGEMENT PLAN

The Dredging Management Plan (DMP) should be a project-specific document that addresses the following key aspects:

- **Dredging Methodology:** The plan will define the specific methods and equipment chosen for dredging operations.
- **Dredged Material Management:** The DMP will identify and evaluate potential disposal options and locations for the dredged material.
- **Sediment Characterization:** A comprehensive analysis of the chemical and physical properties of the material to be dredged will be conducted to understand its behaviour.
- **Baseline Assessment:** The existing bio-physical conditions at the dredging and disposal areas will be established. Social conditions of local fishermen will be assessed, if needed.
- **Impact Assessment and Mitigation:** The DMP will identify and assess impacts on sensitive ecological (and social) receptors such as impacts on marine water quality, marine fauna and flora (and fishermen, if any will be affected). Mitigation measures will be defined to address potential negative effects on aquatic habitats, biodiversity, and water quality (and fishing communities, as applicable).
- **Environmental Monitoring:** The plan will outline relevant environmental parameters and indicators to be monitored throughout the dredging process to ensure compliance and effectiveness of mitigation measures.

APPENDIX O GUIDELINES FOR THE RESTORATION AND REHABILITATION PLAN

The PMU, through its contractors, must develop and implement a proper Rehabilitation and Restoration Plan for the Project. It must provide details on the long-term care of the project area, including ancillary facility locations.

The Restoration and Rehabilitation Plan must cover the following issues.

- **Landscaping and vegetation restoration:** Use indigenous plant species suited to the coastal environment, particularly salt-tolerant vegetation.
- **Habitat restoration:** Rebuild or protect natural coastal features such as sand dunes, salt marshes, and mangroves.
- **Erosion control:** Stabilize slopes and other disturbed areas to prevent erosion through vegetation or other natural materials.
- **Tidal zone restoration**: Re-establish natural tidal flow and water quality to preserve intertidal ecosystems and prevent habitat loss.
- **Sediment transport restoration**: Ensure that the revetment does not cause long-term disruption of natural sediment transport along the coast.
- **Shoreline stabilization**: Use soft engineering techniques, such as beach nourishment or dune stabilization, to reduce the impact of hard infrastructure.
- **Water management:** Implement stormwater management systems
- **Community Engagement and Livelihood Restoration** Involve local communities in restoration and monitoring efforts and support the recovery of livelihoods affected by the project, such as fishing.
- **Ancillary Infrastructure Rehabilitation:** Ensure that supporting infrastructure (e.g., access roads, utilities, drainage systems) does not cause long-term environmental degradation.

APPENDIX P GUIDELINES FOR THE LIVELIHOOD RESTORATION PLAN

The Contractor must develop Livelihood Restoration Plan (LRP) prior to the start of the construction to ensures that affected individuals and communities are supported in restoring or improving their livelihoods, fostering community resilience and project sustainability. The Contractor must present the Plan to the PMU for approval. The Plan can be flexible and adjusted based on changes in Project activities and schedules.

The Livelihood Restoration Plan must at least include the following:

- Objectives.
- Existing baseline: Affected population, current livelihoods and vulnerability analysis.
- Livelihood impact assessment: Identify how the project will affect local livelihoods, including loss of income, loss of land, or reduced access to resources, and identify the duration and magnitude of these impacts.
- Stakeholder engagement.
- Livelihood restoration strategies: Includes types and measures used for livelihood restoration such as compensation, income restoration, access to resources, community development projects, etc.
- Institutional framework: Identify the roles and responsibilities of involved parties.
- Grievance Mechanism: identify accessible procedures for addressing complaints.
- Monitoring & Evaluation: Includes a framework for tracking the success of the plan over time, provides regular updates and adjustment of the plan as needed and regular feedback to the communities.
- Budget and resource.