ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

RURAL ECONOMIC TRANSFORMATION PROJECT (RETRAP): TAPPITA TO TOE TOWN (40 KM) ROAD

MINISTRY OF PUBLIC WORKS

INFRASTRUCTURE IMPLEMENTATION UNIT (IIU)

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earthtime

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABBREVIATIONS AND ACRONYMS

%	percent
°C	Degree Celsius
AADT	Average Annual Daily Traffic
AASHTO	American Association of State Highway and Transportation Officials
ACHPR	African Charter on Human and Peoples' Rights
ACRWC	African Charter on the Rights and Welfare of the Child
AIDS	Acquired Immune Deficiency Syndrome
AM (or a.m.)	Ante Meridiem
ANFO	Ammonium Nitrate / Fuel Oil
BCG	Bacille Calmette-Gurin
BP	Bank Procedure
BS	British Standard
BTEX	Benzene, Toluene, Ethylbenzene & Xylene
CaCO3	Calcium Carbonate
CAT	Convention against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment
CBR	California Bearing Ration test
CEDAW	Convention on the Elimination of All Forms of Discrimination against Women
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CBO	Community Based Organisation
CLA	Community Liaison Assistant
CLO	Community Liaison Officer
CO	Carbon Monoxide
CO2	Carbon Dioxide
COD	Chemical Oxygen Demand
CRC	Convention on the Rights of the Child
CRPD	Convention on the Rights of Persons with Disabilities
CSEP	Contractor's Stakeholder Engagement Plan
CWG	Criteria Working Group
dB (A)	A-weighted decibels
DBT	Design, Build and Transfer
dB (C)	C-weighted decibels
DBFOMT	Design, Build, Finance, Operate, Maintain and Transfer
DCP	Dynamic Cone Penetrometer
DO	Dissolved Oxygen
DSO	Direct Shipping Ore
EA	Environmental Assessment
EEC	European Economic Community
EHSGs	Environmental Health and Safety Guidelines
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EITI	Extractive Industries Transparency Initiative
EPA	Environmental Protection Agency
EPH	Extractable Petroleum Hydrocarbon
EPML	Environmental Protection and Management Law

ERM	Environmental Resources Management
ESCP	Environmental and Social Commitment Plan
ESF	Environmental and Social Framework
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management System
ESS	Environmental and Social Standard
F	Degree Fahrenheit
FAO	Food and Agriculture Organization
FDA	Forestry development Agency
FGM	Female Genital Mutilation
FRL	Fatigue Resistance Layer
FWD	Falling Weight Deflectometer
GIIP	Good International Industry Practice
GoL	Government of Liberia
GPS	Global Positioning System
GRO	Gasoline Range Organics
GRC	Grievance Redress Committee
GRS	Grievance Redress Service
HC	Hydrocarbons
HH	Household
HIES	Household Income and Expenditure Survey
HIV	Human Immunodeficiency Virus Infection
Hz	Hertz
ICCPR	International Covenant on Civil and Political Rights
ICESCR	International Covenant on Economic, Social and Cultural Rights
IBA	Important Bird Areas
ID	Identification
IDA	International Development Association
IFC	International Finance Corporation
IIU	Infrastructure Implementation Unit
ILO	International Labour Organization
IRI	International Roughness Index
ISO	International Organization for Standardization
IT	Information Technology
ITCZ	Inter-Tropical Convergence Zone
IUCN	International Union for the Conservation of Nature
JICA	Japan International Cooperation Agency
km	kilometer
km/h	kilometer per hour
KW	Kilowatt
L_{Aeq}	Equivalent Continuous A-weighted Level
LEC	Liberia Electric Corporation
LIFLEA	Liberia Female Law Enforcement Association
LIWEN	Liberian Women Empowerment Network
LL	Liquid Limit
LNP	Liberia National Police
LWD	Light Weight Deflectometer
m	meter
MFDP	Ministry of Finance and Development Planning
mg/kg	Milligram per kilogram

Mg/l	Milligram per liter
µg/l	Microgram per liter
MGCSP	Ministry of Gender, Children and Social Protection
MOGCSP	Ministry of Gender, Children and Social Protection
MLME	Ministry of Lands, Mines and Energy
mm	millimeter
MOA	Ministry of Agriculture
MOT	Ministry of Transport
MPW	Ministry of Public Works
MS	Military Standard
mS/cm	Millisiemens Per Centimeter
MTBE	Methyl Tertiary Butyl Ether
N.A.	Not Applicable
N/A	Not Available
n.d.	Not detectable
NEOHP	National Environmental and Occupational Health Policy
NGO	Non-Governmental Organisation
NO_2	Nitrite
NO_3	Nitrate
NO_X	Oxides of Nitrogen
NOI	Notice of Intent
NRF	National Road Fund
NTFP	Non-Timber Forest Product
OAU	Organisation of African Unity
IDA	International Development Association
OP	Operational Policy
OPRC	Output- and Performance-Based Road Contracts
Pb	Lead
PCR	Physical Cultural Resources
PDO	Project Development Objective
PFMU	Project Financial Management Unit
PI	Plasticity Index
PM (or p.m.)	Post Meridiem
PO_4	Phosphate
PPE	Personal Protective Equipment
PPP	Public Private Partnership
ppv	peak particle velocity
PTR	Pneumatic Tire Rollers
QC	Quality Control
QR	Quantity Surveyor
RAP	Resettlement Action Plan
RETRAP	Rural Economic Transformation Project
RoW	Right of Way
rms	root mean square value
RoW	Right of way
RPF	Resettlement Policy Framework
RPM	Suspended Particulate matter
RWRS	Rural Women Rights Structure
SANS	South African National Standard
SECRAMP	Southeastern Corridor Road Asset Management Project
SEP	September

SEWODA	South-Eastern Women Development Association
SGBV	Sexual and Gender Based Violence
SGBVCU	The Ministry of Justice SGBV Crimes Unit
SGW	Sample of Groundwater
SO_x	Sulphur oxides
SPM	Suspended particulate matter
SPV	Special Purpose Vehicle
SSL	Sample of Soil
SSW	Sample of Surface Water
SUDS	Sustainable Drainage Systems
T	measurement time
TB	Tuberculosis
TDS	Total Dissolved Solids
TEPH	Total Extractable Petroleum Hydrocarbon
TIP	Trafficking in Persons
TPH	Total Petroleum Hydrocarbon
TOR	Terms of Reference
TSS	Total Suspended Solids
UK	United Kingdom
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations International Children's Emergency Fund
UNMIL	United Nations Mission in Liberia
UPS	Uninterruptible Power Supply
UPVC	Plasticized Polyvinyl Chloride
US	United States
US$	United States Dollar
VOC	Volatile Organic Compounds
WANEP	West Africa Network for Peacebuilding
WB	World Bank
WE4SELF	Women Empowerment for Self-Employment
WHO	World Heath Organistion
WONGOSOL	Women NGOs Secretariat of Liberia
WORIWA	Women Rights Watch
WPWHDO	West Point Women for Health and Development Organization

EXECUTIVE SUMMARY

A. OVERVIEW – UPGRADING OF THE TAPPITA TO TOE TOWN ROAD

The rehabilitation of the 40 km long Tappita-Toe Town road aims at improving the road infrastructure from Tappita to Toe Town in south-eastern Liberia, to provide better access to markets for the farmers of the south-east. The project is part of the Rural Economic Transformation Project (RETRAP), a project aiming at increasing the income of rural poor households in Liberia through sustainable agricultural livelihood enhancements, improved rural access and agricultural marketing infrastructure services.

This Environmental and Social Impact Assessment (ESIA)[1] covers the design and construction phases of the rehabilitation works for the Tappita-Toe Town (40 Km) Road.

The project will be implemented by the Ministry of Public Works (MPW) through the Infrastructure Implementation Unit (IIU), through a Design, Build and Transfer contract. The road is a section of the 112 km long Tappita-Zwedru road. The project will complement the planned road works financed as part of the South Eastern Corridor Road Asset Management Project (SECRAMP) under which a total of a 100 km length of road, between Ganta and Tappita, will be rehabilitated.

The road links Nimba County to Grand Gedeh County in south-eastern Liberia. The road runs generally to the east from Tappita, around 160 km east-north-east of Monrovia.

Once the road is rehabilitated and operational, all maintenance activities will be subject to the concession agreement specific environmental and social provisions, and the Liberian law requirements.

B. PROJECT SITE

Justification and Alternatives

At present this road is an unmaintainable earth track, as most of the gravel used to improve it in the past has been worn away or rolled into the soft substrate below the road surface. The result is that the road is rough and dusty during the dry season, and muddy and often impassable during the wet season. The upgrading project will involve constructing a proper embankment to raise the road above the surrounding ground, building new drainage

[1] *The ESIA will be updated upon completion of the biodiversity field survey; and will include findings of the biodiversity field survey, biodiversity action plan, as well as E&S risks and impacts of the operation and decommissioning phases of the project.*

structures, and developing a properly engineered formation and asphalt surface. This will be undertaken to national highway standards, greatly improving the serviceability of the road.

Alternatives to the project are few and have clear disadvantages. Creating a whole new road alignment on a different route would disturb more land and habitat and fail to achieve the connectivity of the existing settlements. Doing nothing would be to maintain an appallingly bad level of accessibility for a considerable part of Liberia.

There is a strong need for the project, and that none of the possible alternatives are credible in a country that aims for development and prosperity. Consequently, several positive benefits of the project are identifiable. These can be summarised as follows:

- Reduced transport costs and travel times;
- Improved supply of transport services;
- Improved access to agricultural markets
- Improved opportunities for business with greater movements of people and goods;
- Improved access to social services, including health and educational facilities
- Reduced dust nuisance and less sediment in roadside watercourses from the current unpaved road.

Brief Project Description

The project involves the upgrading of the 40 km-road running from Tappita in Nimba County to Toetown in Grand Gedeh County, in the northeastern part of Liberia, as presented in Figure 0-1. It is intended that the road routing and design will follow the existing RoW set by the Ministry of Public Works (MPW). However, in urban areas, the road reserve will be reduced from 22.8 to 15.2 meters (i.e., 75 to 50 feet) from either side of the road centerline in order to reduce project impacts on assets that are within the standard 45.7-meter (i.e. 150-foot) legal RoW. In rural areas, the RoW will remain 22.8 meters (i.e., 75 feet) on either side of the road centerline. In both rural and urban areas, the RoW includes drainage and other roadside structures. Realignment of the RoW will be minimized as much as possible. It is expected that there will be no major road realignment except where it is extremely necessary. The road includes 6 bridges.The road will be upgraded to international blacktop highway standards. To do this, significant earthworks are required to form the embankment and ensure proper drainage, using material from borrow pits along the road. Bridges will be built, and many culverts will also be constructed. For the concrete, and for the road formation and surfacing, aggregates derived from hard rock will need to be quarried and crushed to size. A large amount of bitumen will also need to be used to make the asphalt for the new road surface.

To undertake these major works in a remote rural area, the contractor will establish its own facilities for the duration of the project. These include camps, stores, workshops, offices, and clinics as well as the quarries, borrow pits and batching plants needed to produce the construction materials. The locations of these ancillary facilities is still unknown. The the location and design of these facilities will be determined based on biodiversity field survey and existing literature so as to follow mitigation hierarchy (i.e., avoid, minimize, mitigate, offset) to result in minimum disturbance to natural habitat (flora and fauna).

The rehabilitation of the road will require the establishment of at least one asphalt mixing plant, one rock crushing and screening plant and one concrete batching plant.

The equipment to be used include construction equipment such as rollers, graders, excavators, cranes, trucks, etc. as well testing equipment, and other equipment used in road design and construction. Location of vehicle maintenance area will be selected based on findings of biodiversity field survey as well as existing literature and E&S risks and impacts will be mitigated according to ESMP and in line with National laws and regulations, WB ESF, WBG EHS Guidelines, and GIIP.

The main materials to be used for the project include, but are not limited to cement, steel, crushed rocks, sand, diesel, lubricants, bitumen or asphalt, wood and water. All primary suppliers will be selected according to WB ESF ESS2 (i.e., no child or forced labor use).

The project is expected to produce approximately 300Kg/day of municipal waste, 35 kg/day of sewage sludge as well as minor quantities of spoil overburden, bituminous materials, construction or demolition waste, scraps and hazardous waste. All waste will be managed according to ESMP.

During construction, the project is expected to employ around 100 expats and 300 local workers. Local workforce allocation is estimated at 90 skilled, 80 semi-skilled and 130 unskilled workers. Out of the total local workforce, 20 are estimated to be women of skilled, semi-skilled and unskilled qualifications. Location of workers' camp will be selected based on findings of biodiversity field survey as well as existing literature and E&S risks and impacts will be mitigated according to ESMP and in line with National laws and regulations, WB ESF, WBG EHS Guidelines, and GIIP.

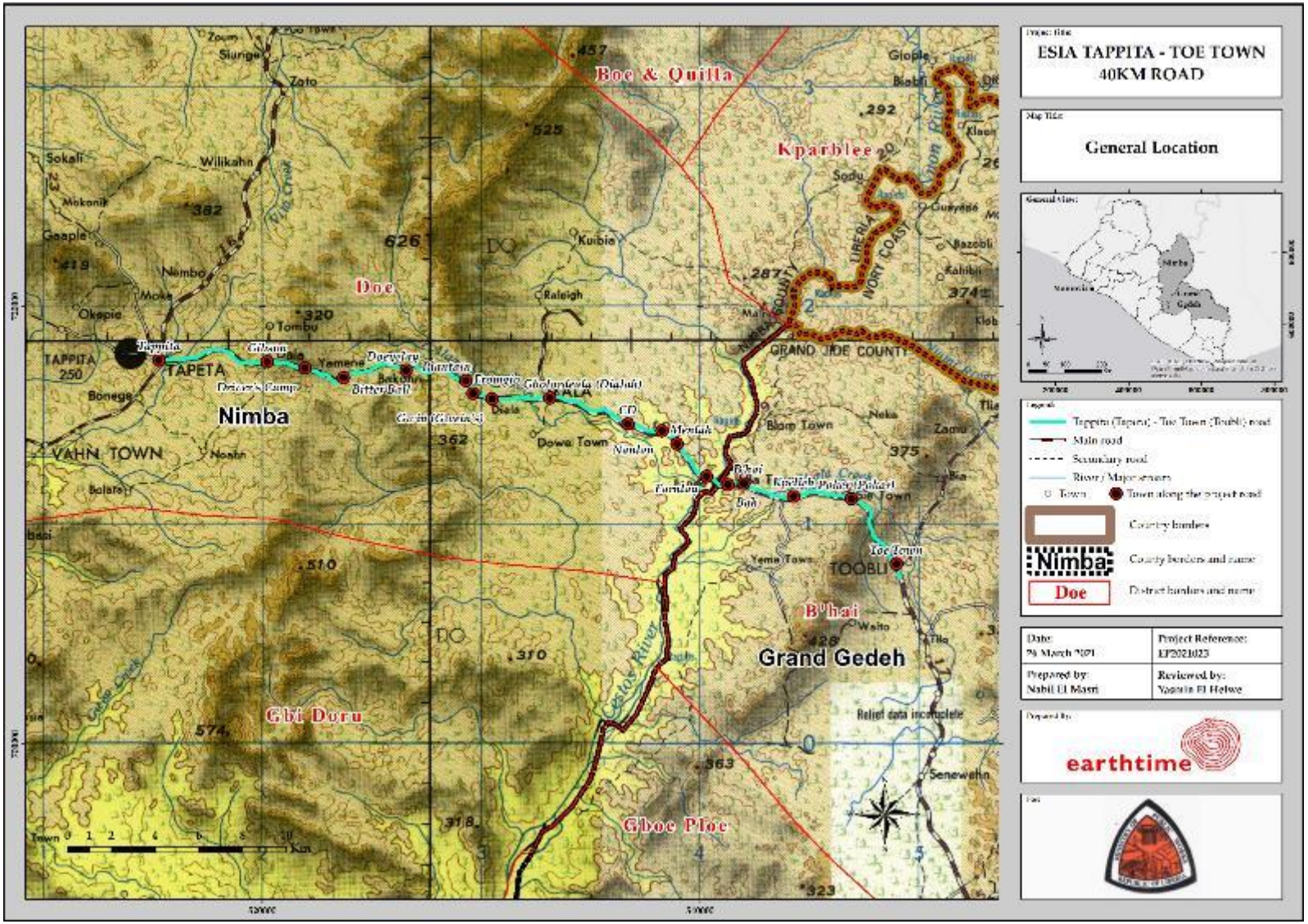


Figure 0-1 A map showing project location

C. LEGAL AND INSTITUTIONAL FRAMEWORK

All projects and activities identified in Annex I of the Environmental Protection and Management Law of Liberia (EPML) are required to conduct an environment impact assessment. The proposed project falls under the "Building and Civil Engineering Industries" category, Annex I, Number 13.

World Bank Safeguards Requirements

Eight of the ten World Bank's Environmental and Social Standards (ESS) are preliminary assessed to be relevant to the project. These are:

- **ESS 1** Assessment and Management of Environmental and Social Risks and Impacts;
- **ESS 2** Labor and Working Conditions;
- **ESS 3** Resource Efficiency and Pollution Prevention and Management;
- **ESS 4** Community Health and Safety;
- **ESS 5** Land Acquisition, Restrictions on Land Use and Involuntary Resettlement;
- **ESS 6** Biodiversity Conservation and Sustainable Management of Living Natural Resources;
- **ESS 8** Cultural Heritage; and
- **ESS 10** Stakeholder Engagement and Information Disclosure.

This ESIA has been developed in line with the requirements of the EPML of Liberia, while satisfying the Bank requirements. A chance find procedure has been incorporated in this ESIA in case of an unexpected impact (such as unmarked graves) and to satisfy the requirements of ESS 8. The rehabilitation works will cause involuntary resettlement. This ESIA will be supplemented by a Resettlement Action Plan (RAP), which is currently being prepared by the IIU and a draft RAP report has been produced.

The Environmental and Social Impact Assessment

This Environmental and Social Impact Assessment (ESIA) covers the design and construction phases for the 40 km of road from Tappita to Toe Town. The ESIA will be updated to include operation and maintenance before start of any work to include operation and decommissioning phases as well. It also covers the ancillary infrastructure that will be required for project implementation, including rock quarries, borrow areas for earthfill, batching plants for concrete and asphalt, workshops, stores, laydown yards and housing

camps. A number of hazardous substances will be involved, including diesel fuel, bitumen, cement and sewage.

This ESIA has been prepared in line with the laws and regulations of the Republic of Liberia, while satisfying requirements of the relevant World Bank ESSs. In general, it highlights the environmental and social stakes and risks, the impacts, and the mitigation measures to prevent the risks and manage the impacts in a corridor one kilometre wide on each side of the road.

D. STAKEHOLDER ENGAGEMENT AND PUBLIC CONSULTATION DURING THE PREPARATION OF THE ESIA

Stakeholder Mapping

A Stakeholder Identification and Analysis was conducted to inform this ESIA and the project's Stakeholder Engagement Plan (SEP). 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 28 cities, towns and villages whose plots and livelihoods will be impacted by the project land take for advancing its objective and reside along the 40kms stretch between Tappita and Toe Town.
    - 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.
- Interested parties:
    - Local communities not affected by direct impacts of the project but reside along the 2kms radius of the 40kms stretch between Tappita and Toe Town;
    - State authorities;
    - Neighboring land users;
    - Community based organizations;
    - Local NGOs;
    - Women's groups;
    - Industrial enterprises;
    - Agricultural producers;
    - Local authorities;
    - Religious groups, including secret societies; and
    - International lending agencies and other potential investors International community including experts and non-governmental organizations.

Stakeholder Consultations

Twelve (12) public consultation meetings were held in the Tappita, Toe Town and another ten (10) towns along the road. The people and officials of these towns attended these meetings, along with representatives of other surrounding towns. A total of 20 towns were covered in the meetings, records of which are included in the ESIA.

Further key informant interviews were conducted in between 1 and 10 March 2021. A total of 14 discussions were held in all 12 communities with Town Chiefs, Elders, teachers, health staff, women's leaders, youth chairmen and other available informants. The information gained from these interviews reinforced and expanded the comments and concerns expressed by the communities in the earlier round of consultations. This is also recorded in the ESIA.

E. DESCRIPTION OF THE ENVIRONMENT

The Existing Bio-physical Environment

The Tappita to Toe Town road runs across the forested landscape of the Liberian hinterland. The terrain is gently undulating, consisting of the weathered lateritic peneplain of central Liberia. This has few rock outcrops, but deep, strongly weathered soils. The soils are ferralsols (latosols or laterites), rich in iron and aluminium, generally quite infertile and highly erodible where they are disturbed or vegetation is removed. The landscape is highly dissected by small creeks, and larger streams and rivers, which drain into the Cestos River.

As for the whole of Liberia, the climate is humid tropical with pronounced wet and dry seasons, running from May to October and November to April respectively. The average annual rainfall is in the range of 1700 to 1800 mm. June, July and September are usually the wettest months, and December and January the driest.

To put it into its biodiversity context, the road corridor runs through an area that was previously fully forested. This forms part of the Upper Guinea evergreen hardwood tropical rainforest that originally ran right across West Africa, but which now has some of its main relics in Liberia. It is very species diverse, with over 2200 vascular plants.

There is frequently a blurred distinction between forest (in both the legal and vegetative senses) and agriculture in this landscape, partly because the prevailing shifting cultivation system moves land from forest to farm for a short period, followed by a long fallow period during which the abandoned land becomes bush until forest re-establishes itself to some extent. Farming households also depend on the remaining forest for a wide range of non-timber forest products and bushmeat. In addition, many tree plantations are under-managed, so that they are difficult to distinguish from secondary forest.

Within this setting, there are no currently protected areas or other conservation sites in the vicinity of the project location, and the habitats all appear to be modified. Most of the forest

near the road is now either degraded by former shifting cultivation or logging, or has been replaced by active shifting cultivation, sedentary lowland rice cultivation, or tree plantations (mainly rubber). Despite disturbance, however, the project area still contains a number of relatively uncommon species, usually protected because of their value for specific non-timber forest products, particularly for medicinal uses.

The broad biodiversity of the forest plants is complemented by a significant animal biodiversity. This is clearly depleted from what would be found in primary forest, but is still likely to be considerable in some areas. Although there are no large mammals resident in the road corridor, the road seems to be located between two mammal hotspots, one to the west of Tappita and another to the east of Toe Town. A number of large mammals such as duikers, antelopes and monkeys could therefore be spotted wandering in the forest areas adjacent to the road. A particular concentration of chimpanzees has been identified in the forests less than 10 km to the south of the road, and it is projected that a number of chimpanzees might roam extensively through the secondary forest lying on both sides of the road. In addition, the forests, bush and riverine areas, and even the active farmland and plantations, provide modified habitats that still support large numbers of small mammals, reptiles, amphibians, birds and insects. Most of these are likely to be common species, but it is possible that the endemic Nimba otter shrew (*Micropotamogale lamottei*) could occupy habitat along the numerous watercourses. This species is classed as Vulnerable on the IUCN Redlist, and its range of occurrence is uncertain. Based on the assessment undertaken, its occurrence in the project area is probable. This is largely on the grounds that numerous zones of watercourse habitat suitable for Nimba otter shrews are crossed by the road. Additional mitigation measures would need to be designed for bridge and culvert sites if it is found to be present in these watercourses.

Significant biodiversity that will be affected by the project is therefore limited to a small number of floral and faunal species. These are relicts scattered through the disjointed remnants of the former large regional forest, while the majority have already been lost through degradation. Mitigation measures will ensure that the project itself does not exacerbate this situation.

The water resources are abundant, both surface water and groundwater. A large number of creeks, streams and rivers are crossed by the road corridor. The sampling and analyses undertaken for the ESIA show that, although not pristine, these are generally clean enough to meet national drinking water standards. There are some exceptions, however, with raised levels of suspended solids suggesting that soil erosion has been increased by human activities in places. In a few locations, raised levels of nitrates and nitrites were detected, probably related to poor sanitation or agricultural runoff. There was no evidence of water contamination with heavy metals, however a slight contamination with petroleum hydrocarbon products was detected at two out of six surface water locations. Runoff from the

earth road must affect watercourses, though this could not be established because the sampling took place during the dry season.

The landform crossed by the road is a highly weathered peneplain with very ancient soils. The sampling and analyses undertaken for the ESIA show that the overall picture of the soils is one of ferralsols – or laterites or latosols – of consistent character throughout the road corridor. They are acidic, deeply weathered and relatively infertile soils. By the end of the wet season, they are particularly heavily leached. They will support limited plant growth, but agricultural use is only effective with the increase of organic matter, since that can raise the nutrient availability by increasing the chemical bonding sites that are absent in the weathered clay fraction.

Since most of the road passes through rural areas, and with relatively low traffic levels, air quality seems to be good during the wet season. Dust is known to be a significant nuisance during the dry season, and will become worse during construction before being almost eliminated on the road itself as a result of the paved surface.

Ambient noise is currently also at acceptable levels, though it can exceed national standards for short periods locally. An example of this identified during ESIA preparation was a truck passing on the bridge over Cestos River, creating high noise level on the nearby river bank.

The Socio-economic Environment

To establish the socio-economic baseline along the Tappita-Toetwon road, a socio-economic baseline survey was carried out among the communities between Tappita and Toe Town. The socio-economic characteristics of the road corridor 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 upgrading of the Tappita Toe Town road. These are the households headed by elderly or very young persons, female headed households and those containing disabled household members.

In common with the national statistics, the population in the survey area is dominated by younger age groups. Some 40 percent of the population is aged under 15 years. This warns of a growing employment problem over the coming years.

All town and rural communities have poor access to basic facilities, including health clinics and elementary schools. Communities living along the road were more likely to use river water as their main source of drinking water as few communities have a hand pump. In the towns and Tappita, people have better access to Elementary Schools and High Schools. The main hospitals are in Tappita.

Women emerged as moderately disadvantaged in terms of educational achievement and potentially economically disadvantaged in terms of access to resources and opportunities. Females were more likely to drop out of school before High School, and again before they graduated from high school, than men.

The data on income indicators shows that people are engaging in a large number of strategies to sustain themselves. Most income in non-farming households is earned through trade or formal employment. Increasing population growth is likely to put pressure on natural resources and the need for work. The pressure for work and employment is prevalent over the survey area with great hopes for development and jobs.

It is clear from these findings that communally accessed natural resources (rivers, forests and bush) are of very high economic and spiritual importance to the people living in the study areas. Any resettlement within these areas will have to be carefully planned to provide alternative resources to ensure that livelihoods and places of worship are not negatively affected. As women, uneducated people and farmers tend to be more vulnerable in terms of access to income; investment in community development needs to be carefully planned to target these vulnerable groups.

Gender Issues and GBV in the project area

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 (GBV) and discrimination. Furthermore, several human rights instruments (i.e., the CEDAW, the Convention on the Rights of the Child (CRC), the Convention on the Rights of Persons with Disabilities (CRPD), the African Charter on the Rights and Welfare of the Child (ACRWC), and the Maputo Protocol) require Liberia to take special measures to protect the rights of individuals who are vulnerable to sexual violence – mainly women, children, and persons with disabilities.

However, GBV is prevalent in Liberia and the country ranks 175th out of 192 countries in the Gender Inequality Index (UNDP, 2020). It appears that marital abuse by men, including insulting, beating and harassment is widely practiced in Nimba and Grand Gedeh Counties. Female Genital Mutilation (FGM), is still extremely common in rural Liberia, especially in Nimba County. In a consultation with the Ministry of Gender, Children and Social Protection (MOGCSP) on how to minimize or stop GBV in the project area, a number of suggestions were made on practical measures that have been incorporated into the ESMP.

The baseline survey conducted revealed that women do not have equal access to information as men and were and only 32 percent were literate, compared to 64 percent of men who were

literate. Daughters are held back from education because it is believed to be important only for boys.

HIV prevalence in women is higher than in men, revealing women's higher vulnerability to HIV infection. While the project can contribute significantly to combating HIV/AIDS and other diseases by providing access to health services, the likelihood of the construction phase causing an influx of mainly single male labourers is high. This could give rise to contractors' workers increasing the prevalence of HIV/AIDS, sexually transmitted diseases, sexual harassment of women.

F. ENVIRONMENTAL AND SOCIAL IMPACTS

As usual with the development of infrastructure, the benefits (summarised in the project justification above) are generally focussed on the socio-economic environment, while the adverse impacts are likely to affect the bio-physical and social environment. Nevertheless, the reduced dust nuisance and less sediment in roadside watercourses will be positive project impacts to the bio-physical environment.

The project covers a large area – a road corridor of about 30 metres in width across 40 km of mixed urban and rural landscape – and so can potentially cause significant damage unless care is taken. Among many negative impacts that will occur, the following list provides a summary of the types that are described in full in the main report:

- Lost vegetation, and the risk of serious soil erosion and sediment supply into watercourses through the quarrying of materials and construction of major earthworks;
- Degraded environmental resources along the road corridor – especially the forests and watercourses, and the habitats they provide – as a result of the largescale project activities;
- Risk of loss of important biodiversity species
- Polluted soil, water or air from the use or generation of hazardous materials;
- Impact of noise and vibration
- Danger of injury or death to both members of the public and project workers from construction activities, including traffic;
- Lost property or livelihoods of people living close to the road;
- Predicted and unpredicted loss of cultural sites

- Damaged social systems and community health as a result of a large transient workforce;
- Risk of poor Stakeholder Engagement Plan and activities leading to frustration and anger among communities and probable delays in construction.
- Risk of increased GBV and sexual harassment, due to the influx of male workers to the project area.

In the ESIA, these issues are disaggregated into potential impacts, against each of which a mitigation strategy can be defined. Following from this, the methodology for the management of environmental and social risks and impacts is described for the project.

G. ENVIRONMENTAL AND SOCIAL MITIGATION, MANAGEMENT AND MONITORING

Mitigation Strategy

For each of the adverse environmental and social impacts identified, a mitigation strategy is defined, categorised as one or more of the standard practices of avoidance, reduction, mitigation and compensation. For each impact, an approach to fulfil the appropriate strategy is then identified (Table 0-1). This is then translated into practical mitigation actions in the Environmental and Social Management Plan (ESMP).

The ESMP is the main reference, management and monitoring document for all project safeguards. 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 impacts in a structured way, they are disaggregated within areas of risk. This led to the following safeguard categories and impact mitigation headings that are used as the basis of the overall ESMP.

Overall safeguards

1. General Environmental and Social Protection

Protection of society

2. Environmental Health and Safety

3. Occupational Health and Safety
4. Community Impacts Management
5. Traffic Management
6. Cultural and Archaeological Heritage Management

Pollution control

7. Hazardous Materials Management (including Spill Contingency and Emergency Response)
8. Construction Materials Management
9. Waste Management

Environmental safeguards

10. Soil Erosion Control
11. Water Resources Management
12. Air Emissions Management
13. Ecological Management Plan
14. Noise and Vibration Management

Conditions of Employment and Workers Code of Conduct

15. Employment issues and grievances management
16. Worker Behaviour Management

Through these categories, the ESMP lays out the management system to ensure that all of the safeguards required by the Government of Liberia and the World Bank 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 also cross-refers to the project's Resettlement Action Plan, which is the equivalent working document to provide safeguards against losses of property and livelihoods.

The ESMP allows the identified potential impacts to be reduced to acceptable residual levels. Mostly they are categorised 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, and the restoration of altered landforms following quarrying and

the loss or alteration of livelihoods and the impacts linked to workers' behaviour. Beyond issues of this nature, the ESMP, if implemented as proposed, will provide an effective mitigation system for the project.

Table 0-1 Linkages of impacts, mitigation strategy and mitigation approach

Identified impact	Mitigation strategy	Mitigation approach
Overall Safeguards		
1. Overall Impacts		
1.1 General environmental damage in the form of degraded land, lowered quality of living, reduced quality of resources, etc., mainly in the 28 communities along the road.	a) Mitigation b) Remediation	a) The ESMP must contain the structure and information required to ensure that all works are undertaken to high environmental and social standards. b) Monitor the implementation of the ESMP and enforce the rehabilitation of any damage caused during project operations.
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 in the roadside areas of the 28 cities, towns and rural communities.	Mitigation	Require project staff and contractors' workers to be sensitised to environmental and social issues. Require the contractor to prepare and implement a comprehensive Code of Conduct.
Protection of Society		
2. Environmental Health and Safety Impacts		
2.1 Injuries occur to the public, especially children, during works in the 28 communities along the road.	Reduction	Require the contractors to enforce the exclusion of the public from the active work sites.
2.2 Injuries occur to the public from exposure to hazardous substances (e.g., cement, diesel) in the 28 communities along the road.	Reduction	Require the contractors to enforce the exclusion of the public from the facilities where hazardous substances are stored and used.
2.3 Infectious and contagious diseases are spread amongst the 28 communities near the road.	Reduction and Mitigation	Require the contractors to employ local laborers are far as possible, and to undertake awareness campaigns on public health issues.
3. Occupational Health and Safety Impacts		

Identified impact	Mitigation strategy	Mitigation approach
3.1 Workers are unaware of the dangers from the sites (road line, quarries, batching plants, etc.) they are working in, leading to high rates of injury.	Mitigation	Require the contractors to prepare and implement an ISO 45001:2018 compliant Occupational Health and Safety Plan (OHS Plan) and recruits an ISO 45001:2018, OHSAS 18001:2007 or similar certified Health and Safety Specialist. Ensure that the supervising engineer recruits its own certified OHS specialist and fulfils its responsibility in supervising the contractor against its ISO compliant OHS Plan.
3.2 Injuries due to inadequate provision of safety equipment	Avoidance	Set a minimum list of personal protective equipment that must be issued to and used by every person entering the work sites.
4. Community Impacts		
4.1 Incoming workers do not respect local communities, leading to social disruption, particularly in the rural towns.	Reduction and Mitigation	Require the contractors to employ local labourers are far as possible, and to maintain a code of conduct for acceptable behaviour.
4.2 Houses and other structures (264 privately owned structures and 9 public structures according to RAP report) are lost in the road right of way.	Compensation	Implement the Resettlement Action Plan to provide full and fair compensation.
4.3 Loss of land use and business (106 businesses according to RAP report) sites in the road right of way, particularly in the cities.	Compensation	Implement the Resettlement Action Plan to provide full and fair compensation.
4.4 Cultivated land and crops (874 rubber trees and 8 farm owners according to RAP report) are disturbed or destroyed, mainly in the rural areas along the road and in the locations chosen for quarries, borrow areas, camps, batching plants, etc.	a) Compensation b) Reduction	a) Implement the Resettlement Action Plan to provide full and fair compensation. b) Enforce the minimisation of land take to the greatest extent possible.
4.5 Local people's livelihoods are adversely affected by project activities (628 persons will be affected according the RAP report).	a) Avoidance b) Compensation	a) Design project activities to be implemented in such a way that livelihoods are little affected; maximise local employment opportunities on the project. b) Implement the Resettlement Action Plan to provide full and fair compensation.
4.6 Cumulative losses are incurred by social groups unable to respond to change. (60 vulnerable people according to RAP report)	Mitigation	Ensure that marginal groups are included in consultations and resettlement provisions.

Identified impact	Mitigation strategy	Mitigation approach
4.7 Local communities (28) are not engaged and consulted in a satisfactory and timely manner or vulnerable groups are not included in community consultations.	Avoidance and Mitigation	Ensure effective implementation, revision, and update of SEP and make sure IIU and Contractor staffing is adequate.
5. Traffic Impacts		
5.1 Use of public roads by project vehicles increases the accident rate and generates nuisance levels of dust: mainly the Tappita-Toe Town road, but also between it and other project infrastructure (camps etc.) and Monrovia.	Mitigation	a) Contractor must develop a comprehensive road safety plan, approved and integrated in the work plan before commencement of work. b) Maintain strict vehicle use and driving rules, and enforce speed controls, for all project vehicles, including contractors' trucks and mobile plant.
5.2 Increased traffic on public roads, running at faster speeds, leading to more accidents and more serious accidents: on sections of the Tappita-Toe Town road as they are completed during construction.	Reduction	Ensure that traffic safety measures are incorporated in engineering designs.
6. Cultural Heritage Impacts		
6.1 Cultural sites are damaged (9 graves identified in the RAP), anywhere that new land is cleared, such as for diversions, camps, quarries and borrow areas.	Avoidance	Provide a detailed procedure to be followed for investigating and taking action in the event that a cultural site needs to be affected.
Pollution Control		
7. Hazardous Materials		
7.1 Pollution to air, soil or water and danger (illness or injury) from the delivery and handling of hazardous materials (including bitumen, mixed asphalt, fuels, lubricants and cement) at project camps, workshops, plants and construction sites.	a) Mitigation b) Remediation	a) Require the contractor to provide detailed protocols to be followed in all refuelling operations as part of its ESMP. b) Require the contractor to define the clean-up and rehabilitation work required in case a spill, leak or other form of pollution occurs in an Oil Spill Response Plan.
7.2 Pollution to air, soil or water and danger (illness or injury) from fuel and oil storage at project stores and workshops.	a) Mitigation b) Remediation	a) Require the contractor to provide detailed protocols to be followed in all refuelling operations as part of its ESMP. b) Define the clean-up and rehabilitation work required in case a spill or leak occurs in an Oil Spill Response Plan.

Identified impact	Mitigation strategy	Mitigation approach
7.3 Pollution to air, soil or water and danger (illness or injury) from refuelling operations at project camps, workshops, plants and construction sites.	a) Mitigation b) Remediation	a) Require the contractor to provide detailed protocols to be followed in all refuelling operations as part of its ESMP. b) Require the contractor to define the clean-up and rehabilitation work required in case a spill occurs in an Oil Spill Response Plan.
7.4 Pollution to air, soil or water and danger (illness or injury) from concrete and asphalt batching plants	a) Mitigation b) Remediation	a) Require the contractor to provide detailed protocols to be followed in all refuelling operations as part of its ESMP. b) Require the contractor to define the clean-up and rehabilitation work required in case pollution occurs in an Oil Spill Response Plan.
8. Construction Materials		
8.1 Damage to the land (degradation, loss of soil and cover, reduced productivity) from borrow pits and quarries	a) Reduction and Mitigation b) Remediation	a) Enforce strict siting and management criteria for material source sites. b) Require full rehabilitation of material extraction sites once their use is complete.
8.2 Disturbance (noise, dust and traffic accidents) and danger of injuries from quarry operation – general	a) Mitigation b) Remediation	a) Enforce strict management criteria for quarries. b) Require full rehabilitation of quarries once their use is complete, to make them safe.
8.3 Disturbance (noise and dust) and danger (serious injury or death) from quarry operation – explosives and blasting	Mitigation	Enforce strict protocols to be followed for the transport, storage and use of explosives, and for all blasting operations.
9. Impacts of Waste Materials		
9.1 Pollution of soil or water and ill-health from waste generation and management at camps and construction sites.	a) Reduction b) Remediation	a) Require the contractor to prepare and implement a comprehensive Waste Management Plan. b) Stipulate the requirements for rehabilitation following any pollution event.
9.2 Pollution of soil or water and ill-health from waste disposal at camps.	a) Mitigation b) Remediation	a) Require the contractor to prepare and implement a comprehensive Waste Management Plan. b) Stipulate the requirements for rehabilitation following any pollution event.
9.3 Pollution of soil or water from poor sanitation at work sites – camps and construction sites.	Mitigation	Require sanitation facilities to be created at all work sites.

Identified impact	Mitigation strategy	Mitigation approach
9.4 Pollution of soil or water from site camps and stores.	a) Mitigation b) Remediation	a) Define sound management guidelines for the storage and use of polluting substances, and for sanitation in particular. b) Stipulate the requirements for rehabilitation following any pollution event.
Environmental safeguards		
10. Soil Loss		
10.1 Erosion and physical damage of soils and earthworks – all construction sites, camps and ancillary infrastructure areas.	a) Mitigation b) Remediation	a) Define the erosion control measures that must be put in place on all bare soil surfaces. b) Define the rehabilitation that must be undertaken if erosion occurs.
11. Pollution of Water		
11.1 Damage to water resources by pollution with sediment or chemicals in runoff in any of the 3 major watercourses and many minor creeks crossed by the road, or nearby wetlands and water supply boreholes.	a) Mitigation b) Reduction	a) Define the erosion control measures that must be put in place on all bare soil surfaces to stop the supply of entrained sediment, and the safeguards to prevent chemical pollution. b) Define the measures that must be used to reduce the likelihood of work sites and facilities affecting watercourses.
11.2 Pollution by entrained sediment from poor drainage systems entering any of the 3 major watercourses and many minor creeks crossed by the road, or nearby wetlands and water supply boreholes.	Mitigation	Define the drainage measures that must be put in place, plus the erosion control measures required on all bare soil surfaces to stop the supply of entrained sediment.
12. Air Pollution		
12.1 Dust from construction sites and access tracks to ancillary infrastructure affects local communities and crops	Mitigation	Provide detailed guidelines on the abatement of dust at all work sites.
12.2 Exhaust fumes affect local communities close to the road and all project ancillary infrastructure.	Reduction	Require compliance with national vehicle emission regulations.
13. Biodiversity Impacts		

Identified impact	Mitigation strategy	Mitigation approach
13.1 Vegetation other than invasive species (i.e. both natural plants and farm plants) is damaged or destroyed unnecessarily – beyond the agreed boundaries, particularly natural plants in the forested sections along the road.	a) Mitigation b) Reduction c) Remediation	a) Conduct floral biodiversity studies and, if needed, prepare and implement a Biodiversity Management Plan (BMP). b) Enforce strict respect for agreed site boundaries. c) Require full rehabilitation of any damaged vegetation, on and off the sites.
13.2 Increased but poorly controlled exploitation of forest resources, including NTFPs, as a result of improved road access, particularly natural plants in the forested sections along the road.	Mitigation	Conduct floral biodiversity studies and, if needed, prepare and implement a Biodiversity Management Plan (BMP). Raise awareness of environmental threats and encourage local communities to improve their management of local forest resources.
13.3 Wild animals other than very common or non-native pest species are killed, particularly in the forested along the road.	Mitigation	Conduct faunal biodiversity studies and, if needed, prepare and implement a Biodiversity Management Plan (BMP). Raise awareness of the regulations on bushmeat and ensure that workers have access to meat from domesticated livestock.
14. Noise and Vibration Impacts		
14.1 Noise disturbance at excessive levels from construction activities, quarries, borrow areas and batching plants.	Mitigation	Require contractors to comply with the national regulations at all times.
14.2 Vibration disturbance causes stress and damage to buildings, either from trucks and machines on construction sites and access tracks, or from quarry operations.	a) Mitigation b) Reduction	a) Provide strict protocols for the use of trucks and mobile equipment close to habitation. b) Ensure that crushers and quarries are located well away from habitation, and that blasting follows strict rules.
Conditions of Employment and Workers Code of Conduct		
15. Employment Issues and Grievances Management		
15.1 Conditions of employment are unfair to or unequal among workers.	Avoidance and Reduction	Prepare Labour Management Procedures and require the contractor to prepare a Labour Management Plan. Require contractor to have all employees sign contracts and Worker Code of Conduct prior to start of work.

Identified impact	Mitigation strategy	Mitigation approach
15.2 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; and /or Vulnerable groups are excluded from employment. -	Avoidance and Reduction	Prepare Labour Management Procedures and require the contractor to prepare a Labour Management Plan
15.3 Workers are unable to redress their grievances.	Mitigation	Contractor to set-up and implement an effective GRM for its employees and train them on its use.
16. Workers' Behaviour Management		
16.1 Workers' behaviour is inappropriate or disrespectful of other workers or local community members, especially of women.	Reduction and Mitigation	a) Require contractors to have all employees to sign Worker Code of Conduct. b) Train employees on Code of Conduct and good behaviour
16.2 Sexual exploitation and gender-based violence increase in the 28 local communities, particularly the rural towns due to the influx of temporary laborers	Reduction and Mitigation	Require the contractors to comply with the World Bank's ESS2 and the national laws on sexual exploitation, and to undertake awareness campaigns on GBV/SEA.

Institutional Arrangements

The Ministry of Public Works (MPW) is responsible for the overall supervision and implementation of the ESMP through its Infrastructure Implementation Unit (IIU). The IIU must have an Environmental Safeguards Specialist and a Social Safeguards Team consisting of a Social Safeguards Specialist and two Community Liaison Assistants. The IIU should also recruit an ISO 45001:2018, OHSAS 18001:2007 or similar certified Health and Safety Specialist. Under this arrangement, implementation of other supplementary safeguards documents, including the RAP, is also the responsibility of the IIU.

The Environmental Protection Agency of Liberia (EPA) is the lead agency for environmental protection and management in Liberia. The EPA is mandated to enforce the Environmental Protection and Management Law 2002 (EPML). Under the EPML, the EPA will issue an environmental permit prior to commencement of the rehabilitation works. The EPA will monitor the project activities from time to time through field visits and through review of quarterly environmental compliance reports submitted to it by the IIU.

Grievance Mechanism

The Grievance Redress Mechanism (GRM) for the project is incorporated in the Stakeholder Engagement Plan. It is based on a system proven to work in the project area under previous projects. It is World Bank's ESS compliant, follows customary norms and fits into the statutory administrative process of the Government of Liberia. The GRM's basis is described in the ESIA and the practical implementation of it is also given in the ESMP.

Budget for ESMP Implementation

Table 0-2 summarises the main areas of cost expenditure allowed for in the ESMP. Most of these are enabling actions. The vast majority of environmental mitigation actions are implicit in the work items, and so covered by the construction costs.

Table 0-2 Summary Costs of the ESMP

Intervention	Items required	Estimated cost (US $)
Biological Surveys and possibly Biological Management Plan	**Biodiversity consultants' fees and survey equipment**	**350,000**
3 x 28 Community safety and environmental health trainings	**Training materials and course delivery by a consultant team**	**75,000**
12 gender awareness trainings for contractor's management and staff	**Training materials and course delivery by a consultant team**	**12,000**
Malaria reduction program among workers' and affected households' families	**Mosquito bed nets**	**21,500**
Safety of workers	**Personal protective equipment as per the ESMP guidelines**	**15,000**
Cultural damage compensation	**Allowance for chance find resolution**	**10,000**
Monitoring of water and air quality, noise and weather	**Monitoring equipment and weather stations**	**165,000**
	Total	**648,500**

Performance Indicators for Monitoring the ESMP Implementation

The ESMP has been developed as a holistic management and monitoring tool for identified safety, environmental and social aspects of the project. It encompasses a wide range of protection and mitigation measures. Recording of compliance is through a formal reporting system. The indicators for performance are national standards where they exist, appropriately selected international standards where Liberian standards are not yet in place, and a series of practical guidelines. The simple but comprehensive monitoring system allows the standard of compliance and responsibility for further work to be identified and reported for action in a clear and accessible format. The following specific indicators will be used to monitor the overall implementation of the ESMP:

A. Evidence of contractor's Environmental and Social Management System including the contractor's ESMP, OHS Plan, Labour Management Plan, Waste Management Plan, Risk Assessment and Emergency Response and Preparedness Plan, Oil Spill response plan, and possibly Biological Management Plan, approved by the IIU prior to commencement of civil work;

B. Contractor's recruitment of an Environmental Specialist, a Social Specialist, a Community Liaison Assistant, and an ISO 45001:2018, OHSAS 18001:2007 or similar certified Health and Safety Specialist.

C. Evidence of Worker Code of Conduct signed by all project workers and staff;

D. Evidence of contractor's adherence to siting guidelines for ancillary facilities and structures, including labour camps, quarries, and borrow pits;

E. Evidence of a functioning GRM at all levels of the project;

F. Evidence of contractor's Workers GRM;

G. Effective GBV/ sexual exploitation and abuse prevention measures; Evidence of the Supervising Engineer's Environmental and Social Management System and Supervising Engineer's recruitment of an Environmental Specialist, a social Specialist and an ISO 45001:2018, OHSAS 18001:2007 or similar certified Health and Safety Specialist.

H. The Supervising Engineer's monthly environmental, social, health and safety monitoring report approved by the IIU, and quarterly monitoring report approved by the IIU and the EPA.

Action Plan for the IIU

Prior to the commencement of the works the IIU should ensure the following:

A. The surveys and assessments necessary for the consolidation of biological data as described in Section 9.7.2 are performed. These surveys should be used to inform the interventions under this ESMP, refine the mitigation activities and define whether a Biological Management Plan is required. The results should be published as an addendum to the ESIA.

B. The siting of the ancillary facilities is in line with the criteria set out in Section 8.4 and that critical habitats are avoided.

C. A detailed inventory of the forest trees is undertaken once the contractor has finalised the land required for ancillary infrastructure and this has been approved by the IIU. This listing must be completed and trees to be felled must be compensated.

D. The contractor has a comprehensive ESMS that is satisfactory to the provisions of this ESMP and the World Bank ESF.

E. The IIU should recruit full-time Environmental Safeguards Specialist, a Social Safeguards Team (consisting of a Social Specialist and two Community Liaison Assistants and an ISO 45001:2018, OHSAS 18001:2007 or similar certified Health and Safety Specialist to continuously monitor the project's environmental, social and health and safety performance.

During works, the IIU must ensure the following:

A. The contractor establishes its ESMS and implements its ESMP and OHS Plan.

B. The Supervising Engineer is performing its duties in monitoring the contractor against its ESMP and OHS Plan

C. The contractor's and Supervising Engineer's Environmental, Social and Health and Safety Staff are assigned and present on the sites.

D. An integrated Environmental, Social and Health and Safety Audit is carried out by an independent Auditor every 6 months to assess compliance with the Contractor ESMP and Contractor OHS Plan.

E. Any violations are corrected by the contractor and the IIU monitors the contractor actions and undertakings in correcting violations.

1 INTRODUCTION

1.1 BACKGROUND

The Government of the Republic of Liberia (GoL) has applied for funding from the World Bank's International Development Association (IDA) for the Rural Economic Transformation Project (RETRAP), a project that aims to increase the income of rural poor households in Liberia through sustainable agricultural livelihood enhancements, improved rural access and agricultural marketing infrastructure services. Under component 3 (sub-component 3.1: Roads) of the RETRAP, the GoL, through the Ministry of Public Works (MPW) and its Infrastructure Implementation Unit (IIU), is seeking to rehabilitate the 40 km road stretch between Tappita and Toe Town, in the northeast of Liberia, through as Design-Build Transfer Works Contract. The road is a section of the 112 km long Tappita-Zwedru road. The project will complement the planned road works financed as part of the South Eastern Corridor Road Asset Management Project (SECRAMP) under which a total of a 100 km length of road, between Ganta and Tappita, will be rehabilitated. Therefore, the proposed section to be rehabilitated under RETRAP will extend the road, commencing from where the SECRAMP-financed section ends.

The project will be undertaken in compliance with the relevant Liberian laws, the World Bank's Environmental & Social Framework, and Good International Industry Practice (GIIP). One of the first steps towards environmental and social compliance is the production of an Environmental and Social Impact Assessment (ESIA) and an Environmental and Social Management Plan (ESMP). This document presents an ESIA for the rehabilitation of the Tappita-Toe Town road and includes an ESMP which is designed to be immediately usable as a self-standing safeguards manual for the design and construction works of the road.

This ESIA strictly covers construction activities as per the scope of work assigned to the ESIA team by the IIU. Operation and decommissioning impacts will be covered in a separate ESIA.

1.2 THE ENVIRONMENTAL IMPACT ASSESSMENT

In accordance with Section 14 of the Environmental Protection and Management Law of The Republic of Liberia of 2002, the Republic of Liberia Environmental Protection Agency Environmental Impact Assessment Procedural Guidelines of 2017 and the World Bank's Environmental and Social Framework (ESF), the project owner, the MPW is undertaking this ESIA for the rehabilitation of the Tappita-Toe Town Road. Its main objective is to ensure that the potential environmental and social impacts from the activities related to road rehabilitation and paving are identified, their significance is assessed, and appropriate mitigation measures are proposed to eliminate or minimize such impacts during a reasonable timeframe, taking into consideration the investment which has to be made.

This ESIA meets the following objectives:

1. Ensure compliance with the local laws and regulations;
2. Ensure compliance with the requirements of the funding agency;
3. Determine the compatibility of the proposed project with the surrounding environment;
4. Identify and assess environmental and social impacts, both adverse and beneficial in the project's area of influence;
5. Manage potential environmental impacts and risks on the surrounding population and environment by avoiding or at least minimizing them within acceptable limits;
6. Assist decision makers in protecting, conserving and managing both the surrounding environment and the affected communities according to the principles of sustainable development;
7. Ensuring that guidance on the risks of importing labour and fair conditions of employment and issues of sexual harassment and gender based violence in the workplace are implemented throughout the project;
8. Incorporate environmental management plans and monitoring mechanisms during design and construction;
9. Clarify the principles, obligations and generic measures for managing environmental and social risks and impacts during the construction phase, as they will be reflected in the concession agreement;
10. Ensure an open and balanced process through public information and consultation, by promoting improved social and environmental performance of MPW.

1.3 THE PURPOSE AND NEED FOR THE PROJECT

The proposed road rehabilitation is an important component in the revitalization of Liberia, a country rebuilding its infrastructure, rehabilitating its economy, attracting investment, and improving the livelihoods of its citizens following years of civil unrest and conflict.

Liberia has only 750 km of paved roads and about 60 percent of rural Liberians lack access to an all-weather road, limiting their ability to participate in economic activities and access vital services such as health and education. The infrastructure constraints are the major impediments to economic recovery and growth in Liberia. Despite abundant arable land and a hospitable climate for agriculture, Liberia faces chronic food insecurity in part because lack of road access.

Agricultural activities are the bedrock of the local economies of rural communities, however one of the main challenges faced by this sector is the limited road transport connectivity. Connecting agricultural productive uses of road infrastructure is critical to enabling sustainable, commercially-led road service provision in un- and under-served rural communities in Liberia.

The Tappita-Toetown road is a critical link in the transportation network, and it was selected for rehabilitation under the RETRAP based on three main factors. These are as follows.

1. The rehabilitation of the Tappita-Toe Town road supports the ongoing attempts by Government to improve the southeastern corridor to an all-weather standard and it is critical to the effective transportation of agricultural goods.
2. There are other government programs donors that are investing in complementary improvements in the feeder roads for enhancing the feeder road network and meeting service delivery requirements.
3. In spite of its relatively short length, this segment of road contributes significantly to market accessibility since it constitutes a key section which is crucial for the overall network.

The south-eastern road corridor, which includes the 40 km section from Tappita to Toe Town, is vital to the nation's reconstruction effort and the improvement of regional cross-border traffic, which will enhance Liberia's trade and interconnection with its neighbors: Ivory Coast, Guinea and Sierra Leone. The corridor has the potential to open up the south-east of Liberia and assist in the delivery of government services such as health and education. It provides access to the Jackson Fiah Doe Memorial Regional Hospital located in Tappita, which is a comprehensive referral hospital. It will also link the south-eastern counties to the planned dry port near Ganta.

Improvements made in the road will be instrumental in:

1. Improving farmers' access to markets, enabling farmers to sell their goods and gain better prices, raising incomes;
2. Reducing transport and material costs by improving accessibility;
3. Improving inland connectivity to the inaccessible and deprived rural areas;
4. Improving health and sanitation;
5. Improving access to services;
6. Reducing poverty and hunger;

7. Establishing employment, training, human resource development, and technology transfer opportunities;
8. Increasing the earning potential;
9. Enabling industrial and commercial growth; and
10. Encouraging community and rural development.

1.4 ESIA REPORT STRUCTURE

The ESIA report has been organized in nine chapters covering all the items listed in the Liberia EIA Procedural Guidelines (EPA 2017). The report structure also includes all the items required by the various World Bank Group requirements. The ESIA structure is summarized in Table 1-1.

Table 1-1 ESIA Report Structure

Chapter	Content
Chapter 1 - Introduction	Presents a brief background to the project, and the purpose and structure of the report.
Chapter 2 – Regulatory Framework	Describes the legal and policy requirements as well as the administrative structure.
Chapter 3 – Project Description	Describes the project components and project Area as well as the need and desirability of the project.
Chapter 4 – Project Alternatives	Describes the various alternatives that were assessed for the project including: routing and technology alternatives.
Chapter 5 - Stakeholder Engagement	Summarises stakeholder engagement activities
Chapter 6 – Baseline Conditions	Provides a detailed baseline assessment of the receiving physical, biological and social environment. An analysis of the gender employment and harassment/ violence situation in Liberia is presented
Chapter 7 – Environmental and Social Impact Assessment	Presents i) the standardised 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 social environment.
Chapter 8 – Environmental and Social Mitigation Measures	Describes the approach to mitigation of the project's impacts as well as the criteria to adopt for the siting of ancillary structures.
Chapter 9 – Environmental and Social Management Plan	Outlines i) the proposed management measures, costs, timeframes and responsibilities to implement the mitigation and enhancement measures, and ii) procedures essential for effectively monitoring social and environmental mitigation and management measures.

2 LEGAL AND INSTITUTIONAL FRAMEWORK

This Chapter describes the applicable international standards and relevant Liberian regulatory framework that set the context within which the project will operate.

2.1 NATIONAL LEGISLATIVE FRAMEWORK

Table 2-1 describes the main categories of legislation in Liberia. Table 2-2 and Table 2-3 provide a summary of Liberian legislation, policies and strategies relevant to the project. Details from selected national legislation relevant to environment are described in sections 2.1.1 through 2.1.4.

Table 2-1 Categories of Legislations in Liberia

Category	Description
Law	Laws are passed by the National Legislature of Liberia comprising of 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 case of environmental bill, 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 Order 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.
Regulations	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

Categories	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 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 all asbestos material in the country.
Forestry	Conservation of the Forests of the Republic of Liberia	1953	These Acts provided for the establishment of the Bureau of Forest Conservation within the Department of Agriculture and Commerce and described the basic legal framework for forest and wildlife management in Liberia.
	Supplementary Act for the Conservation of Forests	1957	
	The Act that created the Forestry Development Authority (FDA)	1976	These two acts established the FDA and defined its responsibilities, outlined forest offences and penalties, made provisions for an Advisory Conservation Committee and specified powers of forest officers with regard to trees in reserve areas. They gave the FDA the power to establish Government Forest Reserves, Native Authority Forest Reserves, Communal Forests and National Parks.
	Amendment to the FDA Act	1988	
	National Forestry Law	2000	This Act makes provision for the management and conservation of forest resources of Liberia, defines ownership rights and other rights in forests, provides for the protection of the environment and wildlife in forests, regulates the trade in forest products and provides for various other matters relative to forestry and wildlife.
	National New Forestry Reform Law	2006	This act amends the national forestry law of 2000 and the act creating the FDA. The administration of this Act provides for the FDA to exercise power under the law to ensure sustainable management of the Republic's forestland, conservation of the forest resources, and protection of the environment. It also has provisions for sustainable economic development with the participation of and for the benefit of all Liberians to contribute to poverty alleviation in the country.
	Act to Establish the Community Rights Law with respect to Forest Lands	2009	The law creates a legal framework that defines and supports community rights in the management and use of community and traditional lands and forest resources.

Categories	Title	Year	Description
Biodiversity Conservation	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.
	Protected Forest Areas Network Law	2003	The Act for the Establishment of a Protected Forest Areas Network required a biologically representative network of protected areas to be established covering at least 30 percent of the existing forest area, comprising about 1.5 million hectares.
	FDA Draft Hunting Regulations	Undated	These regulations include a list of "Fully Protected Animals of Liberia".
	National Wildlife Conservation and Protected Areas Management Act	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.
Water Resources	Water Quality Regulations of Liberia	2018	These Regulations prohibit the pollution of water resources. They also provide measures for compliance, enforcement and offences.
	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.
Mining and Quarrying	Act Adopting a New Minerals and Mining Law	2000	The Act lays out the ownership and rights to minerals in Liberia and the requirements to explore and to operate mines and quarries.
	Draft Mining Act	2014	The Act is aimed at establishing a framework for granting and regulating mineral titles
Occupational Health and Safety	Work Act of Liberia	2015	The recent Work Act repealed Title 18 of the Executive Law, Labor 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. The 1976 Law is currently being updated in order to effectively govern the decentralized health sector and accommodate the changes that have taken place since its promulgation. For example, in 2010 a new chapter was added to the Law to manage HIV/AIDS.[2]
	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.

[2] Liberia Ministry of Health and Social Welfare. 2010. An Act to Amend the Public Health Law, Title 33, Liberian Code of Laws Revised (1976). Accessed from the GOL website: http://legislature.gov.lr/sites/default/files/Public%20Health.pdf

Categories	Title	Year	Description
Land Rights	Aborigines Law	1956	The Act states that each tribe is entitled to the use of as much of the public land in the area inhabited by the tribe, as is required for farming and other enterprises essential to tribal necessities. It shall have the possession of such land as against any other person. It goes further to say that the omission of a tribe to have its territory so delimited shall not however, affect in any way its right to the use of the land. While this Act allows tribal people to own and use the land for living and productive activities, it does not allow the individuals or groups using the land to transfer the land to another user.
	Property Law	1976	This law established the conditions under which a Liberian can own real property and dispose of. It states that one must hold title document for such land and when transferring same, it shall be done by title, duly registered. Land acquired under this law allows the owner to convey or transfer it to another person(s) or entity through legal process.
	Rules & Regulations Governing the Hinterland of Liberia (Revised)	2001	These rules are a successor to the earlier law and regulations on the hinterland. These rules apply not only to the hinterland, but also to land in other counties, under the customary land tenure system. Articles 66 and 67 of the rules grant tribal people in the rural area the right to utilize land in their locale. Any stranger wishing to utilize such land as against their usage shall compensate for the use of the land.
	Liberia Land Commission Act	2009	The objective of this act is to propose, advocate and coordinate reforms of land policy, laws and programs in Liberia. It does not have adjuratory or implementation role. The goal of the commission is "to develop comprehensive national land tenure and land use system that will provide equitable access to land and security of tenure so as to facilitate inclusive sustained growth and development, ensure peace and security and provide sustainable management of the environment".
	Land Right Act	2018	Drafted in 2014, this act was recently signed by the President of Liberia (19 September 2018). The act is part of the recent land reform process in Liberia. the objectives of this act are i) to define the different categories of land ownership and rights in Liberia; ii) to prescribe the means by which each of the categories of land may be acquired, used, transferred and otherwise managed; iii) to ensure that all communities, families, individuals and legal entities enjoy secure land rights and iv) to ensure equal access and equal protection with respect to land ownership, use and management, including ensuring that Customary Land is given protection equal to Private Land and that land ownership is permitted for all Liberians.

Table 2-3 Relevant National Policies, Strategies, Guidelines and Plans

Title	Year	Description
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.
Environmental & Social Impact Assessment (ESIA) Procedural Guidelines	2017	The ESIA Procedural Guidelines provides administrative procedures for the preparation of ESIA to ensure effective environmental governance.
National Environmental Action Plan (NEAP) for the Republic of Liberia (2019-2023)	2019	The NEAP is a 5-year-plan produced by the Environment Protection Agency (EPA) to guide the Government of Liberia in managing Liberia's various environmental resources and matters related to emergent environmental issues, based on an assessment of the status and trends in environmental management. It sets out an action plan with defined deliverables, appointed ministries and agencies and a specific timeframe for each environmental resource or matter related to the environment in the country.
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.
National Biodiversity Strategy and Action Plan (2017-2025)	2004	The strategy is a tool to implement the United Nations (UN) Convention on Biological Diversity, of which Liberia is a member, on the national level. It presents Liberia's strategic goals and objectives for the sustainable management and utilization of its biological resources.
National Forestry Policy	2006	The policy describes the main directions for the future of forestry development in Liberia, and updates earlier polices so they take into account the new Forestry Reform Law.
National Forest Management Strategy	2007	The strategy summarizes the FDA's approach to managing the national forest endowment. It includes objectives, goals, and management actions in pursuit of the overall aim to "conserve and sustainably manage all forest areas so that they will continue to produce a complete range of goods and services for the benefit of all Liberians and contribute to poverty alleviation in the nation" (FDA 2007, 4).
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.
Mineral Policy of Liberia	2010	The Policy provides key principles for mining and addresses quarrying (including sand mining).
National Health Policy and National Health	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.

Title	Year	Description
Plan[3]		
National Gender Policy	2009	The Policy is intended to eradicate and eliminate all gender related problems in Liberia.
Land Right Policy	2013	The policy provides recommendations for land rights in Liberia, centered on four basic types of rights: Public Land, Government Land, Customary Land and Private Land. The policy also fosters equal protection of all relative to all land matters. The policy recognizes that since the founding of Liberia, the lands of customary communities have been less secure than private lands. This must end such that land under customary practice and norms are given protection equal to that of private lands i.e. the land right of men and women.
Code of Forest Harvesting Practices	2017	This Code provides a set of guidelines to forest operators for carrying out sustainable and improved harvesting operations. It applies to all harvesting operations within Liberia's natural forests. It includes among other things, environmental and social performance requirements for timber logging and post-harvesting activities.

[3] Liberia Ministry of Health and Social Welfare. 2007. National Health Policy and National Health Plan. Accessed from the ILO website: http://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---ilo_aids/documents/legaldocument/wcms_126728.pdf

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.

Article 22 (a) provides that every person shall have the right to own property alone as well as in association with others; provided that only Liberian citizens shall have the right to own real property within the Republic.

2.1.2 The Environmental Protection Agency Act

"An Act to establish 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".

Thus, the Environment Protection Agency of Liberia (EPA) was created by the Act creating the Environment Protection Agency of the Republic of Liberia, known as the Environment Protection Agency Act. 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:

1. 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;

2. Identify projects, activities, and programs for which environmental impact assessment must be conducted under this Law;

3. Review and approve environmental impact statements (EIS) and environmental impact assessment (EIA) submitted in accordance with this Act;

4. 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;

5. 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;

6. Encourage the use of appropriate environmentally sound technologies and renewable sources of energy and natural resources;

7. 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 EPML is the principal piece of legislation covering environmental protection and management in Liberia in parallel to the EPA Act. The 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 Environment Protection and Management Law (EPML, 2003b) defines the specific requirements for performing an ESIA and other measures required to protect the environment in Liberia. Further details of the ESIA process are included in Section 2.3 of this chapter.

A summary of the key sections of the Environment Protection and Management Law are presented in Table 2-4.

Table 2-4 Key Sections of the EPML

Section	Description
Section 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.
Section 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; • A comprehensive mitigation plan in accordance with Section 15 of this law.
Section 13	Requires the preparation of an environmental impact study.
Section 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.
Section 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.
Section 25	The EPA is responsible for carrying out periodic environmental audits of activities or projects likely to have adverse effects on the environment.
Section 58	An "Effluent Discharge License" must be obtained from the EPA for any type of effluence discharge into the sewage system, also in case of operation of a sewage system. This license does not exceed one year.
Section 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 entails the party who is generating the waste to take up waste management measures such as treatment, determination or recycling and remediation.
Section 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.
Section 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
Section 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, tunneling 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.
Section 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.
Sections 83-85	Provide for 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.
Section 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.
Section 92	Allows the party to request the Agency to reconsider that order (Section 91) by giving reasons in writing within the same period.
Section 107	States that non-compliance with the restoration order convicts the responsible party to imprisonment and/or a fine.

The project, matter of this ESIA, consists in the rehabilitation of a 40 km section of a road, which falls under the "Building and Civil Engineering Industries" category in Annex I of the EPML. Therefore, the project proponent is required to apply the following obligations of the EPML:

1. the project proponent should submit an application for an environmental impact assessment license, on a prescribed form addressed to the County Environmental Officer of the EPA;

2. the project proponent should publish a notice of intent, which shall state all information necessary for a stakeholder or interested party to identify its interest in the proposed project or activity.

3. the project proponent should submit to the EPA and the relevant Line Ministry a project brief.

4. After review of the Project Brief with the relevant Line Ministries, the EPA evaluates the extent of the project's impacts and then may require the project proponent to prepare an environmental review, an environmental impact study and/or an environmental impact statement. The project proponent is then responsible for the

timely preparation, as well as preparation costs, of the required documents in accordance with all procedures and guidelines prescribed by the EPA.

5. Prior to preparing an environmental review, impact study or impact statement, the project proponent shall conduct public consultations to be termed as "scoping".
6. The project proponent should take appropriate measures to seek the views of the people who may be affected by the project during the study.
7. The project proponent should submit to the agency a scoping report.
8. Where the EPA determines that a full-scale environmental impact assessment should be undertaken, the project proponent should submit to the agency through the County Environment Officer an environmental impact statement on the completion of the environmental impact study.
9. The environmental impact statement should be accompanied by a report containing a non-technical summary of the main findings of the study; and ten copies to be disseminated to affected County and District environmental committees in the affected areas. The environment impact statement is a public document and may be inspected by any person at the registry of the EPA.
10. The project proponent should also provide to the EPA an environmental mitigation plan.

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
- 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, conduct hearing 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

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/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

As the second tier of the local administration, the district level governance structure is headed by the Commissioner. His/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 and assisted by the General Town Chief and a traditional council of elders. At this level, the Clan Chief with support from the General Town Chief and the traditional council ensure peace and security and the protection of the rights of each citizen and resident within the clan.

The Clan and General Town Chief, with 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 national authorities, on the national level, and the Environmental and Social Committees, on the local level.

2.2.2.1 National Level

The Environmental Protection Agency (EPA) of Liberia 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 of Lands, Mines and Energy (MLME), the Ministry of Agriculture (MOA), the Forestry Development Authority (FDA). 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.

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.
Ministry of Lands, Mines and Energy (MLME)	• responsible for the development of mineral, water and energy resources in Liberia; • in charge of land surveys; • coordinates, administers and regulates the use of public and private lands in Liberia, including mineral resources through granting of operation licenses, and regulates beach sand mining; • conducts training and research on land rehabilitation together with the Ministry of Agriculture and the University of Liberia; • manages the energy provision through the National Energy Committee; and • manages water resources through the Liberian Hydrological Services.
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. • has a Sexual and Gender Based Violence Unit (SGBVU) mandated to monitor and report on cases of Sexual and Gender Based Violence (SGBV) throughout the country.

Institution	Key Functions
The Ministry of Justice Sexual and Gender Based Violence Unit (SGBVCU)	• 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 • oversees the prosecution of sexual offenses at Criminal Court "E" and at the regional justice and security hubs. The Ministry of Justice has assigned trained SGBV prosecutors in eight counties including Nimba, located in Sanniquellie.
The Ministry of Labor	• 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. • 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

2.2.2.2.1 County and District Environmental and Social Committees

To decentralize environmental management, the Environmental Protection Agency 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 fulfillment 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 in eight counties. The offices are staffed by Environmental Inspectors. 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

To provide for enforcement of environmental requirements and standards, the Environmental 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. This court is to hear and rule on complaints relating to the environment. 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 ENVIRONMENTAL IMPACT ASSESSMENT PROCESS IN LIBERIA

On April 7, 2017, the EPA as required by the Environment Protection and Management Law of Liberia developed administrative procedures for the preparation of ESIA to ensure effective environmental governance. This process is applied prior to issuance of environment permits.

An EIA Process Flow Chart has been included as Figure 2-1. The main steps in the process are:

- Prepare Application for Environmental Impact License
- Prepare Notice of Intent (NOI)
- Submit Project Brief (allow 14 working days for EPA review and feedback)
- Conduct Scoping Process:
    1. Publish NOI in Media
    2. Prepare Terms of Reference (TOR)
    3. Conduct Meetings with EPA Environmental Committee and District Environmental Committees, as needed.
    4. Conduct Public Meetings with Potentially Affected Communities
    5. Submit Scoping Report to EPA

- Prepare Environmental Review
- Obtain EPA Approval of TOR and Environmental Review
- Prepare Environmental Impact Study and Report (included in EIA)
- Prepare Environmental Impact Statement (EIS) (included in EIA)
- Develop Comprehensive Environmental Mitigation Plan and Implementation Strategy (included in EIA)
- Agency Review of EIA (within 3 months)
- Public Consultation on EIA (within first 30 days of 3 months)
- Public Hearings (EPA to decide whether to hold these)
- Relevant Line Ministries Comment on EIA
- Review by EPA Environmental Assessment Committee
- Approval or Rejection by EPA (within 3 months of receiving EIA)

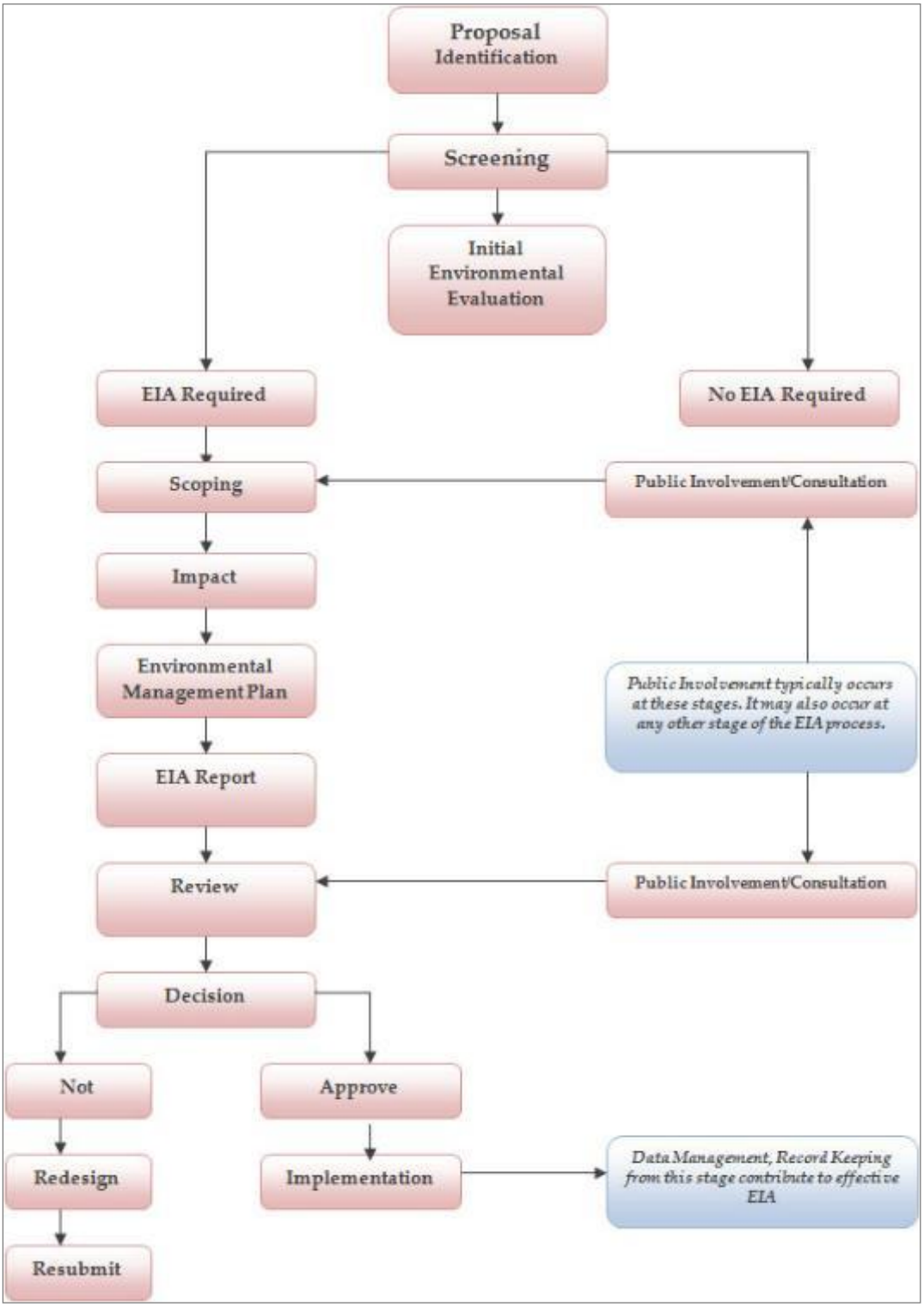


Figure 2-1 EIA process in Liberia

2.3.1 Public Consultation Requirements of the EIA Process

Involvement of the public in the EIA commences with the launch of the EIA process and continues throughout its course. Detailed below are the different requirements of the public involvement throughout the EIA process:

1. After the submission of an application for an environmental impact assessment permit, the project proponent should publish a "notice of intent" that states the information that may be necessary to allow the stakeholders or any interested party to identify their interest in the proposed project or activity. This information should include: the nature of the project, its related activities, its timeframe and its site of operation and the area that may be impacted.

2. Before preparing the EIA document, the project proponent should conduct public consultations with the potential affected stakeholders. This procedure is called the "scoping process" which aims to: 1) inform the stakeholders about the project's details, its potential impacts on the physical, biological and socio-economic environments, and the mitigation measures that can be taken in order to minimize these impacts, and 2) get the stakeholders' input on the various related issues. By achieving this, the scoping process is also a guiding tool for the project proponent and its consultants. It helps them in identifying the project's impacts, mitigation measures and alternatives, which will form the essential part of the EIA document. The scoping process consists of publishing the project's details in the affected district's media, holding public meetings to consult directly with the affected communities and stakeholders, and incorporating the views of these stakeholders in the scoping report which is submitted to the EPA.

3. On the completion of the EIA study report, the public is invited again to participate in the EIA review through public consultation meetings. The public's views on the EIA are taken into consideration by the EPA, when deciding about approving or rejecting the project.

4. In some cases, the EPA also decides to hold a public hearing about the project in order to fortify the public participation. These cases include but are not limited to requests by the public for a public hearing, controversy about the project or expiry of the period stipulated for receipt of comments.

In accordance with the above requirements, public consultation meetings are carried out. A total of twelve meetings are being held in the city of Tappita and the larger and smaller towns along the Tappita-Toe Town road. Records and results of these meeting will be included in the final ESIA report.

2.4 NATIONAL ENVIRONMENTAL QUALITY STANDARDS

Several environmental quality standards are partly prepared by EPA. Some of these environmental quality standards that may be relevant for this project are: 1) Air Quality Standards; 2) Water Quality Standards; 3) Noise Level Standards; and 4) Waste Management Standards.

Air quality standards are not complete for ambient air. They specify the tolerance limits of air pollutants in industrial areas, residential, rural and other areas, and controlled areas for different time durations (e.g. annual average, monthly average, daily average, one-hour peak, instant peak, etc.). The pollutants covered are sulphur oxides (SOx), nitrogen oxides (NOx), nitrogen dioxide, suspended particulate matter (SPM), respirable particulate matter (RPM), lead (Pb), carbon monoxide (CO)/ carbon dioxide (CO_2), and ozone. Residential, rural and other area tolerance limits are almost fully specified for all pollutants, while those for industrial areas and controlled areas are still incomplete. In addition, tolerance limits for hydrocarbons (HC) and volatile organic compounds (VOC) are missing for all three areas. Existing ambient air quality Standards are given in Table 2-6.

Updated water quality standards developed by the EPA are still in the draft form, dating to 2018. These standards are not comprehensive and incomplete. Relevant available water quality standards are presented in Table 2-7 and Table 2-8. These include standards for domestic and recreational waters. These standards exclude drinking water. However, drinking water standards are covered by the Ministry of Health's water standards, presented in Table 2-9.

Noise level standards are complete for many environments. Relevant noise standards are presented in Table 2-10, Table 2-11, Table 2-12, Table 2-13, Table 2-14 and Table 2-15. Other noise standards and pollution control measures can be found in the Environment Protection and Management Law- Noise Pollution Control and Standards Regulations, 2017.

Table 2-6 Ambient Air Quality Tolerance Limits (Environment Protection and Management Law- Air Quality & Standards Regulations, 2009)

Pollutant	Time weighted Average	Industrial area	Residential, Rural & Other area	Controlled areas***
Sulphur oxides (SO_x)	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	
	Month Average			
	24 Hours		*0.048 ppm /125* µg/m³	
	One Hour			
	Instant Peak		*500* µg/m³	
	Instant Peak (10 min)		*0.191 ppm*	
Oxides of Nitrogen (NO_x)	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*	
	Month 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*	
	Month 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
	Mg/Kg			
	Annual Average****		100 µg/m³	
	24 hours***		180 µg/m³	
Suspended Particulate matter (<10 µg/m³) (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
	Month 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***			
VOC	*24 hours***			
Ozone	*1-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.

Table 2-7 Liberian water quality standards for domestic water (Water Quality Regulations of Liberia, 2018-DRAFT)

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

Table 2-8 Liberian water quality standards for recreational water (Water Quality Regulations of Liberia, 2018-DRAFT)

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

Table 2-9 Liberian Drinking 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	mg Cl/l	350	≤ 250.0	≤ 350.0	≤ 450.0
Sulphate	mg SO_4/l	250	≤ 150.0	≤ 200.0	≤ 250.0
Hardness	$CaCO_3$ mg/l	100-500	≤ 190.0	≤ 300.0	≤ 600.0
Iron Total	Fe mg/l	0.1	≤ 0.1	≤ 1.5	≤ 2.0
Manganese	Mn mg/l	0.1	≤ 0.1	≤ 0.3	≤ 0.8
Zinc Total	Zn mg/l	5	≤ 1.0	≤ 2.0	≤ 5.0
Coliform Bacteria	n/ml	0	0	0	≤ 5
Bacteria Total	n/ml	0	0	≤ 10	≤ 50
Dissolved Substance	mg/l	500	≤ 500.0	≤ 1000.0	≤ 1200.0
Suspended Solids	mg/l	-	≤ 10.0	≤ 30.0	≤ 50.0
Ammonia	mg NH_4/l	0.5	≤ 1.0	≤ 3.0	≤ 6.0
Nitrate	mg NO_3/l	50	≤ 40.0	≤ 60.0	≤ 80.0
Nitrite	mg NO_2/l	-	≤ 0.1	≤ 0.5	≤ 1.0
Phosphate	mg PO_4/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	≤ 0.1
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

Parameter	Unit	WHO	Class I	Class II	Class III
KEY					
mg	Milligram				
L	Liter				
ml	Milliliter				
n	Count				
n.d.	non detectable				
Water Classification	**Water can be used as**				
Class I	Drinking water for the population, Water Supply for industry requiring drinking water.				
Class II	For Fisheries, Cultivated fisheries, Organized public bath, Recreational water sports.				
Class III	Industry supply except for industry requiring drinking water, irrigation or agricultural land.				
Prepared for the Government of Liberia by UN Department of Technical Cooperation for UNDP New York 1987					

Table 2-10 Maximum Permissible Noise Levels for General Environment (Environment Protection and Management Law- Noise Pollution Control & Standards Regulations, 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: use duration ***Day: 6.00 a.m. 10.00 p.m.*** ***Night: 10.00 p.m. 6.00 a.m.*** ***The time frame takes into consideration human activity***		

Table 2-11 Maximum Permissible Noise Levels (Continuous or intermittent noise) from a Factory or Workshop (Environment Protection and Management Law- Noise Pollution Control & Standards Regulations, 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)***		

Table 2-12 Maximum Permissible Noise Levels for Impact or Impulsive Noise (Environment Protection and Management Law- Noise Pollution Control & Standards Regulations, 2017)

Sound Level dB (A) (Lmax)	Permitted number of Impulses or Impacts per day
140	100
130	1,000
120	10,000

Table 2-13 Maximum Permissible Noise Levels for Construction Sites (Environment Protection and Management Law- Noise Pollution Control & Standards Regulations, 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. 10.00 p.m.*** ***Night: 10.00 p.m. 6.00 a.m.*** ***The time frame takes into consideration human activity***		

Table 2-14 Maximum Permissible Noise Levels for Accelerating Vehicles (adapted from Environment Protection and Management Law- Noise Pollution Control & Standards Regulations, 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 tones	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

Table 2-15 Maximum Permissible Noise Levels for Residential & Commercial Areas (Environment Protection and Management Law- Noise Pollution Control & Standards Regulations, 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)

2.5 RATIFIED MULTILATERAL ENVIRONMENTAL AND SOCIAL AGREEMENTS (MEAS) APPLICABLE TO THE PROJECT

Relevant international treaties and conventions to which Liberia is a signatory are laid out in Table 2-16.

Table 2-16 International Environmental Conventions

Name of Convention	*Liberia Date of Ratification*	*Relevance to the Project*
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (UNEP, 1979a)	9 June 1981	The project will improve access to parts of Liberia where CITES species can occur.
United Nations Convention to Combat Desertification (UN, 1996)	2 March 1998	Vegetation clearing is anticipated for the project.
Convention on Biological Diversity (UN, 1992a)	8 November 2000	The project will improve access to parts of Liberia with biodiversity importance.
Convention Concerning the Protection of the World's Cultural and Natural Heritage (UNESCO, 1972)	23 March 2002	Potential occurrence of culturally important resources in areas of vegetation clearing and material sourcing.
Stockholm Convention on Persistent Organic Pollutants (UNEP, 2001)	23 May 2002	Potential use of insecticides and pesticides during the project activities.
United Nations Framework Convention on Climate Change (UN, 1992b)	5 November 2002	The project will result in increased traffic in the region and therefore increased greenhouse gas emissions.
Paris Agreement (UN, 2018)	27 August 2018	
International Covenant on Economic, Social and Cultural Rights (ICESCR) (UN, 1976)	22 September 2004	The project is expected to affect the livelihoods of local communities as well implicate a good amount of local labour force.
Convention on the Conservation of Migratory Species of Wild Animals (UNEP, 1979b)	1 December 2004	Potential occurrence of terrestrial and avian migratory species within the project area.
Revised African Convention on the Conservation of Nature and Natural Resources (Maputo Convention) (OAU, 2003)	23 February 2014	The project will improve access to parts of Liberia with conservation value.
Convention for the Protection of the Ozone Layer (Vienna Convention) (UN, 1985)	15 January 1996	Potential use of fire extinguishers, refrigerants and soil fumigants.
Montreal Protocol on Substances that Deplete the Ozone Layer	15 January 1996	
Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer	30 November 2004	

2.6 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 obliged states to respect, protect and fulfill 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 2-17 presents the legal and safeguard provisions that are in place to address this issue.

Table 2-17 Provisions Related to GBV in Liberia

Category	Provisions
International Treaties	• The International Covenant on Civil and Political Rights (ICCPR) (2004); • the International Covenant on Economic, Social and Cultural Rights (ICESCR) (2004); • the Convention against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment (CAT) (1993); • the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW) (1984); • the Convention on the Rights of the Child (CRC) (1990); • the Convention on the Rights of Persons with Disabilities (CRPD) (2012); and • the International Convention on the Elimination of All Forms of Racial Discrimination (1976).
Regional Treaties	• The African Charter on Human and Peoples' Rights (ACHPR) (1982); • the African Charter on the Rights and Welfare of the Child (ACRWC) (2007); and • the Protocol to the ACHPR on the Rights of Women in Africa (the "Maputo Protocol") (2007).
National Policies	• The National Action Plan for the Implementation of United Nations Security Council Resolution 1325 (2009); • the 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[4]; • the National Plan of Action for the Prevention and Management of Gender Based Violence in Liberia (2011-2015); • the National Gender Policy (2012); • the 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[5]; • the 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[6]; • the National Human Rights Action Plan of Liberia (2013), which incorporates recommendations regarding SGBV received during the UPR process; and • the third Joint Program of the Government of Liberia and the United Nations on SGBV and harmful traditional practices, launched in 2016[7].

[4] Ministry of Health and Social Welfare, National Sexual and Reproductive Health Policy, at 9 (2010).
[5] Republic of Liberia, Towards a Reconciled, Peaceful, and Prosperous Liberia: A Strategic Roadmap for National Healing, Peacebuilding, and Reconciliation 2012-2030 (2012) [commonly referred to as the "Reconciliation Roadmap"].
[6] Ministry of Planning and Economic Affairs, Agenda for Transformation: Steps Toward Liberia RISING 2030, at 119-22 (2012).
[7] This programme has a budget of US$36 million to implement its mandate of preventing and responding to SGBV from 2016 to 2020.

2.7 WORD BANK REQUIREMENTS

The project is prepared under the World Bank Environmental and Social Framework (ESF) which requires Borrowers to comply with Ten Environmental and Social Standards (ESS). Eight of the ESS are preliminary assessed to be relevant to the project. These ESSs are summarized in Table 2-18. The rationales behind their relevance to the project is given and the ESS requirements that are applicable to the project are stipulated.

Table 2-18 ESSs triggered by the project

ESS	Rationale of relevance	Main applicable ESS requirements
ESS1 Assessment and Management of Environmental and Social Risks and Impacts	ESS 1 applies to all projects funded by the World Bank.	• The Borrower will assess, manage, and monitor the environmental and social risks and impacts of the project throughout the project life in a manner and within a time frame acceptable to the Bank. • The Borrower will: (a) Conduct an environmental and social assessment of the proposed project, including stakeholder engagement; (b) Undertake stakeholder engagement and disclose appropriate information in accordance with ESS10; (c) Develop an Environmental and Social Commitment Plan (ESCP), and implement all measures and actions set out in the legal agreement including the ESCP; and (d) Conduct monitoring and reporting on the environmental and social performance of the project against the ESSs. • Where the ESCP requires the Borrower to plan or take specific measures and actions over a specified time frame to avoid, minimize, reduce, or mitigate specific risks and impacts of the project, the Borrower will not carry out any activities in relation to the project that may cause material adverse environmental or social risks or impacts until the relevant plans, measures, or actions have been completed in accordance with the ESCP. • If the project comprises or includes existing facilities or existing activities that do not meet the requirements of the ESSs at the time of Board approval, the Borrower will adopt and implement measures satisfactory to the Bank so that specific aspects of such facilities and activities meet the requirements of the ESSs in accordance with the ESCP. • The project will apply the relevant requirements of the Environmental Health and Safety Guidelines (EHSGs). When host country requirements differ from the levels and measures presented in the EHSGs, the Borrower will be required to achieve or implement whichever is more stringent. If less stringent levels or measures than those provided in the EHSGs are appropriate in view of the Borrower's limited technical or financial constraints or other specific project circumstances, the Borrower will provide full and detailed justification for any proposed alternatives through the environmental and social assessment. • More in-depth requirements are stipulated in the ESS 1 Guidance Notes.
ESS 2 Labor and Working Conditions	The project is expected to engage a workforce through a road development contractor (contracted workers).	• The Borrower will develop and implement written labor management procedures applicable to the project. These procedures will address the way in which the Borrower will require third parties (contractors) to manage their workers in accordance with this ESS. • Project workers will be provided with information and documentation that is clear and understandable regarding their terms and conditions of employment, including their rights related to hours of work, wages, overtime, compensation, and benefits, as well as those arising from the requirements of this ESS. This information and documentation will be provided at the beginning of the working relationship, and when any material changes, to the terms or conditions of employment occur. • Project workers will be paid on a regular basis as required by national law and labor management procedures. Deductions from payment of wages will only be made as allowed by national law or the labor management procedures, and project workers will be informed of the conditions under which such deductions will be made. Project workers will be provided

ESS	Rationale of relevance	Main applicable ESS requirements
		with adequate periods of rest per week, annual holiday, and sick, maternity and family leave, as required by national law and labor management procedures. • Where required by national law or the labor management procedures, project workers will receive written notice of termination of employment and details of severance payments in a timely manner. • Decisions relating to the employment or treatment of project workers will not be made on the basis of personal characteristics unrelated to inherent job requirements. The employment of project workers will be based on the principle of equal opportunity and fair treatment, and there will be no discrimination with respect to any aspects of the employment relationship. The labor management procedures will set out measures to prevent and address harassment, intimidation, and/or exploitation. • The Borrower will provide appropriate measures of protection and assistance to address the vulnerabilities of project workers, including specific groups of workers, such as women, people with disabilities, migrant workers, and children of working age. • A child under the minimum age (14 unless national law specifies a higher age) will not be employed or engaged in connection with the project. The labor management procedures will specify the minimum age for employment or engagement in connection with the project, which will be the age of 14 unless national law specifies a higher age. • A child over the minimum age and under 18 will not be employed or engaged by the project in a manner that is likely to be hazardous, interfere with the child's education, or be harmful to the child's health or physical, mental, spiritual, moral, or social development. • If a child over the minimum age and under 18 will be employed or engaged by the project, an appropriate risk assessment is conducted prior to the work commencing; and the Borrower conducts regular monitoring of health, working conditions, hours of work, and the other requirements of this ESS. • Forced labor will not be used in connection with the project. • A grievance mechanism, proportionate to the nature and scale and the potential risks and impacts of the project, will be provided for all contracted workers to raise workplace concerns. Workers will be informed of the grievance mechanism at the time of recruitment and the measures put in place to protect them against reprisal for its use. Measures will be put in place to make the grievance mechanism easily accessible to all such project workers. It will be designed to address concerns promptly, using an understandable and transparent process that provides timely feedback to those concerned in a language they understand, without any retribution, and will operate in an independent and objective manner. • Measures relating to occupational health and safety (OHS) will be applied to the project and will take into account the General Environmental Health and Safety Guidelines (EHSGs), EHSGs for Toll Roads and other Good International Industry Practice (GIIP). The occupational health and safety measures applying to the project will be set out in the legal agreement and the Environmental and Social Commitment Plan (ESCP). • The OHS measures will be designed and implemented to address: (a) identification of potential hazards to project workers; (b) provision of preventive and protective measures; (c) training of project workers and maintenance of training records; (d)

ESS	Rationale of relevance	Main applicable ESS requirements
		documentation and reporting of occupational accidents, diseases and incidents; (e) emergency prevention and preparedness and response; and (f) remedies for adverse impacts such as occupational injuries, deaths, disability, and disease. • All parties who employ or engage project workers will develop and implement procedures to establish and maintain a safe working environment, including that workplaces, machinery, equipment, and processes under their control are safe and without risk to health. Such parties will actively collaborate and consult with project workers in promoting understanding, and methods for, implementation of OHS requirements, as well as in providing information to project workers, training on occupational safety and health, and provision of personal protective equipment without expense to the project workers. • Project workers have the right to report work situations that they believe are not safe or healthy and remove themselves from a work situation which they have reasonable justification to believe is dangerous to their life or health. • Project workers will be provided with facilities appropriate to the circumstances of their work, including access to canteens, hygiene facilities, and appropriate areas for rest. • A system for regular review of occupational safety and health performance and the working environment will be put in place and include identification of safety and health hazards and risks, implementation of effective methods for responding to identified hazards and risks, setting priorities for taking action, and evaluation of results. • The Borrower will make reasonable efforts to ascertain that third parties who engage contracted workers are legitimate and reliable entities and have in place labor management procedures applicable to the project that will allow them to operate in accordance with the requirements of this ESS. • The Borrower will establish procedures for managing and monitoring the performance of such third parties in relation to the requirements of this ESS. In addition, the Borrower will incorporate the requirements of this ESS into contractual agreements with such third parties, together with appropriate noncompliance remedies. The same will apply to subcontractors. • Contracted workers will have access to a grievance mechanism. In cases where the third party employing or engaging the workers is not able to provide a grievance mechanism to such workers, the Borrower will make the grievance mechanism and provide it to the contracted workers.
ESS 3 Resource Efficiency and Pollution Prevention and Management	The project is expected to use rocks, gravel, sand, water and energy. It is also projected to use pesticides, fuel, oils, bitumen that may pollute the soil or water resources in the	• The Borrower will consider ambient conditions and apply technically and financially feasible resource efficiency and pollution prevention measures in accordance with the mitigation hierarchy. The measures will be proportionate to the risks and impacts associated with the project and consistent with GIIP, in the first instance the Environmental Health and Safety Guidelines (EHSGs). • The Borrower will implement technically and financially feasible measures for improving efficient consumption of energy, water, and raw materials, as well as other resources. Such measures will integrate the principles of cleaner production into product design and production processes to conserve raw materials, energy, and water, as well as other resources. Where benchmarking data are available, the Borrower will make a comparison to establish the relative level of efficiency. • The Borrower will avoid the release of pollutants or, when avoidance is not feasible, minimize and control the concentration and mass flow of their release using the performance levels and measures specified in national law or the EHSGs, whichever

ESS	Rationale of relevance	Main applicable ESS requirements
	project area. The project will produce hazardous and non-hazardous waste material.	is most stringent. This applies to the release of pollutants to air, water, and land due to routine, nonroutine, and accidental circumstances, and with the potential for local, regional, and transboundary impacts. • More in-depth requirements on Resource Efficiency and Pollution Prevention and Management are stipulated in the ESS 3 Guidance Notes.
ESS 4 Community Health and Safety	The project is expected to affect the health and safety of the communities living in the project area.	• The Borrower will evaluate the risks and impacts of the project on the health and safety of the affected communities during the project life cycle, including vulnerable groups. The Borrower will identify risks and impacts and propose mitigation measures in accordance with the mitigation hierarchy. • More in- depth requirements are stipulated in the ESS 4 Guidance Notes.
ESS 5 Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	The project involves physical and economic displacement.	• The ESS 5 defines affected persons as persons: (a) Who have formal legal rights to land or assets; (b) Who do not have formal legal rights to land or assets, but have a claim to land or assets that is recognized or recognizable under national law or (c) Who have no recognizable legal right or claim to the land or assets they occupy or use. • The Borrower will demonstrate that involuntary land acquisition or restrictions on land use are limited to direct project requirements for clearly specified project purposes within a clearly specified period of time. The Borrower will consider feasible alternative project designs to avoid or minimize land acquisition or restrictions on land use, especially where this would result in physical or economic displacement, while balancing environmental, social, and financial costs and benefits, and paying particular attention to gender impacts and impacts on the poor and vulnerable. • When land acquisition or restrictions on land use (whether permanent or temporary) cannot be avoided, the Borrower will offer affected persons compensation at replacement cost, and other assistance as may be necessary to help them improve or at least restore their standards of living or livelihoods. • The Borrower will engage with affected communities, including host communities, through the process of stakeholder engagement described in ESS10. Decision-making processes related to resettlement and livelihood restoration will include options and alternatives from which affected persons may choose. • The consultation process should ensure that women's perspectives are obtained, and their interests factored into all aspects of resettlement planning and implementation. • The Borrower will ensure that a grievance mechanism for the project is in place, in accordance with ESS10 as early as possible in project development to address specific concerns about compensation, relocation, or livelihood restoration measures raised by displaced persons (or others) in a timely fashion. • Where land acquisition or restrictions on land use are unavoidable, the Borrower will, as part of the environmental and social assessment, conduct a census to identify the persons who will be affected by the project, to establish an inventory of land and assets to be affected, to determine who will be eligible for compensation and assistance,18 and to discourage ineligible persons, such as opportunistic settlers, from claiming benefits. The social assessment will also address the claims

ESS	Rationale of relevance	Main applicable ESS requirements
		of communities or groups who, for valid reasons, may not be present in the project area during the time of the census, such as seasonal resource users. In conjunction with the census, the Borrower will establish a cut-off date for eligibility. Information regarding the cut-off date will be well documented and will be disseminated throughout the project area at regular intervals in written and (as appropriate) non-written forms and in relevant local languages. This will include posted warnings that persons settling in the project area after the cut-off date may be subject to removal. • The Borrower will prepare a resettlement plan proportionate to the risks and impacts associated with the project: (a) For projects with minor land acquisition or restrictions on land use, as a result of which there will be no significant impact on incomes or livelihoods, the plan will establish eligibility criteria for affected persons, set out procedures and standards for compensation, and incorporate arrangements for consultations, monitoring, and addressing grievances; (b) For projects causing physical displacement, the plan will set out the additional measures relevant to relocation of affected persons; (c) For projects involving economic displacement with significant impacts on livelihoods or income generation, the plan will set out the additional measures relating to livelihood improvement or restoration; and (d) For projects that may impose changes in land use that restrict access to resources in legally designated parks or protected areas or other common property resources on which local people may depend for livelihood purposes, the plan will establish a participatory process for determining appropriate restrictions on use and set out the mitigation measures to address adverse impacts on livelihoods that may result from such restrictions. • More in- depth requirements are stipulated in the ESS 5 Guidance Notes.
ESS 6 Biodiversity Conservation and Sustainable Management of Living Natural Resources	The project is expected to cause direct or indirect loss or degradation of natural habitats.	• The Borrower will avoid adverse impacts on biodiversity and habitats. When avoidance of adverse impacts is not possible, the Borrower will implement measures to minimize adverse impacts and restore biodiversity in accordance with the mitigation hierarchy provided in ESS1 and with the requirements of this ESS. The Borrower will ensure that competent biodiversity expertise is utilized to conduct the environmental and social assessment and the verification of the effectiveness and feasibility of mitigation measures. Where significant risks and adverse impacts on biodiversity have been identified, the Borrower will develop and implement a Biodiversity Management Plan. • Through the environmental and social assessment, the Borrower will identify the potential and assess project-related risks to and impacts on habitats and the biodiversity that they support. • The Borrower's assessment will include characterization of baseline conditions to a degree that is proportional and specific to the anticipated risk and significance of impacts. Where further investigations are needed to evaluate the significance of potential impacts, the Borrower will carry out additional investigation and/or monitoring before undertaking any project-related activities, and before taking irrevocable decisions about project design that could cause significant adverse impacts to potentially affected habitats and the biodiversity that they support. • Where the environmental and social assessment has identified potential risks and impacts on biodiversity or habitats, the Borrower will manage those risks and impacts in accordance with the mitigation hierarchy and GIIP. • The ESS requires a differentiated risk management approach to habitats based on their sensitivity and values. This ESS

ESS	Rationale of relevance	Main applicable ESS requirements
		addresses all habitats, categorized as 'modified habitat', 'natural habitat', and 'critical habitat', along with 'legally protected and internationally and regionally recognized areas of biodiversity value' which may encompass habitat in any or all of these categories. *Modified habitats* are areas that may contain a large proportion of plant and/or animal species of nonnative origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition. Modified habitats may include, for example, areas managed for agriculture, forest plantations, reclaimed coastal zones, and reclaimed wetlands. • The ESS applies to areas of modified habitat that include significant biodiversity value, The Borrower will avoid or minimize impacts on such biodiversity and implement mitigation measures as appropriate. • *Natural habitats* are areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition. • If natural habitats are identified as part of the assessment, the Borrower will seek to avoid adverse impacts on them in accordance with the mitigation hierarchy. Where natural habitats have the potential to be adversely affected by the project, the Borrower will not implement any project-related activities unless: a) There are no technically and financially feasible alternatives; and b) Appropriate mitigation measures are put in place, in accordance with the mitigation hierarchy, to achieve no net loss and, where feasible, preferably a net gain of biodiversity over the long term. When residual impacts remain despite best efforts to avoid, minimize and mitigate impacts, and where appropriate and supported by relevant stakeholders, mitigation measures may include biodiversity offsets adhering to the principle of "like-for-like or better." • *Critical habitat* is defined as areas with high biodiversity importance or value, including: a) Habitat of significant importance to Critically Endangered or Endangered species, as listed in the IUCN Red List of threatened species or equivalent national approaches; b) Habitat of significant importance to endemic or restricted-range species; c) Habitat supporting globally or nationally significant concentrations of migratory or congregatory species; d) Highly threatened or unique ecosystems; and e) Ecological functions or characteristics that are needed to maintain the viability of the biodiversity values described above in (a) to (d). • In areas of critical habitat, the Borrower will not implement any project activities that have potential adverse impacts unless all of the following conditions are met: a) No other viable alternatives within the region exist for development of the project in habitats of lesser biodiversity value; b) All due process required under international obligations or national law that is a prerequisite to a country granting approval for project activities in or adjacent to a critical habitat has been complied with; c) The potential adverse impacts, or likelihood of such, on the habitat will not lead to measurable net reduction or negative change in those biodiversity values for which the critical habitat was designated;

ESS	Rationale of relevance	Main applicable ESS requirements
		d) The project is not anticipated to lead to a net reduction in the population13 of any Critically Endangered, Endangered, or restricted-range species, over a reasonable time period;14 e) The project will not involve significant conversion or significant degradation of critical habitats. In circumstances where the project involves new or renewed forestry or agricultural plantations, it will not convert or degrade any critical habitat; f) The project's mitigation strategy will be designed to achieve net gains of those biodiversity values for which the critical habitat was designated; and g) A robust and appropriately designed, long-term biodiversity monitoring and evaluation program aimed at assessing the status of the critical habitat is integrated into the Borrower's management program. Where a Borrower has satisfied the conditions (a) to (g), the project's mitigation strategy will be described in a Biodiversity Management Plan and set out in the legal agreement (including the ESCP). • More in- depth requirements are stipulated in the ESS 6 Guidance Notes.
ESS 8 **Cultural Heritage**	The project includes activities that involve large excavation works such as establishment of quarries and borrow pits as well as vegetation clearing and road construction. These activities might affect tangible and intangible cultural heritage and/or reveal undiscovered archeological elements.	• The Borrower will avoid impacts on cultural heritage. When avoidance of impacts is not possible, the Borrower will identify and implement measures to address impacts on cultural heritage in accordance with the mitigation hierarchy. Where appropriate, the Borrower will develop a Cultural Heritage Management Plan. • The Borrower will implement globally recognized practices for field-based study, documentation, and protection of cultural heritage in connection with the project, including by contractors and other third parties. • A chance finds procedure is a project-specific procedure which will be followed if previously unknown cultural heritage is encountered during project activities. It will be included in all contracts relating to construction of the project, including excavations, demolition, movement of earth, flooding, or other changes in the physical environment. • More in- depth requirements are stipulated in the ESS 8 Guidance Notes.
ESS 10 **Stakeholder Engagement and**	ESS 10 applies to all projects funded by the World Bank.	• The Borrower will engage with stakeholders throughout the project life cycle, commencing such engagement as early as possible in the project development process and in a time frame that enables meaningful consultations with stakeholders on project design. The nature, scope, and frequency of stakeholder engagement will be proportionate to the nature and scale of

ESS	Rationale of relevance	Main applicable ESS requirements
Information Disclosure		the project and its potential risks and impacts. • The Borrower will engage in meaningful consultations with all stakeholders. The Borrower will provide stakeholders with timely, relevant, understandable, and accessible information, and consult with them in a culturally appropriate manner, which is free of manipulation, interference, coercion, discrimination, and intimidation. • The process of stakeholder engagement will involve the following: (i) stakeholder identification and analysis; (ii) planning how the engagement with stakeholders will take place; (iii) disclosure of information; (iv) consultation with stakeholders; (v) addressing and responding to grievances; and (vi) reporting to stakeholders. • The Borrower will maintain and disclose as part of the environmental and social assessment, a documented record of stakeholder engagement, including a description of the stakeholders consulted, a summary of the feedback received, and a brief explanation of how the feedback was taken into account, or the reasons why it was not. • In consultation with the Bank, the Borrower will develop and implement a Stakeholder Engagement Plan (SEP) proportionate to the nature and scale of the project and its potential risks and impacts. A draft of the SEP will be disclosed as early as possible, and before project appraisal, and the Borrower will seek the views of stakeholders on the SEP, including on the identification of stakeholders and the proposals for future engagement. If significant changes are made to the SEP, the Borrower will disclose the updated SEP. • More in- depth requirements are stipulated in the ESS 10 Guidance Notes.

3 PROJECT DESCRIPTION

3.1 PROJECT DEVELOPMENT OBJECTIVE (PDO)

The Rural Economic Transformation Project (RETRAP) development objective is to increase the income of rural poor households in Liberia through sustainable agricultural livelihood enhancements and improved rural access and agricultural marketing infrastructure services. The rehabilitation of the 40 km long Tappita-Toe Town road aims at fulfilling the development objective part related to the improvement of road infrastructure to provide better access to markets for the farmers of south-eastern Liberia.

3.2 PROJECT COMPONENTS

The rehabilitation and improvement of the Tappita-Toe Town (40 Km) Road, matter of this ESIA, constitutes sub-component 3.1: Roads of the RETRAP, which has four components. These are:

- Component 1: Improving the enabling environment for agribusiness development;
- Component 2: Enhancing competitiveness and market access through productive alliances;
- Component 3: Agro-logistics and infrastructure investments; and
- Component 4: Project coordination and management and contingency emergency response.

Sub-component 3.1 (Roads) of RETRAP will rehabilitate a 40 km section from Tappita in Nimba County to Toe Town in Grand Gedeh County of the 112 km long Tappita - Zwedru road, through a Design-Build Transfer Works Contract. The 40 km section proposed to be rehabilitated will extend the planned road works along the Ganta-Tappita road under the South Eastern Corridor Road Asset Management Project (SECRAMP), in Nimba County.

3.3 PROJECT BENEFICIARIES

The project beneficiaries will include small holder farmers within the targeted counties, agribusinesses and business development services enterprises that have good business links to smallholder farmers in the targeted counties, residents living along the 40 km of the Tappita – Toe Town road as well as road transport users from all over Liberia and the neighboring countries who will benefit from access to an all-weather paved road. This includes households in immediately adjacent areas and those in towns and cities connected to the road, transport service providers, including trucking companies, who will see substantial cost reductions and

improved travel time, and businesses and institutions that need reliable road access, including some outside the project area.

During the construction phase, local residents will benefit from employment opportunities, albeit mostly for unskilled workers and heavy-duty vehicle operators. There will however be some on-the-job training opportunities for construction workers at a variety of skill levels.

The immediate effect of the project on the transport sector will be in several areas, including an increase in traffic volume, changes in modal mix and freight composition, a reduction of transport costs, and a reduction in seasonal variations of traffic.

These travel and transport changes will ease the access of the local farmers to the agricultural markets, and of the agribusinesses to the local farmers, and improve the local residents' mobility for accessing social and economic services and facilities. It is expected that there will be a wider development impact on the local economy. Furthermore, the above impacts will affect most households living along the road corridors to varying degrees. Ultimately, the project will improve household welfare and reduce poverty.

3.4 PROJECT LOCATION

The Tappita-Toe Town road is located within Nimba and Grand Gedeh Counties. The 40 km road, subject of this ESIA, begins in the city of Tappita and runs towards the city of Toe Town (Figure 3-1). The road passes through 18 settlements (Table 3-1). Major settlements crossed by the road are: Tappita City, Toe Town and Dialah. Two districts of Nimba County and Grand Gedeh are therefore covered by the road. These are: Doe district and B'hai District.

Table 3-1 List of settlements along the Tappita-Toe Town road

Settlement	Coordinates		District	County
	X	Y		
Tappita	515278	717552	Doe	Nimba
Gibson	520213	717481	Doe	Nimba
Driver's Camp	521942	717184	Doe	Nimba
Bitter Ball	523705	716752	Doe	Nimba
Doeyelay	526566	717084	Doe	Nimba
Plantain	529293	716618	Doe	Nimba
Fromgio	529622	716034	Doe	Nimba
Gwin (Gwein's)	530482	715777	Doe	Nimba
Gbolordeala (Dialah)	533128	715822	Doe	Nimba
CD	536682	714630	Doe	Nimba
Nanlan	538252	714324	Doe	Nimba
Menlah	538932	713724	Doe	Nimba
Farnlay	540284	712226	Doe	Nimba
B'hai	541981	711918	B'hai	Grand Gedeh
Bah	541252	711854	B'hai	Grand Gedeh

Settlement	Coordinates		District	County
	X	Y		
Kpelleh	544262	711324	B'hai	Grand Gedeh
Poker (Pokar)	546900	711211	B'hai	Grand Gedeh
Toe Town	548959	708231	B'hai	Grand Gedeh

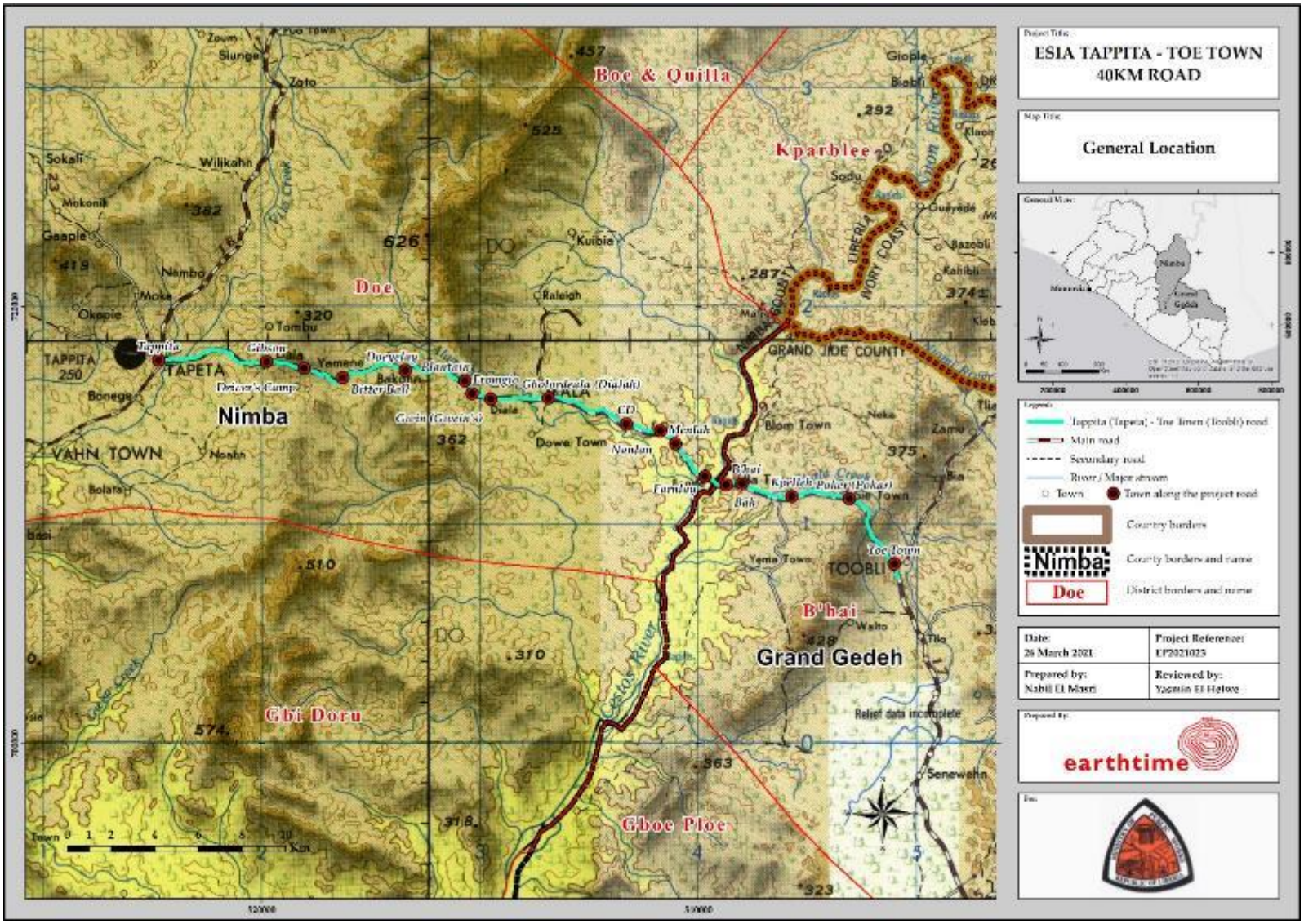


Figure 3-1 Map showing the general location of the route from Tappita to Toe Town

3.5 PROJECT DURATION

The project is expected to extend for 3 years: 2 years for design and construction and another year of defected liability period. The project is supposed to kick-off before the end of 2021.

3.6 EXISTING ROAD CONDITIONS

The existing road connecting Tappita to Toe Town is mostly a gravel single carriageway with widths varying from 6.5 to 7.4 meters in most places. Short sections within some of the villages are surfaced. The surface condition of the road varies by section but is poor overall and extremely difficult to transit during the rainy season. Most of the gravel material has been eroded, exposing the weak underlying subgrade which gives rise to impassable sections for most vehicles during the rainy season.

With limited funding for maintenance, the immediate response has largely consisted of the removal of unsuitable material and grading activities in critical zones. Over the years, this has led to significant sections being graded to below the original ground level, which entrenches the cycle of ponding on the carriageway, significant rutting under truck loads and further deterioration of the road. Typical conditions during the rainy season are shown in Figure 3-2.

Traffic levels have an Average Annual Daily Traffic (AADT) during dry season were measured in 2017 (base year) to be 5,579 in the Tappita-Toe Town (West) and 3,052 in the Tappita- Toe Town (east). This traffic for all sections and vehicle classes will naturally escalate in the future. With the project road being unsurfaced, traffic volumes are low due to poor conditions of the road corridor and road usage is very limited during the rainy season as seen in Figure 3-2.

The road crosses several swampy areas, road edges are overgrown and functional side drains were not observed.

There are six bridges from Tappita to Toe Town (Table 3-2). The bridges have either steel or concrete beams and the condition varies. There are no signs of excessive damming or overtopping at the bridge locations. Continuous grading of the road has lowered many of the approaches to bridges to a level below the deck.

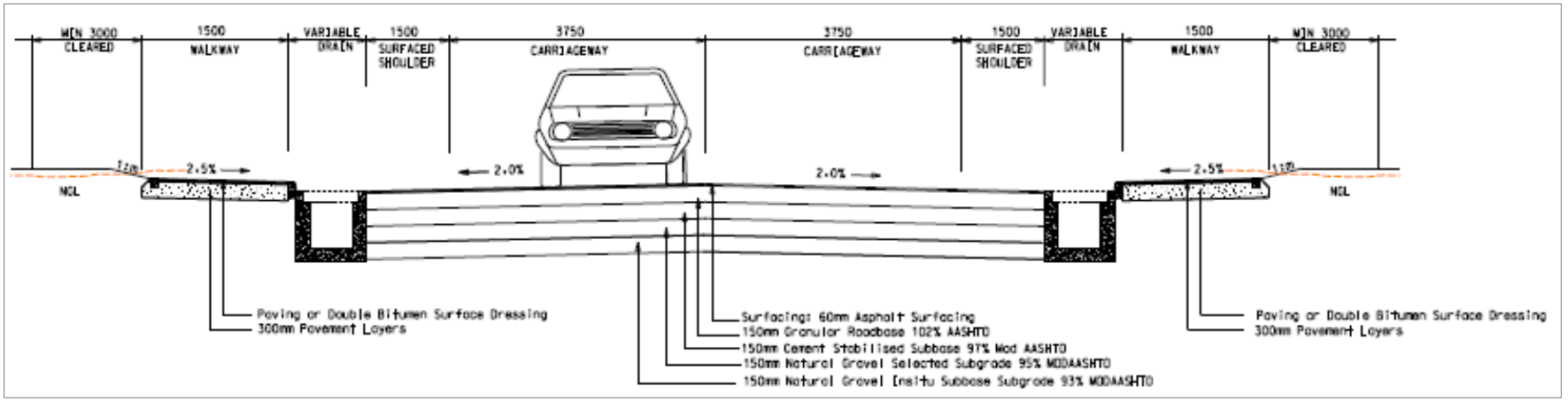
Figure 3-2 Typical development of critical sections along the Road in the rainy season (Source: Earthtime, September 2018)

Table 3-2 Existing Bridges along Tappita-Toe Town (Source: Final Conceptual Design Report, January 2020)

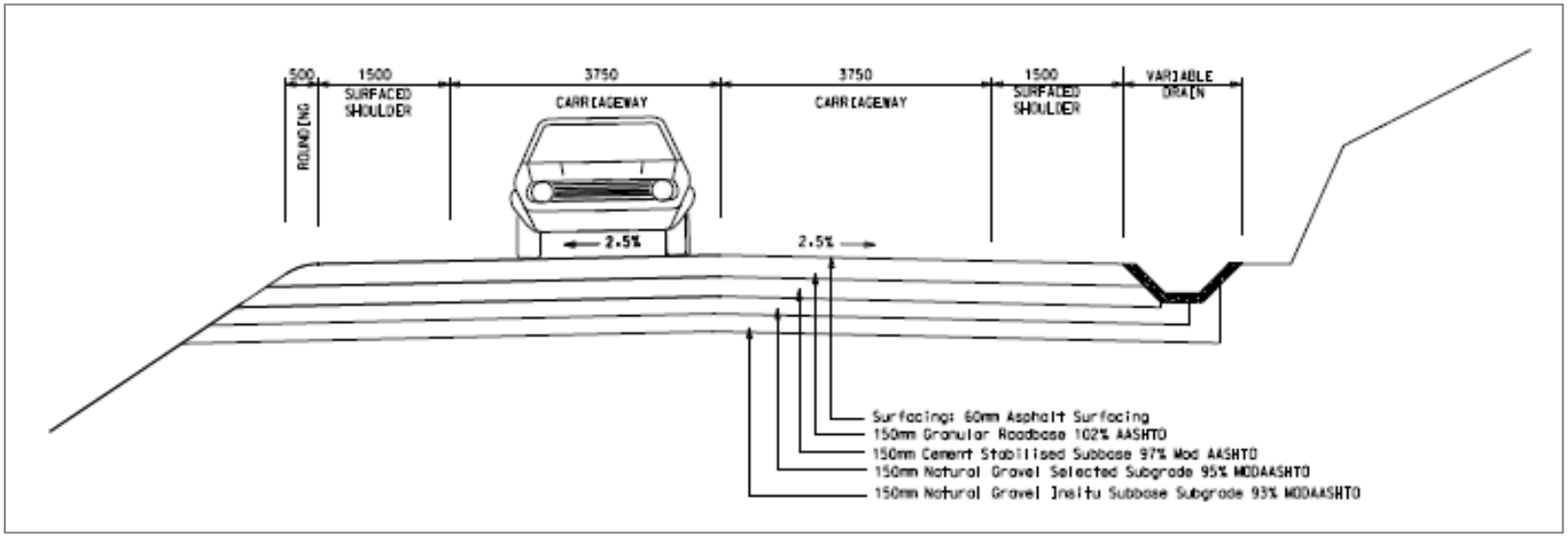
Tappita to Toe Town – Existing Bridges		
No.	**Chainage**	**Size**
1	0+115	7000x18000
2	18+550	9000x15650
3	25+815	9000x19450
4	28+375	9000x155900
5	31+315	9000x31350
6	36+810	9000x12500

3.7 IMPROVED ROAD DESIGN

The rehabilitated road would consist of a single carriageway of two, 3.75-meter-wide lanes and 1.5-meter paved shoulders. In the urban zones, the road section will have 1.5-meter-wide block-paved pedestrian walkways on both sides with covered concrete side drains, as required. The pavement will have a 20-year design life. Figure 3-3 shows the typical cross-sections of the road design in towns and villages, and in rural areas. The project also includes the establishment of quarries, borrow pits, storage areas and camp sites in the area.



(a)



(b)

Figure 3-3 Typical cross section in (a) towns/villages and (b) rural areas (Source: Final Conceptual Design Report, January 2020)

3.8 CONSTRUCTION PHASE INFRASTRUCTURE

3.8.1 Road Infrastructure

3.8.1.1 Right of Way (RoW)

It is intended that the road routing and design will follow the existing RoW set by the Ministry of Public Works (MPW). However, in urban areas, the road reserve will be reduced from 22.8 to 15.2 meters (i.e., 75 to 50 feet) from either side of the road centerline. The reduction in the carriageway in urban areas is done to reduce project impacts on assets that are within the standard 45.7-meter (i.e. 150-foot) legal RoW. In rural areas, the RoW will remain 22.8 meters (i.e., 75 feet) on either side of the road centerline. In both rural and urban areas, the RoW includes drainage and other roadside structures. Realignment of the RoW will be minimized as much as possible. It is expected that there will be no major road realignment except where it is extremely necessary. In practice this would only take place in locations where it is necessary to improve the safety of poor sections of horizontal or vertical alignment, or where a new bridge or culvert has to be located off the existing alignment for constructability reasons. If there are realignments, the impacts will be assessed, and the RAP will be updated.

The road corridor is within the tropical rainforest area. However, much of the forest on both sides of the road has been replaced with secondary vegetation resulting from forest clearance for agricultural purposes and other form of forest exploitation. The present vegetation is composed of rubber trees, open grass vegetation, farm plots, plantain, banana, maize, cassava, pineapple, shrubby vegetation, and numerous palm trees.

The extent of clearance of forest trees – native, naturally growing trees rather than planted crop trees such as rubber – is not yet determined. This is because there has not yet been a detailed tree survey of the road right of way in connection with the final design for the upgraded road, and because the locations of land take for ancillary infrastructure (i.e. camps, quarries, borrow areas, etc.) are not yet known. Forest trees might need to be felled for a number of reasons: (a) to clear areas in the right of way that have never been cleared before, but now require it for the upgrading of the road; (b) to clear land for ancillary infrastructure, as described below in section 3.8.2; and (c) to clear land for access tracks to ancillary infrastructure. This matter is particularly addressed in the biological baseline (section 6.2), in the chapters covering impact assessment and mitigation (chapters 7, 8 and 9, where it is covered under the ecological impact series) and in the Environmental and Social Management Plan (section 9.7.2).

3.8.1.2 Pavement

The road upgrade encompasses upgrading the entire road section from the current surfacing to bituminous standard and will be an asphalt mix on a granular base. The pavement design in explained in Table 3-2 is considered for 20-year design life:

Table 3-2 Pavement layering design (Source: Final Conceptual Design Report, January 2020)

Layer	Thickness (mm)
Asphalt, medium grade, wearing course	60
Crushed stone base	150
Stabilized gravel subbase	150
Natural gravel subgrade	150
Natural gravel fill or in-situ subgrade	150

3.8.1.3 Bridges

The reconstructed or new bridges will be designed with reinforced concrete and will have a 7.5 m wide carriageway and a 1.5 m wide pedestrian sidewalk along both sides of the carriageway, with guardrails. Guardrails between the sidewalks and the carriageway will be provided to protect pedestrians. The impact of wind, water currents and seismic forces will also be considered. The bridge deck will be supported on solid concrete abutments or reinforced concrete pillars. The decks will be provided with vertical drainage spouts covered with heavy-duty cast iron gratings.

The side slopes of the approach road embankment in both directions will be protected with grouted riprap of a minimum size of 300 x 300 mm and 150 mm thick over a 150 mm gravel blanket for a length of 30 meters from the abutment. Similar measures will be taken for quadrants. Special river training treatments will be done for bridge approaches. Weep holes of 150 x 150 mm will be provided at staggered intervals of 1500 mm c/c and protected with crushed aggregate filter at the back. The clear vent way and the fatigue resistance layer (FRL) will be not less than the existing.

3.8.1.4 Drainage system

The road rehabilitation will involve several drainage structures for intercepting, removing and controlling water entering the road structure. These consist of cross drainage, longitudinal drainage and subsoil drainage.

For cross drainage system, the minor drainage structure will consist of concrete pipe culverts with a minimum size of culverts of 900mm diameter, mainly for cleaning purposes.

Longitudinal drainages are side drains along cutting that will serve as cut-off drains for surface water. Water flow velocity in the drainages are calculated to be very high, so they will be concrete lined. Fill toe line protection by means of cement grouted stone pitching will be

required where the anticipated water flow velocity along the fill toe line is very high. The erosion potential of the soil in which the side drain is excavated or where the fill toe line is located will ultimately govern the protection required. Hydraulic evaluation of culverts will be carried out on the assumption that inlet control conditions will prevail. Precast concrete or rectangular box culverts can be used for drainage crossings.

Subsoil drainages are normally installed where the ground water could adversely influence the road pavement structure, its performance or its durability. Due care must be taken during the material investigations to determine whether ground water is present, especially during the wet season. Exact position and extent of the subsoil drainage systems will be determined by the contractor during the detail design phase of the project. Subsoil drain outlets must be properly protected during construction to prevent rodents and other animals to inhabit the pipes and thus create blockages which in turn would lead to more frequent maintenance, and ultimately pavement failures.

The inlet and outlet of each drainage structure will be provided with wing walls and apron slabs. The standard design procedure will be adopted for the sizing and geometrical layout according to the computed flows.

3.8.1.5 Pedestrian Walkways

Pedestrian walkways will be constructed on both sides of the road in urban areas. These walkways will be 1.5 m wide (Figure 3-3). They will be paved with a 300-mm thick paving or double bitumen layer.

3.8.2 Ancillary Infrastructure

3.8.2.1 Diversions

During construction, diversions may be required. These diversions will ideally remain within the RoW. In sections where this will not be possible, traffic may have to be diverted temporarily across private land. In such cases, impacts should be evaluated, and mitigation measures and the RAP should be updated. For the purposes of the ESIA, and with the implementing contractor not selected, it is assumed that diversions will be needed along the entire road length for certain periods. In rural areas these must be within the right of way except where culverts are being reconstructed or steep terrain requires a wider deviation; in these cases, there will be additional measures in the RAP. In urban areas, diversions may be required around back roads, for which cases a range of impacts and consequent mitigation measures are identified as necessary and covered in the ESIA. The key stipulation for all diversions is the need to manage them carefully, for short durations only. The impacts and mitigation measures for the siting, use and closure of diversions are covered in Chapter 8 (Section 8.4).

3.8.2.2 Quarries and Borrow Pits

Quarries and borrow pits will be needed to provide the necessary materials for the construction works. Information on the numbers, designs and exact locations of these features is not yet available. Consequently, the ESIA estimates that there will be one quarry for the crushed stone and sand required in construction, and up to 8 borrow pits to obtain the gravels and engineering fills required in the road formation. It is possible that existing quarries could be used, but it is most likely that new quarries will be required. These will involve the creation of access, clearance of vegetation and soils, construction of working areas and storage facilities, drilling, blasting and crushing of rock, and the transportation of the products to the construction sites. All of these can have significant environmental impacts, and so the ESIA incorporates the likely impacts based on experience from other projects, and gives detailed guidance on the obligatory mitigation measures that must be followed during the siting, operation and subsequent rehabilitation of quarry sites. Borrow pits do not have such big impacts individually, but are more numerous. The impacts and mitigation measures for the siting, use and closure of these facilities are therefore also covered in Chapter 8 (Section 8.4).

3.8.2.3 Concrete Batching Plants and Hot Mixing Plants

Concrete batching and asphalt hot mixing plants will be needed to support the construction works. Again, information is not yet available on the numbers, designs and exact locations of these facilities. For the ESIA, it is assumed that the selected project implementation contractor will require one of each of these plants. Poorly sited or managed, they can create significant environmental impacts. For this reason, the ESIA incorporates the likely impacts based on experience from other projects, and gives detailed guidance on the obligatory mitigation measures that must be followed during the siting, operation and closure of the plants.

3.8.2.4 Storage Areas, Parking Lots and Workshops

The contractor will need to create areas for the storage and management of equipment (heavy machinery, vehicles, engines, etc.) as well as materials (paving material, lubricants, fuel, chemicals, etc.), explosives and solid waste. As with the other ancillary facilities, information on the number, design and exact locations of these areas is not yet available because the contractor has not been selected and there are no other established locations for these activities that can be designated on the road section. Pollution can be a significant problem where machines, fuels and lubricants are involved, and so special measures are essential to ensure that the environment and society are properly protected. The ESIA uses experience from other projects to identify the likely impacts and determine the mitigation measures that must be used to ensure that these facilities are safeguarded.

3.8.2.5 Camp Sites

As with the other ancillary facilities, the construction of temporary camps will be required to accommodate the project employees and provide offices for the management and administrative staff. Again, information on the number, design and exact locations of these areas is not yet available because the contractor has not yet been selected and there are no clearly definable locations. Apart from the risk of pollution, residential and work camps can have significant positive and negative impacts on the socio-economic environment. For this reason, the ESIA provides the necessary guidelines for the siting, operating and closing of camps, to ensure that the potential positive impacts are enhanced and the negative impacts mitigated.

3.9 PROJECT ACTIVITIES

The project activities will consist of a range of operations that are aimed at ensuring that the rehabilitation of the Tappita-Toe Town Road will be completed on time and will be operational and maintained as required. The main activities will occur in three different phases: Design Phase, Construction Phase, and Operation Phase.

This ESIA covers the works planned to be carried out during the Design and Construction Phases. The road operation and maintenance activities will be covered by the Environmental and Social Obligations in the Contractor Agreement.

3.9.1 Design Phase

The design phase includes the following activities:

- Surveying
- Geotechnical Investigations
- Design of pavements
- Design of other structures
- Design of camps

3.9.1.1 Topographical Survey

The cross section of the road for the entire width of the RoW or 50 meters, whichever is the greater, shall be taken at 20-meter intervals along the road centerline and along the centerline of all culverts, structures, etc. The line and level of the works will be at intervals of not more than 20 meters for the complete road prior to the commencement of construction and after the completion of asphalt works. Based on the survey data, the contractor will prepare a strip

plan, cross section, long section and plan of the road as it currently exists and as it is proposed, showing, amongst other things, the side slopes of embankments, drains, culverts, bridges, streams and rivers and their flow direction, and the carriageway, shoulder, gradient, cross fall and chainage.

3.9.1.2 Soil Survey

Samples of the existing sub-grade and soil from test pits along the RoW will be collected at intervals of 500 meters. The samples will be subjected to Atterberg limit tests, a sieve analysis and modified Proctor compaction tests and CBR tests. Parallel in situ testing by DCP, LWD or similar may be conducted. The Contractor will also identify borrow pits and quarries, collect samples, prepare log sheets that show the horizontal and vertical spread of useful materials and conduct the necessary laboratory tests in accordance with the AASHTO specifications to ascertain the quality and quantity of the soil. The contractor will also conduct the necessary geotechnical explorations at quarries and borrow pits for logging.

3.9.1.3 Geotechnical Investigation

This activity relates to the construction of new bridges and the location of drains and culverts.

For the new bridges, the location of the abutment will be pegged on site and one borehole drilled at each location extending beyond a depth of 5 meters below scour level and at least 3 meters into continuous hard strata where the standard penetration value is more than 50. If rock is encountered, rock core samples of at least 50 mm in diameter will be extracted for a further depth of 3 m. These samples will be subjected to petrographic and compression tests to determine the mineralogy and bearing capacity of the strata. Disturbed or undisturbed samples will be collected at depth intervals of 1.5 meters or earlier if the strata changes and will be subjected to such tests to determine soil classification as per the AASHTO and general characteristics such as LL, PI, organic content and bearing capacity. Standard penetration or similar tests shall be done at intervals of 1.5 meters.

For other locations, the contractor can conduct the necessary tests and investigations to obtain the information he needs to design the foundation. The current foundation will be inspected carefully to ascertain whether rehabilitation or reconstruction is required.

3.9.1.4 Design for Pavement

During this phase criteria such as the current traffic, growth rate, properties of the sub-grade and drainage among others are assessed along the road. The design for the sub-grade, sub-base and crushed aggregate base is provided. A strip plan that indicates the plan dimensions of the existing and proposed road, showing the locations and dimensions of the carriageway, shoulder, structures, streams, rivers, towns, villages and other related information is prepared.

3.9.1.5 Design for other structures

During this phase, design for the bridges, drains, culverts is provided according to specifications and final drawings for these structures are prepared.

3.9.1.6 Design of camps

During this phase, design for the camps is provided and a Camp Management Plan is prepared.

3.9.2 Construction Phase

During this phase, construction of the pavement and bridges, and installation of the drainage system, temporary camps, quarries, borrow pits, mixing and batching plants takes place. Activities can be described as follows:

1. Establishment, supply and construction of offices and residential premises, and provision of supplies;
2. Procurement and mobilization of equipment, vehicles and software;
3. Vegetation clearing along the RoW;
4. Earthworks: strengthening and widening of the embankment or cut formations;
5. Installation of borrow pits, quarries, crushers, hot mix plants, concrete batching and wash plants;
6. Construction and installation of culverts and drainage works;
7. Construction of the asphalt carriageway and shoulders;
8. Construction and rehabilitation of bridges: reinforcing concrete approach slabs for existing bridges, construction of guardrails over embankments and approaches to bridges, and construction of new bridges;
9. Desilting of existing drainage lines;
10. Slope protection;
11. Quadrant pitching;
12. Ancillary works such as road lane marking and installation of traffic sign boards.

It is anticipated that the construction phase will last approximately 2 years, however the timeframe for each of these activities is not yet defined.

For the purposes of the ESIA, it is assumed that all of the woody, shrubby and herbaceous vegetation in the RoW will be cleared; and that all of the drainage lines within the RoW will be desilted. It is on this basis that the impacts are assessed and the mitigation measures determined.

3.9.3 Operation and maintenance Phase

Upon completion of the road construction activities, operation and maintenance of the road will be carried out. Operations and maintenance activities are not within the scope of this ESIA; they will be covered by a separate ESIA and ESMP.

This phase should include inspection of the condition of the road and maintenance of emergent problems that might occur in the structure of the road. These include potholes, patching, pavement cracking, rutting and raveling, loose pavement edges, differences between the heights of shoulders and the pavement, and problems in the paved shoulders structure. Inspection is usually done visually and sometimes requires some measurements to be taken.

3.10 EQUIPMENT AND MATERIAL

3.10.1 Plants

The rehabilitation of the road will require the establishment of at least one asphalt mixing plant, one rock crushing and screening plant and one concrete batching plant. The ideal would be one plant situated at 20 km (middle point of the road) in order to decrease haulage distance to no more than 20 km. The production rates of each of the plants is given in Table 3-3 below.

Table 3-3 Plants

Plant type	Minimum Production rate
Asphalt Plant	250 tons per hour
Crushing and Screening Plant	200 tons per hour
Concrete Plant	50 cubic meter per hour (minimum batch size of 1 cubic meter)

3.10.2 Construction Equipment

Types and estimated numbers of construction equipment that will be used are described in Table 3-4.

Table 3-4 Construction equipment

Equipment/Plant Type & Characteristics	Minimum No. Required
Asphalt Paver (adjustable 3 – 7.5m width)	1
Breakdown Roller	1
PTR (Tire Roller)	1
Finish Roller	1
Front End Loader	1
Motor Grader	1
Excavator	1
Bulldozer	1
Pug Mill	1
Crane with minimum 20 tons Capacity	1
Dump truck	5
Tipper	5
Workshop	1
Tow – Truck	1
Ambulance	1

3.10.3 Testing and other equipment

Besides construction equipment, some equipment will be required for testing and other purposes. These include but are not limited to the items listed in Table 3-5.

Table 3-5 Testing equipment

Testing Equipment
1. Topographic equipment including Total Station, Auto Level, Tapes and accessories. 2. CBR Equipment 3. Dynamic Cone Penetrometer (DCP) 4. Casagrande Set (Atterberg Limits) 5. Soil Classification Equipment 6. Sieves and Granulometry Test Equipment 7. Proctor Equipment 8. Sand Replacement Equipment 9. Pycnometer
10. Marshall Equipment 11. Asphalt Penetration Equipment 12. Concrete Compression Machine 13. Abram's Slump cone and other Concrete Testing requirements 14. Material testing equipment required for quarries, asphalt, asphalt mixture, and aggregates 15. Falling Weight Deflectometer (FWD) 16. Roughness – IRI (International Roughness Index) measurement equipment

3.10.4 Materials

The main materials to be used for the project include, but are not limited to, the materials listed in Table 3-6.

Table 3-6 Materials

Materials
1. Cement 2. Steel rod, plates and bars 3. Crushed rocks, 4. Sand 5. Water 6. Diesel fuel and lubricants 7. Bitumen or asphalt 8. Wood for form works

3.11 WASTES

Information on the types and quantities of wastes expected to result from the different activities of this project, as well as the disposal measures planned for these wastes are described in Table 3-7. On the basis of these waste types, and using the scale of the project to estimate the volumes of waste that will be generated, the impacts are assessed and appropriate mitigation measures determined in this ESIA.

Table 3-7 Wastes expected to result from the project

Type of waste	Quantity	Planned management
Spoil overburden or topsoil wastes	Minor	Topsoil excavated will be mixed and spread on the road as a base for the pavement.
Bituminous Materials (Bitumen, asphalt and empty containers)	Minor	Empty containers of bitumen and asphalt will be cleaned and collected by authorized scrap dealers.
Municipal Waste	Approximately 300Kg/day, of which 175 Kg/day is biodegradable and 125 Kg/day is non-biodegradable	Solid waste will be collected by a solid waste collector certified by the EPA.
Hazardous Waste	Minor	Used oil from machine sets will be disposed as per the EPA guidelines.
Sewage sludge	Approximately 35 Kg/day	Sludge will be stored in a septic tank and will be drawn away by a certified sewage service provider.
Construction or Demolition waste	Minor	Wastes arising due to construction activity will be disposed safely through authorized recyclers.
Redundant machinery or scraps	Minor	Scrap will be collected safely by authorized scrap dealers.

3.12 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. The contract will mandate as much local labour as possible with at least 30% given to women. The baseline survey found extensive skills available in the area and many unemployed people for

unskilled work. Unless efforts are made to employ local Labour, is the potential for detrimental impacts from an influx of non-local labor is high.

Employment will include equal opportunities for both men and women. A written statement in the contractor's contract will include commitment to 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). Employment of workers by the contractor will be done in a strictly non-discriminatory manner; forced labour will never be permitted. The contractor's contract will include commitments to have labor management procedures that are consistent with the World Bank's ESS 2 on labor and working conditions. Sub-contractors, if engaged, will have to make the same commitments. Workers will have access to a Grievance Redress Mechanism (GRM), through which they can raise their concerns, in accordance with ESS 2 requirements. The contractor should provide such GRM, or otherwise the GRM provided in this document should be applied. The Bank's ESS 2 provisions regarding sexual exploitation (including minors and prostitution) will be applied to protect female workers against all kinds of sexual exploitation, harassment and violence through. All contractor workers will have to sign the Workers Code of Conduct, which will include strict prohibitions of any form sexual exploitation, harassment and violence. Labour management provisions and prevention of GBV will be addressed in Chapters 8 and 9.

During construction, the project is expected to employ around 100 expats and 300 local workers. Local workforce allocation is estimated at 90 skilled, 80 semi-skilled and 130 unskilled workers. Out of the total local workforce, 20 are estimated to be women of skilled, semi-skilled and unskilled qualifications.

Minimum key staff needed for the design and construction of the road is listed in Table 3-8. Skilled and unskilled local workers are listed in Table 3-9.

Table 3-8 Key staff

Design Phase (Contractor's Staff)	Construction Phase (Contractor's Staff)	Consultants
1. Chief Project Consultant 2. Chief Consultant Representative 3. Bridge Design Engineer 4. Road Design Engineer 5. Chief Surveyor 6. Chief Quantity Surveyor (QS) 7. Quantity Surveyor (QS)	8. Road Manager 9. Chief Engineer Roads 10. Chief Engineer Bridges 11. Chief Quality control (QC) Engineer 12. Chief Surveyor 13. Chief Quantity Surveyor (QS) 14. Asset Management Specialist 15. System Analyst/Administrator 16. Resident Engineer – Road 17. Road Maintenance Engineer 18. Quantity Surveyor (QS)	19. Chief Project Consultant / Project Manager 20. Chief Consultant representative 21. Bridge Design Engineer 22. Road Design Engineer 23. Soil /Material Engineer 24. Environmental Manager 25. Health and sSafety Specialist 26. Social Safeguards Specialist

		27. Community Liaison Assistant

Table 3-9 Skilled and semi-skilled local workforce

Category	Workforce
Constructors	Masons Carpenters Plumbers Electricians
Operators	Excavators Bulldozers Loaders Compactors Graders Asphalt Plant operators Pavers Rollers Backhoe operators Drillers Crushers
Workshops	Mechanics Welders Electricians Paver Mechanics
Drivers	Heavy Duty Drivers Light Duty Drivers Trailer Drivers Crane Drivers
Others	Steel Fixers Cooks Painters Survey Assistants Lab Assistants Crane Assistants Other Miscellaneous Staff

4 PROJECT ALTERNATIVES

4.1 BASIC RATIONALE

The Tappita-Toe Town road has deteriorated to an extremely poor condition. As one of the nation's main strategic linkages, it represents a serious bottleneck on development. Given that the road already exists, and parts deteriorate to a very bad condition every wet season, there can hardly be a serious case to be made against its being upgraded.

The main benefits of the project are expected to be in the form of reduced vehicle operating costs and time savings for existing and generated traffic, leading to improved access of farmers along the road to markets, reduced agricultural input and marketing costs, and improved access to social service facilities. These are expected to improve rural agricultural, and non-agricultural, productivity and development.

As well as the economic benefits from a better road, environmental benefits will include a marginal net reduction in the total vehicle emissions because of improved travel conditions. Due to the sealing of the highway, there will be much less polluted runoff from the road surface during the wet season, and lower dust levels in the dry season.

4.2 ROUTE

Overall, the route from Tappita to Toe Town is relatively direct, intercepting twenty-eight (28) settlements, including parts of the urban area of Tappita, particularly the areas called Drivers Camp and Gibson Town, two (2) relatively large towns (Gbolordeala (Dialah) and Toe Town, and 23 other smaller towns, villages and hamlets. However, it has few straight sections because of the undulating terrain and the need to cross the numerous stream lines at advantageous points. The road was never properly engineered initially, but developed as an earth track along the naturally best alignment. If a completely new road were to be constructed, it would follow a straighter alignment with broader curvature. As it is, the road will need some of the twists and bends to be removed in order to make the higher design speed safer and more comfortable. However, it is not intended to realign more than short sections, and to utilise the existing alignment to the greatest extent possible. By this means the project will avoid the need for significant additional land take.

4.3 CONSTRUCTION APPROACH

The existing road and the proposed new design are both summarised in chapter 3. The existing road is mostly an earth surface, generally at the same level as the surrounding ground. Some parts may have had embankments in the past, but they have been eroded away. Most of the unbound gravel surfacing that may have been applied in the past has also been eroded away. This does not allow a road to be kept serviceable during the wet season, because

the ground simply saturates and is washed out by passing traffic. The proposed design will construct a laterite embankment, topped with selected materials that meet engineering strength qualities and sealed with bitumen-based asphalt. By raising the road above the surrounding land, the whole formation is kept dry and therefore retains its strength. This is the key to ensuring both maintainability and longevity.

The constraint of the proposed approach is that it requires considerable volumes of the various materials. In turn, this leads to the need for significant areas of borrow pits to provide the laterite fill for the embankment, and quarries to provide the hard stone aggregates for the granular road base and chippings for the asphalt. Winning these materials involves considerable additional land take and permanent disturbance of the land surface. However, there is no realistic alternative to the standard design of an embankment road across the highly weathered residual soils of the Liberian hinterland, under the very humid climate. This is a tried and tested approach used throughout the world, and is straightforward to construct. In environmental terms, the local sourcing of materials at least means that the impacts of the project are restricted to the immediate vicinity.

Alternative surfacing materials could be considered in place of bituminous asphalt. The main alternatives are gravel or a cement-based material. Gravel is traditionally used on low traffic roads, but it is frequently difficult to obtain a reasonable quality of material. Many gravels are derived from riverine or alluvial sources, with the result that particles tend to be rounded and to lack both the sharp edges required to achieve a good interlock and the fine material needed for binding. Laterite-based gravels often contain too high a proportion of clay, making them weak and cohesion less when wet. For these reasons, gravels tend to require very high maintenance regimes. Also, they do not have the same surface smoothness and friction coefficients as asphalt, making them considerably less safe for higher traffic speeds.

Concrete aggregate surfacing based on Portland cement (rather than bitumen, which is the binder used in asphalt) has been used widely in some parts of the world. It can form a durable surface, but is slower and more costly to construct than an asphalt surface. For significant road lengths, such as the 40-km Tappita-Toe Town road, the additional cost would be significant. By limiting the construction cost, the MPW is able to ensure that a longer section of the overall Ganta-Zwedru Highway can be completed under the project.

4.4 NO-PROJECT ALTERNATIVE

In the event that the project was not to occur ("no action"), the existing road will continue to generate significant impacts, harming the environment (water quality, air quality, significant risk to public safety etc.) and indirectly depressing the local economies. It is hard to find any argument as to why such an important linkage should not be improved. The proposed project will transform it dramatically, since it will change a traditional earth road with very limited engineered formation or drainage, into a well-constructed, all-weather, sealed highway.

Continuing with the current standard of road can only hold back the local, regional and (since it is a key strategic link between the centre of Liberia and the south-east) national economies. It is not possible to maintain the existing road because the weak materials and almost absent drainage mean that it cannot carry traffic with any degree of reliability once it has been subject to even moderate levels of rainfall.

The no-project alternative is therefore not a supportable proposition.

5 PUBLIC PARTICIPATION AND STAKEHOLDER ENGAGEMENT

The MPW, through the IIU, will develop and maintain records of contacts, information and exchanges with stakeholders and of complaints. The required activities are defined in a Stakeholder Engagement Plan (SEP). The SEP includes:

- The results of the identification of the stakeholder analysis of their interests and concerns - including vulnerable groups;
- Measures to promote dialogue and cooperation with stakeholders; adequate channels to inform and obtain feedback and, measures to empower local communities – keeping in mind and exercise curation to cultural sensitivity and ethnicity peculiarities;
- A public information plan to ensure adequate and timely dissemination of information to local people.
- A description of the consultation process, the recording of observations and comments, methods of communicating the results of the E&S Assessment to the stakeholders;
- Grievance mechanisms (project, district, county, MPW levels).

The Tappita-Toe Town road project will have a Stakeholders Engagement Plan (SEP) which will build on the public information and community engagement activities conducted for the ESIA and the RAP. The MPW is responsible for integrating the stakeholder engagement material gathered for this ESIA with that obtained during the RAP. The project will continue to conduct public consultation both with affected communities and interested parties during its entire life cycle. With the objective of fulfilling the Bank's ESS 1 requirements on stakeholder consultation and the requirements imposed by ESS 10 Stakeholder Engagement and Information Disclosure, the IIU will:

- Appoint a Social Safeguards Specialist to provide oversight and supervision of interactions with communities with the MPW team.
- Require the MPW team to hire and deploy a Community Liaison Officer to manage grievances, information exchanges and community participation throughout the process.
- View stakeholders' consultation as an ongoing process continuing throughout the life of the project.
- Conduct stakeholder engagement before the letting of the construction contract, which will require the following elements:

  - Stakeholder identification and analysis with a particular emphasis to organizing dialogue with affected groups; giving special attention to vulnerable groups whose vital interests can potentially be affected by the project;
  - Stakeholder engagement planning, engagement activities and consultations where appropriate, using diverse consultation methods (meetings, roundtable discussions, public hearings, focus groups, radio, newspapers, etc.);
  - Information disclosure;
  - Consultation and engagement;
  - Grievance mechanism;
  - Regular reporting to interested stakeholders.

- Adopt the stakeholder engagement plan, operationalized prior to the letting of the construction contract, that is proportionate to the nature and scale of the project and its potential adverse impacts on the affected communities keeping in mind sensitivity of the environment and social concerns, and the level of public interest;
- Identify and document the various individuals or groups who (i) are affected or likely to be affected (directly or indirectly) by the project (affected parties), or (ii) may have an interest in the project (other interested parties).
- Establish an effective grievance mechanism to facilitate prevention and/or timely resolution of disputes or conflicts that may arise during the project life cycle. This is very important and will have staffing in place before works start.
- Lessons learned from other Bank financed road projects in Liberia, particularly, LIBRAMP and SECRAMP, are to be included in the Tappita-Toe Town road project's stakeholder engagement plan.

The Social Safeguards Specialist will involve local government authorities, traditional leaders, district judges and, opinion leaders during the implementation projects. Their involvement has proven to be very helpful in handling disputes aroused during LIBRAMP and SECRAMP implementation in Nimba County.

Stakeholder engagement and consultation in the broader project area and in impact corridors throughout the length of Tappita-Toe Town road will be conducted on ongoing basis. Land and property issues connected to the conflict and post-conflict era will be referred to and include the Counties authorities and traditional leaders.

The IIU will ensure respect for the local culture at all times, considering that although there are Christians and some few Muslims in the area, traditional religion is still practiced. Traditional leaders will be given due respect similar to the county authorities or judiciary

representatives. The IIU will conduct careful consultation and develop an appropriate engagement plan.

5.1 STAKEHOLDER MAPPING AND REGISTER

The Stakeholder Engagement Plan specifies the creation and maintenance of a Stakeholder Register which will be amended or /updated on the basis of ongoing consultations throughout the project lifecycle. The Stakeholder Register is the open list of stakeholders containing contact details and information on the expectations, concerns, suggestions, notes, comments, as well as on notices, invitations and responses sent and other relevant information required in organizing and maintaining effective dialogue. The Register will be amended and updated as the dialogue evolves.

5.1.1 Stakeholder Identification

For the stakeholder analysis, stakeholders are classified into affected communities and interested parties as shown below:

- Affected parties:
    - Residents (men and women) of the 28 cities, towns and villages whose plots and livelihoods will be impacted by the project land take for advancing its objective and reside along the 40kms stretch between Tappita and Toe Town;
    - Residents hoping for work on the project;
    - Owners and employees of businesses in the area that may offer services to the project and future travellers – food hawkers, tyre repairers, fuel sellers, etc.; and
    - 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.
- Interested parties:
    - District residents hoping to get employment, expand businesses into the area of influence of the project;
    - Owners of transportation vehicles – truck owners and drivers, taxi cars and motorcycles;
    - Local communities not affected by direct impacts of the project but reside along the 2kms radius of the 40kms stretch between Tappita and Toe Town;
    - State authorities;

- Neighboring land users;
- Community based organizations;
- Local NGOs;
- Women's groups;
- Industrial enterprises ;
- Agricultural producers ;
- Local authorities;
- Religious groups, including secret societies; and
- International lending agencies and other potential investors International community including experts and non-governmental organizations.

5.1.2 Stakeholder Analysis

The key stakeholders identified as a result of the ESIA analysis are listed in Table 5-1. For the purpose of planning stakeholder engagement activities, a summary analysis of their expectations and concerns has been made. Stakeholder concerns were solicited or verified through various sources. The information on stakeholders, their expectations and concerns will be amended over the course of consultations and will lead to subsequent SEP updates.

The IIU will maintain interaction with stakeholders in order to establish and maintain relationships with residents of the project area who are affected and exposed to risks associated with the project implementation.

The IIU will follow the following guiding principles for developing and maintaining dialogue with stakeholders:

- Identify and update contact details for all the stakeholders, review their expectations and concerns related to the project;
- Ensure early information dissemination, seek and obtain feedbacks, incorporate those feedbacks into the project and share with stakeholders the adjustments made on the basis of their feedback;
- Ensure all-inclusive participation of all stakeholders with special emphasis given to the PAPs and communities impacted by social aspects of the project, and most importantly those vulnerable groups of the affected communities.

Consultations with stakeholders have been essential components of the RAP preparation and will continue to be during the project implementation process. This is part of the role and responsibilities of the Community Liaison Officer and the Social Safeguards Specialist. Consultations have been held and will be held on ongoing basis for the purpose of:

- Communicating the project's related information to stakeholders,
- Gathering information about their expectations, and
- Understanding their preferences and concerns, as well as including those concerns and preferences in decision-making process.

The IIU will conduct effective consultations and the consultation will start and be based on early provision of required and adequate information, including design documents, plans and programs. The consultation will focus on the already identified social risks by this ESIA, as well as on new and proposed measures and actions to prevent, minimize, mitigate or compensate.

The IIU will conduct consultations and update social risks mitigation measures on ongoing basis through the use of Community Liaison Officer. It is important to note that consultations with stakeholders are an ongoing process throughout the project life cycle and will be conducted at subsequent stages of the project implementation on a regular basis.

Table 5-1 Stakeholders mapping and registration matrix

Stakeholder	Impact of the project	Measure Taken	Expectation
Affected Parties			
PAPs	Physical Displacement	Consulted during RAP preparation	Fair compensation and assistance
	Economic Displacement	Consulted during RAP preparation	Fair compensation and assistance
	Vulnerable Groups	Consulted during RAP preparation	Fair compensation and assistance as well as differentiated treatment
Interested Groups			
Local communities including PAPs	All residents	Consulted during RAP preparation	Greater ease of transport and access to more frequent and cheaper transport services
	Employment seekers	**Consulted during RAP preparation**	**Work on the project**
	Small business owners	**Consulted during RAP preparation**	**Opportunities to provide services or inputs from food hawkers to materials suppliers** **Opportunities to expand sales into the project area communities**
	Transportation providers – trucks, cars and motorcycles	**Consulted during RAP preparation**	**Expansion of operating routes and services**
	Government service employees	Consulted during RAP preparation	Easier supplies for schools and health clinics, opportunity to improve services
County Authorities	Greater mobility of people within and outside Nimba and Grand Gedeh	Consulted during the SIA and the RAP	• Increased economic activities • Increased access to service delivery: education, health • Increased Job opportunities • Capacity support
	Engagement in RAP and grievance resolution	Consulted during the SIA and the RAP Created at county level	• Capacity building in handling disputes. • Financial resources to carry out their tasks, • Logistics and administrative support.
	Engagement in quarry and camp sites negotiation	Consulted during the SIA and the RAP	• Capacity building in negotiating quarry and camp sites • Financial resources to carry out their tasks, • Logistics and administrative support.
Districts	Greater mobility of people within and outside the District.	Consulted during the SIA and the RAP	• Increased economic activities – access to markets • Increased access to service delivery: education, health

Stakeholder	Impact of the project	Measure Taken	Expectation
			• Increased Job opportunities • Capacity support
	Engagement in RAP and grievance resolution	Consulted during the SIA and the RAP and created at County level	• Capacity building in handling disputes. • Financial resources to carry out their tasks • Logistics and administrative support.
	Engagement in quarry and camp sites negotiation	Consulted during the RAP	• Capacity building in negotiating quarry and camp sites • Financial resources to carry out their tasks • Logistics and administrative support.
Traditional Institutions	• Greater mobility of people within and outside communities	Consulted during the RAP	• Increased economic activities • Increased access to service delivery: education, health • Increased access to economic infrastructure: markets, distribution networks, financial institutions • Job opportunities • Capacity support
	Engagement in RAP and grievance resolution	Consulted during the SIA and RAP Created at county level	• Capacity building in handling disputes. • Financial resources to carry out their tasks • Logistics and administrative support.
	Engagement in quarry, camp sites and borrow pits negotiation	Consulted during the SIA and RAP	• Capacity building in negotiating quarry and camp sites acquisition • Financial resources to carry out their tasks, • Logistics and administrative support.
	Engagement on labor requirements, conditions and opportunities	Consulted during SIA and RAP	• Capacity building for project related skill

5.2 PARTICIPATION

Participation in the implementation and monitoring of the Tappita-Toe Town road project is key to its success. The participation strategy of the project includes identification and consultation with project affected communities and other interested parties. The project will use a participatory approach to identity and incorporate the views of all stakeholders in the project design and implementation as far as is practical given that the area of influence is the right of way of the road.

Ongoing consultation at the community level will ensure the committees have representation of each major tribe. The smaller communities along the corridor are mostly inhabited by the same tribe (Gio, Mano and Krahn or incoming tribal groups such as the Kpelleh). In more urban communities like Tappita and the other bigger towns along the road, consultation has to be inclusive to have representation of Fula and the Mandingo Muslim peoples as well as other small minorities. Their involvement helps in identifying social risks and in mitigating those risks adequately.

The participatory arrangements through which voices and point of views will be incorporated into the project mechanisms will include ESIA feedback from transport unions, road users, transportation agencies, communities and NGOs.

5.2.1 Findings of the consultations held during the SIA

Twelve public consultation meetings were held in the affected communities between 1st March and 10th March of 2021 (see Table 5-2 and Table 5-3). The people and officials of these cities along with representatives of other surrounding towns attended these meetings. A total of 12 towns were covered in the meetings which included representation from neighbouring hamlets. Attendance lists are appended in Appendix F.

The public meetings included:

- Introduction about the Project;
- Discussion with the stakeholders on the proposed social impacts of the project, specifically the resettlement and grievance process;

The meetings provided a platform for all the relevant stakeholders to raise their concerns, highlight project related social, environmental and economic issues of significance and reach a common understanding on the way forward to address all significant issues of concern.

Attendees of the public meetings included residents directly affected, others from the same communities, teachers and health workers, transport union members, local business owners, market managers, the traditional town leadership Chief and Elders, the Women's groups representatives, the Youth groups.

Further 14 key informant interviews were conducted between 1 and 10 March 2021. These discussions were held in all 12 communities with Town Chiefs, Elders, Teachers, Health staff, Women's leaders, Youth Chairmen and other available informants. The information gained from these interviews has reinforced and expanded the comments and concerns expressed by the communities in the earlier round of consultations.

5.2.1.1 Issues Articulated during Consultations

The main concerns and questions raised during the public meetings are summarized in Table 5-2 and Table 5-3.

Concerns focused on the following:

- The compensation process with regards to assessment of losses, types of compensations, beneficiaries of these compensation and time of compensations;
- Assistance to vulnerable groups (physically challenged head of households, widows, and elderly heads of households) in the resettlement process;
- Job opportunities for local communities; interviewees expanded these comments to press for work for both men and women, especially those who will be relocated out of the RoW;
- Dust and contamination of already poor water sources;
- Damage to houses caused by vibration during construction;
- Road safety, due to reckless drivers once the road is paved;
- Vehicle speeds, children safety on the road, protection from construction vehicle movements; and
- Increases criminal activity.

Table 5-2 Comments made at consultation meetings 1-6

Discussion topics	Answers and comments					
	Community 1	Community 2	Community 3	Community 4	Community 5	Community 6
	Tappita	Bitter Ball Camp	Doeyelay	Diahlah	Farnlay	Bah Town
Date of consultation	March 1, 2021	March 1, 2021	March 4, 2021	March 7, 2021	March 7, 2021	March 3, 2021
What is the estimated population of this community?	43,137	350	1,600	4,960	1, 315	1070
What are those activities that you do to earn your living?	Farming and petty businesses and some local mining	Farming (grow rubber, cocoa, bitter balls, rice, plantain), palm oil, livestock, and some pit sawing	Agriculture –rice and vegetable; charcoal production, hunting, fishing and petty business	Farming: rice, cassava, oil palm, rubber, and selling agriculture products, vegetables and the like.	Farming (rice, plantain), hunting and pit sawing.	Farming, fishing, small businesses and hunting.
Which of these activities do you depend on to earn cash income?	Farming and business	Rice, plantain and vegetables	Charcoal sale, farming and hunting	Plantain sales	Farming	Farming and business
What do you spend your money on mainly?	School fees and family support	School fees, health services and construction of new homes	School fees, health services, food and clothing	Food, school fees and health services	Food, school fees, clothes, construction of new homes and health services	School fees and family support
Where do you sell these products and how far is it from here?	In the town.	In Tappita market and the community. It takes about 1 hour to get to the market when walking.	Tappita market – Cost of access is: L$2,500; Monrovia - L$18,000 - L$20,000 fair; Zwedru - L$4,000 - L$7,000.00.	In Tappita or Monrovia City.	On the roadside, at Tappita and Monrovia City.	In big market in Toe Town, three (3) hours away
Do you raise livestock? If yes, how and where?	Yes	No	Yes, goats and sheep, on the farms	No	Yes, on the farms.	Yes, in the town.
What are the major needs of	Good road conditions to allow access to	Water, school (no nearby school; nearest	Road, safe drinking water, and clinic.	Road, safe drinking water, public latrine,	Clinic, road and electricity	Clinic, market building, school, safe

Discussion topics	Answers and comments					
	Community 1	**Community 2**	**Community 3**	**Community 4**	**Community 5**	**Community 6**
	Tappita	**Bitter Ball Camp**	**Doeyelay**	**Diahlah**	**Farnlay**	**Bah Town**
this community and why?	markets, livestock for survival, and employment.	school is about 30 minutes-walk away), toilets.		renovation of our school building, access to hospital		drinking water and public toilet.
Which of these needs you would say is first, second, third …….?	Road; employment; livestock	School building, Safe drinking water, and toilet	Road, clinic, safe drinking water	Road, public latrine, safe drinking water	Road, farming materials and tools, clinic	Safe drinking water, clinic and school.
Who makes decision for the community?	The City Mayor in consultation with the city council	The Chief and elders.	The elders, town chief, youth and women leader.	The elders, youth representative, women representative, the chief and his council	The Town Chief, chairlady, youth leader, women leader and elders	The elders.
Why?	The City Mayor is the head of the City and works in consultation with the City Council.	They are the custodians of the community and head of the town	We trust in them. They do so to make us to live in peace	For law and orderliness, proper planning base on the trust we have in them.	We know them and trust them to make good decisions.	They are the bosses and traditional heads in the town
Who decides on land issues?	The land authority and the private landowners.	Chiefs and elders	The elders and the community	The Land Committee	Chief and elders and the Land Committee	The chief elders
How many times do you meet to discuss town matters	Four times a month	Two times a month	Two times in a month	Weekly	Three (3) to five (5) times a month	Two (2) times in the month.
Who are those invited to discussions?	The City Mayor, the City Council, zonal heads and representation from other groups	All the community members including elders, youth and women groups	No entry	The four quarter chiefs, elders, youth representatives and women representatives.	All citizens sometimes; at other times, only the quarter chiefs, elders, youth leader and women leader	Youth leaders, town chief, chairlady and representatives from quarters in the town

Discussion topics	Answers and comments					
	Community 1	**Community 2**	**Community 3**	**Community 4**	**Community 5**	**Community 6**
	Tappita	**Bitter Ball Camp**	**Doeyelay**	**Diahlah**	**Farnlay**	**Bah Town**
Is there anyone who owns private/deeded land in this community?	Yes, there are private landowners with deeds.	Yes, all land is privately owned by different people.	Yes.	Yes, there are some people who have private deeded land.	Yes, there are private landowners.	No, but there are persons with Tribal Land Certificates.
Is anyone in the community living, farming or having a market stall inside the Right of Way?	Yes, lots of people	Yes, market stalls and homes/houses	Yes	Yes, houses, market stalls and farmland	Yes	Yes, market stalls
What would be good about this project?	Reduced travel cost, improved access to health facilities and markets, job opportunities, increased family interaction.	All the community members including elders, youth and women groups appreciate the project benefits	Free movement, easy access to markets and health institutions, reduced travel time.	Access to improved road, improved access to markets; reduced travel time and cost.	Easy movement, easy access to markets and to health centers; reduced prices, reduced transportation costs and travel time.	Easy access to travel, reduction in prices of items, reduction in transportation cost.
What would you fear or see happening as a result of this project?	Increased crime rate, drugs trafficking, increased accidents, loss of cattle by accident, family breakup; drugs trafficking etc.	Accidents, diseases, "heartmen"(gangs of men who capture individuals and remove body parts including the heart for ritual and medicines), increased crime rates	Increased road accidents, increased crimes, death to our livestock due to high speed.	Increased road accidents, increased crimes, having to relocate our houses, loss of property migration, violence and increased sickness.	Increased road accidents, increased crimes, excessive speeding endangering lives of our children.	Increased road accidents, increased crimes and drug trafficking.

Discussion topics	Answers and comments					
	Community 1	**Community 2**	**Community 3**	**Community 4**	**Community 5**	**Community 6**
	Tappita	**Bitter Ball Camp**	**Doeyelay**	**Diahlah**	**Farnlay**	**Bah Town**
What would you expect?	To improve the livelihood of the community people where the project is directed	Visit of family members, building of the road, and employment opportunities. We are happy for the improvement of the road.	Development and employment opportunities when the company comes.	Employment, learning of new skills from people working on the road.	Installation of speed breakers to reduce the speed of moving objects in towns, more investors and NGOs, increased income generating opportunities, employment and training opportunities.	Development in our town.
Concerns			Marie Dahn (Midwife)- during the rainy season, pregnant women suffer the most as cannot be carried on bikes so they have to walk or be carried in hammock. Some of them even give birth on the road	What will become of people whose structure were not marked for demolition but get affected during the demolition exercises in a town?		None

Table 5-3 Comments made at consultation meeting 7-12

Discussion topics	Community 7 Toe Town	Community 8 Pokar Town	Community 9 Kpelleh Town	Community 10 B-hai Town	Community 11 Nanlah	Community 12 Drivers' Camp
Date of consultation	March 4, 2021	March 5, 2021	March 7, 2021	March 7, 2021	March 6, 2021	March 1, 2021
What is the estimated population of this community?	6375	1075	156	1050	630	150
What are those activities that you do to earn your living?	Farming, small businesses and hunting	Farming, business, hunting and sand mining	Farming and hunting	Farming, fishing and petty trade	Farming (plantain, collection and sales of snails), hunting, pit sawing, vegetable gardening	Cutting palm, growing rice, distilling liquor, selling small items and producing charcoal
Which of these activities do you depend on to earn cash income?	Doing business and agriculture.	Farming	Farming	Farming	Farming, general agriculture	Charcoal production, farming and petty business.
What do you spend your money on mainly?	School fees, health services, transportation and family	School fees, building houses	School fees, building houses	School fees, building houses	Education, health services, food and clothing	School fees, hiring labor for farm work, medication, transportation, food and clothing
Where do you sell these products and how far is it from here?	In the local market in the town, which is 35 minutes away, at the big market in Ganta and sometimes in Monrovia. Also take some to Zwedru.	Outside the town as far as Toe Town. We take one hour to get to the market.	At Toe Town and Monrovia at times.	At Toe Town and Tappita markets.	On the roadside in Nenlah. We also sell in Tappita and Toe Town.	At Tappita Market which is 30 minutes away.
Do you raise livestock? If yes, how and where?	Yes, we raise livestock in the town.	Yes, in the town with no fence attached	Yes, in the town freely	Yes, we raise in the town freely	Yes, here in Nenlah	Yes, only chicken

Discussion topics	Community 7 Toe Town	Community 8 Pokar Town	Community 9 Kpelleh Town	Community 10 B-hai Town	Community 11 Nanlah	Community 12 Drivers' Camp
What are the major needs of this community and why?	Road, school, hospital and a bank in the town.	Road connectivity, safe drinking water, school and a clinic	Community school, clinic and safe drinking water	Road, market building, electricity, improvement in health sector	Road, safe drinking water, latrine, loan for farmers	Hand pump, Palava hut, toilet and renovation of our school.
Which of these needs you would say is first, second, third …….?	Road, school and hospital	Road, school and safe drinking water	School, clinic and safe drinking water	Road, market and electricity	Safe drinking water, agriculture inputs, loans for farmers	Road, water, toilet and town hall
Who makes decision for the community?	District Commissioner and the City Mayor.	Town chief	Town Chief	Town Chief	Elders, women, Town Chief and youths	Quarter chief, security, elders, women and the youth
Why?	They own the city	The decision of the town chief is the voice of the people	He is the head of the town	He is the head of the town.	We trust him and he is responsible	We want everybody's inputs. Secondly, we trust our chief
Who decides on land issues?	The Land Commissioner and City Mayor.	The Town chief	The Town Chief	The chief elder	The Land Committee chairman and elders	The Quarter chief and elders
How many times do you meet to discuss town matters	Two (2) to three (3) times a month.	Three (3) times in a month.	Four (4) times the month	Two (2) times a month.	Two (2) to three (3) times a month.	Weekly
Who are those invited to discussions?	The entire town residents	The entire town residents	The entire town residents	The entire town residents	Youth, elders, women wing and the town chief	Mainly elders, youth and women representatives
Is there anyone who owns private/deeded land in this community?	Yes	Yes, but only with Tribal Certificate.	Yes, but the deed is missing	Yes, but only with Tribal Certificate.	No	Yes

Discussion topics	Community 7 Toe Town	Community 8 Pokar Town	Community 9 Kpelleh Town	Community 10 B-hai Town	Community 11 Nanlah	Community 12 Drivers' Camp
Is anyone in the community living, farming or having a market stall inside the Right of Way?	Yes	Yes	Yes	Yes	Yes, 4 persons	Yes
What would be good about this project?	Easy travel and lower fares	Low transportation fares, high profits from business, drop in the price of rice and easy travel.	More business, increased family interactions, low transportation fare.	Access to transportation, low fares and improvement to our town	Free movement, access to health facilities, improved economy, access to markets and better education	Easy access to markets and hospital; reduction in fares, prices and travel time.
What would you fear or see happening as a result of this project?	Accidents, increased crimes, loss of land, drugs usage	Accident, bad drugs, criminals	Accidents on the road, damage to properties	Increased Criminal rate, accidents	Accidents, speeding increase in crime rate, diseases, breakup of families due to cash violence	Accidents due to speeding, increased crime rate, drugs, diseases etc.
What would you expect?	Development	Investors; lower transportation cost.	Investors, more development.	Development	Construction of the road, decreased death rate, development, electricity (because the powerline is passing through our community)	The road to be paved; streetlights and employment.
Concerns	None	None	None	None	None	None

5.2.2 Findings of the key interview discussions held in March 2021

Additional discussions were held with key informants as part of a rapid town survey conducted during the socio-economic baseline survey period, in March 2021. Table 5-4 sets out the persons contacted and their comments, verbatim. Table 5-5 sets out the themes of response. Of interest to note is that the road condition affects all aspects of community life; people cannot travel easily, access to health and education services is poor, supplying schools and clinics cannot get through. The situation escalates in the wet season and people cannot get good prices for their goods. The comments reflect earlier material collected on social concerns during the public consultations and reinforce their validity.

In total, fourteen (14) key informants were interviewed, of which ten (10) males and four (4) females. They included a Paramount Chief, a mayor, several town chiefs, a Liberian Market Association Superintendent, chairladies, and several elders and farmers.

Of additional significance here is the frequency of women in important positions in rural communities.

Table 5-4 Key informants, March 2021

SN	Place	Date	Name	Role	Sex	Quotes and comments
1	Tappita	March,1 2021	Mr Joseph Yini	Elder	M	"The road condition is our greatest problem, we cannot get building materials here." Mr Yini is keen to offer accommodation to the workers to foster good relations.
2	Tappita	March,1 2021	Mrs Linda Morgan	Liberian Market Association Superintendent	F	"The bad condition of the road is our major constraint. It causes high prices. There is a high crime rate, things are stolen from the hospital so that it has lost its referral status. There is no market building and no loans for women to make market."
3	Tappita	March,1 2021	Hon. Samuel D Kruah	Paramount Chief	M	"The bad road condition limits everything we do."
4	Tappita – David Lassana village	March,1 2021	David Lassana	Quarter Chief	M	"The road is bad, no development without a better road."
5	Nanlah	March,6 2021	Moses B Kruah	Elder	M	"The road is very bad. We have no safe drinking water. We have difficulty getting to the hospital and farms. Input prices are too high."; "People had to pay for the house marking for previous projects (at USD 25 per house) for proof of ownership – too high and costs too much to go"; "Our houses are very poor quality – will vibrations damage the poor houses?"
6	Gwin's Town	March,4 2021	Mary Nuah	Chairlady	F	"The road is very bad. We have no development. It is difficult getting to the market, health posts and hospital and this is really affecting us"; "Us farmers appreciate the road improvement – it will bring us development"; "Houses in this town are in the RoW"
7			Joseph Siatoe	Elder	M	
8	Doeyelay	March,4 2021	Sam K Slangon	Businessman	M	"The poor road condition is our main problem – when it is spoilt we cannot go to market and everything will spoil"; "Our school is falling down and we have no clinic. It is difficult to travel to these places." The respondents are very happy to see the road project as, without it", " our children will have no prosperity"
9			Vonyee P Johnson	Chairlady	F	
10	Bah Town	March,3 2021	T Trouh	Community Health Assistant	F	"The road condition is bad. We have no safe water. The medical facility is not close to us. We fear our school kids walking a long distance along the road"
11	B'hai Town	March,7 2021	Wosse Nyanyee	Town Chief	M	"Our problem is the road and no market, we get poor prices for produce."
12	Kpelleh Village	March,7 2021	John C Wamah	Town Chief	M	"Poor road condition cause our produce to not reach the market in time."

SN	Place	Date	Name	Role	Sex	Quotes and comments
13	Pokor Town	March,5 2021	Romeo Karrr	Town Chief	M	"Lack of a good road is our major problem in his community. The poor road causes poor housing as the cost of materials is too high."
14	Toe's Town	March,4 2021	Hon Mose B Monroe	Mayor	M	Lack of a good road – no development

Table 5-5 Themes of response

Theme
Poor road condition
Lack of safe drinking water and sanitation
High commodity prices (due to road network)
Lack of health services and capacity (clinics etc)
Lack of education services (schools, teachers)
No LMA market hall
Lack of a guest house
Can't access Police, administration services
Can't sell produce due to road condition
Road safety
Unemployment
No school supplies due to road condition
High prices of farming tools and inputs
Increased theft due to road condition
Difficult to travel
Fears that criminals will take advantage of the road improvement

5.3 GRIEVANCE REDRESS MECHANISM

The project's Stakeholder Engagement Plan and the RAP specify the Grievance Redress Mechanism for the project. The recording, response to and reporting of grievances is a vital part of the Stakeholder Engagement Plan and constitutes a separate sub-activity. Grievances will be raised on a variety of issues, all will be effectively processed and reported. This section proposes a methodology for managing complaints systematically and effectively throughout the project. Complaints vary widely and can include, for example, allegations of:

- Adverse environmental impact by contractors or sub-contractors
- Damage to property
- Payments for employment access
- Disagreements over compensation assessment and payment
- Unfair allocation of contracts
- Poor quality of work in communities
- Culturally inappropriate behaviour
- Others

Many grievances/complaints originate from misunderstanding of compensation issues and procedures. Grievance Redress Mechanisms (GRMs) at various levels will be established. Allocation for the requisite funding in order to offset its operational and administrative cost is catered for in the RAP. A grievance redress mechanism committee of knowledgeable persons who are experienced in the area of conflict resolution will be identified and established at various levels. The Ministry of Public Works and its Infrastructure Implementation Unit (MPW/IIU) in collaboration with PAPs will be responsible for establishing the GRMs.

The tools for documenting and reporting on grievances are the Community Grievance Matrix and the Stakeholder Engagement Matrix. The following grievance management structure will be in place at the community level and mirrors that proposed in the RAP report.

This methodology for community grievance redress is capable of covering wider issues concerned with construction impacts. It applies equally to all activities by the contractor and the IIU as well as sub-contractors. The mechanism proposed here provides a system for recognising and responding coherently to a complaint through identifying a person responsible for investigating the complaint and coordinating response.

The methodology covers:

- Receiving complaints through any of the contractor's offices;
- Assessing information needs;

- Allocating responsibility for investigation;
- Recording the process;
- Contacting the complainant;
- Determination of the facts;
- Agreeing responsibility and action where required;
- Informing the complainant;
- Dealing with disagreements over response and outcome;
- Implementing action;
- Researching complainant satisfaction; and
- Monitoring and evaluating the outcome.

5.3.1 The Mechanism

The Grievance Redress Mechanism is established to apply to all RETRAP's subcomponent 3.1 (Roads) activities that will be financed by the project. It includes issues related to asset valuation, resettlement compensation and assistance, environmental and other social issues that will arise during project implementation. A separate grievance redress mechanism will be required within each contractor's company to address internal employment grievances including those of sexual harassment or gender-based violence in the workplace.

The potential adverse impacts associated with subcomponent 3.1 of the RETRAP are substantial and, if not properly managed and mitigated, will give rise to conflicts among the affected population. Grievance Redress Mechanisms are essential tools for allowing affected people to voice their concerns and grievances arising from project implementation, often related but not limited to resettlement and compensation issues. These mechanisms are fundamental to addressing and resolving project affected persons' concerns, claims and grievances outside of the judicial system (the court), as well as helping to prevent disruption of project implementation activities through violent demonstration by aggrieved PAPs.

The overall role of the grievance mechanism is to deploy a reliable, effective and timely process for capturing and responding to the concerns and grievances of PAPs. A well-functioning grievance mechanism is one which addresses concerns in a transparent manner that is culturally appropriate and readily accessible to all segments of the affected communities, at no cost and without retribution. The GRM is therefore a part of the institutional arrangement for the effective implementation of the RAP.

The Grievance Mechanism will comprise of committees of project affected communities and will be setup at four different levels (project, district, county and national levels) to make it easy for PAPs to access without incurring additional cost through long distance travel.

Because of its proximity to PAPs, it is expected that most of the grievances/complaints that may be filed will be handled and resolved at the project level.

Project/Community Level Grievance Redress Committee (GRC)

During the stakeholder consultations for the RAP, Community level GRCs were constituted and set up in nine (9) towns/villages (3 in Grand Geddeh and 6 in Nimba) across the project impact corridor. The CGRCs are charged with the responsibility to handle and address project related grievances/complaints that may be filed by PAPs and other community members during the construction phase of the project. The Community level GRCs will operate in accordance with the grievance redress procedures laid out in the Grievance Redress Mechanisms. Each Community level GRC consists of a chair, co-chair, secretary and members.

A project-level GRM is a system of dispute resolution that shall be established at the impact corridor/location. Its objective is to bring the GRM closer to PAPs. First instance dispute/grievances shall be handled at the project level where the impact area is. All effort shall be made to resolve issues at the first instance.

The project/community level GRM shall have the following members:

- The Contractors' Social Safeguards Specialist, Chairperson
- The County's Resident Engineer, member
- The Contracting Entity, IIU, member
- Town/Village Chief, member
- Representative of PAPs – female, member
- Representative of PAPs – male, member

The project level GRC shall resolve or reach a decision five (5) days from the date the complaint is received. The chairperson of the GRM committee shall communicate the committee's decision to the aggrieved PAP(s) in writing and keep record of all decisions related to each case.

District Level Grievance Redress Committee (GRC)

The objective of the district level GRM is to resolve complaints that the project level GRM is unable to handle. The District level GRM shall comprise of the following members:

- District Commissioner, Chairperson
- City Mayor, member
- District Magistrate/Circuit, member

- Clan Chief, member
- Project/Community Level GRM Chairperson, member
- Representative of PAPs – female, member
- Representative of PAPs – male, member

District level GRM shall do everything possible to resolve issues within fifteen (15) days from the date the case has been transferred to it from the project level GRM. The chairperson of the GRM committee shall communicate the committee's decision to the aggrieved PAP(s) in writing and keep record of all decisions related to each case.

County Level Grievance Redress Committee (GRC)

A committee of knowledgeable persons, experienced in the subject area, shall be constituted at the county level to handle complaints that have not been addressed or resolved at the district level in the project area.

The county level GRM shall be composed of the following members:

- County Superintendent, Chairperson
- Project/Community Level GRM Chairperson, member
- Land Commissioner, member
- County Inspector, member
- County Engineer, member
- Representative of PAPs – female, member
- Representative of PAPs – male, member

The county level GRM shall do everything possible to resolve issues within fifteen (15) days from the date the case has been transferred to it from the District level GRM Committee. The chair of the committee shall communicate the committee's decision to the aggrieved PAP(s) in writing and keep record of all decisions related to each case.

IIU/MPW Level Grievance Redress Committee

A committee of knowledgeable persons, experience in the subject area, shall be constituted at the IIU/MPW to handle complaints that have not been addressed or resolved at the county level in the project impact area or corridor. The IIU/MPW level GRM shall be comprised of the following members:

- Deputy Minister for Administration, MPW, Chairperson
- MPW Legal Counsel, member

- IIU Social Safeguard Officer, member
- Property Valuator (MPW), member
- Internal Auditor, member
- Representative of PAPs – female, member
- Representative of PAPs – male, member

The IIU MPW level Grievance redress Mechanism committee shall do everything possible to resolve issues within fifteen (15) days from the date the case has been transferred to it from the county level GRM committee. The chairperson of the committee shall communicate the committee's decision to the aggrieved PAP(s) in writing. The decision reached at the IIU/MPW GRM committee level will be the final decision. The committee shall keep record of all decisions related to each case.

5.3.1.1 Grievance Procedures

The following procedures shall be followed while filing and processing complains:

- **Grievance Register Book:** A grievance register book shall be opened and kept in the office of each GRM committee and duplicated by the Contractor's Social Safeguards Specialist. All grievances shall be registered when and upon the receipt of complaints from the aggrieved. The book shall have: i) case reference number, ii) the aggrieved name, iii) the date the case is received, iv) the date the case is resolved and, v) a remarks column.
- **Responsibility for registering complaints*:*** The Contractor's Social Safeguards Specialist in the project area shall register in the Grievance Register Book all written complaints received.
- ***Case receipt:*** Within 24 hours of receiving complaints, the Contractor's Social Safeguards Specialist shall issue a letter to the aggrieved acknowledging receipt of the case and providing a date when the case will be reviewed as well as the venue.
- **Public access to the book*:*** The book shall be accessible to the public.
- **PAPs*:*** All PAPs who have issues with their compensation and assistances are required to submit written complaints to the appropriate level of GRM.
- **Mediation meetings and outcomes*:*** Mediation meetings and outcomes will be recorded and kept in safe places at each of the Grievance Redress Mechanism Committee's locations.
- **Central register*:*** The MPW shall be responsible for maintaining a central register of all grievances in a central Grievance Matrix and is responsible for monitoring the resolution of all grievances and updating the central register on a monthly basis.

- **Last resort*:*** The court of law will be a "last resort" option if all mediation efforts to resolve the complaint(s) at the four GRM levels fail. As per the Constitution of the Republic of Liberia, any aggrieved person has the right to take his/her case to the court of law.

6 ENVIRONMENTAL AND SOCIAL BASELINE

Environmental baseline data are important to understand the physical, biological and socio-economic characteristics of the project's environment. Such information sets the ground for the analysis of the potential impacts of the project's activities on the existing environment. Therefore, the collection of baseline data, presented in this chapter, focuses on the information required to conduct an ESIA for a road project.

6.1 PHYSICAL ENVIRONMENT

An assessment of the project area's physical characteristics was conducted based on the following items:

- a review of published literature on Liberia and Nimba and Grand Gedeh Counties,
- a review of documents provided by the project owners,
- a review of topographic, geological and hydrological maps of the project area,
- the consultant's general knowledge of the project area,
- observations during field visits to the project area in February 2020, and
- the sampling results for noise, water resources and soil.

This initial assessment helps provide the required baseline data to prepare a complete ESIA Report.

6.1.1 Topography

Liberia can be divided into three distinct topographical areas (Figure 6-1):

- a *flat coastal plain* which extends up to 80 km inland and is characterised by the abundance of creeks, lagoons, and mangrove swamps;
- an *area of broken, forested hills* with altitudes from 180–370 m, which covers most of the country; and
- an area of *mountains* in the northern highlands, with elevations reaching 1,384 m.

The Tappita-Toe Town road is located within the broken, forested hills zone (Figure 6-1) with altitudes between approximately 200 m and 300 m above sea level. This broken terrain is a peneplain formed through intense and prolonged weathering and erosion. It is characterized by deep, lateritic soils with gentle, rounded slopes, and dissected by numerous watercourses.

Figure 6-1 Project location with respect to the general elevation map of Liberia

6.1.2 Meteorological Setting

The climate of Liberia is determined by the equatorial position and the distribution of low and high-pressure belts over the African continental landmass and the Atlantic Ocean. A fairly warm temperature with high humidity through most of the year occurs because of the moderating influence of the ocean and the tropical location.[8]

Figure 6-2 gives a general idea about the evolution of the different meteorological parameters throughout the year at the coast.

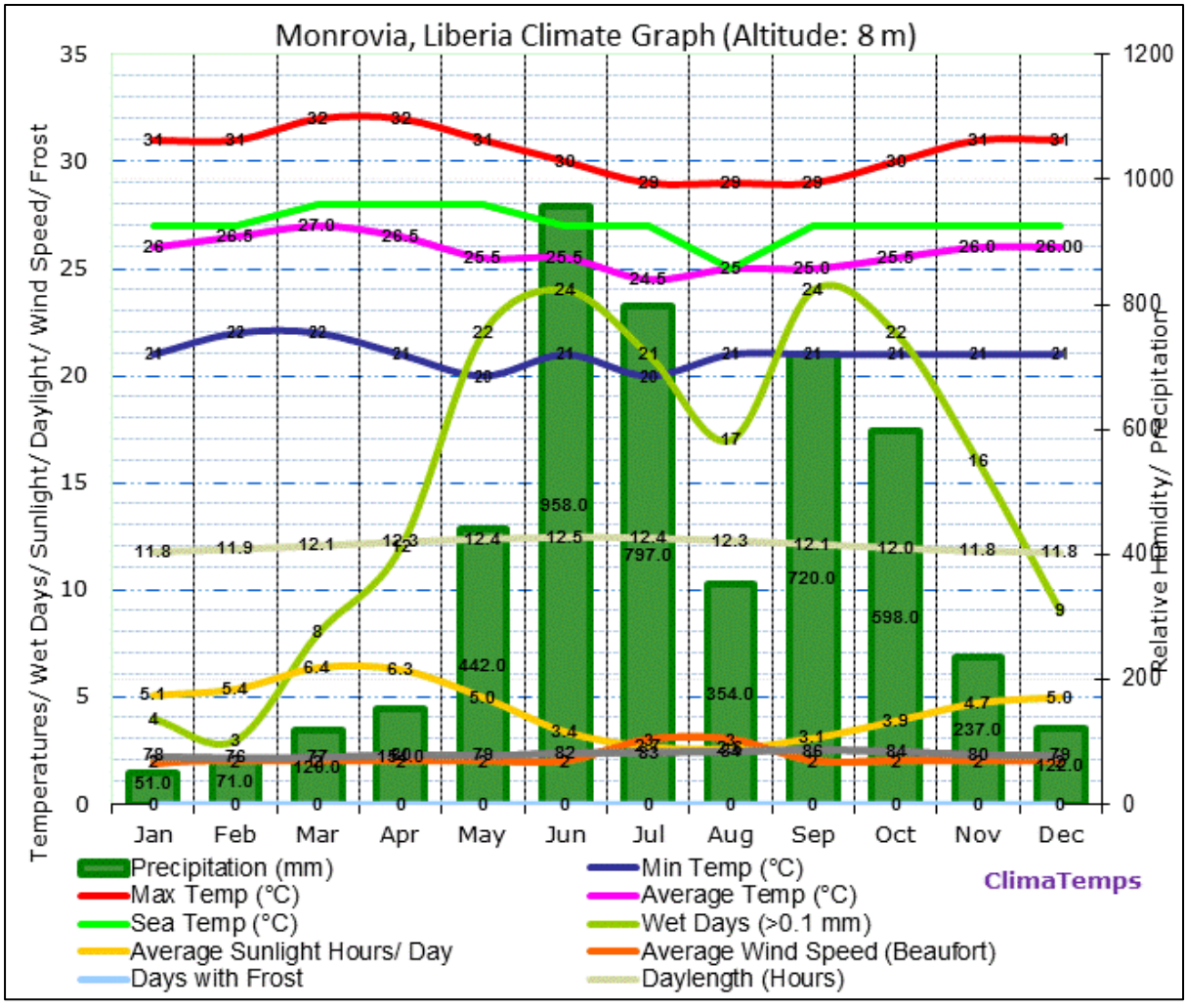


Figure 6-2 Average meteorological parameters throughout the year in Monrovia (www.climatetemp.info, retrieved on May 18, 2016)

Meteorological data including primarily precipitation, ambient temperature, and wind direction and speed, are necessary for developing and understanding an important part of the

[8] UNDP, 2006. First State of the Environment Report for Liberia. Monrovia, Liberia.

environmental conditions in the region and consequently for adequately assessing environmental impacts in a comprehensive approach.

Although no recent data are available for the project site, the following sections present available historical data for the period between 1930 and 1980 in two weather stations that were installed in the area surrounding the project area. Those stations are:

- Ganta in the St-John River Basin (Latitude: 7º14'N; Longitude: 8º59'W)
- Tappita in the Cestos River Basin (Latitude: 6º30'N; Longitude: 8º52'W)

6.1.2.1 Precipitation

Liberia has two seasons: the rainy season and the dry season. The dry season lasts from November to April and the rainy season is from May to October.

The average annual rainfall along the coastal belt is over 4,000 mm (157 inches) but reduces significantly to 1,300 mm (51 inches) at the forest-savannah boundary in the north.[9] Monrovia, the capital, receives almost 4,572 mm (181 inches) of rain per year. The corridor of the eastward flowing Cavalla River is one of the driest areas of the country, but even there the land receives over 1,775 mm (70 inches) of rain annually. The months of heaviest rainfall vary from one part of the country to another, but are normally June, July and September. Observations concerning the diurnal distribution of rainfall prove that most of the rain received along the coast falls during the night and early morning between 6 PM and 07 AM.

Figure 6-3 presents the available historical data on the variation of the rainfall throughout the year in Ganta and Tappita for the following periods:

- Ganta: average monthly rainfall from 1934-1973
- Tappita: average monthly rainfall from 1952-1973

[9] Bongers, F., Poorter, L, Van Rompaey, R.S.A.R, and Parren, M.P.E, 1999. Distribution of Twelve Moist Forest Canopy Tree Species in Liberia, and Cote d'Ivoire

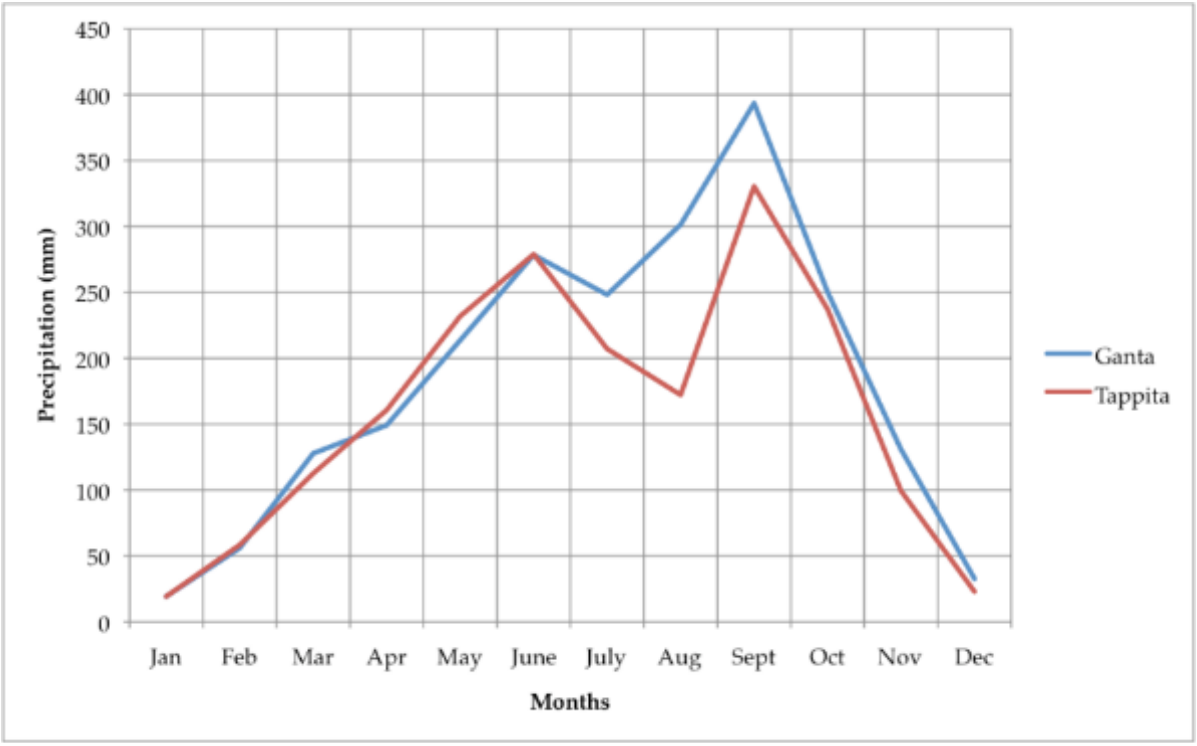


Figure 6-3 Average rainfall (mm / Month) in the project area (adapted from Liberian Hydrological Service, 1982, 1981)

6.1.2.2 Temperature and Sunshine

Generally, the temperature remains warm throughout the country and there is little variation between the seasons. The temperature over the country ranges from 27°C to 32°C (80.6°F to 89.6°F) during the day and from 21°C to 24°C (69.8°F to 75.2°F) at night. The average annual temperature along the coast ranges from 24°C to 30°C (69.8°F to 86°F). In the interior, it is between 27°C and 32°C (80.6°F and 89.6°F). The highest daytime temperatures occur between January and March and the lowest between August and September.

The sun is overhead, or within a few degrees of it, at noon throughout the year, giving rise to intense insolation in all parts of the country, resulting in high temperatures with little monthly variations.[10] The temperature would be much higher without cloud cover, winds, humidity and rainfall, which are influenced by both the maritime influence and the vegetation cover of the country. The days with the longest hours of sunshine fall between December and March. The daily sunshine hours are at a minimum during July, August and September.

Figure 6-4 shows average temperature variation throughout the year recorded by the Ganta and Tappita stations described in the previous section.

[10] UNDP, 2006.

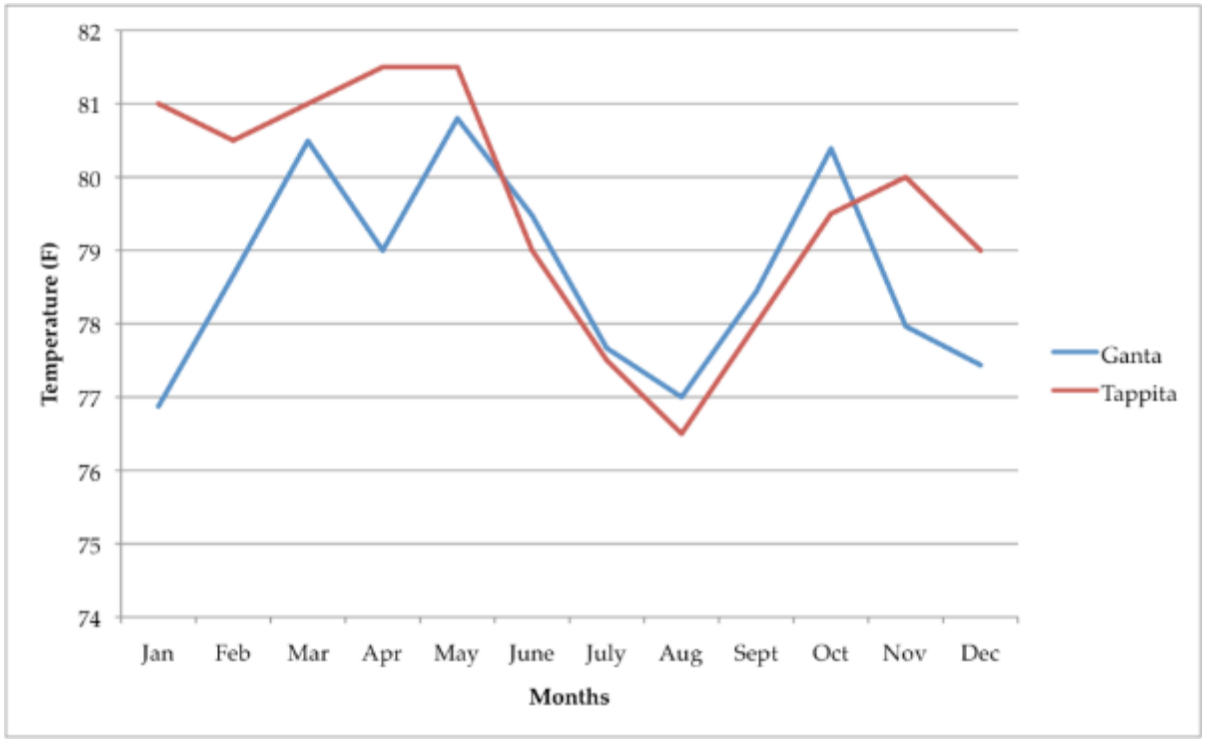


Figure 6-4 Average monthly temperature (in degrees Fahrenheit degree) in the project area (adapted from Liberian Hydrological Service, 1982, 1981)

6.1.2.3 Wind

The seasons in Liberia mainly result from the movement of air masses:

- the Inter-Tropical Convergence Zone (ITCZ), which shifts northwards across Liberia for the northern hemisphere summer,
- the moist air masses over the Atlantic Ocean, which are drawn in from the south, and
- dry continental air that is drawn off the interior of North Africa during the northern hemisphere winter, particularly pronounced as the Harmattan.

The pressure shifts between the air masses, driven by the seasonal movements of the sun, force the dry continental air mass and the moist south-equatorial maritime air mass to replace each other roughly every six months.

The only available information about the wind direction and speed is for Robertsfield in Montserado County (JICA, 2000-2006).

Wind Direction: The monthly mean wind direction shows south-east as the dominant direction and south as the second dominant direction.[11]

[11] Japan International Cooperation Agency (JICA), 2009, The Master Plan Study on Urban Facilities Restoration and Improvement in Monrovia in The Republic of Liberia. Monrovia, Liberia.

Wind Speed: The monthly mean wind speed shows a maximum of 10.3 km/h in August, a minimum of 7.1 km/h in January and an average of 9.3 km/h.[12] Total wind speed is greatest in the rainy season and lowest in the dry season, being lower in the interior, where the high vegetation cover serves as a windbreak. Along the coast, the average annual wind speed is 30 km/h.[13]

6.1.2.4 Relative Humidity

The relative humidity in Liberia is high throughout much of the year (Figure 6-2). A relative humidity of 90% to 100% is common during the rainy season. During the dry season, it decreases to as low as 65%. Along the coast, it does not drop below 80%. On average, it is above 90%. There is a wider variation in the interior and the relative humidity may fall below 20% during the Harmattan period, which is characterized by a dust-laden wind from the Sahara Desert.[14] Recent or historical data on humidity in the project area are not available.

6.1.3 Geological Setting

The 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.

Most of the Tappita-Toe Town road corridor develops in the Pan-African Belt. The rocks of the region date from the Paleoproterozoic age. Over them, some alluvial flood plains are developed, particularly in bands close to the main rivers. Also, some Aeolian deposits are noticeable.

6.1.4 Water Resources

6.1.4.1 Existing Water Resources in the Project Area

Communities along the road rely on wells and hand pumps for drinking, cooking, cleaning and sanitary use. Major groundwater sources include wells with hand pumps, most of which were installed during the emergency relief program following the civil war, and shallow

[12] JICA, 2009.
[13] Brandolini, G. V. and M. Tigani (2006). Liberia Environmental Profile. December 2006, Monrovia.
[14] UNDP, 2006

hand-dug wells, which are prone to contamination from rural run-off and pose infection risk to the communities.

The communities living in the project area also rely on surface water bodies for their water supply, especially during the dry season when the wells are almost dry. Moreover, the local communities use the local creeks for livelihood activities such as fishing and transport.

The area crossed by the road is abundant with water bodies. The Cestos River is the major watercourse that drains the area. (Figure 6-5). The Cestos River is one of the six major rivers of Liberia. The Cestos River crosses through the Tappita-Toe Town road between Farnlay and Bah Town. In addition, three major tributaries of the Cestos River cross through the road. These are: the Gwehn Creek, the Alogashi River and the Tahi Creek. The Gwehn Creek draws its headwaters to the north of Tappita and its tributaries intersect the road. The Alogashi River draws its headwaters to the north of Doeyelay, then runs parallel to the road between Doeyelay and Farnlay and crosses though the road twice. The Tahi Creek crosses though the road to the east of the Cestos River. The road also crosses several smaller perennial and seasonal creeks and swamps which are not represented in Figure 6-5.

Understanding the local surface and groundwater quality is an important factor in the project's impact assessment and helps design proper mitigations. For the purpose of this ESIA, and in order to obtain an idea on baseline water quality in the project area, spot water sampling was carried out for a number of watercourses intersecting the Tappita-Toe Town road, as well as for a number of wells along the road. Details and results of the sampling are presented in Section 6.1.4.2 and 6.1.4.3 below.

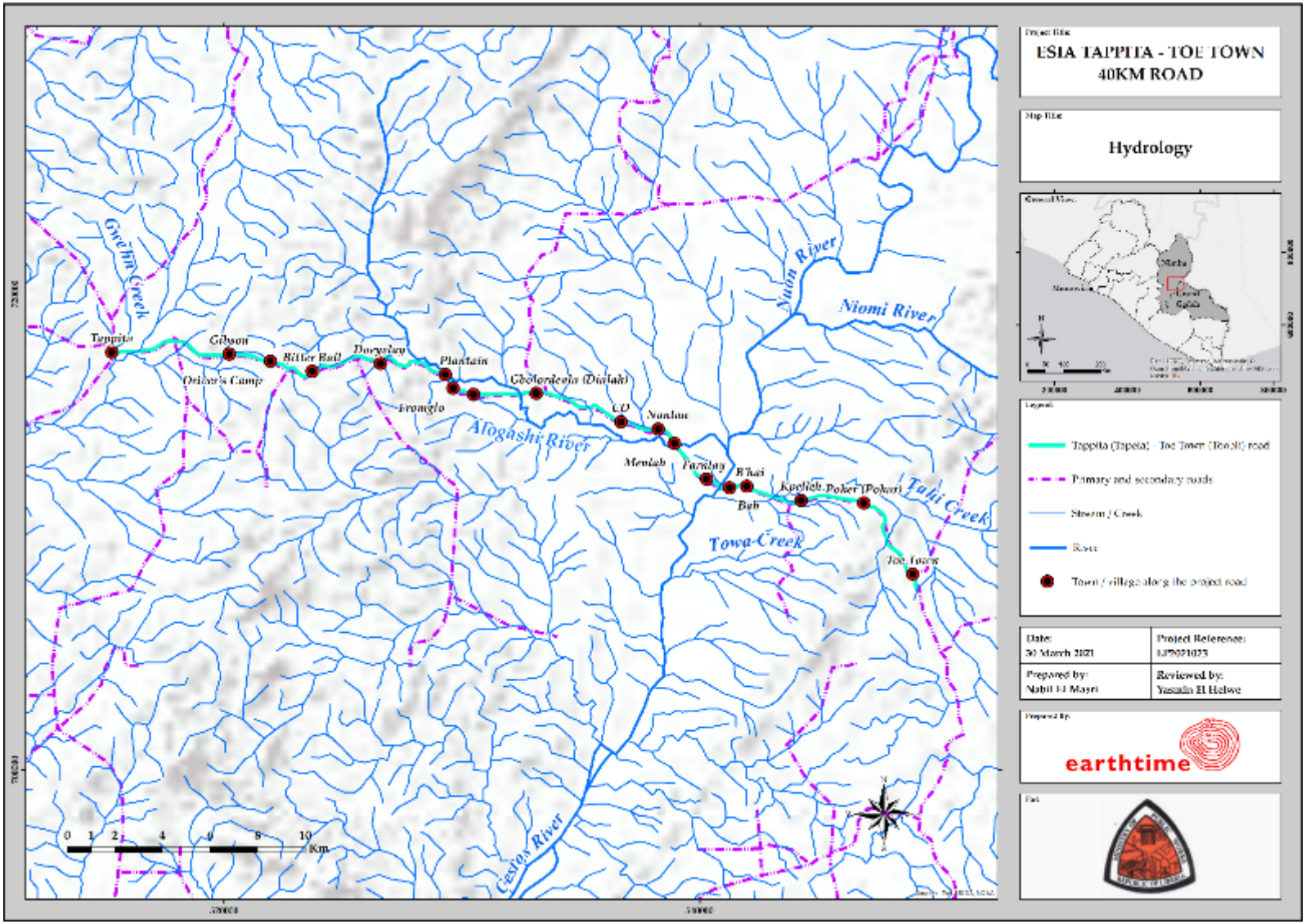


Figure 6-5 Hydrology in the project area

6.1.4.2 Baseline Water Quality Collection along the Tappita-Toe Town Road

Spot sampling was carried out for several creeks intersecting the road, as well as for a number of wells along the road. The sampling took place on 11th and 12th February 2021. In total, 6 surface water and 4 groundwater samples were collected. Sampling locations are presented in Table 6-1 and Figure 6-6.

Sampling locations were selected to give a representative idea of the water quality in the project area. The focus was to obtain records from the watercourses and groundwater sources crossed by the Tappita-Toe Town road. These will be the first receptors of potential impacts arising from the planned construction activities. Sampling locations for surface water included upstream and downstream sites where possible: this was achieved on the Alogashi River (samples S04 and S06)).

Prior to the sampling operation, Liberlab laboratory in Monrovia was contacted to provide adequate and sterile containers for the requested tests. For each sampling location, 8 different containers were filled. These were:

- 2 plastic bottles (500 mL each)
- 1 glass bottle (500 mL)
- 2 glass vials (40 mL each)
- 1 plastic bottle containing HNO3 preservative (sample filtered using syringes and filters provided by Laboratory)
- 1 plastic bottle (60 mL) containing H2SO4 preservative
- 1 plastic bottle (60 mL) containing NaOH preservative

Surface water samples were collected (Figure 6-7) as per the following procedure:

1. Choosing sampling locations: Sampling was undertaken at a location representative of the general flow in the watercourse.
2. Sterile gloves were used to keep hands safe and to make sure the sampling bottles were not contaminated.
3. Sampling container: A clean 2 L plastic was used to collect the sample.
4. Rinsing the sampling container: At each location, the bottle was immersed in the water body to be sampled, filled, then emptied and capped.
5. Collecting the sample:

a. The bottle was immersed in the water on its side before opening it.

b. The bottle was opened in the water.

c. The bottle was filled 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. The bottle was removed from the water body.

6. Filling the laboratory containers (for containers that do not contain any preservation liquid):

    a. The sample was poured from the sampling bottle into the laboratory container.

    b. The laboratory container was filled till its top.

    c. The container was recapped while avoiding trapped air bubbles.

7. Filling the laboratory containers (for bottles that contain a preservation liquid):

    a. The sample was poured from the sampling bottle into the laboratory container without overflowing the bottle.

    b. The bottle was recapped while avoiding trapped air bubbles.

    c. If the parameters to be tested require filtering: a syringe provided by ALS was used to withdraw water from the sampling bottle, then attached to a filter and emptied into the containers that contain the preservative liquid.

8. All of the laboratory containers were labeled carefully with the sample ID, the date of sampling and the time of sampling, using a permanent marker.

9. The laboratory containers were stored in cool and dark conditions using a cool box containing ice.

Groundwater samples were collected as per the following procedure (Figure 6-8):

1. Sterile gloves were used to keep hands safe and to make sure the sampling bottles were not contaminated.

2. Water was pumped or removed using a bucket for wells without pumps.

3. The laboratory containers were filled to the rim, while avoiding overflowing and trapped air bubbles.

4. If the parameters to be tested require filtering: a syringe provided by ALS was used to withdraw water from a filled bottle, then attached to a filter and emptied into the

laboratory containers.

5. All eight laboratory containers were labeled carefully with the sample ID, the date of sampling and the time of sampling, using a permanent marker.

6. The laboratory containers were stored in cool and dark conditions using a cool box containing ice.

Upon the return to Monrovia, all the laboratory containers were inspected to make sure they had been labelled correctly, and then sent to the laboratory.

For each water sample, 58 different parameters were tested; these included parameters that define the general quality of the water such as pH, conductivity, turbidity, nutrients and minerals, and parameters that can indicate pollution such as heavy metals and petroleum products. Heavy metals included arsenic, lead and mercury. A wide range of petroleum hydrocarbon fractions (38, in total) was analysed. The tested parameters are presented in Table 6-2 (Section 6.1.4.3 below).

Bacteriological testing was not undertaken because of the remoteness of the sites and the difficulty of transporting samples quickly enough, with a full cold chain of custody, to obtain tests in under 24 hours.

Table 6-1 Details of surface water and groundwater sampling locations

Sample Code	Sampling Date & Time	Coordinates*		Name of Creek**	Weather Conditions	Description of Sampling Location***	Flow Direction**,***	Observations
		X	Y					
SW01	11-Feb-2021 4:05 PM	547793	709866	Unknown	Sunny	Creek near Neerison's Rubber Farm – approx. 5 m to the left side of the road upstream	North-East (to the right side of the road)	Clear water
SW02	11-Feb-2021 5:01 PM	543428	711339	Unknown	Sunny	Bridge near Poker (Pokar) town, bamboo area - approximately 30 m to the left side of the road	North-West (to the left side of the road)	Turbid water
SW03	11-Feb-202 15:54 PM	540738	711979	Cestos River	Sunny	Approximately 20 m to the right side of the road	North-West (to the left side of the road)	Clear water
SW04	11-Feb-2021 6:18 PM	538893	713772	Alogashi River (Nen River)	Clear	Approximately 30 m to the left side of the road (Downstream)	North-East (to the right side of the road)	None
SW05	12-Feb-2021 10:51 AM	515810	717369	Gwehn Creek	Sunny	Swampy area – 200-300 m to the left side of the road (Downstream)	North-East (to the left side of the road)	Turbid water
SW06	12-Feb-2021 11:50 AM	532350	715793	Alogashi River (Nen River)	Sunny	Approximately 10 m to the right side of the road (Upstream)	North-East (to the left side of the road)	Turbid water
GW01	11-Feb-2021 3:12pm	549089	708015	N/A	Sunny	In Toe Town	N/A	Open well - hand dug
GW02	11-Feb-2021 6:47pm	533315	715920	N/A	Clear	In Dialah (Gobordeala) - Near health center	N/A	Hand pump with cover
GW03	12-Feb-2021 1:10pm	530463	715585	N/A	Sunny	In Gwin (Gwein) town	N/A	Open well - hand dug
GW04	12-Feb-2021 2:30pm	516166	717538	N/A	Sunny	In Tappita	N/A	Hand dug well with cover

*Projected Coordinate System (PCS): WGS 1984 UTM Zone 29N
**N/A = Not applicable
***Left/Right is considered in a Toe Town-to-Tappita direction

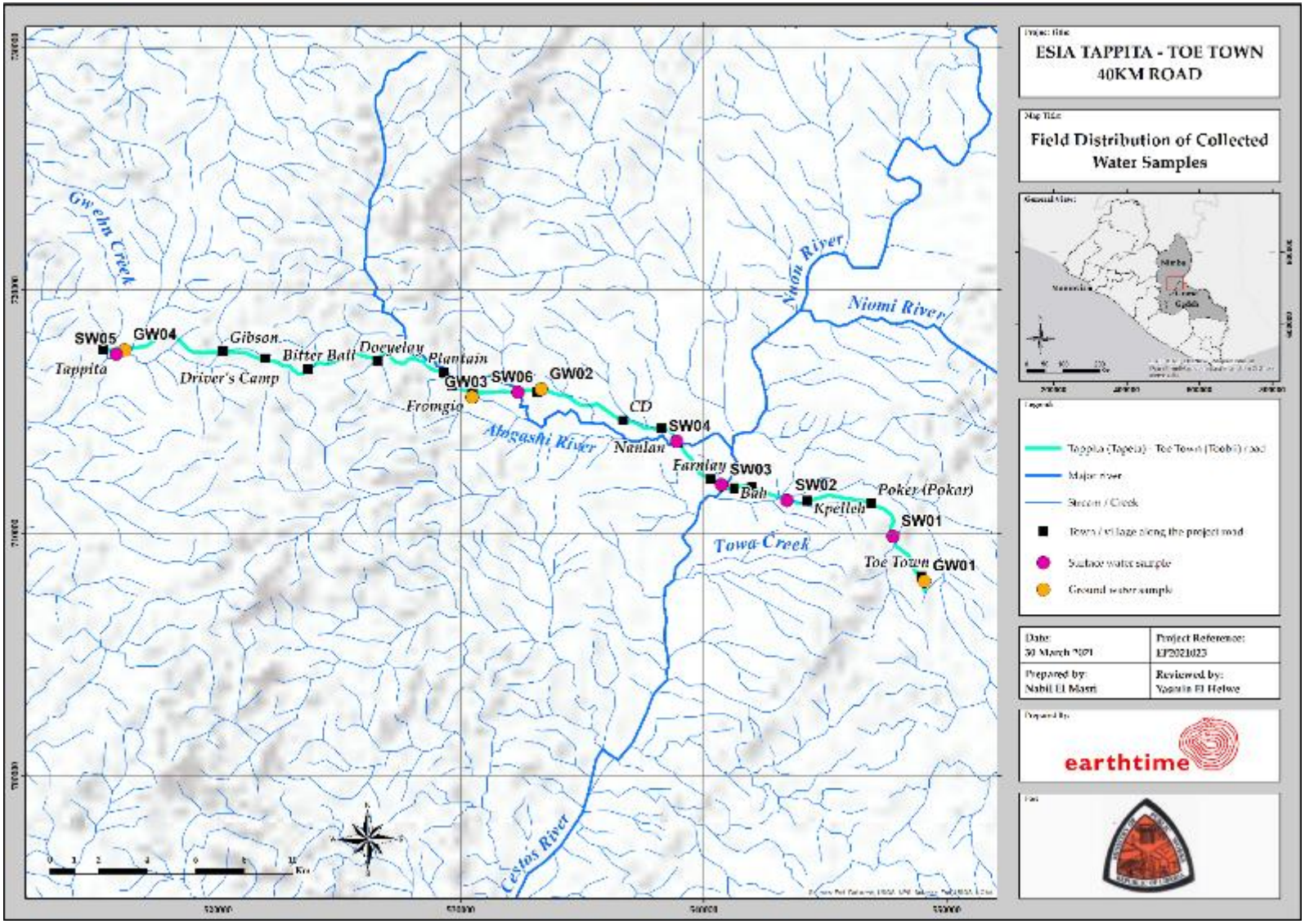


Figure 6-6 Surface and groundwater sampling location

(a)

(b)

Figure 6-7 Surface water sampling at SW03 (a) and SW05 (b)

(a)

(b)

Figure 6-8 Groundwater sampling at GW01 (a) and GW02 (b)

6.1.4.3 Laboratory Results

Surface water quality results, along with standard values, are presented in Table 6-2. Groundwater quality results, along with standard values, are presented in Table 6-3. The original lab report is included in Appendix B.

Test results are compared to the Liberian drinking water quality standard presented in Chapter 2 (Section 2.4), which include the World Health Organization (WHO) guideline standard where available.

In general, parameter concentrations in surface water samples are within the above-mentioned standards except for:

- Ammoniacal Nitrogen, which exceeds the Ministry of Health standard in 2 sampling locations out of 6 (SW02 and SSW03);
- Nitrite, which exceeds the Ministry of Health standard in 1 sampling location out of 6 (SW01);
- Total Suspended Solids, which exceeds the Ministry of Health standard in 1 sampling location out of 6 (SW05); and
- Iron, which exceeds the Ministry of Health and WHO standards in all sampling locations.

The majority of parameter concentrations in groundwater samples were within standards for drinking water except for:

- Nitrate, which exceeds the Ministry of Health standard and WHO standards in two wells out of the 4 sampled wells (GW01 and GW02);
- Nitrite, which exceeds the Ministry of Health standard in 2 wells out of 4 (GW01 and GW02); and
- pH, which is below the range given in the Ministry of Health standard in all the wells.

The project area is mostly rural. Settlements in the area are isolated by long sections of vegetated and agricultural land belonging to the local communities. Surface water in the area is used as a source of drinking water. The area lacks proper sanitation, and many communities use the open land or the nearby creeks for their sanitation needs. There are hardly any industrial activities in the area. Therefore, the water quality in the project area depends mostly on the natural environment, as affected by agricultural and human waste from communities in the area, and impacts from the presence of the road itself.

High concentrations of ammonia, nitrites and nitrates in surface and groundwater samples is usually an indication of the presence of high levels of organic matter in these waters, which may be due to the fact that the area has no sanitation means and the communities use the nearby environment for sanitation purposes. Alternatively, they could be derived from runoff from agricultural land in the area.

TSS values higher than the standards in surface water sampling locations can be due to soil erosion associated with agricultural practices, runoff from the unpaved road itself, or even decaying plants and animals. Although 1 sample (SW05) exceeds the Ministry of Health Class I guideline standard, the result value (10,8 mg/L) is very close to the standard value (≤ 10.0).

The site observations revealed that the water at SW05 was relatively turbid at the time of sampling.

High iron concentrations in all surface water samples can be linked to the very high levels of iron found in ferralsols, the dominant soils in the project area (see 6.1.5 on soil quality). This is naturally occurring and not toxic, but it is likely to affect the taste of the water.

Low pH values in groundwater samples in Liberia are common, mainly due to the fact that the soils in Liberia are naturally acidic. As groundwater passes through them it becomes acidic as well. This has been observed in many study areas. pH values of the soil samples collected in the project area were between 4.84 and 6.08 (see 6.1.5.4), therefore acidic. pH does not have a direct impact on health, but can affect the smell, taste or color of the water[15].

None of the heavy metals (arsenic, lead and mercury) showed any results of concern, and in most cases were below the level of detection (especially arsenic and mercury). It can therefore be taken that the surface water and groundwater in the road corridor show no evidence of heavy metal pollution before the project works have commenced. Petroleum hydrocarbons levels were all below the level of detection, except in samples SW01 and SW02, where the Total Petroleum Hydrocarbon (TPH) was at 35 µg/l and 11 µg/l, respectively. At SW01, the TPH value is solely due to the Aromatics >EC21-EC35 fraction as shown in Table 6-2. The fraction causing the Total Petroleum Hydrocarbon value of 11 µg/l in SW02 could not be verified as all fractions of petroleum hydrocarbons in this sample were at levels below the detection level. This result is the cumulative total of all the aromatic and aliphatic fractions, which even being at levels below the detection level, when added together they could result in a total higher than the detection level. These results suggest that although the overall picture of the surface and groundwater quality in the project area is of clean waters, some contamination with petroleum hydrocarbons can be observed in the surface water, but not likely in the groundwater.

[15] US EPA, 2009. National Primary Drinking Water Regulation.

Table 6-2 Surface water sampling test results

Parameter	Unit	Standards		Sample Code					
		WHO	Ministry of Health (Class I)	SW01	SW02	SW03	SW04	SW05	SW06
Inorganics									
Alkalinity, Total as $CaCO_3$	mg/l	N/A	N/A	20.5	20.1	32.6	29.2	20.1	27.3
Ammoniacal Nitrogen as N	mg/l	0.5	≤ 0.1	<0.2*	0.273	0.324	<0.2*	<0.2*	<0.2*
Chloride	mg/l	350	≤ 250.0	<2	2.2	<2	2	2.2	2
COD, unfiltered	mg/l	N/A	N/A	40.3	13.2	11.1	16.6	15.4	9.48
Conductivity at 20°C	mS/cm	N/A	N/A	0.0403	0.0388	0.0523	0.0452	0.0355	0.0481
Dissolved solids, Total	mg/l	500	≤ 500.0	33.7	32.5	43.8	39.4	32.2	43.8
Nitrate as NO3	mg/l	50	≤ 40.0	2.25	0.68	<0.3	0.412	<0.3	0.503
Nitrite as NO2	mg/l	N/A	≤ 0.1	0.282	<0.05	0.056	0.081	0.057	0.08
Oxygen, dissolved	mg/l	N/A	N/A	9.49	10.5	9.91	9.79	9.53	9.39
pH	pH Units	N/A	6.5 - 8.0	7.23	7.16	7.79	7.3	7.08	7.18
Sulphate	mg/l	250	≤ 150.0	<2	<2	<2	<2	<2	<2
Suspended solids, Total	mg/l	N/A	≤ 10.0	3.3	5.8	<2	4.75	10.8	<2
Turbidity	ntu	N/A	N/A	6.84	13.5	4.48	13.7	22.1	7.65
Metals									
Arsenic	µg/l	50	≤ 50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Iron	mg/l	0.1	≤ 0.1	0.563	0.732	0.625	0.492	1.37	0.335
Lead	µg/l	100	≤ 100	<0.2	<0.2	<0.2	<0.2	0.308	0.223
Magnesium	mg/l	N/A	N/A	1.78	1.55	2.02	1.87	1.09	2.03
Phosphorus	µg/l	N/A	N/A	<10	<10	<10	<10	<10	<10
Potassium	mg/l	N/A	N/A	0.528	1.71	1.89	1.51	1.56	1.32
Mercury	µg/l	10	n.d.	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Parameter	Unit	Standards		Sample Code					
		WHO	Ministry of Health (Class I)	SW01	SW02	SW03	SW04	SW05	SW06
Extractable Petroleum Hydrocarbons (EPH) (Diesel Range Organics (DRO)) (C10-C40)									
EPH Range >C10 - C40 (aq)	µg/l	N/A	N/A	<100	<100	<100	<100	<100	<100
EPH CWG (Aliphatic fraction)									
Aliphatics >C12-C16 (aq)	µg/l	N/A	N/A	<10	<10	<10	<10	<10	<10
Aliphatics >C16-C21 (aq)	µg/l	N/A	N/A	<10	<10	<10	<10	<10	<10
Aliphatics >C16-C35 Aqueous	µg/l	N/A	N/A	<10	<10	<10	<10	<10	<10
Aliphatics >C21-C35 (aq)	µg/l	N/A	N/A	<10	<10	<10	<10	<10	<10
Total Aliphatics >C12-C35 (aq)	µg/l	N/A	N/A	<10	<10	<10	<10	<10	<10
EPH CWG (Aromatic fraction)									
Aromatics >EC12-EC16 (aq)	µg/l	N/A	N/A	<10	<10	<10	<10	<10	<10
Aromatics >EC16-EC21 (aq)	µg/l	N/A	N/A	<10	<10	<10	<10	<10	<10
Aromatics >EC21-EC35 (aq)	µg/l	N/A	N/A	35	<10	<10	<10	<10	<10
Total Aromatics >EC12-EC35 (aq)	µg/l	N/A	N/A	35	<10	<10	<10	<10	<10
Total Gasoline Range Organic Hydrocarbons (GRO) including BTEX and MTBE									
Aliphatics >C10-C12	µg/l	N/A	N/A	<10	<10	<10	<10	<10	<10
Aliphatics >C5-C6	µg/l	N/A	N/A	<10	<10	<10	<10	<10	<10
Aliphatics >C6-C8	µg/l	N/A	N/A	<10	<10	<10	<10	<10	<10
Aliphatics >C8-C10	µg/l	N/A	N/A	<10	<10	<10	<10	<10	<10
Aromatics >EC10-EC12	µg/l	N/A	N/A	<10	<10	<10	<10	<10	<10
Aromatics >EC5-EC7	µg/l	N/A	N/A	<10	<10	<10	<10	<10	<10
Aromatics >EC7-EC8	µg/l	N/A	N/A	<10	<10	<10	<10	<10	<10
Aromatics >EC8-EC10	µg/l	N/A	N/A	<10	<10	<10	<10	<10	<10
Benzene	µg/l	10	N/A	<7	<7	<7	<7	<7	<7
EPH (C6-C10)	µg/l	N/A	N/A	<100	<100	<100	<100	<100	<100
Ethylbenzene	µg/l	300	N/A	<5	<5	<5	<5	<5	<5

Parameter	Unit	Standards		Sample Code					
		WHO	Ministry of Health (Class I)	SW01	SW02	SW03	SW04	SW05	SW06
GRO >C5-C10	µg/l	N/A	N/A	<10	<10	<10	<10	<10	<10
GRO >C5-C12	µg/l	N/A	N/A	<50	<50	<50	<50	<50	<50
m,p-Xylene	µg/l	N/A	N/A	<8	<8	<8	<8	<8	<8
Methyl tertiary butyl ether (MTBE)	µg/l	N/A	N/A	<3	<3	<3	<3	<3	<3
o-Xylene	µg/l	N/A	N/A	<3	<3	<3	<3	<3	<3
Sum of detected BTEX	µg/l	N/A	N/A	<28	<28	<28	<28	<28	<28
Sum of detected Xylenes	µg/l	N/A	N/A	<11	<11	<11	<11	<11	<11
Toluene	µg/l	700	N/A	<4	<4	<4	<4	<4	<4
Total Petroleum Hydrocarbons (TPH) CWG									
Total Aliphatics & Aromatics >C5-35 (aq)	µg/l	N/A	N/A	35	11	<10	<10	<10	<10
Total EPH									
Total EPH (C6-C40) (aq)	µg/l	N/A	N/A	<100	<100	<100	<100	<100	<100
Volatile Organic Compounds									
Benzene	µg/l	10	N/A	<1	<1	<1	<1	<1	<1
Ethylbenzene	µg/l	300	N/A	<1	<1	<1	<1	<1	<1
m,p-Xylene	µg/l	N/A	N/A	<1	<1	<1	<1	<1	<1
o-Xylene	µg/l	N/A	N/A	<1	<1	<1	<1	<1	<1
Methyl tertiary butyl ether (MTBE)	µg/l	N/A	N/A	<1	<1	<1	<1	<1	<1
Sum of detected BTEX	µg/l	N/A	N/A	<5	<5	<5	<5	<5	<5
Toluene	µg/l	700	N/A	<1	<1	<1	<1	<1	<1

N/A = Not Available
n.d.= not detectable
Color Coding:
= Exceeding WHO standard and (or) Ministry of Health standard
* = Method detection Limit is higher than WHO Standard and (or) Ministry of Health standard

Table 6-3 Groundwater sampling test results

Parameter	Unit	Standards		Sample Code			
		WHO	Ministry of Health (Class I)	GW01	GW02	GW03	GW04
Inorganics							
Alkalinity, Total as $CaCO_3$	mg/l	N/A	N/A	3.5	20.8	13	5
Ammoniacal Nitrogen as N	mg/l	0.5	≤ 0.1	<0.2*	<0.2*	<0.2*	<0.2*
Chloride	mg/l	350	≤ 250.0	16.7	9.2	2	13.1
COD, unfiltered	mg/l	N/A	N/A	<7	<7	<7	<7
Conductivity at 20.°C	mS/cm	N/A	N/A	0.19	0.136	0.0236	0.0824
Dissolved solids, Total (meter)	mg/l	500	≤ 500.0	148	113	21.3	65.3
Nitrate as NO3	mg/l	50	≤ 40.0	71.7	53.1	0.778	19.6
Nitrite as NO2	mg/l	N/A	≤ 0.1	0.217	0.234	0.085	0.077
Oxygen, dissolved	mg/l	N/A	N/A	9.27	8.25	8.99	9.69
pH	-	N/A	6.5 - 8.0	5.16	6.38	5.83	5.73
Sulphate	mg/l	250	≤ 150.0	<2	<2	<2	<2
Suspended solids, Total	mg/l	N/A	≤ 10.0	<2	<2	3.15	8.55
Turbidity	ntu	N/A	N/A	0.441	0.636	5.55	11.5
Metals							
Arsenic	µg/l	50	≤ 50	<0.5	<0.5	<0.5	<0.5
Iron	mg/l	0.1	≤ 0.1	<0.019	<0.019	0.0471	<0.019
Lead	µg/l	100	≤ 100	6.96	0.554	0.395	0.748
Magnesium	mg/l	N/A	N/A	2.19	3.65	0.433	0.46
Phosphorus	µg/l	N/A	N/A	<10	18.2	<10	<10
Potassium	mg/l	N/A	N/A	10.2	1.69	0.795	1.44
Mercury	µg/l	10	n.d.	<0.01	<0.01	<0.01	<0.01
Extractable Petroleum Hydrocarbons (EPH) (Diesel Range Organics (DRO)) (C10-C40)							
EPH Range >C10 - C40 (aq)	µg/l	N/A	N/A	<100	<100	<100	<100

Parameter	Unit	Standards		Sample Code			
		WHO	Ministry of Health (Class I)	GW01	GW02	GW03	GW04
EPH CWG (Aliphatic fraction)							
Aliphatics >C12-C16 (aq)	µg/l	N/A	N/A	<10	<10	<10	<10
Aliphatics >C16-C21 (aq)	µg/l	N/A	N/A	<10	<10	<10	<10
Aliphatics >C16-C35 Aqueous	µg/l	N/A	N/A	<10	<10	<10	<10
Aliphatics >C21-C35 (aq)	µg/l	N/A	N/A	<10	<10	<10	<10
Total Aliphatics >C12-C35 (aq)	µg/l	N/A	N/A	<10	<10	<10	<10
EPH CWG (Aromatic fraction)							
Aromatics >EC12-EC16 (aq)	µg/l	N/A	N/A	<10	<10	<10	<10
Aromatics >EC16-EC21 (aq)	µg/l	N/A	N/A	<10	<10	<10	<10
Aromatics >EC21-EC35 (aq)	µg/l	N/A	N/A	<10	<10	<10	<10
Total Aromatics >EC12-EC35 (aq)	µg/l	N/A	N/A	<10	<10	<10	<10
Total Gasoline Range Organic Hydrocarbons (GRO) including BTEX and MTBE							
Aliphatics >C10-C12	µg/l	N/A	N/A	<10	<10	<10	<10
Aliphatics >C5-C6	µg/l	N/A	N/A	<10	<10	<10	<10
Aliphatics >C6-C8	µg/l	N/A	N/A	<10	<10	<10	<10
Aliphatics >C8-C10	µg/l	N/A	N/A	<10	<10	<10	<10
Aromatics >EC10-EC12	µg/l	N/A	N/A	<10	<10	<10	<10
Aromatics >EC5-EC7	µg/l	N/A	N/A	<10	<10	<10	<10
Aromatics >EC7-EC8	µg/l	N/A	N/A	<10	<10	<10	<10
Aromatics >EC8-EC10	µg/l	N/A	N/A	<10	<10	<10	<10
Benzene	µg/l	10	N/A	<7	<7	<7	<7
EPH (C6-C10)	µg/l	N/A	N/A	<100	<100	<100	<100
Ethylbenzene	µg/l	300	N/A	<5	<5	<5	<5
GRO >C5-C10	µg/l	N/A	N/A	<10	<10	<10	<10
GRO >C5-C12	µg/l	N/A	N/A	<50	<50	<50	<50
m,p-Xylene	µg/l	N/A	N/A	<8	<8	<8	<8

Parameter	Unit	Standards		Sample Code			
		WHO	Ministry of Health (Class I)	GW01	GW02	GW03	GW04
Methyl tertiary butyl ether (MTBE)	µg/l	N/A	N/A	<3	<3	<3	<3
o-Xylene	µg/l	N/A	N/A	<3	<3	<3	<3
Sum of detected BTEX	µg/l	N/A	N/A	<28	<28	<28	<28
Sum of detected Xylenes	µg/l	N/A	N/A	<11	<11	<11	<11
Toluene	µg/l	700	N/A	<4	<4	<4	<4
Total Petroleum Hydrocarbons CWG							
Total Aliphatics & Aromatics >C5-35 (aq)	µg/l	N/A	N/A	<10	<10	<10	<10
Total EPH							
Total EPH (C6-C40) (aq)	µg/l	N/A	N/A	<100	<100	<100	<100
Volatile Organic Compounds							
Benzene	µg/l	N/A	N/A	<1	<1	<1	<1
Ethylbenzene	µg/l	300	N/A	<1	<1	<1	<1
m,p-Xylene	µg/l	N/A	N/A	<1	<1	<1	<1
Methyl tertiary butyl ether (MTBE)	µg/l	N/A	N/A	<1	<1	<1	<1
o-Xylene	µg/l	N/A	N/A	<1	<1	<1	<1
Sum of detected BTEX	µg/l	N/A	N/A	<5	<5	<5	<5
Toluene	µg/l	700	N/A	<1	<1	<1	<1
Total EPH (C6-C40) (aq)	µg/l	N/A	N/A	<1	<1	<1	<1

N/A = Not Available
n.d.= not detectable
Color Coding:
= Exceeding WHO standard and (or) Ministry of Health standard
= Is below the range given in the WHO standard and (or) the Ministry of Health standard
* = Method detection Limit is higher than WHO Standard and (or) Ministry of Health standard

6.1.5 Soil

6.1.5.1 Soils in Liberia

The Liberian hinterland is an ancient geological landscape where the humid tropical climate has caused intensive mechanical and chemical weathering of the parent rock and leaching of the soil profile for millennia. The bedrock from which the soils have formed are mainly of crystalline, igneous and metamorphic origin, consisting of granites, gneisses, schists and shales. The three major soil groups in Liberia are ferralsols or latosols, lithosols or leptosols, and regosols (coastal and alluvial sands), though other soils occur locally as described below for Nimba.

It is important to appreciate that soils in Liberia are mostly not fertile, despite the lush growth of herbaceous vegetation during the wet season. They are very heavily weathered as a result of the prolonged heat and humidity of the tropics, leading to dominant clays that retain few nutrients, volatilised organic matter and rain-leached profiles. It is these features that lead to the way in which the landscape is managed. In particular, the prevalence of shifting cultivation is a sound agricultural response to this situation, although it is destructive of primary forests and of questionable sustainability. The production of tree crops is also appropriate in this setting, because the deeper rooting of trees allows them to access nutrients that are leached from the upper soil horizons.

6.1.5.2 The Setting of Soils in the project area

The most detailed account of soils in the project area was published in 2014 by ArcelorMittal (Guide to Soils and Plant Growth in Northern Nimba County, Liberia; Nimba Western Range Iron Ore Project, ArcelorMittal Liberia). The description below is based on that work. Other research on soils in Liberia is very generic, being mostly undertaken at the regional scale and showing only swathes of the main soil groups across West Africa.

The landscape of the project area is the product of weathering, erosion and deposition over millions of years under tropical climates in a stable tectonic environment. Steep upper slopes below ridgelines at about 1000 metres above sea level are formed on iron formation or other more resistant rocks. These pass down into lower, flatter slopes and then into undulating plains with a network of poorly drained valley floors at 400 to 500 metres, bounded by better-drained terraces. Weathering products comprise decomposed bedrock with recognisable relict structure (saprolite), passing up into residual soil with no relict structure (laterite). Colluvium (material that has moved down a slope) derived from these materials, together with particles of more resistant rock types, has accumulated towards the foot of steep hillsides.

Soils tend to be dominated by terrain characteristics in this area. Those on the upper slopes are generally shallow leptosols (very shallow soils over continuous rock or soils that are

extremely gravelly or stony). Deeper ferralic cambisols (iron-rich, well-drained brown soils) have developed on the lower slopes, particularly where colluvium has accumulated.

Low hills on the undulating plains typically have deep ferralsols (deeply weathered, red or yellow soils of the humid tropics), called latosols in some classifications, developed over very long periods of time in residual soils derived from decomposed gneiss. Younger fluvisols (soils derived from river deposits) and gleysols (stagnant, waterlogged grey soils) have developed in alluvial materials on terraces and valley floors.

The ferralsols and ferralic cambisols are typically sandy clay loams or clay loams and have a clay mineralogy dominated by low activity kaolinite (i.e. very highly weathered minerals). Vertisols (deep and usually more fertile clay rich tropical soils), characterised by smectite or montmorillonite clay, are not found here.

Table 6-4 and Figure 6-9 give a summary and illustrations of the main soils found in the project area.

Table 6-4 Summary of the main soils found in the project area

Position	Soil group	Summary description
Upland soils	**Ferralsols and ferralic cambisols** (Main slopes and undulating land)	Strong brown to dark red, well drained soils developed in-situ from deeply weathered gneiss or ironstone (iron-ore bearing) bedrock, occurring on undulating to steeply sloping dissected plains and major hill slopes. The soils are mainly deep (>2.0m), fine-gravelly clays and sandy clays with weakly developed subangular blocky structures. Many soils are also gravelly. Sandy soils occur, as do shallow soils overlying very stony and bouldery ironstone.
	Leptosols (Hill tops and upper slopes)	very shallow soils over continuous rock and soils that are extremely gravelly or stony, or both. In Nimba they are mainly found on hill tops, on hard iron formations or on hard granite domes.
Valley soils	**Gleysols** (Valley margins)	Yellowish brown to brown soils occurring at the margins of the dissected plains and valley bottoms on gently sloping to undulating old alluvial or colluvial terraces and in-situ on weathered gneiss or colluvial toe slopes. Soils are clayey or loamy textured, weakly structured, well to imperfectly drained and usually affected by groundwater: this is shown by mottling in the subsoil.
	Gleysols (Valley bottoms)	Mainly deep, very poorly drained, gleyed alluvial soils of varying texture, occurring in the small and usually swampy valley floors within the uplands. The soils are grey, mottled, gleyed and affected by shallow groundwater. Some soils are peaty.
	Fluvisols (Floodplains)	Dark brown to yellowish brown deep alluvial soils bordering the main rivers and flooded annually. Soil textures are variable and frequently stratified. Soils are well to moderately well drained.

Cambisol under cultivation

Cambisol under forest

Ferralsol under cultivation

Ferralsol under forest

Gleysol

Fluvisol

Figure 6-9 Illustrations of typical soil profiles. Sources: all ArcelorMittal (2014) except gleysol, from www.ulrichschuler.net

6.1.5.3 Baseline Soil Information Collection along the Tappita-Toe Town Road

For the purpose of developing a baseline on soil conditions in the project area for this ESIA, A spot soil sampling was carried out for a number of locations along the road. The sampling took place on 11th and 12th February 2021. In total, 6 soil samples were collected.

Sampling locations were selected to give a representative view of the soil conditions in the project area. The focus was to obtain records from locations along the road, covering all of the identified land cover types and land uses in representative proportions. Sampling locations are presented in Table 6-5 and Figure 6-10. The samples were almost all within the road right of way. Once the dominant land use in an area had been determined, a typical location was selected within the actual area of interest, where there were no structures or large vegetation, or signs of disturbance unusual to the surroundings.

Prior to the sampling operation, Liberlab laboratory in Monrovia provided adequate and sterile sampling containers for the requested tests. For each sampling location, two 250 g glass jars were filled.

Soil samples were collected as per the following procedure (see Figure 6-11):

- Sterile gloves were used to keep hands safe and to make sure the sampling bottles were not contaminated.
- A soil auger was used to extract the sample. The auger was pushed to 60 cm below the ground level and turned into the soil, then lifted to remove the core. The core was hand mixed then placed in the sample container.
- The sample containers were labelled with the sample identifier, and the time and date of sampling, using a permanent marker.
- The sample containers were stored in cool and dark conditions using a cool box containing ice.

Upon return to Monrovia, all the sample containers were inspected to make sure they had been labelled correctly, and then sent to the laboratory.

For each soil sample, 28 different parameters were tested; these included parameters that define the general quality of the soils such as colour, inclusions, moisture content, pH, conductivity, nutrients and minerals, and parameters that can indicate pollution such as heavy metals and petroleum products. Heavy metals included boron, lead, cadmium, zinc, among others. Exchangeable Petroleum Hydrocarbons Fraction Range >C10-C40 was also analysed. The tested parameters are presented in Table 6-6 (Section 6.1.5.4 below)

Table 6-5 Details of soil sampling locations

Sample Code	Sampling Date & Time	Coordinates*		Weather Conditions	Description	Land use
		X	Y			
S01	11-Feb-2021 3:01pm	549077	708007	Sunny	In Toe Town near the road	Dry land
S02	11-Feb-2021 4:00pm	547851	709842	Sunny	Neerison's Rubber Farm	Active rubber farm
S03	11-Feb-2021 5:54pm	540738	711979	Clear	Cestos River bank, under bridge	Riparian area
S04	12-Feb-2021 12:30pm	531651	715850	Sunny	Dry Swamp, may have been previously used for agriculture	Dry swamp
S05	12-Feb-2021 1:37pm	528530	717023	Sunny	High vegetation	High vegetation
S06	12-Feb-2021 2:33pm	516150	717503	Sunny	Banana plantation	Agriculture
*Projected Coordinate System (PCS): WGS 1984 UTM Zone 29N						

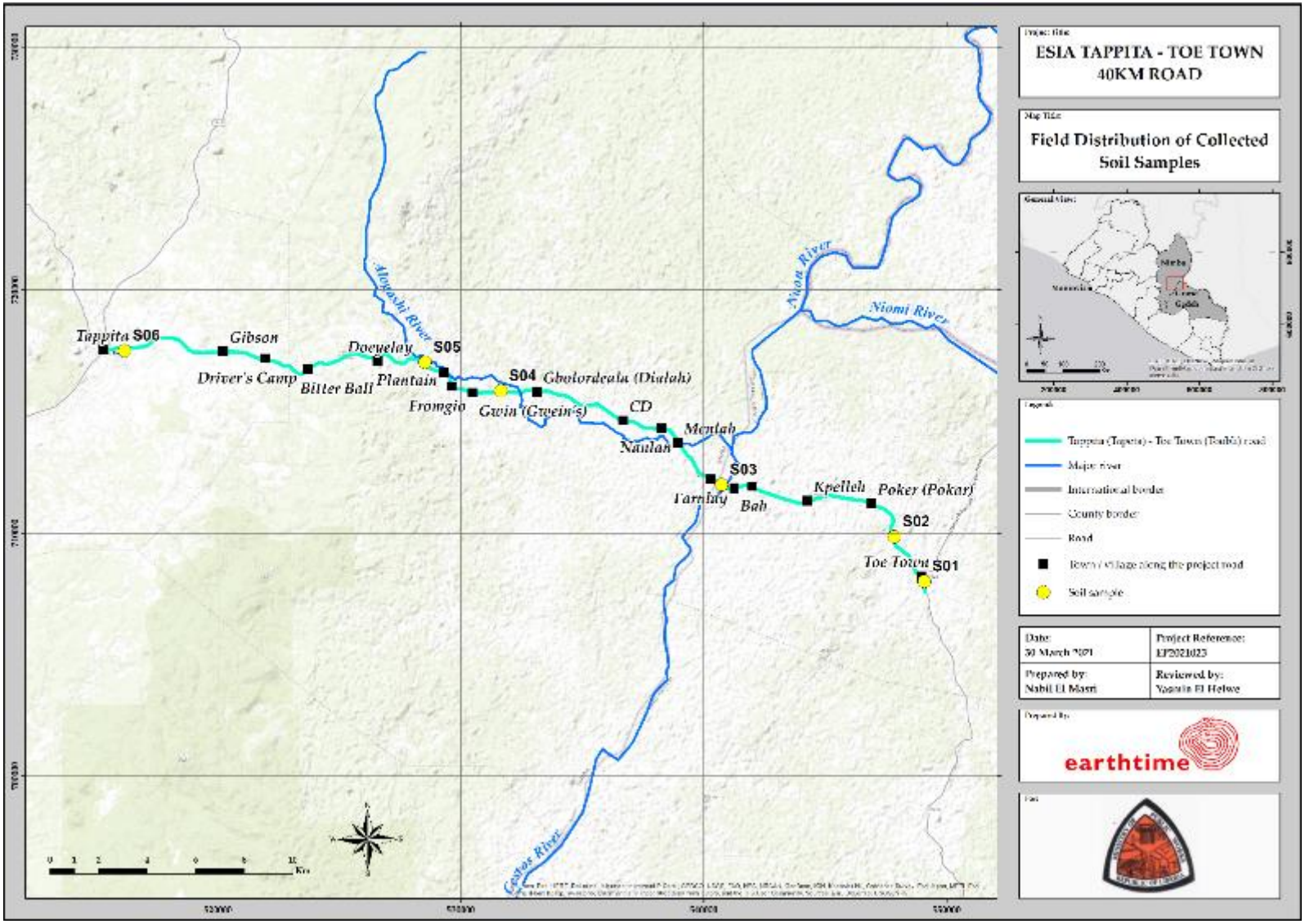


Figure 6-10 Soil sampling locations

Figure 6-11 Soil sampling at S02

6.1.5.4 Laboratory Results

Soil quality results are presented in Table 6-6. The original lab report is included in Appendix B. As there is currently no definitive Liberian standard for soil quality, the test results were interpreted following a number of different guidelines.

- For structural, nutritional and agricultural quality, the guidelines of Landon (1991)[16] and FAO (2000)[17] were used.
- For contamination screening, the Dutch Intervention Values for Soil[18], the soil guideline values issued by UK Environment Agency Contaminated Land Exposure Assessment[19] and the European Community's Directive 86/276/EEC[20] were used.

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

[16] Landon, J.R. (ed.). 1991. Booker Tropical Soil Manual. Longman, and Booker and Tate.
[17] FAO. 2000. Simple soil, water and plant testing techniques for soil resource management. AGL/Misc/28/2000. (Proceedings of a training course held in Ibadan, Nigeria, 16-27 September 1996. Adepetu, J.A., Nabhan H. & Osinubi A., eds). International Inst. of Tropical Agriculture, FAO, Rome.
[18] Ministerie van Volkshuisvesting, Ruimtelijke Ordening en Milieu (VROM), 2013. Soil Remediation Circular 2013 Netherlands.
[19] https://www.claire.co.uk/information-centre/water-and-land-library-wall/44-risk-assessment/178-soil-guideline-values (accessed 22 October 2018).
[20] https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A31986L0278 (accessed 22 October 2018).

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 analyses.

The results show a remarkable uniformity in the soils along the road. The classification of ferralsols (or latosols or laterites) is confirmed by a number of properties, but particularly from the very high levels of iron and aluminium. It is clear that the landform crossed by the road is a highly weathered peneplain (a low relief plain developed by weathering and erosion) with very ancient soils. Intense and prolonged weathering has given rise to mineralogy dominated by iron and aluminium, the classic feature of lateritic soils. The textural class is sandy, with some samples showing tendencies to be more loamy or more clayey. This is also typical of ferralsols, which contain considerable amounts of clay that form the infill in a matrix of harder, less weathered mineral fragments that make up the sand fraction; there is a relatively small proportion of silt-sized particles in these soils.

Laterites tend to be acidic, and this is also confirmed by the test results. The soils are in the pH range of 4.0 to 6.0 (the highest pH being 6.08). Aluminium becomes more soluble in soils at a lower pH, and can then start to inhibit the fertility by replacing plant nutrients in the soil water.

The organic carbon is low in all of the soils, less than one percent in all samples. This is the result of rapid decomposition of organic matter in the warm, moist environment, and its subsequent leaching due to heavy rain. These low levels suggest low innate fertility of the soils.

The major plant nutrients are nitrogen, phosphorus and potassium. Nitrogen availability tends to be very volatile and consequently varies through the year. Mineralisation of nitrogen during dry weather is frequently negated by its take-up by plants once growth starts in the rainy season (leading to the bright green nitrogen flush of the first new growth), and subsequent leaching. With sampling in February during the dry season, low nitrogen levels would be expected. The testing measured nitrogen in three forms: ammonium, nitrate and nitrite. In all cases the exchangeable ammonium was below the level of detection. In the form of nitrates and nitrites, it was also very low, reaching a maximum of 41 parts per million in one sample, which just above the FAO lowest critical value. In general, anything below 0.1 percent of total nitrogen is considered very low, so it is clear that most of the nitrogen in these ecosystems must be in the plants at this time of year and not in the soils.

Phosphorus, tested as phosphate which is the form in which it is available to plants, was below the level of detection in all samples. Total phosphorus levels were also low, since they ranged from 30 to 200 parts per million (or milligrams per kilogram), and a general rule is that low levels in tropical soils are below 200 mg/kg, and medium levels are between 200 and 1,000 mg/kg. This nutrient is therefore also very limited.

Potassium is more variable, ranging from 90 to below 250 mg / kg. The same is found for the other cations (calcium, magnesium and sodium), which are minor plant nutrients. Interpretation of these is not straightforward, however, as these are total values and not exchangeable values. It is likely that these ferralsols have low cation exchange capacities (and therefore limited amounts of the cation nutrients available to plants), because the intensive weathering leads to the dominance of kaolinite in the clay mineral fraction; and kaolinite is the simplest of the lattice clay structures, with the result that it has very low nutrient reserves because there are few electro-chemical bonding sites for these elements within the lattice structure. As a result, it is likely that the great majority of cation nutrients are not available to plants.

The overall picture of the soils is one of ferralsols – or laterites or latosols – of consistent character throughout the road corridor. They are acidic, deeply weathered and relatively infertile soils. By the end of the wet season, they are particularly heavily leached. They will support limited plant growth, but agricultural use is only effective with the increase of organic matter, since that can raise the nutrient availability by increasing the chemical bonding sites that are absent in the weathered clay fraction.

As well as establishing a baseline of the agricultural potential of soils through the road corridor, the samples were also tested for evidence of pollution. This was done by undertaking analyses for a range of heavy metals and for exchangeable petroleum hydrocarbons (EPH). None of these showed any results of concern, and in many cases were below the level of detection (especially boron and cadmium). EPH levels were all very low. It can therefore be taken that the soils in the road corridor show no evidence of pollution before the project works have commenced.

Table 6-6 Soil sampling test results (SSL05-18)

Parameter	Unit	Sample Code					
		S01	S02	S03	S04	S05	S06
Colour	-	Light Brown	Light Brown	Light Brown	Light Brown	Light Brown	Light Brown
Description	-	Sandy Clay	Sandy Loam	Sand	Sand	Sandy Silt Loam	Sandy Silt Loam
Inclusion 1)	-	Stones	Stones	None	Vegetation	None	Vegetation
Inclusion 2)	-	Vegetation	Vegetation	None	None	None	None
Moisture Content Ratio	%	12	14	10	7.7	13	8.9
Total Organic Carbon	%	0.32	0.667	0.3	0.375	0.298	0.457
Acidity as HCl	mg/kg	<20	<20	29.9	39.9	<20	30.8
Alkalinity, Total as $CaCO_3$	mg/kg	11.4	11.7	14	24.4	<10	16.5
Conductivity at 20°C	mS/cm	1.69	1.71	1.93	1.86	1.74	1.83
Exchangeable Ammonia as NH_4	mg/kg	<12	<12	<12	<12	<12	<12
Nitrate as NO_3, 2:1 water soluble	mg/kg	18.4	24.3	41	3.63	3	28.6
Nitrite as NO_2, 2:1 water soluble	mg/kg	0.16	0.15	<0.1	0.25	<0.1	0.12
pH	pH Units	5.74	4.86	5.63	5.48	4.89	6.08
Phosphate (ortho) as PO_4	mg/kg	<1	<1	<1	<1	<1	<1
Water Soluble Sulphate as SO4 2:1 Extract	mg/kg	0.0043	0.0055	0.0072	0.0054	<0.004	0.0114
Aluminium	mg/kg	23300	23000	1740	5570	12000	9950
Boron	mg/kg	<0.7	<0.7	<0.7	0.807	<0.7	<0.7
Cadmium	mg/kg	<0.02	<0.02	<0.02	0.0912	<0.02	<0.02
Iron	mg/kg	113000	108000	5140	4430	8960	10500
Lead	mg/kg	1.94	1.53	2.2	4.89	3.03	4.66
Manganese	mg/kg	60.6	237	78.2	63.2	19.7	68.9
Phosphorus	mg/kg	108	194	124	81.4	30.8	115
Zinc	mg/kg	18.1	30.6	12.8	7.73	5.74	12.9
Calcium	mg/kg	218	418	954	2340	42.6	412
Magnesium	mg/kg	123	213	353	255	136	213
Potassium	mg/kg	201	129	202	236	93.7	160
Sodium	mg/kg	46.1	28.8	38.8	45.5	15.9	20
EPH Range >C10 - C40	mg/kg	<35	<35	<35	<35	<35	<35

6.1.6 Noise

Historic data are not available on noise levels in the project area. Nevertheless, sources of noise in the area are generally limited. Background noise is dominated by vehicular traffic. Noise could also emanate from charcoal production and subsistence farming activities, as well as local shops and services in urban centres. Thus, mainly transient noise (intermittent with short duration) exists in the project area; with the exception of urban centres, where the noise is relatively higher and constant in daylight hours, sometimes extending till after midnight.

For the purpose of this ESIA, and in order to get an idea on the baseline noise level and the potential sources of noise in the project area, noise level recordings were taken on different sections of the road, at different times of the day and during different activities. Details and results of the noise sampling are presented in Section 6.1.6.1 and 6.1.6.2 below.

6.1.6.1 Baseline Noise Information Collection along the Tappita-Toe Town Road

Spot noise level sampling was carried out for several locations along the road. The sampling took place on 11th and 12th February 2021. In total, 6 noise recordings were collected.

Sampling locations were selected to give a representative idea of the noise level in the project area. The focus was to obtain records from different locations along the road. Sampling locations are presented in Figure 6-12 and Table 6-8.

Sound level values were collected over a period of 30 minutes at each location. The noise measurements were collected with a Casella 63X model digital sound level meter, using a tripod that maintained the instrument at a height of 1.2 to 1.5 m above the ground (Figure 6-13). The equipment collected A-, C- and Z-weighted level readings for a period of 30-minutes.

All noise recordings were taken during the day when the weather was not windy or rainy.

6.1.6.2 Sampling Results

Noise sampling results are displayed in Table 6-8. Only the A-weighted noise measurement is presented in the table because it is the most representative measurement: it covers the full audible range 20 Hz to 20 kHz and is similar to the response of the human ear. The equivalent continuous A-weighted sound pressure level, L_{Aeq}, is the single number that represents the average sound energy measured over that period. The L_{Aeq} is the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period. Full reports from the noise level survey are presented in Appendix C.

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. typical dB(A) noise levels are listed in Table 6-7 below.

Table 6-7 Typical dB(A) noise levels

Noise level (dB(A))	Equivalence to the human ear
0	Threshold of hearing
30	Rural area at night, still air
40	Public library; refrigerator humming at 2 metres
50	Quiet office, no machinery; boiling kettle at 0.5 metre
60	Normal conversation
70	Telephone ringing at 2 metres; vacuum cleaner at 3 metres
80	General factory noise level
100	Pneumatic drill at 5 metres
120	Discotheque – 1 metre in front of loudspeaker
140	Threshold of pain

The daytime noise level on the sides of the road generally varied between 59 dB L_{Aeq} and 69 dB L_{Aeq} (Locations NL01, NL04 and NL05). Variations in the L_{Aeq} in these locations mainly depend on the level of traffic along the road and the types of vehicles passing, as well as the type of human activity, if present, at the time of recording. However, two noise level values recorded at these locations are higher than the national standard limit of 60 dB day-time L_{Aeq} set for such areas (Table 6-9 (D)). The noise level under the bridge of Cestos River (Location NL03) was at 68.8 dB. This relatively high value is due to the crossing of a truck over the Cestos River bridge while the noise level was being recorded.

Sampling locations that were not directly on the road, in the adjacent farming areas or in the natural environment, had noise level measurements between 44 dB L_{Aeq} and 51 dB L_{Aeq} (NL02 and NL06). These values are lower than the national standard daytime limit of 60 dB L_{Aeq} set for such areas and typical of areas with a predominantly rural character.

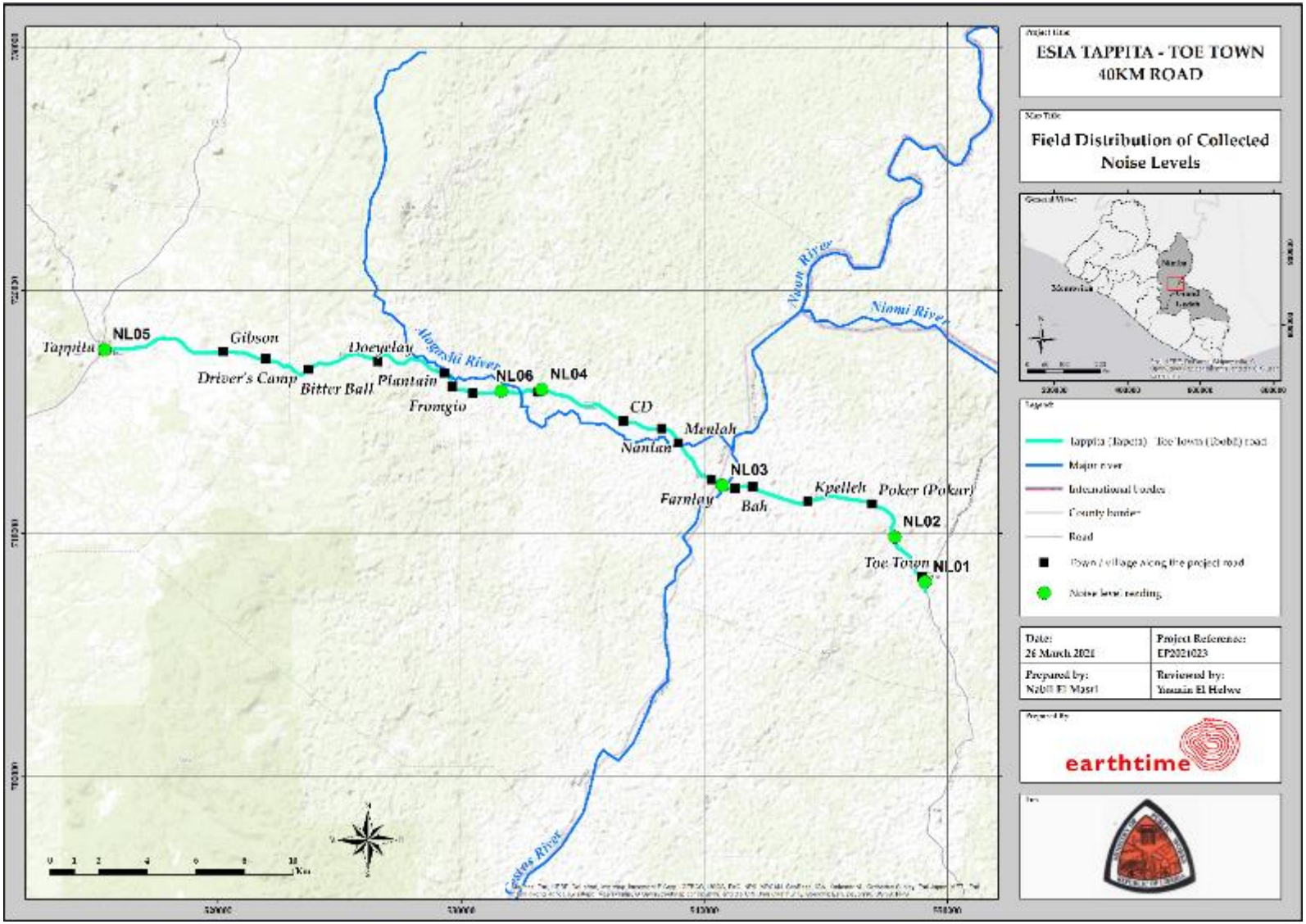


Figure 6-12 Noise sampling locations

Table 6-8 Details of noise sampling locations and results

Sample Code	Sampling Date & Time	Coordinates*		Weather Conditions	Description of Sampling Locations	Observations	$L_{Aeq, 30\ min}$**	$L_{AFmax, 30\ min}$*	$L_{AFmin, 30\ min}$*
		X	Y						
NL01	11-Feb-2021 2:36 PM	549077	708007	Sunny	Side of the road, in Toe Town	Residential area	59.1	87.2	37
NL02	11-Feb-2021 3:51PM	547840	709853	Sunny	Neerison's Rubber Farm	Active rubber farm	50.9	83.5	26.1
NL03	11-Feb-2021 5:23 PM	540739	711980	Clear	On the bank of Cestos River, 10 meters away from the bridge	Truck crossing the bridge during recording	68.8	108.2	41.7
NL04	11-Feb-2021 6:47 PM	533315	715920	Clear	Side of the road, next to Dialah health center (Gbolordeala)	Clinic	61.7	86.4	41.8
NL05	12-Feb-2021 9:13 AM	515328	717558	Sunny	Tappita center	Active area with many shops	69	96.6	49.3
NL06	11-Feb-2021 12:16 PM	531651	715850	Sunny	Dry swamp area	None	44.9	76.8	29.7

* Projected Coordinate System (PCS): WGS 1984 UTM Zone 29N

** $L_{Aeq, 30\ min}$ = A-weighted equivalent continuous sound level recorded over 30 minutes
$L_{AFmax, 30\ min}$ = A-weighted fast maximum sound level meter recorded over 30 minutes
$L_{AFmin, 30\ min}$ = A-weighted fast minimum sound level meter recorded over 30 minutes

Figure 6-13 Noise sampling at NL03

Table 6-9 Maximum Permissible Noise Levels for General Environment in Liberia (Environmental Protection Agency of Liberia, 2017. Noise Pollution Control & Standards Regulations)

Facility	Noise Limits B (A) (Leq)	
	DAY	NIGHT
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
Time Frame: use duration *Day: 6.00 a.m. 10.00 p.m.* *Night: 10.00 p.m. 6.00 a.m.* *The time frame takes into consideration human activity*		

6.1.7 Air Quality

6.1.7.1 Introduction

Historic data on air quality levels in the project area are not available. As the project falls within an area with a dominant rural character, levels of gaseous pollution are low and sources of air pollutants are limited.

The current principal source of air pollution throughout the entire project area is emissions from vehicular traffic (dust and exhaust emissions) along the Tappita-Toe Town road itself

and the small roads leading to it. Vehicle exhaust emissions are mainly volatile organic compounds (VOC), oxides of nitrogen (NO_x), particulate matter ($PM_{2.5}$ and PM_{10}), and carbon monoxide (CO), which are released from the tailpipe while a vehicle is operating. Adding to these, dust is generated as a result of the movement of loose fine particles along the road upon vehicular passage, since the road is currently unpaved.

Emissions from charcoal production, slash-and-burn activities and domestic cooking may also represent important but localized sources of dust and pollutant emissions. Another source of dust is the Harmattan, the dry dusty trade wind that blows from the Sahara during the dry season.

The meaningful determination of air quality as a primary data collection activity is a long-term process and was not attempted during the preparation of this ESIA. Data were obtained from a similar road in Nimba County, from locations ranging from 135 to 150 km from the project site at Tappita, recorded previously as part of another published ESIA. These are provided and discussed in the following subsections.

6.1.7.2 Available Air Quality Data for Nimba County

A summary of the PM_{10} and $PM_{2.5}$ concentrations measured over the period November 2008 to May 2010 for three roadside locations in northern Nimba County is provided in Table 6-10. The seasonal variability of PM_{10} concentrations during this period is reported in greater detail in Table 6-11. Monitoring at the Gbapa site ceased in April 2009.

Considerable caution needs to be applied to the interpretation of these observations as data capture rates at all locations were low due to site-specific difficulties. The following conclusions may be drawn from these data through comparison with the guideline standards (see section 9.8).

- The period mean PM_{10} baseline concentrations exceeded the WHO Interim Target 1 annual mean guideline at Gbapa and Zolowee. The period mean PM_{10} concentration at Sanniquellie was within the assessment criteria of 70 $\mu g/m^3$.
- There is considerable variation about the mean for PM_{10} concentrations at all sites, with greater variations occurring in drier conditions when winds are most likely to transport particulate matter into the study area from the Sahara, increasing the likelihood of the 24-hour mean concentrations becoming elevated.
- The period mean $PM_{2.5}$ concentrations were well within the WHO Interim Target 1 annual mean guideline at Gbapa and Sanniquellie. At Zolowee, the period mean $PM_{2.5}$ was very close to, but within the criteria. The data indicate that there is a risk of exceedance of the annual mean $PM_{2.5}$ guideline in the area around the monitoring site.

Table 6-10 Measured PM10 and PM2.5 concentrations. Source: Nimba Western Area Iron Ore Concentrator Mining Project, Liberia: Environmental and Social Impact Assessment; ArcelorMittal, March 2013

Site	Data capture	Period mean	
		PM_{10}	$PM_{2.5}$
Gbapa	56%	158	27
Zolowee	43%	259	34
Sanniquellie	60%	52	10

Table 6-11 Monthly variation in measured PM10 concentrations, November 2008 to October 2009. Source: Nimba Western Area Iron Ore Concentrator Mining Project, Liberia: Environmental and Social Impact Assessment; ArcelorMittal, March 2013

Season	Month	Sanniquellie		Zolowee		Gbapa	
		Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.
Dry	Nov	3	3	204	255	99	59
Dry	Dec	103	158	249	263	397	239
Dry	Jan	189	571	282	639	238	170
Dry	Feb	46	88	333	273	28	29
Dry	Mar	73	107	311	547	107	78
Dry	Apr	3	5	202	175	46	23
Wet	May	10	18	296	653	-	-
Wet	Jun	5	6	146	210	-	-
Wet	Jul	20	13	86	59	-	-
Wet	Aug	6	7	528	1105	-	-
Wet	Sep	11	9	137	64	-	-
Wet	Oct	12	14	234	266	-	-

Further analysis of the data shows that there is a marked seasonal effect on airborne concentrations of particulate matter. Measured concentrations during the wet season are typically reduced as dust emissions from unpaved roads would be substantially suppressed, although episodes of high particulate matter concentrations have been recorded in all months. The dry season also coincides with the Harmattan winds, which can cause regional-scale dust episodes lasting for extended periods. Although the Harmattan is likely to have affected measured particulate matter concentrations during the monitoring period, local sources are still considered to be the predominant source of emission.

The monitoring period at Gbapa was shorter than at the other sites, data collection only took place between November 2008 and April 2009. The period mean and 24-hour mean concentrations reported for this site are therefore very likely to have been elevated by the monitoring period coinciding with the dry season and the Harmattan. Monitoring over a longer period would probably have given period mean data lower than that shown.

The proximity of the Zolowee monitoring site to the unpaved main road from Sanniquellie to Yekepa means that recorded levels are inevitably dominated by traffic-related dust and this is reflected in the less obvious seasonal pattern at this site. As many residential properties within the study area are located a similar distance from such roads, the baseline data can therefore be considered to be representative of baseline conditions at sensitive receptors. Long-term concentrations of particulate matter within the wider area would be likely to be lower than the values reported.

The measured $PM_{2.5}$ concentrations are significantly lower than the PM_{10} levels (ratios ranging from 0.13 at Zolowee to 0.19 at Sanniquellie). This indicates a significant coarse dust emissions source, consistent with re-suspended dust from unpaved roads.

6.1.7.3 Measured Baseline Dust Deposition Rates

The same source has been used to provide a summary indication of the baseline dust deposition rates measured at the same three sites in northern Nimba, between November 2008 and January 2009. These data are provided in Table 6-12. Considerable caution should be applied to interpretation of these data, as they represent only two months of sampling during the dry season.

Table 6-12 Measured dust deposition rates. Source: Nimba Western Area Iron Ore Concentrator Mining Project, Liberia: Environmental and Social Impact Assessment; ArcelorMittal, March 2013

Site	Monitoring period	Dust deposition (mg/m²/day)
Gbapa	20/11/08 – 22/12/08	117
	22/12/08 – 28/01/09	114
Zolowee	20/11/08 – 22/12/08	452
	22/12/08 – 28/01/09	558
Sanniquellie	25/11/08 – 22/12/08	49
	22/12/08 – 28/01/09	97

The dust deposition rates at all sites are within the South African standard for dust deposition within residential areas (see section 9.8). The highest levels are seen to have occurred at Zolowee, while the levels recorded at Gbapa and Sanniquellie are much lower.

As in the case of measured particulate matter concentrations, it is highly likely that the higher values reported for the Zolowee site are attributable to the proximity of unpaved traffic routes. While this can be considered to be representative of conditions during the dry season near to such roads, baseline dust deposition within the wider area would be lower.

6.1.7.4 Nitrogen Dioxide and Sulphur Dioxide

The 2013 ArcelorMittal ESIA also undertook a baseline diffusion tube survey in northern Nimba County, in March 2012. The results are presented in Table 6-13.

Although concentrations measured from month to month will vary due to meteorological conditions and seasonality the results indicate that, as expected, baseline concentrations of combustion pollutants within the area are very low in most locations. Slightly elevated concentrations, in comparison with background levels, were found in close proximity to roads and other emission sources. The data indicate that there is no existing risk of a breach of the long term and short-term air quality standards for NO_2 and SO_2.

Table 6-13 Diffusion tube monitoring results, March to July 2012. Source: Nimba Western Area Iron Ore Concentrator Mining Project, Liberia: Environmental and Social Impact Assessment; ArcelorMittal, March 2013

Location	Mean measured pollutant concentration (μg/m³)	
	NO_2	SO_2
Gbapa	4.5	1.4
Zolowee	3.9	0.8
Makinto	5.2	0.9

6.1.7.5 Greenhouse Gas Levels

Total emissions of carbon dioxide from Liberia in 2014 were estimated by the Carbon Dioxide Information Analysis Center at 255,000 tonnes of carbon, principally arising from liquid fuel combustion. This amounts to around 0.06 tonnes of carbon per capita. Liberia is number 167 in a list of 220 countries in terms of total carbon release, and 200 out of 220 in terms of per capita release. Emissions have remained largely unchanged since 1990, and represent only a very small proportion of the total emissions arising from the Sub-Saharan African region.

6.2 BIOLOGICAL ENVIRONMENT

6.2.1 Flora

6.2.1.1 The Setting

Nationally, Liberia's forests represent an important ecosystem for a variety of fauna and flora, providing habitat for more than 2,200 vascular plant species, nearly 590 bird species (13 of which are found nowhere else), and more than 100 mammals such as the pygmy hippopotamus, the Diana monkey and the critically endangered West African chimpanzee. Much of the forest has been either degraded through partial conversions for shifting agriculture and logging, or full-scale change due to the development of plantations, infrastructure and mining. Despite this, some large tracts of primary forest remain, mostly in the north-west and south-east of Liberia, and in pockets elsewhere. These become increasingly fragmented and isolated away from the core forest areas. In Nimba County, they are limited mainly to the scattered mountains that rise above the undulating, weathered peneplain of the general landscape.

Moves to preserve Liberia's forests complement efforts made across West Africa to guarantee the protection and connectivity of forest lands within the Upper Guinean rain forest. Protection in the past has included the reservation of forests for both conservation and logging, and since 2009 has included legal protection for community-managed forests (which usually include at least some harvesting). Nevertheless, protection for conservation has become more widely gazetted in recent years, with a growing number of nature reserves and national parks, as shown in Figure 6-14. Other conservation designations are also present, including Ramsar wetland sites, Key Biodiversity Areas, and Important Bird and Biodiversity Areas.

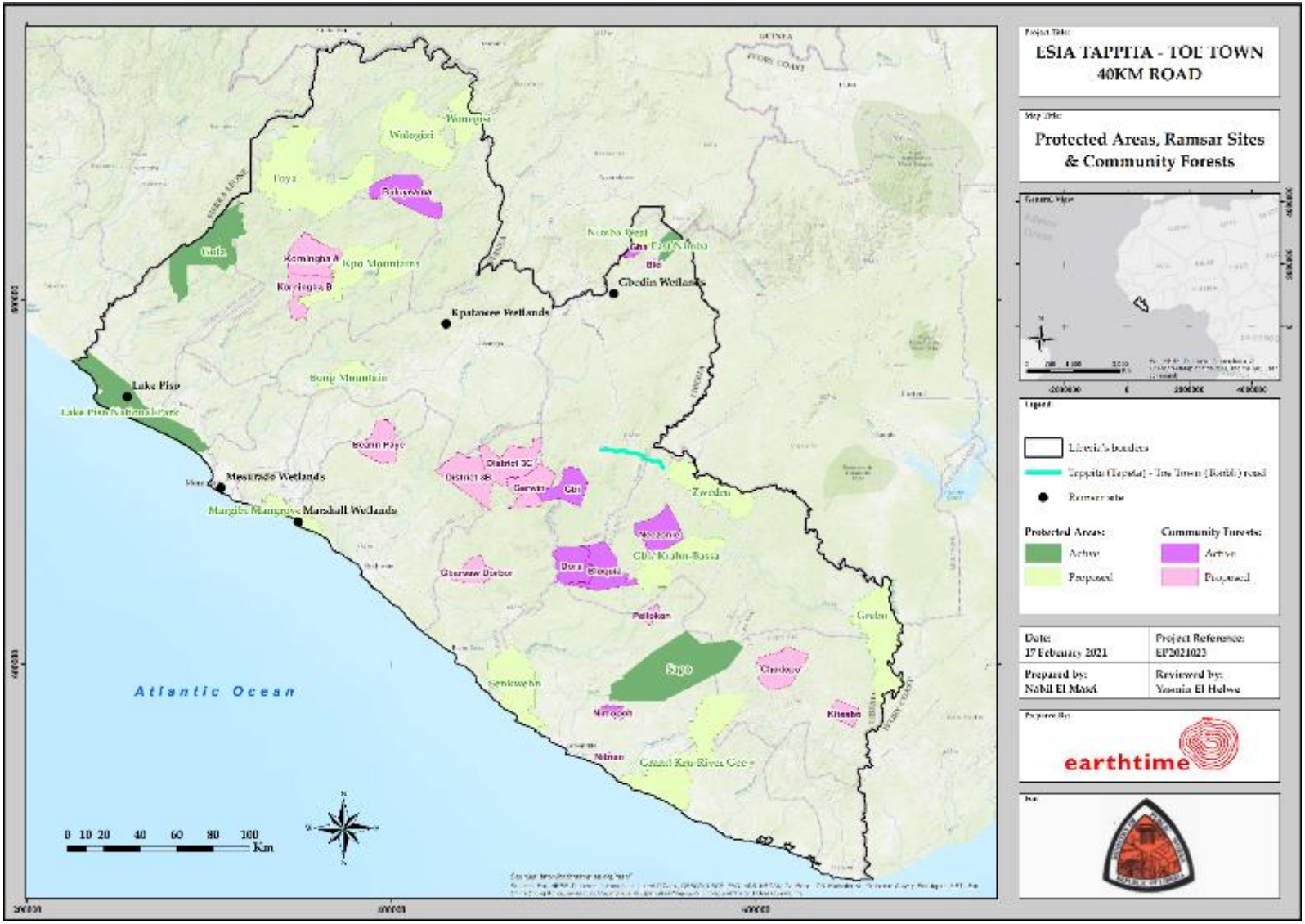


Figure 6-14 Map showing the protected areas, designated Ramsar sites and community forests in Liberia

6.2.1.2 Protected Areas, Natural and Critical Habitat

There is no nationally or internationally designated protected area crossed or located near the road from Tappita to Toe Town. As well as there being no national parks or nature reserves in the area, none of Liberia's RAMSAR wetlands of international importance, Key Biodiversity Areas, or Important Bird and Biodiversity Areas occurs in the vicinity of the road. However, the north western border of the Zwedru proposed protected area is less than 10 km away from the road at Toe Town as shown in Figure 6-14.

The Zwedru forest is fragmented forest of 15,000 hectares located in Grand Gedeh County. It is currently under threat from slash and burn agricultural activities. The forest is a proposed Important Bird Area (IBA) as it is the only known site for the Liberian Greenbul (*Phyllastrephus leucolepis*) and holds a large population of Gola Malimbe (*Malimbus ballmanni*).[21]

The whole area of the road corridor runs through modified habitat. Despite this, it is possible that species of conservation concern may be encountered, either of plants or animals, as described in the paragraphs below Few patches of natural habitats as defined by the World Bank's ESS 6 may occur within this modified habitat however it is unlikely that critical habitats are present.

6.2.1.3 Project Area

The most detailed botanical surveys in the project area have been those undertaken by ArcelorMittal, mostly covering the northern part of the county but also in a transect along the Yekepa to Buchanan railway. In an ESIA published in 2013, a total of 1,358 species had been fully named and a further 150 taxa given "temporary, so-called, vague names". This included plants in the montane forests in the northern mountains, savannah species and some coastal species around Buchanan. In terms of rarity, around 120 plant species were listed as being of restricted global range and conservation priority.

As the road corridor transects a considerable tract of open forest and detailed botanical surveys are non-existent in the area, an in-depth view of the project site's actual plant associations was not possible. The best available general source was therefore used for this part of the baseline. The ArcelorMittal work covered a range of similar terrain to that found in this project, and therefore its findings for Nimba are likely to be valid for the purpose of this baseline.

Among the forest plants, some 651 species in Nimba were identified by the ArcelorMittal ESIA of 2013 as being used for some form of non-timber forest product (NTFP). Of these, 65 percent

[21] Environment Protection Agency, 2019. Sixth National Report of Liberia to the Convention on Biological Diversity.

(421 species) were recorded as "useful" by local Zoes, and among these 65 species were considered particularly important. More species (257) are used medicinally than for any other use category; 173 species are used as materials; 103 have social uses; and 76 species are used as food. Fewer species have environmental uses (e.g. shade trees, fertilizer), are used as poison, animal food or food additives. Of the total, 168 species have uses in more than one use category. All of the NTFP are traded locally, with about 30 of these species are considered by the communities to be difficult to obtain in the necessary quantities, while the others are locally common.

In general, therefore, Nimba's natural forests are important both for biodiversity conservation and for artisanal productive uses.

6.2.1.4 Land Cover

The area traversed by the road supports a great deal of vegetation, but there is no primary forest remaining in the road corridor. All of the remaining uncultivated forest is secondary regrowth, resulting from major disturbances through a combination of shifting cultivation and logging. The project area does not include any montane locations, but the numerous creeks and rivers mean that there is a considerable amount of riverine forest in the corridor, and this tends to be more biodiverse than dryland forest in terms of both flora and fauna.

A series of land cover maps of the road corridor are given in Figure 6-15, Figure 6-16, Figure 6-17 and Figure 6-18, interpreted from satellite imagery dated March 2020, and ground-truthed in February 2021. The road corridor was mapped to a width of one kilometre on either side of the road. This band was chosen because it was considered to give a representative picture of the land around the project, without increasing ESIA production costs unnecessarily. As both observations on the ground and the maps in Figure 6-15 to Figure 6-18 show, most of the impact of the existing road is very narrow, usually extending only a few hundred metres from the road at most. Broader zones of land converted from forest to other uses are seen around the cities, where it is the dense urban population rather than the road itself giving rise to a wider area of impact on land cover. Furthermore, since this information is based on satellite data, it is an area of the baseline that can be re-created in the future using what will by then be historical data, so that change in a wider corridor can easily be evaluated at a later date.

It is clear from the land cover mapping that forest dominates the land use, but in many cases it was not possible to differentiate between degraded natural forest and tree plantations. This is because many plantations are poorly managed, and the trees are not in discernible lines. For this reason, all tree cover has been classed as "forest", to avoid defining only the clear plantations as such. All the forest that is not tree plantation is highly disturbed rather than primary, but there is a significant tree cover. The other main class of rural land use distinguished is of "grassland", which covers bush without trees, current agricultural land,

and young fallow land without trees.

The overall pattern of land cover along the road corridor can be summarised as follows.

- From the center of Tappita, the road runs through a land that is built-up for about 3 km, surrounded by a mosaic of grassland and open forest, with sparse areas of closed forest.
- For the next 6 km, the road runs through land that is dominated by forests (mostly open), with relatively sparse areas of grassland. This includes the road lengths through Gibson and Driver's Camp.
- For another 10 km, the road runs through land that is dominated by mostly closed forests, with sparse areas of open forests and grassland and a few built-up areas and dry land in Doeyelay and Gwin.
- For another 11 km, the landscape has more trees and less agriculture, although it still passes through a number of villages, of which Dialah and Farnlay. To the east of Farnlay, the road is intersected by the Cestos River which creates a riparian corridor crossing through the road.
- Closed forests then dominate the land cover in the road corridor for about the next 8 to 9 km, although there are still villages at intervals and sometimes the roadsides have buildings alongside them for up to 1 km, as at Pokar Town, but with bush and forest behind.
- The last 1 to 2 km of the road into the centre of Toe Town runs through built up areas, dry land and agricultural land, but also with bush and forest behind them.

The main crops cultivated are rubber, palm, cassava, banana and plantain, but often the crops are not intensively cultivated or maintained. This may change once the upgraded highway gives access to markets, but the current baseline is one mainly of shifting cultivation, poorly managed plantations and open and closed forests.

The socio-economic survey reported in section 6.3 included a review of access to the forest and bush, and the importance of it to households. It is clear that there is a high dependence on natural resources by households in the more rural areas, helping to account for the lack of primary forest. A wide range of non-timber forest products are collected, in addition to the use of small timber for firewood and charcoal production. Provision for increased understanding of this is incorporated in the ESMP (see Chapter 9), to ensure that mitigation measures are best targeted and that potentially important plant species are protected.

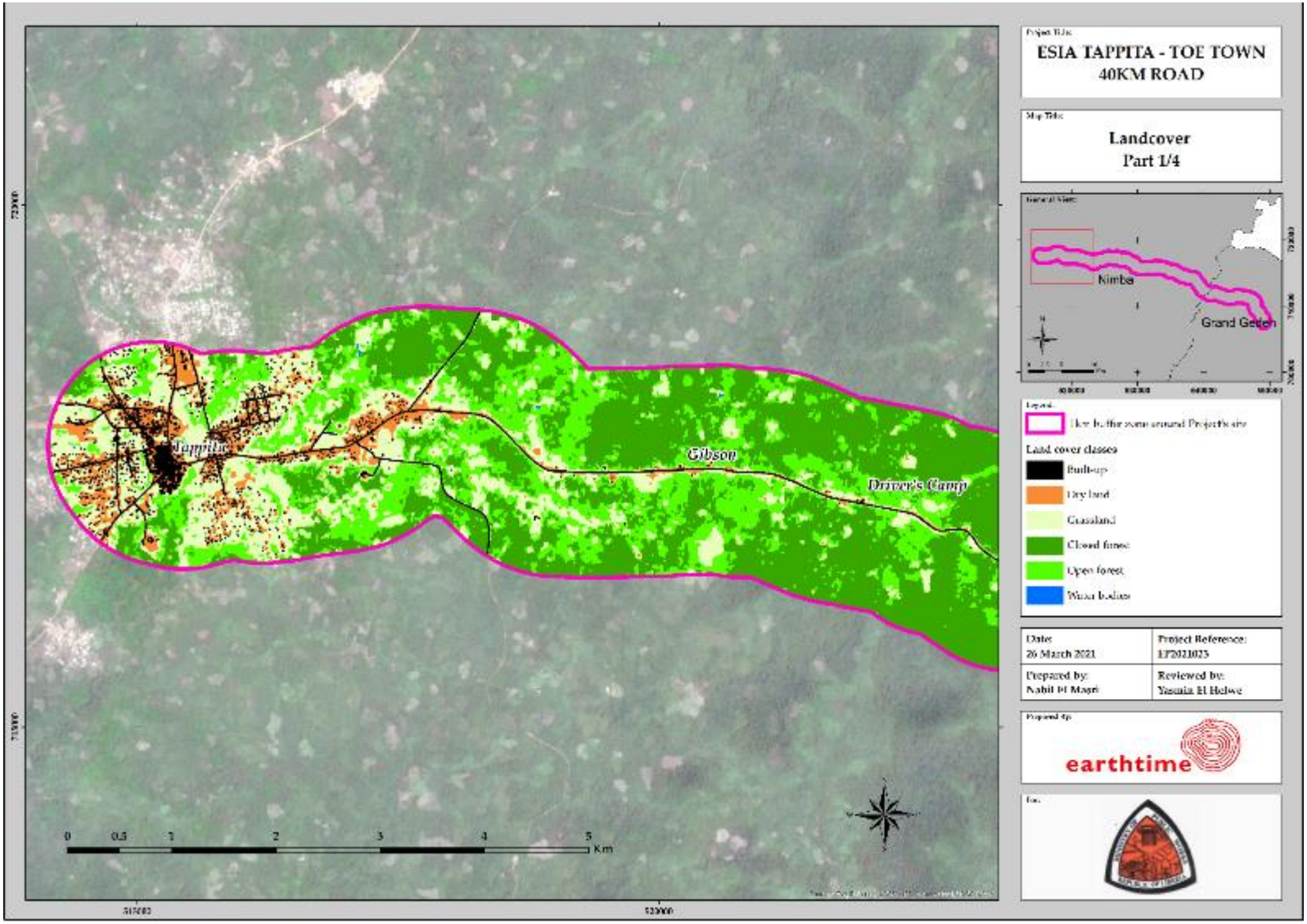


Figure 6-15 Land cover map (Section 1) of the road corridor (1 km each side of the road)

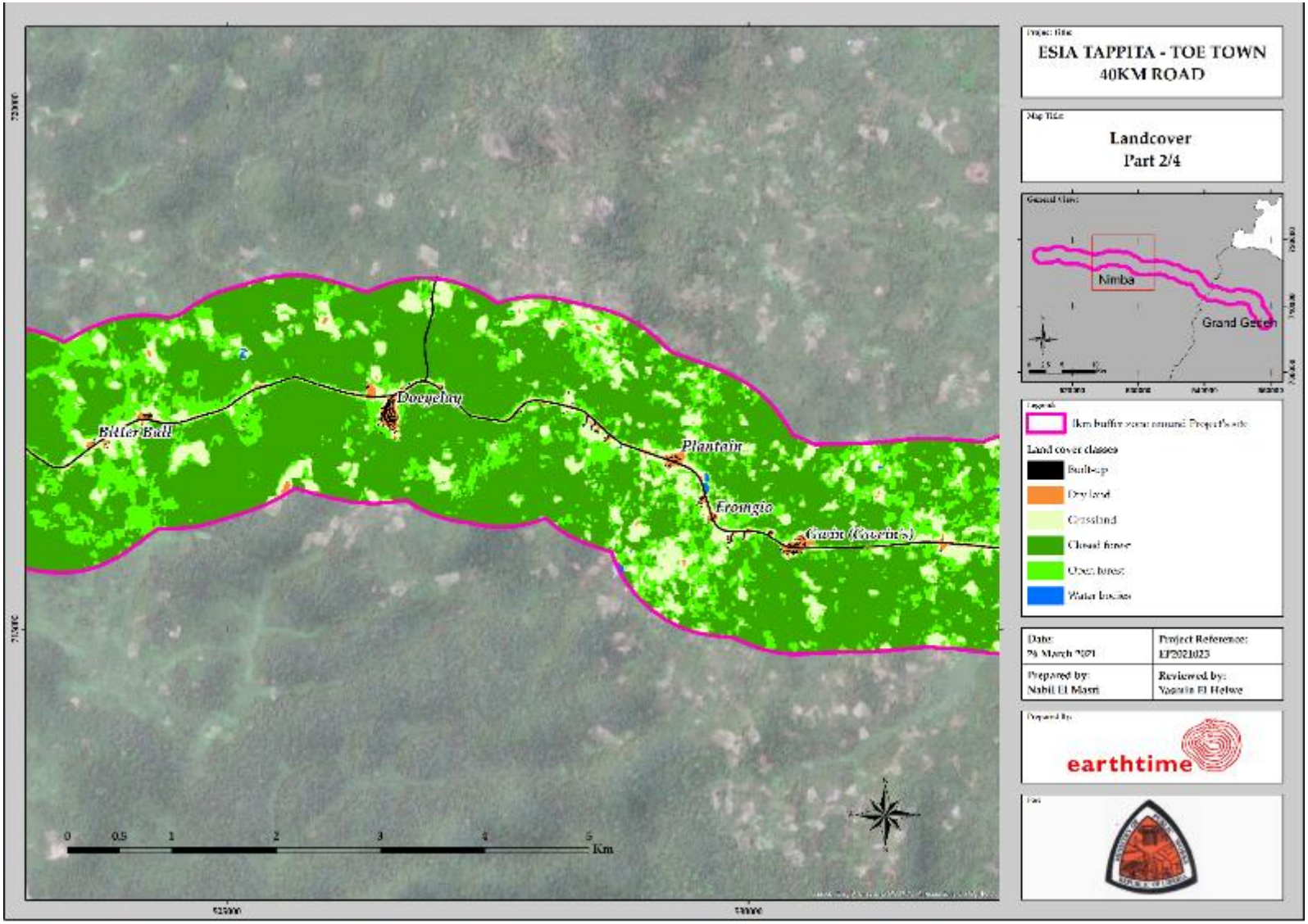


Figure 6-16 Land cover map (Section 2) of the road corridor (1 km each side of the road)

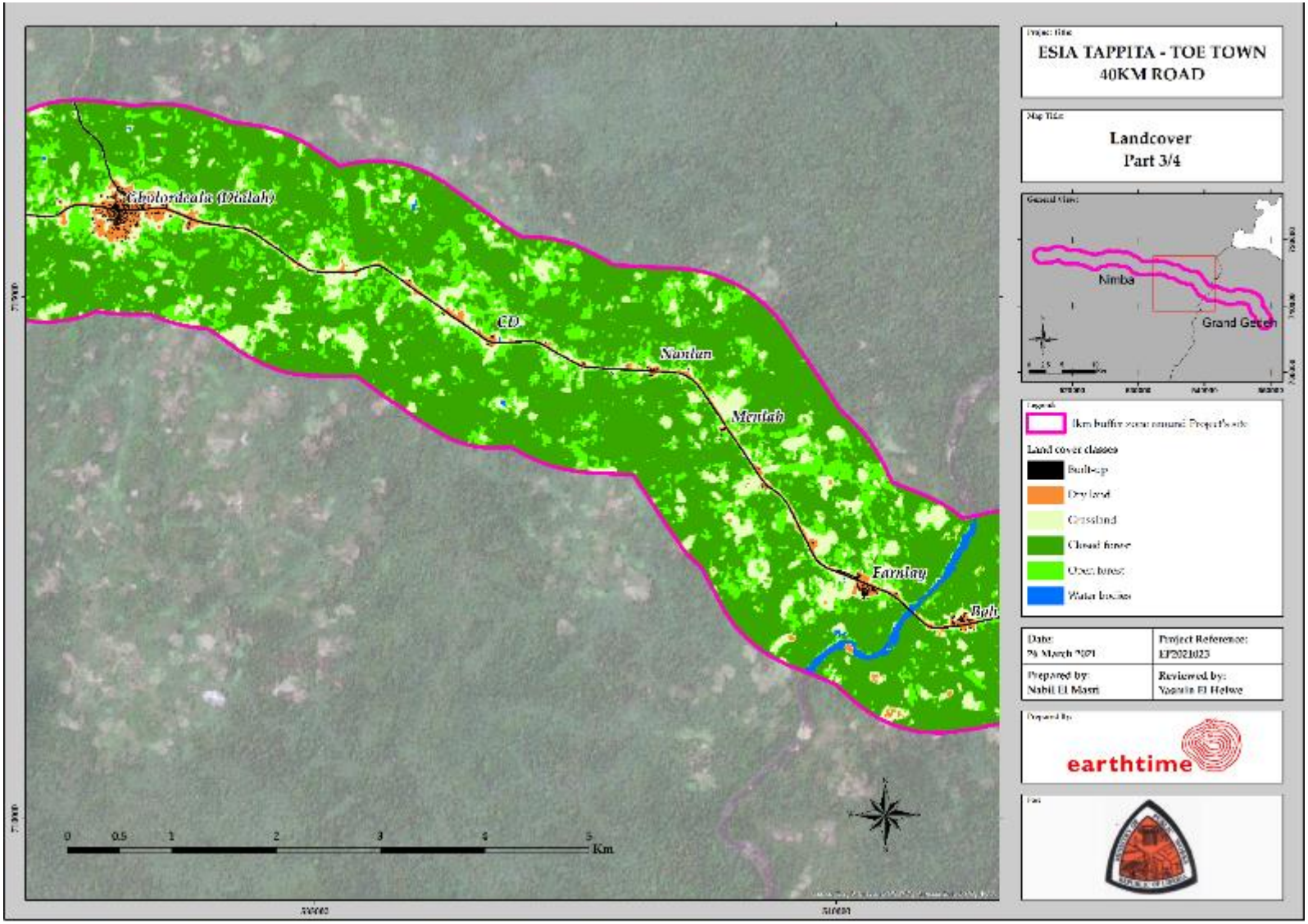


Figure 6-17 Land cover map (Section 3) of the road corridor (1 km each side of the road)

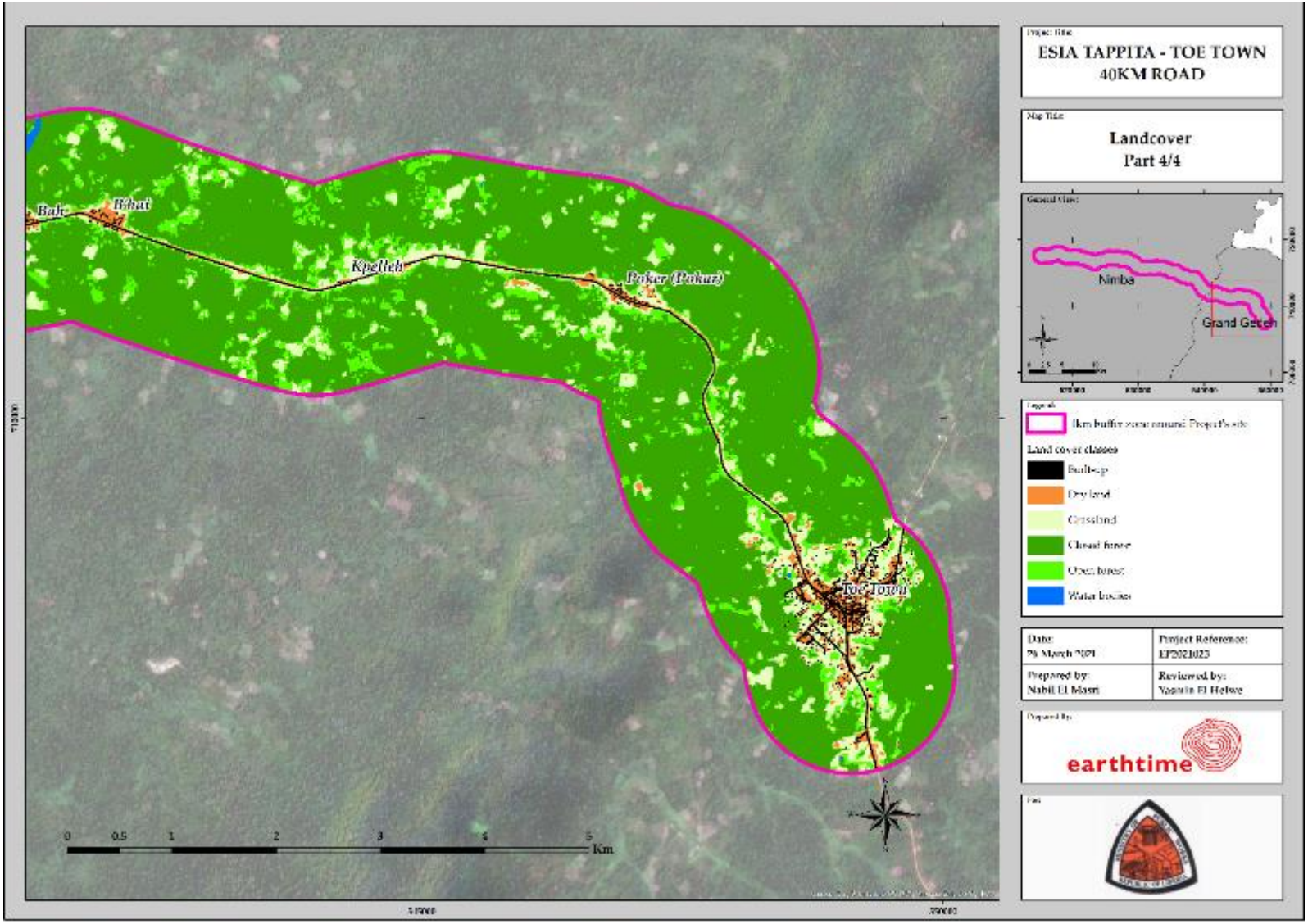


Figure 6-18 Land cover map (Section 4) of the road corridor (1 km each side of the road)

6.2.1.5 Clearance of Forest Trees

As stated in section 3.8, the details of forest trees to be cleared in the road right of way have not yet been surveyed in detail, in relation to the exact land take for the engineering works of upgrading the road. In addition, as the siting of ancillary infrastructure (i.e., camps, quarries, borrow areas, etc.) has not yet been determined, it is consequently not possible to define the extent of impact on the existing forest resources at this stage. The assumption is that the entire right of way of the road, a total width of 30.4 metres, will need to be cleared. However, this will mainly affect planted crop trees, particularly rubber, rather than native forest trees. The RAP reports a total of 874 rubber trees to be affected by the project. This is because nearly all of the right of way has been cleared of its original vegetation. Nevertheless, at least some forest trees will certainly need to be cleared for the ancillary infrastructure and the access tracks which serve it. This issue is therefore addressed in the impact assessment and mitigation measures proposed in the next three chapters.

6.2.2 Fauna

6.2.2.1 Overview

The degraded forests and bush described above are generally very biodiverse, but mostly with small mammals, reptiles, amphibians, birds and insects. There are very few large mammals remaining in these areas. The project site lies some 140 km from the Nimba Range which, from a global conservation perspective, is among the most important areas in Africa, with numerous endemic species, many of them globally threatened. The importance of this area is recognised by its inclusion in national and international conservation priority schemes. Although fragmented, there is still connectivity between areas of primary and secondary forest, and wetlands, over large expanses of Liberia. This means that, although disturbed, there can still be surprisingly high rates of faunal diversity even within the 1 km zone of influence of the road.

Baseline data on faunal species and their habitats presented in the following paragraphs is based on a literature review, and on the consultant's knowledge and assumptions about the area. As with flora, the most comprehensive studies of fauna in the region have been by ArcelorMittal, which has published detailed surveys of fauna around its mine and offset scheme sites in northern Nimba, in a series of ESIA in 2011, 2013 and 2017. While these provide excellent resources, they focus mainly on the less disturbed and riverine forests, and do not provide many details on the fauna found in the most disturbed habitats.

6.2.2.2 Fauna in the Project Area

Mammals may be relatively scarce in the project area because of the fragmented nature of the forests. Nevertheless, systematic surveys carried out between 2010 and 2012 by a group of

national and international experts (Figure 6-19) show that mammals are relatively rich in number throughout many parts of Liberia. The road stretches between two mammal hotspots: one to the west of Tappita and another to the east of Toe Town. Some large mammals such as duikers, antelopes and monkeys could therefore be spotted in the forest areas adjacent to the road. Mammalian species usually found in disturbed areas are rodents, including cane rats and squirrels. Less common species are the antelopes, duikers, foxes and monkeys that tend to be found in the less disturbed forests.

The citically endangered Chimpanzees (i.e., the western chimpanzee, *Pan troglodytes verus*) occur in areas throughout the country. A particular concentration has been identified by the same group of experts between 2010 and 2012 in the forests less than 10 km to the south of the road. It is therefore projected that a number of chimpanzees might roam extensively through the secondary forest lying on both sides of the road (see map in Figure 6-20). It is therefore proposed that evidence for the presence of this species is particularly sought as part of the ESMP (see Chapter 9).

The endemic Nimba otter shrew (*Micropotamogale lamottei*) is stated on the Ramsar Convention listing as occurring at the Gbedin wetlands, located about 60 km northeast of Tappita (the closest point of the project site). In a document published by ArcelorMittal in 2013 (Conservation Status of the Nimba Otter Shrew *Micropotamogale lamoteii* (Afrosoricida) within the ArcelorMittal Concession), the global distribution of the species was discussed. Most records of it come from within a 50 km boundary of Mount Nimba, with outliers at Ziela (to the north-west, in Guinea) and the Putu hills (to the south-east of Tappita), as shown in Figure 6-21. An important question that has major implications for the conservation of this species is its exact area of occupancy: does the species occur uniformly throughout this area, or does it have a patchy distribution? Unfortunately, with the information at hand, it is not yet possible to answer this question. Prior to the 2013 ArcelorMittal study, very little was known about the habitat requirements of the Nimba otter shrew, but that study showed it to occupy a wide range of wetland habitats from small streams to larger rivers without any statistically significant association except for water depth (which may or may not be biologically meaningful). Despite the progress made in understanding this species' habitat requirements, our knowledge of its spatial ecology (how it uses its habitat) is still almost completely absent.

The dilemma for the project is that the Nimba otter shrew may be present in the streams crossed by the road. Although it was previously thought to dwell only in mountainous areas, it has now also been found and reported in lowland locations. It was classified as Endangered on the IUCN Redlist in 2008, but currently it qualifies as vulnerable because data from 2018 suggested that the extent of its occurrence is more than 14,000 km². If present in the area adjacent to the road, it would require additionally strict mitigation measures around bridge and culvert construction sites. It is therefore proposed that evidence for the presence of this species is particularly sought as part of the ESMP (see Chapter 9).

The forest avifauna of the Nimba Mountains is extremely rich, although the extent of birdlife into the disturbed forests to the south is unclear. Some of those species may be encountered nesting in or passing through the area adjacent to the road. Birdlife International describes more than 150 key species from the Nimba Mountains, of which 1 is endangered, 7 are vulnerable and 3 are near threatened according to IUCN Red list of Threatened Species. Endangered, vulnerable and near threatened bird species found in the Nimba Mountains are described in Table 6-14.

The nearest area protected for birds is the Gbedin wetlands, which are a highly modified habitat dominated by lowland rice production. This is approximately 90 km from the nearest point of the project road. The Ramsar Convention listing of the site is not very explicit on the rationale for bird protection, merely stating as follows: "The paddy fields provide a good feeding ground for many bird species including Palaearctic and Nearctic migrants as well as resident breeders such as the Plover (*Charadrius dubius*), Bar-Godwit (*Limosa lapponica*) and the Forbes' Plover (*C. forbesi*)."

The Zwedru forest, which is a proposed Important Bird Areas (IBA), lies less than 10 km to the east of Toe Town, in Grand Gedeh County. As per the Sixth National Report of Liberia to the Convention on Biological Diversity (2019), the forest is the only known site for the Liberian Greenbul (*Phyllastrephus leucolepis*) and holds a large population of Gola Malimbe (*Malimbus ballmanni*). Birdlife International describes more than 160 key species from the Zwedru Forest, of which 2 are endangered, 7 are vulnerable and 5 are near threatened according to IUCN Red list of Threatened Species. Endangered, vulnerable and near threatened bird species found in the Zwedru Forest are described in Table 6-15. Those species may be encountered nesting in or passing through the area adjacent to the road.

It is not considered that the project will have any significant impact on birds, although precautions should be taken to ensure that wildlife in general is not unduly affected. This would include the strong discouragement of bushmeat hunting, that frequently includes birds.

Table 6-14 Threatened and endangered bird species of the Nimba Mountains (adapted from BirdLife International, 2021. Important Bird Areas factsheet: Nimba Mountains. Downloaded from http://www.birdlife.org on 07/03/2021.)

Species	IUCN Category
Sierra Leone Prinia *Schistolais leontica*	Endangered
Shelley's Eagle-owl *Bubo shelleyi*	Vulnerable
Rufous Fishing-owl Scotopeliaussheri	Vulnerable
Yellow-casqued Hornbill *Ceratogymnaelata*	Vulnerable
Western Wattled Cuckooshrike *Lobotos lobatus*	Vulnerable
White-necked Rockfowl *Picathartes gymnocephalus*	Vulnerable
Yellow-bearded Greenbul *Crinigerolivaceus*	Vulnerable
Nimba Flycatcher *Melaenornis annamarulae*	Vulnerable
Blue-moustached Bee-eater *Merops mentalis*	Near Threatened
Green-tailed Bristlebill *Bleda eximius*	Near Threatened
Rufous-winged Illadopsis *Illadopsis rufescens*	Near Threatened
Note: the current IUCN Red List category may vary from that which was in place at the time of assessment.	

Table 6-15 Threatened and endangered bird species of the Zwedru Forest (adapted from BirdLife International, 2021. Important Bird Areas factsheet: Zwedru. Downloaded from http://www.birdlife.org on 07/03/2021.)

Species	IUCN Category
Timneh Parrot *Psittacus timneh*	Endangered
Gola Malimbe *Malimbus ballmanni*	Endangered
White-breasted Guinea fowl *Agelastes meleagrides*	Vulnerable
Shelley's Eagle-owl *Bubo shelleyi*	Vulnerable
Rufous Fishing-owl *Scotopelia ussheri*	Vulnerable
Brown-cheeked Hornbill *Bycanistes cylindricus*	Vulnerable
Yellow-casqued Hornbill *Ceratogymna elata*	Vulnerable
White-necked Picathartes*Picathartes gymnocephalus*	Vulnerable
Yellow-bearded Greenbul *Criniger olivaceus*	Vulnerable
Blue-moustached Bee-eater *Merops mentalis*	Near Threatened
Green-tailed Bristlebill *Bleda eximius*	Near Threatened
Rufous-winged Illadopsis *Illadopsis rufescens*	Near Threatened
Copper-tailed Glossy-starling *Lamprotornis cupreocauda*	Near Threatened
Red-fronted Antpecker *Parmoptila rubrifrons*	Near Threatened
Note: the current IUCN Red List category may vary from that which was in place at the time of assessment.	

Other fauna that are present in the road corridor are summarised below.

- Reptiles that might be found in the project area include lizards, skinks and numerous snakes. ArcelorMittal's 2013 Guide to the Snakes of Liberia lists 57 snake species identified in Nimba County alone, and many of these could be present in the project area (although a significant number are tree snakes living in the primary lowland and montane forests around the Nimba Range).
- Amphibians include a large number of ground-dwelling and arboreal frogs.
- Fish species, including catfish, crayfish, tilapia, bonny, sunfish, and mudfish, are usually found in the inland riverine and lacustrine wetlands of Liberia. These species may be encountered in the creeks, streams and wetlands crossed by the road.

- A large number of invertebrates occur in the habitats crossed by the road. Among these, butterflies, dragonflies and damselflies are of particular interest since it is known from the three ArcelorMittal ESIA and other reports emerging from that company's biodiversity offset scheme, that they are particularly prolific in Nimba. The occurrence of particular species of invertebrates often provides indications of the level of disturbance of habitats, and it is proposed that this should be the subject of further investigation as part of the ESMP (see Chapter 9).

Bushmeat hunting is a strong potential threat to native fauna. In terms of determining the current baseline and future trends, it is important to understand the prevalence of this activity, since its impacts might later be confused with environmental deterioration caused by road upgrading. The socio-economic surveys reported in section 6.3 found that bushmeat consumption was widespread in the project area. Animals hunted were usually small mammals and rodents, but a third of households consume deer. Small animal consumption – Opossum, bat, ant bear, monkey, porcupines, rats etc were caught and eaten in rural areas. The communities therefore have a dependence for survival on local forest produce. Further research is necessary on this topic, to establish more information on the species and approximate numbers of animals killed. This is incorporated in the ESMP (see Chapter 9), to ensure that the mitigation measures are closely targeted and help to reduce pressure on less abundant species.

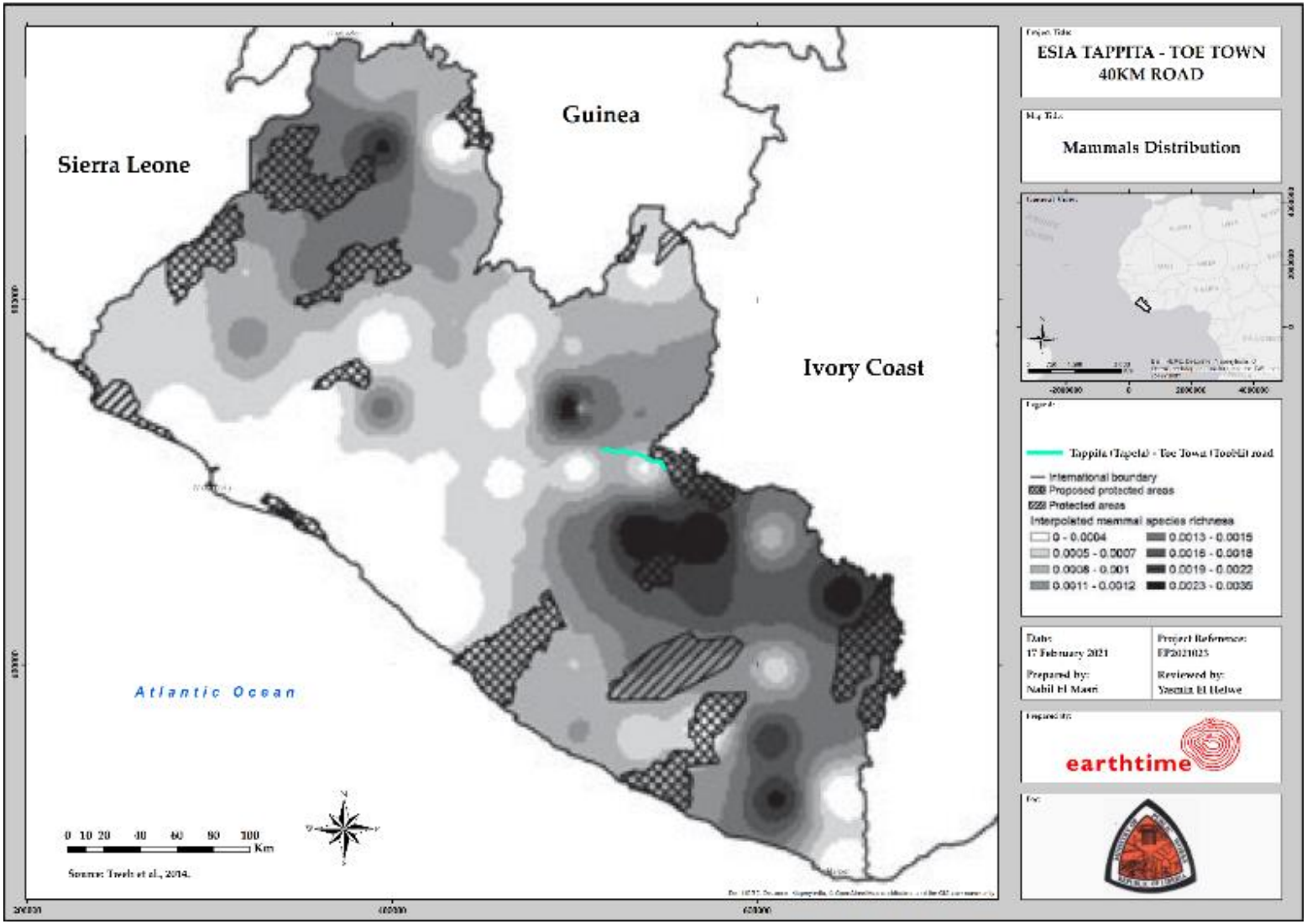


Figure 6-19 Mammal species richness map of Liberia (Source: Tweh et al., 2015. Conservation status of chimpanzees *Pan troglodytes verus* and other large mammals in Liberia: a nationwide survey Oryx, 49(4), 710-718.)

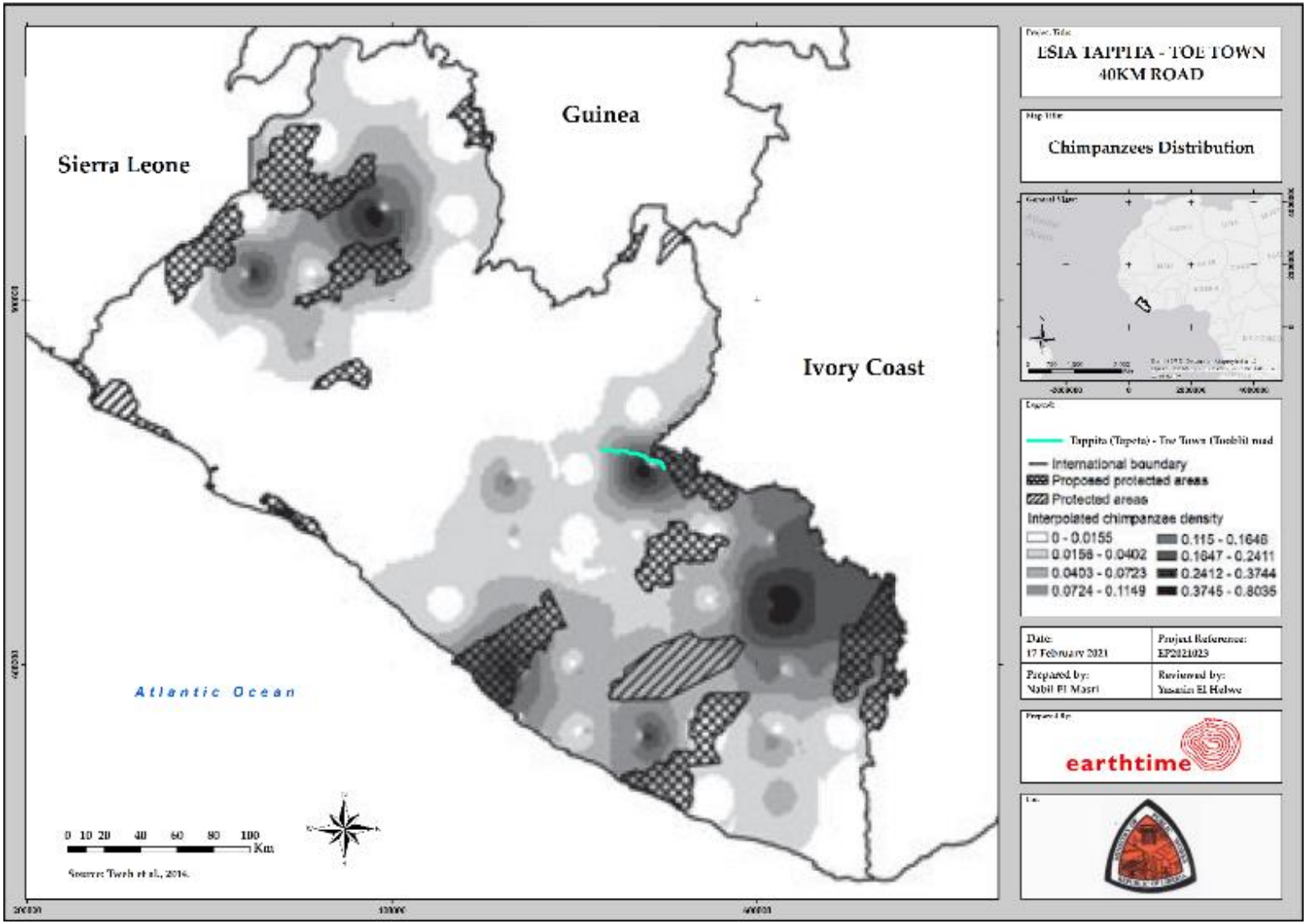


Figure 6-20 Chimpanzee density map of Liberia (Source: Tweh et al., 2015. Conservation status of chimpanzees *Pan troglodytes verus* and other large mammals in Liberia: a nationwide survey Oryx, 49(4), 710-718.)

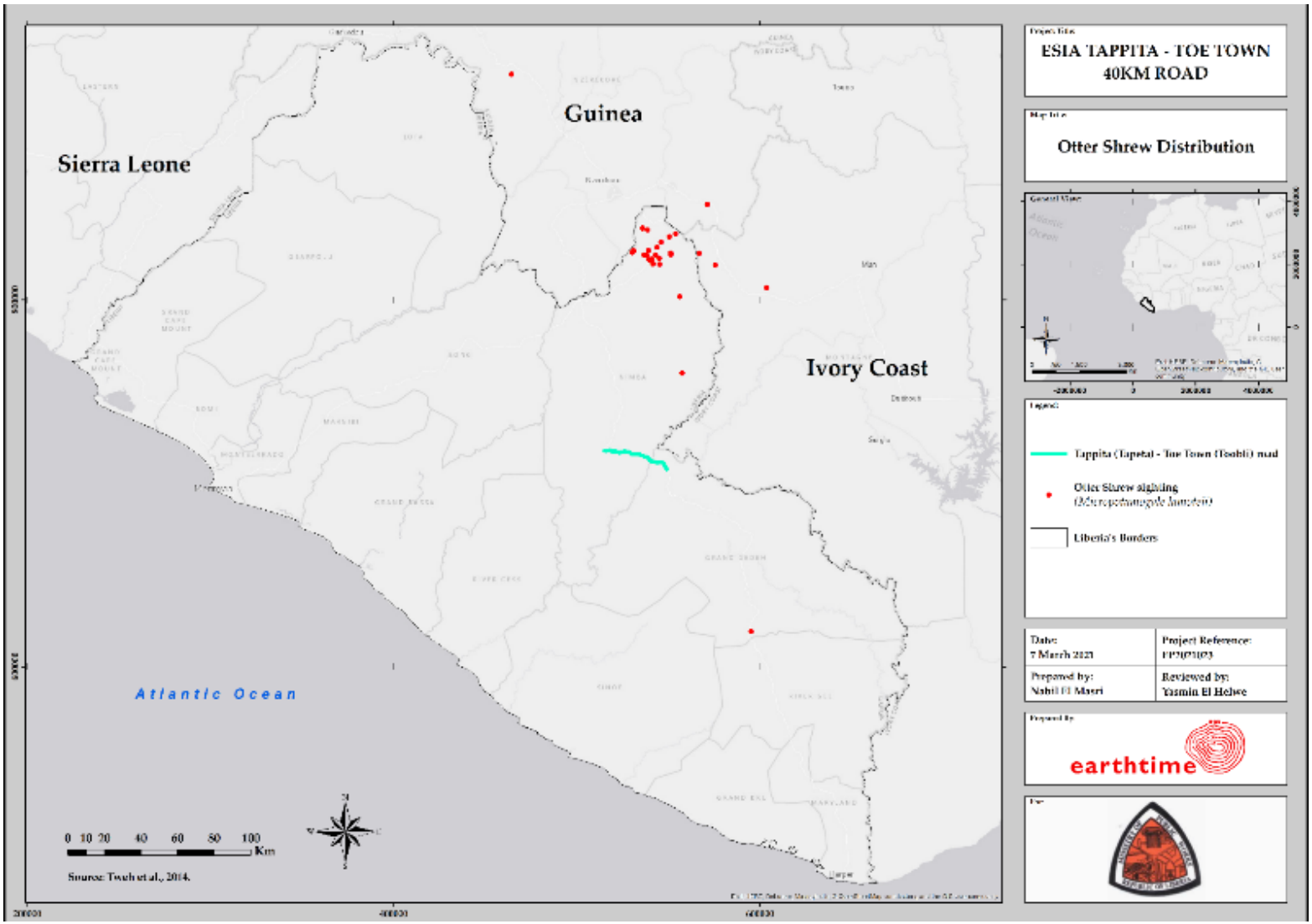


Figure 6-21 Known locations in the global distribution of the endemic Nimba otter shrew

6.2.3 Nuisance Species, Pests and Vectors

Nuisance species, pests and vectors are all threats to the biodiversity of plants and animals of an area. Biodiversity provides the source of harvestable goods including food, medicines and building materials; it is necessary for the regulation of natural processes such as carbon sequestration, soil formation and water purification, is essential for pollination, and helps control pest species and disease.

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 terrestrial and freshwater environments are *Bidens pilosa, Cardiospermum grandiflorum, Cenchrus polystachios, Ceratitis capitata, Chromolaena odorata, Civettictis civetta, Columba livia, Cricetomys gambianus, Dioscorea bulbifera, Eichhornia crassipes, Estrilda astrild, Hypnea musciformis, Imperata cylindrical, Lantana camara, Lates niloticus, Leucaena leucocephala, Lygodium microphyllum, Maconellicoccus hirsutus, Panicum repens, Paspalum scrobiculatum, Phymatosorus scolopendria, Porphyrio porphyrio, Psittacula krameri, Rhizophora mangle, Rottboellia cochinchinensis, Solenopsis geminata, Tilapia zillii, Vibrio Cholerae* and *Cyprinus carpio*.[22] Some of these species are found in the project area, particularly the very common herbaceous plant *Chromolaena odorata*.

The two major pest species found in the project area and 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 percent of all outpatient consultations, 18 percent 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

[22] Global Invasive Species Database. Available at: http://www.iucngisd.org/gisd/. Retrieved on March 7, 2021.

cause in creating more available reproductive locations for mosquitoes. Wetland areas crossed by the road provide stagnant water for mosquitoes.

6.3 THE SOCIO-ECONOMIC BASELINE SURVEY

6.3.1 Introduction

The project will result in the major improvement and upgrading of the 40 km section of the Tappita-Zwedru road between Tappita and Toe Town (also known as Toobli). The road is currently almost impassable. The road section passes through both Nimba County, Doe District and Grand Gedeh County, B'Hai District. The current alignment crosses a number of creeks and streams and is very damaged, the road is badly rutted and huge water-filled potholes have formed. Delays in passing the road are frequent and extensive. Lorries travel in convoy to enable winching each other out of danger and the road is frequently impassable in the rains even for four-wheel-drive vehicles. This leads to people and goods being unable to move, and to restrictions in access to health and education services.

This section provides an analysis of the existing socio-economic conditions in the areas to be affected by the upgrading of the road.

- Parts of the urban areas of Tappita are affected, particularly the areas called Drivers Camp and Gibson Town: the road will connect the eastern part of the city of Tappita to the small town of Toe Town – a distance of 40 km, on route to Zwedru in Grand Gedeh County. Tappita is a small city, providing important social and commercial services to surrounding areas.
- Towns: 2 larger - Gbolordeala (Dialah) and Toe Town, and 2 smaller towns lie along the length of the highway. These towns are split into a number of "Quarters" –areas where people live and which have a number of service functions such as markets, transport centers, schools etc.
- Very small towns, villages and hamlets: a further 24 much smaller communities are also located along the road. These are usually collections of family-related households that live in proximity and farm in the surrounding areas. These communities usually have limited services, tend to share schools and travel to larger centers for other facilities.

A socio-economic baseline survey was carried out among the communities between Tappita and Toe Town in March 2021, using the methodology designed for Liberian rural roads assessment, which was applied in 2018 for the Ganta-Tappita road project (South-Eastern Corridor Road Assets Management Project (SECRAMP) by the social consultant, and updated for this survey. The original survey design was made for Nimba County, so the methodology is appropriate for both Counties. The survey consisted of a public information and consultation exercise with community groups and focus group discussions and a household

survey material, supplemented by a town questionnaire gathered for all towns along the road, collecting information from key informants on town activities. The use of both focus group discussions with a sample socio-economic survey of households and the town survey allows for triangulation of data collected and ensures all towns are surveyed.

6.3.2 Objective of the Consultation and Socio-economic Baseline Survey

The work carried out responds to the need to provide the social component of the Environmental and Social Impact Assessment (ESIA) required to international best practice standards as set out by the World Bank's ESS 1 and ESS 10 and the EPML. These standards require that communities are informed and consulted about the project before its commencement and then informed about the information presented in the ESIA. This is intended to ensure their responses are included in project design and that impacts are assessed against the socio-economic profile of the affected communities – these data are then used to design the implementation process and any mitigation strategies as revealed necessary by the ESIA.

The first information and consultation meetings were carried out under this work; feedback meetings need to be held in the same communities, post ESIA agreement.

The purpose of the socio-economic survey is to provide a baseline against which the impacts of the road upgrading activities can be assessed, and later, mitigated. Directions and rates of change can be measured through second and subsequent repeats of the same survey and in an ex-post evaluation. A baseline survey identifies issues which require specific action to reduce the social risks on specific groups of people and this then feeds into the action plan for resettlement and impacts on cultural property, reveals opportunities where the project owner can add value to a project, informs decision making in the selection of project alternatives, and assists in a better understanding of, and more effective consultation with, communities.

This survey was carried out prior to construction so that it captures a true representation of the socio-economic status of communities prior to any physical works. The survey was:

- Led by an international social survey specialist with long term experience of social survey collection in Liberia;
- Managed by a national social survey specialist with extensive work experience in Nimba and Grand Gedeh; and
- Undertaken by two survey teams consisting of a survey supervisor and two interviewers each, and supported by a data entry clerk. All the survey team members have experience in ESIA social surveys, two interpreters were employed to assist where local languages required additional interpretation.

6.3.3 Methodology

6.3.3.1 Consultation Exercise

The consultation exercise was designed to reach all communities located along the road section. This required meetings in the two directly affected city quarters of Tappita, the towns of Gbolordeala (Dialah) and Toe Town, and the smaller towns and villages along the road section. The road section passes through both Nimba County, Doe District and Grand Gedeh County, B'Hai District.

The need for and invitation to community meetings was announced over local radio on the advice of the respective District Development Officers and followed up with visits to Town and Quarter Chiefs to agree times and location of consultation meetings. In all, 12 community meetings were held between 1 March and 10 March 2021. The proforma discussion sheet is included in Appendix F whilst the information collected is included in section 5.2.

The invitation to meetings was extended to Chiefs, Elders, representatives of Women's Groups, Youth Groups, local NGOs and Community Based Organisations (CBOs) and any other concerned person. The full lists of attendees are included in Appendix F.

6.3.3.2 Key Informant Interviews

The town questionnaire (Appendix E) was administered to all affected towns, large and small. The interviewer identified 14 key informants – mostly Town Chiefs, Elders, women's leaders, youth leaders, and anyone with oversight of town activities, to enable a picture of community life, of how people use the road and the likely impact of the project. Of the 14 respondents, 4 were women occupying positions as a Clan Chiefs, a Town Chief, a women's group chairlady and a Community Health Assistant. It was designed to give insight into local conditions, facilities and services and into what impacts the project will have and what the improvements in access will mean for local people. More than one form was filled for each town depending on the availability of the key informants.

6.3.3.3 The Household Survey Sample

The communities (described as 'towns' in Liberia) that will be affected by the project activities were identified using analysis of existing mapping and verification in the field. Figure 6-22 shows the location of the identified settlements between Tappita and Toe Town.

All communities within 1 km of the road were defined as immediately affected. These communities comprised approximately 30,000 people according to the key informant town questionnaires. This figure includes most of the metropolitan area of Tappita, as the road continues through the town on its way to Toe Town before continuing onto Zwedru. All communities were included in the survey sample frame.

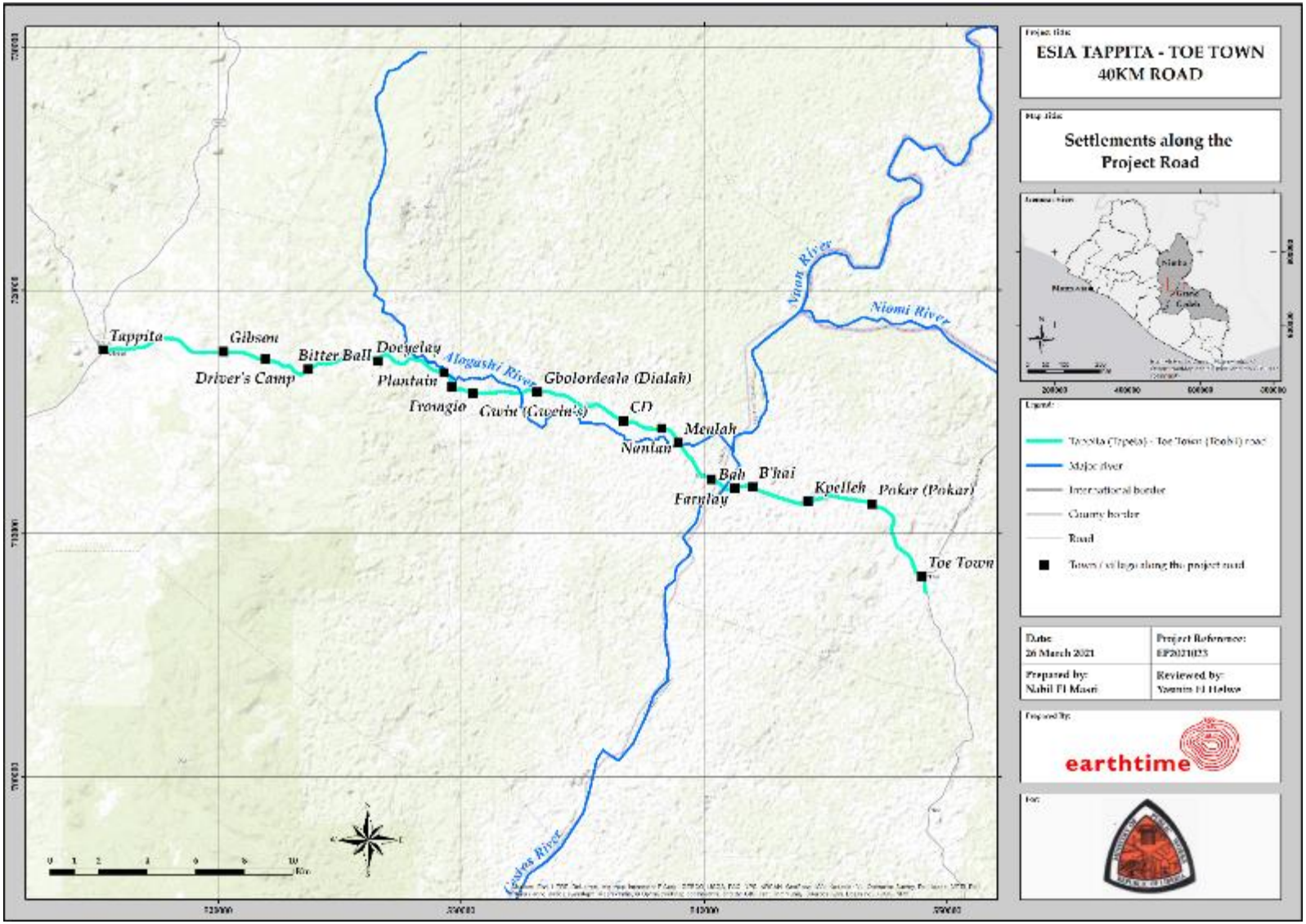


Figure 6-22 Map showing the cities and towns along the Tappita-Toe Town road

6.3.4 The Sampling Method

6.3.4.1 Cluster Sampling for the Household Survey

The sampling unit for the main baseline survey was the household (HH) using the "common pot" definition of a household being a group of usually related people cooking and eating together. People who share or rent part of a dwelling but do not eat with the main inhabitants are a separate household.

The clusters were identified using random numbers selection on a list of settlements, or affected wards for Tappita. In this project situation, it was not possible to get household lists (a sampling frame) in advance to enable simple random sampling within the population of interest. Given the time frame for the survey and the predicted range of variation in data among rural households in a small area, it was decided to interview 150 households in 15 locations selected at random, as shown in Table 6-16 150 HH is the minimum sample size needed in the area covered and population size in order to achieve the conventionally used confidence level of 90% (z = 1.645) with a corresponding 10% margin of error (e=0.1), and the highest level of variance was assumed.

Table 6-16 List of towns surveyed along the Tappita – Toe Town road ection

No.	Town	District	County	Local Population Estimate, 2021*
1	Tappita	Doe	Nimba	43,137**
2	Gibson Town - Tappita	Doe	Nimba	12,000
3	Driver's Camp - Tappita	Doe	Nimba	1,400
4	Bitter Ball Village	Doe	Nimba	350
5	Doeyelay Village	Doe	Nimba	1600
6	Plantain Village	Doe	Nimba	1240
7	Gwin (Gwein's) Town	Doe	Nimba	2000
8	Gbolordeala (Dialah)	Doe	Nimba	4960
9	Nanlan	Doe	Nimba	630
10	Farnlay	Doe	Nimba	1315
11	Bah Town	Doe	Nimba	1070
12	B'hai Town	B'hai	Grand Gedeh	1050
13	Kpelleh Village	B'hai	Grand Gedeh	156
14	Poker (Pokar) Town	B'hai	Grand Gedeh	1075
15	Toe Town	B'hai	Grand Gedeh	6375

* These figures were given by Mayor, Chiefs and Elders during the Town Questionnaire and are only approximate.
** The figure for Tappita is for the whole city but only half the city is affected by this road segment upgrade.

6.3.4.2 Random Sampling within the Cluster

A cluster was one town if there are a low number of households, or a Town Quarter if the population size was large. A sample selection was done to select 15 households inside each cluster through systematic random sampling from within each cluster as far as was possible. Where the community had more than one Quarter, the Quarter to be sampled was selected by random number tables. HH were selected at random at the Town or Quarter level using two

methods. If there were fifteen or less HH in the Town or selected Quarter, the Town or Quarter Chief was asked to draw up a list of HH, and all households were interviewed. If there were less than 15 HH in the Town or Quarter, the next Town or Quarter was included. If there were more than 15 HH in the Town or Quarter, the centre of the Town or Quarter was located. A pen was dropped to determine randomly a direction for each researcher. The researchers then walked out to the edge of the Town or Quarter, recording the time it took to get from the centre to the edge. The time it took to travel out to the edge of the town was divided by the number of HH to be surveyed in that town to get a length of time 'n'. The researchers then surveyed each n^{th} HH until he or she reached the centre of the town or starting point.

6.3.4.3 Quality Assurance

In total, 150 households were interviewed. The data collected was quality assured to ISO 9001 standards through a standard operating procedure of checks and clarifications at collection, coding and data entry stages. Unique identifiers for each HH and each person within the HH were created. The data entry format included range checks, logical checks and reliability checks.

All interviewers had a full briefing and practice of the questionnaire before the formal data collection process began on the 1st of March, 2021. Each survey team supervisor was required to check each questionnaire daily with each interviewer, and the supervisor was checked by the lead survey consultant who also sat in on initial interviews to ensure understanding and accuracy of recording.

The household survey form is included in Appendix D and the town survey form in Appendix E.

6.3.4.4 Limitation of the Study

The data collected varies in its reliability. Interviewees found the questions on demography easy to respond to although some found it difficult to remember when they were born. This problem became more pronounced with older interviewees.

Data on income and expenditure were very difficult to establish in a rapid assessment and so information was collected on sources of income rather than actual sums – an extensive survey of household income could form a useful extension to this work. Many HH had members running several enterprises with small amounts of purchases and sales in each enterprise, making calculating the profit on each difficult. Most respondents are also reluctant to share accurate assessments. It was therefore decided to collect information on aspects of household income and expenditure to demonstrate their ranges. Without sufficient time to gain interviewee confidence and to collect data over the financial year, interviewees tend to under-report income and overinflate expenditure, resulting in negative values when expenditure is subtracted from income.

The data on health and vaccinations relied on interviewees' memory of other people's health experiences. Some respondents had good knowledge of the illnesses and vaccinations that family members had, while others may have been guessing.

As with all surveys conducted with the help of translators, there is a risk that answers were not accurately translated and questions sometimes over simplified. This survey had a very tight time frame and so rapid appraisal techniques are used which assume that answers are accurate

6.3.5 Study Area

The project area is contained in Doe District of Nimba County and crosses into B'Hai District of Grand Gedeh County. Within each District, communities are grouped in clans and towns. The 40 km road length affects the city of Tappita, 4 small towns, 24 villages and hamlets. The landscape is gently undulating, mostly forested and with fields of subsistence crops and some perennial tree crops. Grand Gedeh County is more sparsely populated than Nimba and has more forested areas, fewer settlements and a much lower population density – 30 persons a square kilometre as compared to 104 persons per square kilometre in Nimba in 2008.[23] The road is the main access point from Nimba to the south-eastern counties of Grand Gedeh, and then to Sinoe, River Gee, Grand Kru and Maryland.

6.3.6 Governance and Administrative Context

The basic unit of local government is the office of the Town Chief. The Chief operates at the interface between older governance systems and the modern administration. The relationship between the Chief system and local administration is enshrined in law. In theory, the Town Chief collects all legal taxes on behalf of the government. In reality, chiefs tend to collect taxes for redistribution at the town level or otherwise. In some communities, the Town Chief is officially responsible for allocating communal land for farming among the town people.

The Town Chief reports to the Clan Chief- head of a clan or a group of towns. The Clan Chief is responsible for addressing indigenous issues within his clan. Serious issues which cannot be solved by the Town Chief are brought to the Clan Chief for resolution. The Clan Chief reports to the Paramount Chief, who is the head of the Clan Chiefs, Elders and Town Chiefs. The Paramount Chief is the head of cultural and indigenous activities and adjudicates on matters in each district that cannot be solved by the Clan Chief.

[23] Liberia Institute of Statistics and Geo-Information Services (LISGIS), 2009. 2008 Population and Housing Census Final Results.

There are two Paramount Chiefs in the area crossed by the road and three Clan Chiefs, one of which is a woman. Each town has its own Town Chief who supervises Quarter Chiefs in larger settlements. Chiefs are advised by the Elders; women can hold either role.

The chiefdom system is the main route for information transfer to the towns and villages and provides immediate access to the administrative and judicial systems for rural communities. The Paramount Chief reports to the District Commissioner of each district, who supervises, monitors and evaluates all administrative matters arising from the Paramount Chiefs' offices. The District Commissioner reports to the County Superintendent, who is appointed by the President. The County Superintendent is the executive head of the county; he or she has oversight over all public officials within the county.

The County City of Nimba is Sanniquellie with the District Headquarters for Doe located in Zuolay. The County Town of Grand Gedeh is Zwedru with the District Headquarters for B'hai in the town of Toe Town. Zuolay is on the Ganta-Tappita section of this road whilst Toe Town is the eastern end of this road section. These District Headquarters form additional service hubs for development in the districts.

6.3.7 Demographics and Ethnic Composition

6.3.7.1 Household and Population Characteristics

Small towns can change name and can also have a number of names, and most do not match those in the 2008 census. The 2008 Census is shortly to be updated with a new census in March 2021 but will not be available for some time to come. The 2016 National Household Income and Expenditure Survey[24] has the most recent population figures but they are not broken down to District and community levels.

The total sample size was 1235 individuals in 150 households, including 588 women and 647 men and an average household size of 8.23 persons per household and with a corresponding sex ratio of 1:0.91. 540 persons (43.7%) are aged 14 or less in total, indicating enormous future pressure for employment and services along the road. The crude population distribution in Table 6-17 may reflect older people having difficulty remembering their ages.

Table 6-17 Crude population distribution by age groups

Age group	Male	Female	Total
0-14	302	242	544
15-29	161	181	342
30-44	102	89	191
45-59	52	47	99

[24] Liberia Institute of Statistics and Geo-Information Services, 2018. Liberia Household Income and Expenditure 2016.

60-74	23	20	43
75-89	4	7	11
90+	1	1	2
Total	**647**	**588**	**1235**

The population data reveals that 51% of the HHs live in the city or towns whilst 49% live in the rural areas. This is unsurprising given the lower population densities in rural areas and the focus of employment being in towns and cities. Whilst the average household size in Nimba County in 2016 was 4.7 persons and 4.3 in Grand Gedeh,[25] in this survey the average household size was 8.25 persons. Specifically, it was 8.52 persons per household in the cities and towns and 7.99 in the rural areas. These higher-than-average household sizes indicate increasing pressure for employment and for productive land in coming years.

The status of head of household (HHH) is usually the land or plot owner and generally is also the oldest person in the household – only a few households in the towns or cities have HHH resulting from the highest earnings. The difference in household size between male and female headed households is small. Male headed households form 73% of households with an average household size of 8.51 and female headed households 27% with an average household size of 7.49 persons. There is no significant difference in the average age of HHHs of either sex at 44 years. However, Table 6-18 shows the age profile by sex of the HHH and shows that female headed households have slightly younger aged members.

Table 6-18 Age group of population by sex of head of the household (HHH)

Age Group	Sex of HHH		Percentage of HH members*		Grand Total
	Male	Female	% of Male HH members	% of Female HH members	
0-14	**409**	**135**	**43.4**	**46.6**	**544**
15-29	**263**	**79**	**27.9**	**27.2**	**342**
30-44	**145**	**46**	**15.4**	**15.8**	**191**
45-59	**86**	**13**	**9.2**	**4.5**	**99**
60-74	**30**	**13**	**3.2**	**4.5**	**43**
75-89	**7**	**4**	**0.7**	**1.4**	**11**
90-104	**2**	**0**	**0.2**	**0**	**2**
Grand Total	**942**	**290**	**100**	**100**	**1232**

***The percentages show the proportions of household members of each age group by sex of HH head i.e., 409/942 x 100 not 409/544 x 100.**

6.3.7.2 Ethnicity

In Nimba and Grand Gedeh Counties, the major ethnic groups are Krahn, Mano and Gio, two very closely related tribal groups but these form 76% of the survey group only with multiple other ethnicities found (Table 6-19). In part this is the result of repeated waves of major

[25] LISGIS, 2018.

population displacements during the civil war to 2003 and some displaced persons settling where they last arrived, and, in part, the search for employment has increased mobility with many prepared to travel outside their birth County and ethnic group. There is only a weak tendency for non Krahn, Mano and Gio ethnic groups to live in towns and cities, those non-local tribe wives that do not live in the towns and city, are generally wives of persons from the main ethnic groups.

Table 6-19 Ethnicity in the sample population

Ethnicity	Men		Women		% Men	% Women	Grand Total	
Krahn	201		188		51.7	48.3	389	
Mano	80	278	68	271	54.1	45.9	148	549
Gio	198		203		49.4	50.6	401	
Bassa	8		13		38.1	61.9	21	
Fula	2		6		25	75	8	
Gblee	10		6		62.5	37.5	16	
Gola	1		1		50	50	2	
Grebo	22		21		51.2	48.8	43	
Kpelleh	59		34		63.4	36.6	93	
Kru	14		13		51.9	48.1	27	
Loma	8		15		34.8	65.2	23	
Mandingo	26		11		70.3	29.7	37	
Undeclared	18		9		66.7	33.3	27	
Grand Total	647		588		52.4	47.6	1235	

The Mano and other closely related tribes (Gio and Dan) form an ethnic group that are part of the Mende peoples that migrated from the Sahel areas into the Guinea-Liberia region in the 17th and 18th centuries. The ethnic group of the Mano extends over the Mano (St. John) River basin in a transborder ethnic grouping with strong traditions and social and cultural links. Traditionally the Mano groups were animist but many have adopted one of the various Christian religions whilst others, particularly the Mandingo, have adopted Islam. The traditional secret societies – Poro for men and Sande for women - are still strongly institutionalized in rural areas, but less so in cities.

The Krahn are an ethnic group of Liberia and Ivory Coast. This group belongs to the Kru language family. Liberia's Krahn were originally hunters, fishermen and farmers, traditionally focusing on rice and cassava production. Slow or failing development of regions with many Krahn settlers led many of the younger Krahn generations to migrate to areas such as Monrovia. Traditionally, the Krahn were animists, though many have converted to Christianity.

The Fula and Mandingo are traditionally Muslim and there is a mosque in Tappita.

Only 20 wives in the surveyed HHs have an ethnicity different from that of their husbands, one wife came from Cote Ivoire, the rest from other Liberian Counties and multiple ethnic

groups. There is no difference in the incidence of cross ethnic marriages between town and rural areas.

6.3.7.3 Migration

Most Krahn, Mano and Gio persons surveyed were born in either Nimba or Grand Gedeh (74%). One Fulani person was originally born in Senegal but the Mandingo families were born in either Nimba or Grand Gedeh. Of the 30 households not in the above groups, 13 were from Kpelleh tribes from multiple Districts, the remainder were of minor groupings from varied origins. This data reflects the internal displacement during the civil wars.

6.3.7.4 Vulnerable Groups

Vulnerability is closely related to income or access to income generating opportunities, age, educational status and lack of protection or destruction of the family unit during the civil war. Female headed households tend to have access to fewer income generating opportunities (see below), report fewer survival strategies and have both young and older dependents.

Traditional society before the civil war looked after and respected the contribution of the elderly to community management and support. Older family members were looked after by their children and were less likely to be in need of basic amenities such as shelter, food, care etc. The civil war caused the breakdown of the family in very many cases, particularly through the following effects.

- People had to flee and families broke up. Many families had to move many times during the war and lost family linkages, belongings, land and entitlement to a livelihood.
- Many people died as the result of violence, increased disease and lack of health facilities, leaving less able family members without support. Social ills of alcohol, gambling and drug abuse increased, reducing support to family members.
- Girls in particular were abused and abandoned, leaving young girls with infants and no support. Prostitution increased as women tried to survive but resulted in lack of support and no menfolk as part of the family unit.
- Education services stopped, leaving young people with low levels of literacy and numeracy, and no means to enter training opportunities that required basic skills.
- Households had to survive as best they could, leading to members migrating for work.

The result was broken families, fractured relationships, abandoned elders and children, and young people who had lost their educational opportunities or who had to drop out of school for lack of basic support for survival. This pattern is only slowly improving with increased social cohesion post war recovery.

The NHIES, 2016 study revised the definitions and measurements of poverty and vulnerability. Vulnerable groups are defined as:

- Illiterate household heads with other family members lacking education or school drop outs;
- Women headed households;
- Disabled family members;
- Households comprising only persons older than 55;
- Households headed by children under 18 years; and
- Landless rural households.

These groups need special attention during the project design and mitigation planning to ensure that their livelihoods are maintained or improved and that further disadvantage does not accrue. Statistics relating to these vulnerability criteria are discussed in the relevant sections. It is of interest to note that the majority of households surveyed, 73 percent (N=109), attributed household headship to a male family member, and female headed households were 27 percent (N=41).

There were six reported instances of disabilities amongst the surveyed households of which two were household heads too old to work (one male and one female). Three other women and one other man reported disabilities.

6.3.8 Access to Key Resources and Infrastructure

The Town survey revealed the shortage of services in the area of influence of the road. Table 6-20 and Table 6-21 show the distribution of facilities and services. Towns were allocated to City, Town or Rural Town on the basis of their population in 2008 as reported in the census. This is a little arbitrary but allows display of the paucity of services in rural towns and the concentration in cities.

Tappita is the main urban centre for people living along the road and has the widest variety of services and facilities. It has three elementary schools and two high schools, health posts and a big referral hospital and a separate church hospital, churches of various denominations, a large market and market stalls, a bank and police post. There is no bank in Tappita, people have to travel to Ganta or Zwedru.

The smaller towns of Gbolordeala (Dialah), B'hai town, and Toe Town have basic elementary education services but lack other social or business-related services or facilities. The lack of almost all facilities underlies the poor development achievement of the area and the inhibition of progress through the very poor road condition. Only Tappita has mains electricity supply. Some smaller towns have private generators. Charging of phones is facilitated by charging

booths using generators in small towns. Kpelleh village is out of coverage of all three mobile networks available in Liberia which is in itself an indication of remoteness.

Only the biggest towns have a market ground where there is a weekly market attended by salespersons bringing in goods to sell. Only Tappita has a covered market hall operated by the Liberian Marketing Association.

Service provision in the areas outside Tappita (see Table 6-22) are very poor. Most communities except the smallest hamlets have at least someone with a generator using petrol (gas) to power light. Fuel availability fluctuates in supply and cost depending on the ease with which the fuel can be brought. Fuel is sold from giant ex-mayonnaise bottles as there are few petrol pumps working in Liberia. Shops or services are only found in towns, most activities require travel to Tappita or Zwedru.

Most communities state that fuel for vehicles can be bought in their towns, but supplies are erratic, and costs escalate in the wet seasons and when the road condition is very bad. The larger towns have transport unions: these are organizations that manage and regulate transport availability and costs to ensure that all drivers have a share of the work, and that costs are more uniform than they would be otherwise. Rural communities have to wait for a passing vehicle to have sufficient space and to stop to pick them up. There are no timetables, and vehicles move when they are full. The transport system facilitates movement to local markets as well as to the big towns.

Tappita has the full range of shops and services, acting as the centre for distribution to the surrounding towns. Figure 6-23 and Table 6-22 show average walking time to services. Walking times are highest in remoter, rural areas and least in cities.

Table 6-20 Facilities and services available in the project affected towns

Town	Elementary School	High School	Colleges	Health Post	Clinic	Hospital	Church	Market Hall	Cooperatives	Poro/ Sande	Police Post	Has LEC*	Cell phone coverage
Tappita (1)	2	1	-	-	-	1	2	1	-	Sande	Yes	Yes	Yes
Kparquoi (LassanaVillage)	1	-	-	-	-	-	1	1	1		-	-	Yes
Nanlah	-	-	-	-	-	-	1	-	-		-	-	Yes
Gwin's Town	-	-	-	-	-	-	-	-	-		-	-	Yes
Gbolordeala (Dialah)	1	-	-	1	-	-	4	-	-	Poro and Sande	-	-	Yes
Bah town	-	-	-	-	-	-	-	-	-	Krahn groups	-	-	Yes
B'Hai Town	1	-	-	-	-	-	Yes	Yes	-		-	-	Yes
Kpelleh Village	-	-	-	-	-	-	Yes	-	-		-	-	No
Poker (Pokor) Town	1	-	-	-	-	-	Yes	-	-		-	-	Yes
*LEC: Liberia Electricity Corporation													

Table 6-21 Services in communities

Town	Has shoe repair	Has Tailor	Has food stalls	Has food shops	Has hardware store	Has tire repair	Has transport union	Has fuel supply	Has firewood	Has building materials
Tappita	>1	>1	Yes	N	Yes	Yes	Yes	Yes	Yes	Yes
Lassana Village	-	-	Yes	Yes	-	-	-	-	Yes	-
Nanlah	-	-	Yes	Yes	-	-	-	In jar	Yes	-
Gwin's Town	-	-	-	-	-	-	-	-	Yes	-
Gbolordeala (Dialah)	-	-	Yes	Yes	-	-	-	In jar	Yes	-
Bah Town	-	Yes	Yes	-	-	-	-	-	Yes	-
B'hai Town	-	-	-	-	-	-	-	-	Yes	-
Kpelleh Village	-	-	-	-	-	-	-	-	Yes	-
Poker (Pokor) Town	Yes	Yes	Yes	Yes	-	-	-	-	Yes	-
Toe Town	Yes	Yes	Yes	Yes	-	Yes	Yes	In jar	Yes	Yes

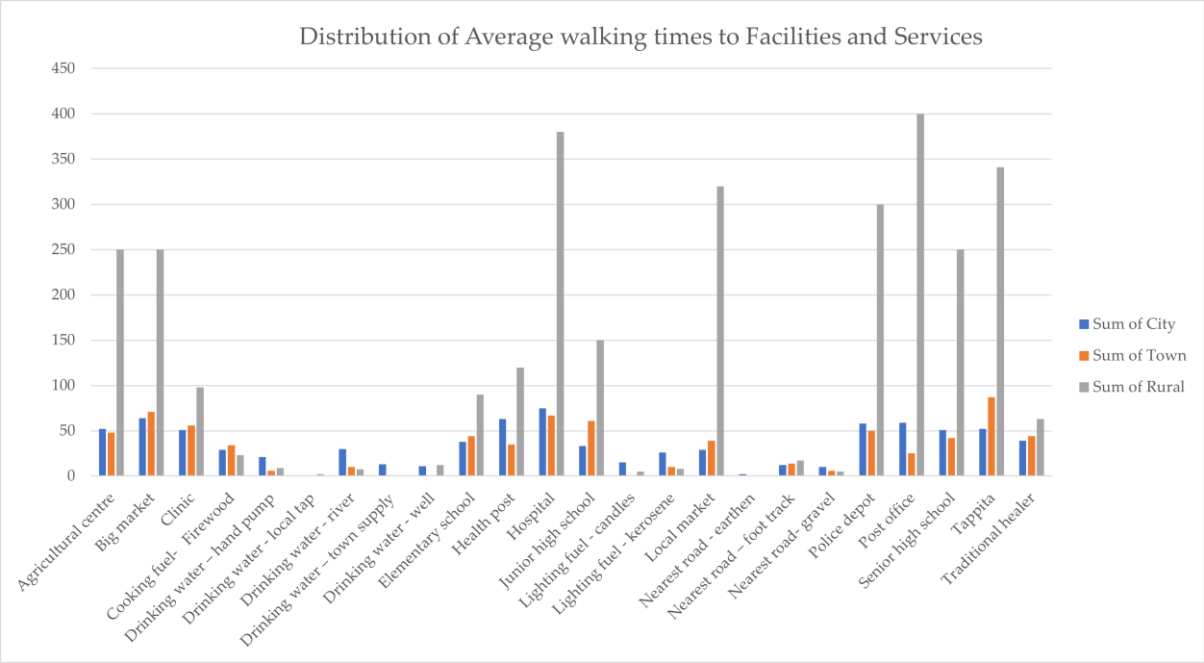


Figure 6-23 Average walking time (in minutes) to services, by settlement type

After the poor road condition, the key informants stated that the availability of safe drinking water is a major issue, with the smaller communities still using creeks for supplies. Larger towns often have hand pumps, but many are poorly maintained. No community has an efficient sanitation system, and all wanted community latrines.

It is expected that after completion of the road upgrading, more services will become available to communities and that transport of goods and people becomes cheaper and easier.

Walking times to access services and facilities by survey respondents are summarised in Table 6-22. They are longest in rural communities and shortest in the cities. For example, walking times to access all types of schools are shortest in the urban areas, usually longer in towns and much higher in the rural areas. Rural school attendance often has to be enabled through motorcycle taxis in the absence of easy transport. Whilst larger towns and Tappita have most facilities, rural settlements often do not and face very long walking times or expensive vehicle trips. The same pattern is shown for walking times to big towns, big markets, police posts and post offices. Walking times to collect drinking water and other very locally available facilities, are very similar in all settlements.

Table 6-22 Estimated Walking Times to Services and Facilities in Minutes

Destination	City	Town	Village	Average
Elementary school	38	44	90	43
Junior high school	33	61	150	62
Senior high school	51	42	250	111
Health post	63	35	120	63
Clinic	51	56	98	58
Hospital	75	67	380	178
Traditional healer	39	44	63	45
Cooking fuel- Firewood	29	34	23	27
Lighting fuel - kerosene	26	10	8	45
Lighting fuel - candles	15	-	5	10
Drinking water - well	11	-	12	11.7
Drinking water - river	30	10	7.5	14
Drinking water – hand pump	21	6	9	10
Drinking water – town supply	13	-	-	13
Drinking water - local tap	-	-	2	2
Nearest road – foot track	12	14	17	15
Nearest road - earthen	2	-	1	1.5
Nearest road- gravel	10	6	5	7.4
Post office	59	25	400	287
Police depot	58	50	300	87
Agricultural centre	52	48	250	175
Local market	29	39	320	53
Big market	64	71	250	175
Tappita	52	87	341	133

6.3.9 Health

6.3.9.1 Access to Health Services

Access to health services is very difficult especially when the road condition is very bad. People cannot access clinics and hospitals easily and many depend on local healers. Improvements to ease the time and cost of transport along the road will mean that more people can access better quality health facilities.

6.3.9.2 Illnesses Reported and Deaths

Respondents were asked to indicate if someone had been ill in the household in the last year. Some 110 (78%) households reported taking medicines for illnesses. There was roughly equal reporting of illnesses by both male and female headed households.

Of the 48 deaths reported in the previous year, old age and malaria together form 40 percent as the most often reported causes of death, followed by those where the cause was unknown. Allegations of witchcraft are often made where no diagnosis was made. The case of a person

dying whilst "in animal" relates to traditional groups who believe they can transform into an animal related to their clan affiliations and that a death occurred whilst in the trance. The results are provided in Table 6-23.

Table 6-23 Reported causes of deaths,

Reported Causes of Death	Number
Accident	3
Asthma	1
Brief Illness	2
Blood pressure	1
Cancer	1
Chronic Cold	1
Diabetes	1
Heart Attack	2
Hepatitis	1
Kidney	1
Liver problems	3
Malaria	7
Old Age	7
Pneumonia	1
Prolonged Illness	1
Sickness	1
Stomach Pain	1
Unknown	10
Witchcraft	2
Person was in Animal	1
Total	48

6.3.9.3 Vaccinations

Liberia is seen as a global model for success in increasing vaccination coverage in post-conflict countries (UNICEF, 2007).

Free vaccinations for children are provided by government hospitals as follows:

- 0-11 months: BCG (for Tuberculosis), Hepatitis B;
- 0-59 months: Polio;
- 9 months: Measles, Yellow Fever; and
- Women 14-49 years (child-bearing ages): Tetanus Toxinus.

Vaccination data collected was based on the ability of the interviewees to remember the vaccination history of other household members. In the survey, all (100%) households reported that their children had received the full programme of vaccinations.

The impact of Covid 19 in Liberia appears modest in terms of cases and deaths - 2030 cases and 85 deaths to March 6, 2021[26]. However, in the absence of extensive testing, cases may be

[26] https://www.worldometers.info/coronavirus/country/liberia/ downloaded 17 March 2021.

much higher but unreported. In order to foster the early introduction of COVID-19 vaccine in Liberia, the country has identified its 20% priority population or target group in accordance with the guidance. The priority group includes health care workers, elderly people (60+), people with co-morbidities, refugees and other essential workers who cannot social distance due to the work they performed.

On March 5, 2021, **Liberia** received 96,000 COVID-19 vaccine doses shipped via the COVAX initiative.[27] In order to foster the early introduction of COVID-19 vaccine in Liberia, the country has identified its 20% priority population or target group in accordance with the guidance. The priority group includes health care workers, elderly people (60+), people with co-morbidities, refugees and other essential workers who cannot social distance due to the work they performed. There is as yet no information on the rate of distribution nationally.

Liberia's near-term outlook is highly uncertain. Under the baseline scenario, a sharp rebound is expected with real GDP growth projected to rise to an average of 4.1 percent during 2021-22. However, under the downside scenario, real GDP is expected to recover more slowly, growing at an average rate of 3.7 percent in 2021-22. In both scenarios, the medium-term recovery will be underpinned by the post-COVID-19 normalization of economic activity and the implementation of structural reforms designed to alleviate constraints on productivity growth and support economic diversification. The population living below the national poverty line is expected to increase from 55.5 percent in 2019 to 68.9 percent, which means that an additional 526,000 Liberians are at risk of falling into poverty.[28] This will impact local people in the project area of influence increasing vulnerability.

6.3.9.4 Antenatal care

There was widespread recognition among women of the importance of antenatal care. Some 98% of all households stated that they had gone for antenatal checkups during the last pregnancy, but it should be noted that the number of times that women attended check-ups was not recorded. All but 5 households claim that women gave birth at a clinic; 3 gave birth at home and 2 others gave birth on the way.

[27] https://www.afro.who.int/news/96000-doses-covid-19-vaccine-arrives-liberia downloaded 17 March 2021.

[28] Bakanova,Marina; Tarwo,Gweh Gaye, 2020. Liberia Economic Update: The COVID-19 Crisis in Liberia - Projected Impact and Policy Options for a Robust Recovery (English). Washington, D.C.: World Bank Group. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/159581596116122714/liberia-economic-update-the-covid-19-crisis-in-liberia-projected-impact-and-policy-options-for-a-robust-recovery

6.3.9.5 Sanitation Facilities

Only 112 households (75%) reported having some form of toilet in the form of a pit latrine or permanent materials toilets, and the remainder use the bush or other communal facilities. Most city households have a toilet facility made of permanent materials whereas town households have fewer toilets of permanent materials and a higher use of pit latrines, Table 6-24.

Table 6-24 Distribution of sanitary facilities by location

Type of Sanitation Facility	City	Town	Rural	Total	Percentage
No facilities	6	28	3	38	25
Toilet/ permanent Materials	39	8	27	74	50
Pit Latrine	1	25	12	38	25
Total	46	61	42	150	100

6.3.10 Education and Skills

6.3.10.1 Access to Education

Educational level attendances are shown in Table 6-25. The survey responses show that 15 percent of adults aged 15 and over had never been to school. Women were more likely than men to have missed out on school; 19% of women aged 15 and over had never been to school compared with 11.1% percent of men, this rises to 30% for women in rural areas. Literacy was not measured in this survey, but it can be deduced from the proportion of people who never attended school that at least 15 percent of the sample aged 15 and over are illiterate. Women generally achieve lower levels of education especially at Senior High and Graduate levels.

Similarly, illiteracy is highest in rural areas and school attainment level reached is highest in the city and towns where access to schools is easiest (Table 6-26). Improving the road will enable children to travel to school more easily and more cheaply, especially in the rainy season, and achieve better at school.

Children's school attendance is shown in Table 6-26. Of young people aged between 6 and 18,5.5% of the total are not attending school with no difference between boys and girls or between rural and urban areas. Generally, almost the same proportion of girls start school as boys, the drop-off in girls achievement starting at Junior High School level and continuing at higher levels. Girls in the rural areas have poorer access to secondary education through lower provision and difficulties of access. When these data are broken down by location, it can be seen that illiteracy is lowest in the cities and where the success rate in achieving a full High School education is highest. Liberia has made great strides in making educational services available, reducing the illiteracy rate and keeping more young people in education. Access to secondary education in rural areas is needed to close the attainment gap between men and women.

Table 6-25 Reported household members' school achievement to date

Education	Men	Women	% Men	% Women	Grand Total
Illiterate aged >15 years	**73**	**112**	**11.1**	**19**	**184**
Can read and write Elementary G5 completed	**104**	**113**	**16.1**	**19.2**	**217**
Elementary level G6 completed	**169**	**143**	**26.1**	**24.3**	**312**
Junior High G9 completed	**87**	**104**	**13.4**	**17.7**	**191**
Senior High G 12 completed	**98**	**48**	**15.1**	**8.2**	**146**
Graduate and above	**29**	**6**	**4.5**	**1**	**35**
Vocational Training	**5**	**2**	**0.8**	**0.4**	**7**
Infant 0-5 years	**61**	**42**	**9.3**	**7.1**	**102**
Not attending school but aged 5-18 years	**17**	**14**	**2.6**	**2.4**	**31**
No information	**4**	**4**	**0.6**	**0.7**	**8**
Grand Total	**647**	**588**	**100**	**100**	**1235**

Table 6-26 Reported household members' school achievement to date by urban/ rural split

Education	Urban	Rural	% Urban	% Rural	Grand Total
Illiterate aged >15 years	59	127	9.4	20.6	186
Can read and write Elementary G5 completed	127	90	20.7	14.7	217
Elementary level G6 completed	136	176	22.1	28.7	312
Junior High G9 completed	110	81	17.9	13.2	191
Senior High G 12 completed	89	57	14.5	9.3	146
Graduate and above	22	13	3.6	2.1	35
Vocational Training	6	1	1	0.2	7
Infant 0-5 years	50	52	8.1	8.5	102
Not attending school but aged 5-18 years	15	16	2.4	2.6	31
Data absent	4	4			8
Grand Total	**618**	**617**	**100**	**100**	**1235**

6.3.10.2 Skills and Training

The skills already possessed in communities are an indication of the potential for employment of local people on the project as well as for economic expansion possible following the completion of the road. Skill sets in the towns are the foundation for entrepreneurship and small businesses. The responses on these are shown in Table 6-27. Whilst both men and women express interest in employment on the project, there are good numbers of skilled, semi-skilled and unskilled manual labor available, that could usefully be employed on the project. There are drivers and mechanics available. 147 men and 32 women declared having skills that may be useful in the project construction.

Table 6-27 Skills in communities

Skills	Male			Female		
	City	Town	Rural	City	Town	Rural
Bamboo Construction	2	8	16	-	-	1
Reed Mats	3	3	26	-	1	3
Carpentry	4	3	9	-	-	-
Masonry	4	3	11	-	-	-
House Construction	9	2	15	-	-	-
Food Processing for sale	5	3	14	6	5	4
Soap making	-	-	1	5	6	1
Total	33	22	92	11	12	9

Rural communities and towns have households with other skills – mostly the ability to grow rubber and other tree crops, mechanical skills and driving (Table 6-28). These are important for ensuring livelihoods are maintained and not lost to the project. The other skills identified in the survey are mostly agricultural in the rural areas, rubber and other tree cash crops and growing vegetables for market. Few town and city respondents declared other skills – two professional men and one office worker were found. Three vehicle drivers were identified, 2 in rural areas and a mechanic. Few city or town women declared any skills whereas rural women have multiple skills in cash and subsistence cropping.

Only 6 men (all in the city) and two women (rural based) have social security registrations, which inhibits local employment potential.

Table 6-28 Non construction skills in the surveyed household

Other skills	Male	Female	Location
Rubber	3	26	Only rural men 6 women in the city, 12 in the town and 19 rural women
Cocoa	1	1	Only in rural households
Coffee	1		Only in rural households
Growing vegetables for market	9	11	Only in rural households
Driving vehicles	3	-	2 men in rural areas, 1 in town
Mechanic	1	-	1 in town
Office work	1	-	1 in city
Professional work	2	-	1 in city
Day wage Labour	4	1	City and town households
Nurse	-	1	Rural clinic nurse
Tailor	-	1	Rural
Other skills	8	5	Mostly in towns and rural communities
Total	33	46	

The area has had extensive coverage of various empowerment and income generating programmes (Table 6-29). Most households have been reached by health and sanitation programmes and those for women's reproductive health. Formal savings and credit training run by banks and NGOs have reached very many households as have informal Susu savings programmes. Agricultural programmes and those aimed at livestock improvement appear to

have poor coverage in rural areas whilst managing to reach city and town dwellers. In part this is due to the very poor road condition making it difficult to reach rural communities. The potential is there for economic development once access is improved and these programmes can reach the rural areas.

Table 6-29 Training programs attended by respondents

Training Programmes	City	Town	Rural	Total
Empowerment Programmes	35	33	34	102
Health and Sanitation	32	32	41	140
Women's Reproductive Health	25	29	33	135
Women's Literacy	15	23	5	43
Adult Literacy	15	24	3	42
Formal Savings and Credit	37	39	35	111
Informal savings and credit - Susu	31	40	37	108
Agricultural Extension	10	23	15	48
Livestock Raising	10	16	27	53
Bee keeping	7	6	8	21
Goat raising	9	12	28	49
Poultry raising	17	14	35	66
Other	7	0	2	9

6.3.11 Social Capital

6.3.11.1 Participation in Community Activities

Knowledge of community activities is important as it indicates cohesiveness and participation rates. Some 87 percent of households (88% Male heads of Households - MHHH and 85% female heads of Households -FHHH) belonged to at least one kind of community group, with the proportion of variation differing insignificantly by location. Church groups were most popular with most households having members, followed by hand pump groups in rural areas and savings groups in all areas. In the rural areas, 30 MHHH were members of a Kuu agricultural group sharing labour as were 12 FHHH.

The capacity for communal effort is a useful indicator for the Resettlement Action Plan and the proposals for replacing livelihoods. By far the most common and popular community groups were church groups. There was a church group, sometimes at a number of churches, in almost every town, and in situations where there were none, people joined church groups in neighbouring towns.

Community meetings for a variety of purposes were held in all communities surveyed. Men were very slightly less likely to attend community meetings than women, but all households involved in community groups declared that both men and women could participate in meetings. Political meetings were not as ubiquitous as community meetings but were held in the majority of bigger communities.

- 34% households stated that men attended political meetings.
- 20% of households stated that women attended political meetings.
- 91% of households stated that women could freely participate in all meetings.

All survey locations report a number of women's groups in each place, all but the smallest village have youth groups. The larger towns have savings groups and business associations. Several Liberian NGOs are based in the towns, extending in part to the rural villages.

Only one cooperative was found, located in Tappita.

6.3.11.2 Cultural Practices

The majority of the sample was Christian, the remainder were Muslim. Many Christians practice a mixture of traditional beliefs and Christianity. A Mosque is found only in Tappita. Prejudice against Muslims in the civil war forced many to flee and may reflect on the numbers claiming this belief. There was reluctance among interviewees to profess belief in Animism or traditional beliefs. Furthermore, many of the traditional belief systems practiced in Liberia involve secrecy.

The Mano and Gio peoples practice the secret society Poro and Sande collective activities in the study area. These activities are secret and, in general, people preferred not to answer questions on these activities. They are traditional systems of social teaching and control rather than a religion. The Krahn also have societies but these are more oriented towards self-help and community support than as a social control.

There were no cultural or archaeological sites near to or in the road right of way. There were however some 9 graves near the road alignment that will be assessed by the RAP team for relocation.

6.3.12 Economic Activities and Income Sources

The survey looked at the activities declared by all aged 15+ years. The majority of persons are either farming or conducting some level of business activity ranging from petty street trading to more substantial businesses (Table 6-30). Most farming activities were in the rural areas. There are many more types of economic opportunities for men in the survey area than there are for women. Over half of women are engaged at work in and around the home or conducting business – mostly petty trading in markets or villages. Only men were found as agricultural labour, hunting or working away. The survey found 22 disabled persons unable to work, 16 men and 8 women.

Formal and informal employment opportunities were few and mostly available to men and in the city or towns. Busines and employment activities are most common in Tappita and the towns.

Table 6-30 Economic activity by sex of adult over the age of 15 and by location

Economic Activity	Men	Women		City	Town	Rural	Total
Farm own land	142	37		28	30	121	179
Own land and sharecropping	12	-		8	-	4	12
Sharecropping	1	-		1	-	-	1
Agricultural labour	18	-		7	4	7	18
Public Service	12	5		6	7	4	17
Employment	23	8		17	12	2	31
Business	99	94		72	73	48	193
Hunting	2	-		1	1	-	2
Working away	1	1		2	-	-	2
Retired	6	-			5	1	6
Unemployed	18	3		15	5	1	21
Disabled and unable to work	15	7		4	2	16	22
Domestic care	-	188		22	38	128	188
Grand Total	350	342		183	177	332	692

6.3.13 Land and Labour Systems

In this section, patterns of land tenure practices in the study area are described. In particular, the distinction between 'owned' and communally accessed land is investigated and the relationship between land ownership and income explored.

6.3.13.1 Land tenure practices

People's relationship with land was categorised as either 'owned' – use of the land has been permitted by custom and time, 'rented', 'customary' or 'squatting'. New rural land ownership changes and alienation of communal land to private ownership has not been permitted since the civil war and remain in need of clarification under the new land policy that has yet to become law. No new deeds have been issued and so ownership documentation updating is problematic. [The majority of the land needing acquisition for this project is already vested as government land for the right of way for the project, and therefore very little further acquisition is required].

'Rented' is mainly applied to peri-urban situations or where big families owned land and rented it to their kin or friends in return for money or a percentage of the harvest. Communal land was understood as government or tribal land that was allocated by the Town Chief or traditional owner. No household described their relationship to the land they lived on as 'squatting'.

Historically, access to land in Liberia was governed through the Chief and Elders of a rural town. This is, to a certain extent, still the case; in all of the towns and particularly in rural communities surveyed across the study, it was reported that strangers could access land by asking permission from the Chief and Elders. Even in the relatively new communities, it was reported that the first squatter assumed the role of a traditional Chief and made decisions about where people could live or farm. In places where land access can be acquired through

purchase, the process of purchasing land is overseen by the Town Chief, traditional authority or the landowner. Urban practices are different where land in long established municipalities is already covered by title deeds for plots, and where sale and transfer follow the legally defined process.

Other land allocation practices that were reported involved collective decision making and kinship-based allocation systems among big families. These families do not distribute land in the historical sense but rent family land that is registered to them as tribal land. The families to whom the land is tribally registered have special rights over the land, in that they can plant tree crops (rubber and cocoa trees). Families which rent the land may only plant subsistence crops (rice, cassava, maize, cucumber, bitter ball, etc.).

Land allocation practices are influenced by tenureship and differences were observed between the rural areas, larger towns and cities. The pattern that emerges from the data on land tenureship and allocation practices is that when land is considered communal, access to land tends to be governed by the Chief. When land is considered 'owned', other allocation systems are used, such as "allocation by long time holder". The Chief and traditional authorities remain influential in systems that involve purchase and rent, resulting in a hybrid system operating.

The categories of 'owned with title deed' and 'communal' are distinct. While the data were mostly consistent, there are categories of ownership according to the stage of alienation from communal to private title deeds achieved. This results in one of many grey areas in Liberian land tenure systems that have evolved from "vernacular land markets" or markets where no de jure property rights existed but where people had de facto rights to buy and sell land. Under this system, land was divided into communal government land and 'private' land (i.e. land that could be bought and sold).

The move away from the dualistic notion of communal government land and privately owned land began when American settlers started to buy 'private land' from ethnic Liberians. As private land ownership expanded, the commodification of land created grey zones in the classification of land tenure that slid between the de facto land ownership (the older system of customary allocated land) and the newer de jure land titles.

6.3.13.2 Size of Land Holdings

Some 105 individual plots were recorded with average plot size varying between location and sex of the owner Table 6-31). These were owned or used by 90 households with men owning or using 2.5 times as many plots as women plot users. Men had 76 plots as opposed to 29 plots for women. Only 15 persons had two plots. The average plot size was greater for men (34.2) acres – varying from 250 acres to less than one acre – compared to 8.24 acres for women (Table 6-32). The average plot size for plots owned by women is skewed by the ownership of

two large rubber plots, the majority of women's plots were around 1 acre. In general, variations in range of plot size are due to some few very large holdings for tree cash crops as opposed to smaller land sizes for household subsistence. Plot sizes are generally smaller in towns than rural communities.

Table 6-31 Land plots numbers and their location

Land plot	Count		Location			Total
	Plot 1	Plot 2	City	Town	Rural	
Male holders	67	9	14	21	40	**76**
Female holders	23	6	6	26	16	**29**
Total	90	15	20	47	56	**105**

Table 6-32 Average plot sizes in acres

Average plot size	City	Town	Rural	Number
Male holders	7	26.8	48	76
Female holders	2	4.3	12.4	29

6.3.13.3 Land and Labour, and their Relationship to Wealth

It is often assumed that land ownership is correlated with other indications of wealth – ownership of vehicles, generators, sending family members to university etc. While this is true for families owning large areas of tree crops being actively farmed for rubber, coffee and cocoa, the relationship is disrupted by the difficulty of marketing produce and low prices attained at the farm gate. Similarly, prices of food crops are low, and marketing is difficult in the rural villages along the road as the road condition limits travel and timeliness of sale.

6.3.13.4 Agricultural Labour Markets

It is not availability of farming land alone that facilitates wealth accumulation, but rather access to labour to farm the land. The hiring of labour for agriculture is associated with cash crop farms. The kuu groups are evidence of partnerships sharing the cost and availability of labour. Traditionally, kuu groups worked for food and visited each member's plot in turn to undertake the labour of felling and brushing forest for farms. As time has gone by, the voluntary nature of participation has declined and both men and women expect to be paid for this type of agricultural labour rather than describe themselves as agricultural labourers full time.

The kuu system of shared labour and mutual support is still being used in the project area although it is more commonly undertaken for wages rather than for free.

6.3.13.5 Natural Resource Access

Access to natural resources plays an important role in the livelihood strategies of the surveyed populations. The main natural resources include the rivers and the forest or 'bush'. Access to

these resources not only reduces the amount of money needed for cooking fuels such as charcoal and firewood, but in many cases also represents an income generating resource. Only one household claimed that one person was fulltime working in the forests.

Almost all households reported access to the bush, and many reported using plants from the bush for firewood, medicine and building materials. Other data surveyed in Nimba, (ArcelorMittal's 2013 ESIA for the Nimba Western Range Iron Ore Deposits), indicates that when a household has access to the 'bush' as a source of firewood it saves, on average, 44 percent of expenditure on fuel compared to a household that has no access to the 'bush'.

Many households accessed the bush for a range of income generating products such as palm oil production, charcoal burning, hunting and fishing.

6.3.13.6 Division of Labour at the Household Level

Data collected in the household survey provide some insight into which agricultural tasks are predominantly performed by which gender. For a more nuanced insight into how agricultural work is divided, a more in-depth gender analysis would need to be carried out.

Agricultural tasks carried out at the household level were identified and interviewees were asked which member performed each agricultural task. Not all tasks apply to all households or all crop types and the data only refers to households undertaking agriculture. Table 6-33 describes the division of each task by gender and age. Girls and boys up to and including age 14 were categorised as children.

Overwhelmingly, the heavier tasks of preparing land – brushing, felling and land preparation - for agriculture were carried out by men with some women involved in land preparation. Older children and family members were expected to assist with these activities. Considerable amounts of hired labour is also used in these tasks.

Table 6-33 Numbers of Households Undertaking Agricultural Tasks by Gender

Agricultural work task	Males	Females	Children	Hired
Brushing	48	1	5	58
Felling	50	1	7	46
Burning	57	1	22	25
Land Preparation	51	7	18	18
Sowing	25	27	1	29
Seed nursery (rice)	34	14	17	16
Transplantation (rice)	27	13	29	14
Weeding	19	22	30	26
Manuring	42	3	20	14
Harvesting	9	16	49	22
Transportation	26	13	44	13
Cleaning/ processing	18	26	45	15
Storage	7	60	35	16
Marketing	2	68	34	0

Contrary to popular perceptions, most "growing" tasks are performed by both males and females. Activities such as sowing, transplantation, seed nursery, transplantation and weeding are undertaken by both men and women, whilst harvesting, processing and storing were carried out by female and child household members.

The data collected on division of labour also provide an insight into the agricultural systems being used. Only 60 out of 105 households (HH) reported fertilising their fields, reflecting the widespread use of rotational farming or slash and burn agriculture. It is also clear that beekeeping is not common; only one of households reported practicing beekeeping and only 2 households reported hunting.

In contrast, all domestic tasks of are predominantly carried out by females with children assisting with water and firewood collection and washing clothes (Table 6-34). Childcare and that of the elderly is a female responsibility, only undertaken by men where there is no woman in the household.

Table 6-34 Numbers of Households Undertaking Agricultural Tasks by Gender

Agricultural work task	Males	Females	Children	Total
Collecting firewood	10	70	53	**133**
Collecting drinking water	3	54	83	**140**
Grinding grains	2	79	56	**137**
Washing clothes	2	56	83	**141**
Cooking	1	108	32	**141**
Childcare	0	109	17	**126**
Elder Care	2	62	10	**74**

6.3.14 Incomes and Expenditures

The economy of the project area is primarily focussed on agriculture and related services and small business supplying household needs in all city, town and rural households. As data on monetary incomes and expenditure were not possible in the time frame of the survey, this section looks at the range of tree crops grown by survey households, animal ownership and food security.

6.3.14.1 Crops Cultivated

Interestingly, city households have access to tree crop land and more city than town households are growing tree crops (Table 6-35). Most rural households grow tree crops. Plantain is the most popular crop – often marketed for sale. Rubber tends to be grown on larger plots and marketed out of the Districts. Fewer FHH grow tree crops than do MHH, particularly major cash crops of rubber and cocoa, indicating lower access to land and resources and demonstrating vulnerability.

Table 6-35 Numbers of Households with crop production

Households growing tree crops	City	Town	Rural	Total	MHH	FHH
Number of households in category	47	42	61	150	109	41
Timber and firewood	11	3	11	25	18	7
Bamboo clumps	13	2	2	17	14	3
Rubber	16	6	16	38	32	6
Cocoa	16	7	20	43	37	6
Kola	12	8	8	28	24	4
Oil Palm	10	8	14	32	25	7
Citrus Orange	13	4	7	24	20	4
Avocado	13	7	16	36	31	5
Breadfruit	11	4	7	22	20	2
Plantain	18	15	49	82	65	17
Pineapple	15	5	20	40	31	9
Sugar cane	20	2	8	30	23	7
Banana	18	12	42	72	58	14
Mango Plum	15	6	18	39	30	9

6.3.14.2 Ownership of Animals

The incidence of animal ownership is low in the project area. Men own the oxen, pigs and the sole beekeeper is male. Both women and men keep goats and chickens/ ducks and have dogs. Animal ownership is more frequent in the rural areas, but significant numbers of city and town households have goats and chickens (Table 6-36).

Table 6-36 Numbers of Households with Animal Ownership

Animals kept	Sex of HHH	City	Town	Rural	Total
Oxen	M	1	1	-	2
	F	-	-	-	-
Goats and sheep	M	10	18	2	30
	F	2	6	10	18
Chickens	M	-	2	19	21
	F	6	14	25	45
Ducks	M	8	2	9	19
	F	4	12	9	25
Rabbit	M	-	-	-	-
	F	1	-	-	1
Pigs	M	1	-	3	4
	F	1	-	-	1
Dogs	M	1	2	13	16
	F	1	6	9	16
Bees	M	1	-	-	1
	F	-	-	-	-

6.3.14.3 Food Security

As one indicator of food security, interviewees were asked whether they grew rice and cassava, and for how long these crops lasted as a food source. Male headed HH reported an additional one month of food security (7.8 months of the year) than did female headed HH at 6.7 months of the year. Overall, a higher proportion of HH grew cassava than rice; 56 percent of farming HH grew cassava compared with 38 percent that grew rice. While the proportion of households growing rice and cassava was much higher in the rural areas, it should be borne in mind that using the duration of rice and cassava stocks as an indicator of food security is relevant only to those which grew rice and cassava.

Of those which grew rice, 72 percent reported that their stocks ran out before they harvested again. Cassava can be harvested all year round and is more likely to provide a source of food from one season to the next. Of those growing cassava, 67 percent of HH reported that their cassava lasted more than 12 months. However, it should be noted that rice tends to be consumed more regularly than cassava; on average, households report eating rice every day and cassava once or twice a week. When rice stocks ran out, households always bought rice as a staple; but when their cassava ran out, households did not always buy cassava.

When interviewees were asked what strategies they use to get through the hungry season, 40 percent reported no change in their activities. This appears to indicate that their activities are not as dependent on seasonality as sub-Saharan households are generally thought to be. For 21 percent of households, this question did not apply, meaning that their income was not affected by the seasons. Of those which did adapt, the strategies were dispersed, resulting in low numbers in each category. The most commonly reported strategies were business (81 HH) and wage labour. There was no difference between the three locations (city, town or rural) or between MHH and FHH.

Bushmeat was a significant source of protein. People were more likely to purchase bushmeat than hunt for it themselves; it seems that hunting is less of a livelihood, more an occasional activity that people engage in to obtain meat. All but one household consume bushmeat at some frequency but the majority do not eat bush meat more frequently than twice a month. Animals hunted were usually small mammals and rodents, but a third of households consume deer. Small animal consumption – opossum, bat, ant bear, monkey, porcupines, rats, etc. were caught and eaten in rural areas. The communities therefore have a dependence for survival on local forest produce.

6.3.14.4 Income and Poverty

Economic development has been held back by the condition of the road, which inhibits traffic and raises transport costs in the wet season. Farmers cannot sell produce easily as buyers cannot get to them and investment in tree crops is limited as transport difficulties mean it is not economically worthwhile harvesting the trees. Most farms grow subsistence rice and cassava crops for home consumption or very local marketing. Poverty is prevalent in the area served by this road.

The HIES reports three poverty levels: a food poverty level whereby families have insufficient resources to feed themselves regularly; an overall poverty level where families have insufficient means to meet their food and non-food needs; and an extreme or absolute poverty level. The absolute poverty level – equivalent to household incomes less than $1.90 per person per day – has dropped in Liberia from 68.6 percent in 2007 to 50.9 percent in 2016.[29] Meaning that slightly more than a half of the Liberian population is poor. This also means that 50.9 percent of Liberians could not achieve the minimum expenditure to acquire basic food and non-food items by 2016. Grand Gedeh has 63.7% of people in absolute poverty. This is higher in Nimba at 66.6% of people.

Poverty is higher in rural areas compared to urban areas. Nationally, rural poverty is 71.6 percent compared to urban poverty at 31.5 percent. Food poverty in Liberia is 39% in rural areas (50.9 percent) and is lower than overall poverty rates because many households can grow food for subsistence. Food poverty in Nimba affected 45.2% people and 47.8% in Grand Gedeh. Extreme poverty nationally is 26.5% percent in rural areas compared to 7.2 percent in urban settings. In Nimba, extreme rural poverty is 20.6% and in Grand Gedeh it is 17.5%. These three sets of figures place the two Counties in the medium range of poverty statistics at County level.

Comparing poverty levels by the gender of the household head, male-headed households have slightly higher poverty than the female-headed households. Poverty levels are 52.3

[29] LISGIS, 2018.

percent among the male-headed households and 46.3 percent among female-headed household. Considering different age categories of household heads, the highest levels of poverty are found among household heads above age 60, at 60.2 percent. The lowest poverty rate is found for those in households whose heads are under age of 20 and between age 20 and 29, at 41.8 and 43 percent respectively.

The highest levels of poverty nationally are found in households in which the head has no formal education, 66 percent, compared to 58.7 percent for heads with at least some primary education, 43.8 percent for heads with at least some secondary education, and 15.9 percent for heads with post-secondary education.

Considering the County data for poverty by employment categories of the household head, people living in households in which the head whose primary activity is self-employed agriculture have substantially higher poverty rates, 79.6 percent, compared to those heads working in paid employment, at 34.5 percent; non-agricultural self-employment, at 40.1 percent; and heads not currently working or are in unpaid employment at, 51.2 percent. About 58 percent of those in agriculture are also in food poverty and more than one-third are in extreme poverty.

6.3.14.5 Wealth Indicators

Wealthier families tend to own vehicles, have generators and often have a non-agricultural business interest. The majority of wealthier households are located in the cities and larger towns. The emergence of new villages and hamlets since the 2008 census shows the pressure for agricultural land.

Income and expenditure data are available for groups of Counties in Liberia in the 2016 Household Income and Expenditure Survey (HIES) reported in 2018. However, Nimba County statistics were aggregated with those of Lofa and Bong Counties in this survey in the North Central category, and Grand Gedeh was amalgamated with other Counties in the South East A group so inference from this data is of limited value.

The baseline socio-economic household survey looked at the distribution of wealth indicators through possessions that indicate a history of cash income to acquire (bicycles, carts, cars or trucks, radios, generators, televisions, etc.). The information is summarised in Table 6-37. The nearer the average wealth indicator is to 1.0, the greater the number of households with the item and the greater the relative wealth.

It was found that while many households had a radio, almost all households had a pestle and mortar especially in rural areas (Table 6-37). Very few carts are found and very low levels of other modes of transport. The frequency of wealth indicator ownership shows peak in the towns with lower levels in the city and rural areas with least items. Generators and TVs are more likely to be owned by city and town households, and mobile phone ownership is almost

universal in Tappita and the towns but at only 60% in rural households. Without a mobile phone, it is difficult for the seller to get market information and get a better price.

On average, city households owned 3.23 wealth indicators, town households 4.09 and rural households on average 3.45 indicators. These figures show that living in a city is not a straightforward path to greater incomes.

Table 6-37 Distribution of wealth indicators by settlement type

Indicators of wealth	City	Town	Rural	Total
Average of radio	0.73	0.93	0.6	0.71
Average of generator	0.28	0.59	0.16	0.32
Average of fishing nets	0.22	0.29	0.58	0.38
Average of sewing machine	0.09	0.5	0.05	0.6
Average of cart	0	0	0.02	0
Average of pestle and mortar	0.91	0.98	1.0	0.97
Average of any other transport	0.11	0.19	1.08	0.12
Average of mobile phone	0.91	1.0	0.90	0.93
Average of shotgun	0.06	0.07	0.16	0.11
Average wealth items owned	**3.23**	**4.09**	**3.45**	**3.56**

6.3.14.6 Income Sources and Expenditure Groups

Household incomes in the project Counties are derived from numerous sources, household members undertaking different types of activity over the year to gain a cash income. Table 6-33 shows how many households gained income from each source; many households have multiple sources. This data is indicative only as some households refused to respond and others may forget some elements.

The data shows that most households are engaged in some form of business or selling produce. Most farming households sell subsistence food to generate an income and households from all locations sell firewood or make charcoal. Non-agricultural income sources are very few but the frequency of micro-enterprises in the city shows that development is coming slowly. If the average number of income sources per household is examined, it shows that city households have a lower average number of sources open to them followed by the town sources. Rural households have more options, but these are mostly agricultural. Bigger business above petty trading level, professional and employment opportunities are best in the city and towns.

When the data is disaggregated by sex of the head of households, female headed households (FHHH) have half the number of sources of income open to them on average (shaded in the Table 6-38). That proportionately fewer FHHH take up many income generating opportunities, points to a lower capacity to respond to development and increased vulnerability to project impacts for these households. Sales of agricultural produce are primary sources of income but a lower proportion of FHH are selling produce. Slightly more

FHH than MHH are involved in business but the majority of these are involved at the petty trading level rather than bigger business.

Table 6-38 Income sources

Sources of income	City	Town	Rural	Total	MHH	FHH
Number of households in category	**47**	**42**	**61**	**150**	**109**	**41**
Selling rice	24	21	28	89	76	13
Selling cassava	26	21	44	91	75	16
Selling Plantain	19	19	53	91	72	19
Selling Tree cash crop produce	8	13	20	41	37	4
Sales of Livestock / poultry	9	11	26	46	39	7
Sales of vegetables and fruit	11	10	34	55	45	10
Sales of plants, seeds etc	0	4	12	16	14	2
Agriculture wage labour	11	14	22	47	42	7
Non agriculture wage labour	4	4	8	16	14	2
Professional work/ fees etc	7	12	7	26	24	2
Formal employment	2	5	4	11	9	2
Micro-enterprises	16	5	8	29	17	12
Business	26	31	24	81	60	21
Pension/ remittance	-	-	3	3	3	0
Rent interest	5	2	2	9	7	2
Asset sales	2	1	6	9	7	2
Other	-	-	3	3	3	0
Artisanal Mining income	4	2	5	11	10	1
Selling firewood	15	19	17	51	38	13
Selling charcoal	15	19	15	49	37	12
Selling bushmeat	4	8	11	23	19	4
Average sources per HH	**3.91**	**4.76**	**5.3**	**4.72**	**5.24**	**2.7**

Most households make payments for household basic needs - food, education, clothing, health, transportation and communication as well as firewood and charcoal (Table 6-39). Only 58% households make savings or take loans. City and town households have slightly lower average expenditure groups than rural groups, rural groups are more likely to spend on cultural or family weddings and funerals. Some rural families are landless and have to buy in all basic needs, other rural families have own production and can sell to fund other activities.

FHHH tend to have fewer types of expenditure than MHHH, making fewer health, social and cultural expenditures including alcohol. The inference is that FHHH have fewer opportunities and need to limit and manage expenditure to use limited resources.

Table 6-39 Expenditure categories

Expenditure categories	City	Town	Rural	Total	MHH	FHH
Number of households in category	**47**	**42**	**61**	**150**	**109**	**41**
Food	44	39	58	141	103	38

Expenditure categories	City	Town	Rural	Total	MHH	FHH
Bushmeat	35	33	57	125	91	34
Clothing	38	33	60	131	96	35
Education/ reading material	41	40	58	139	104	35
Medicine/ Doctor/ Hospital	38	36	57	131	98	33
Lighting and cooking fuel	25	26	46	97	71	26
Livestock	9	12	24	45	38	7
Farm inputs	15	9	34	58	40	18
Transportation/ Communication	32	25	53	110	81	29
Donations for social action	22	16	34	72	59	13
Religious and cultural expenses	22	19	39	80	63	17
Marriage/ funeral expenses	24	19	41	84	68	16
Alcohol/ Palm Wine	10	6	22	38	31	7
Income generation materials	19	15	20	54	35	19
Savings/ loans/ Susu	25	25	38	88	68	20
Taxes/ Fees/ Fines	11	7	12	30	23	7
Other	4	2	5	11	9	2
Firewood	30	33	45	108	79	29
Charcoal	36	32	32	100	73	27
Average expenditure groups/ household in group	**11.21**	**11.16**	**13**		**12.28**	**11.04**

6.3.15 Conclusions on the Socio-economic Baseline

The aim of the socio-economic survey is to gain data on how the project may impact the local people. Of 150 Households, 106 thought that they would be impacted in some way by the project. This number should be viewed cautiously as at the time households had no concrete idea of exactly how they would be impacted and so this figure highlights apprehension among local people. Of the 106 HH, 85 were MHH and 21 FHH. Concern among male headed households was highest in the towns, lower in the rural areas and least in the city. Only rural FHHH expressed concern.

Of 86 concerned MHHH, 60% were concerned they would have to lose their house, compared to only 36% of FHHH. 19 MHHH and only 4 FHHH were concerned that they might have to lose business opportunities. Some few households thought they may lose head loading income if the road was improved and 9 HH had a farm in the RoW. 7MHHH and 4FHHH have farms in the RoW.

The socio-economic characteristics of the road corridor 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 upgrading of the Tappita Toe Town road. These are the households headed by elderly or very young persons, female headed households and those containing disabled household members.

In common with the national statistics, the population in the survey area is dominated by younger age groups. Some 40 percent of the population is aged under 15 years. This warns of a growing employment problem over the coming years.

All town and rural communities have poor access to basic facilities, including health clinics and elementary schools. Communities living along the road were more likely to use river water as their main source of drinking water as few communities have a hand pump. In the towns and Tappita, people have better access to Elementary Schools and High Schools. The main hospitals are in Tappita.

Women emerged as moderately disadvantaged in terms of educational achievement and potentially economically disadvantaged in terms of access to resources and opportunities. Females were more likely to drop out of school before High School, and again before they graduated from high school, than men.

The data on income indicators shows that people are engaging in a large number of strategies to sustain themselves. Most income in non-farming households is earned through trade or formal employment. Increasing population growth is likely to put pressure on natural resources and the need for work. The pressure for work and employment is prevalent over the survey area with great hopes for development and jobs.

It is clear from these findings that communally accessed natural resources (rivers, forests and bush) are of very high economic and spiritual importance to the people living in the study areas. Any resettlement within these areas will have to be carefully planned to provide alternative resources to ensure that livelihoods and places of worship are not negatively affected. As women, uneducated people and farmers tend to be more vulnerable in terms of access to income; investment in community development needs to be carefully planned to target these vulnerable groups.

6.4 GENDER ISSUES IN THE PROJECT AREA

Increasing emphasis has been placed on the need to ensure that women benefit equally from opportunities that projects present – employment, compensation and livelihood improvements, and also that the conditions for women improve and do not lead to increased harm for women. It is recognised that women usually face discrimination in employment for the same work as men and additional negative impacts through sexual harassment at work and gender-based violence (GBV). The World Bank requires that projects actively include measures to promote equal employment opportunities for women and fair, non-exploitative conditions of contract for all workers. Additionally, contractors are required to control and manage their workforces to eliminate sexual harassment and GBV in the workplace or as an impact on the project environment populations. This section sets out the gender setting on these issues in Liberia.

6.4.1 National Setting on Harassment and Gender Based Violence

Liberia has ratified or acceded to the core international human rights treaties. It is a party to the major regional human rights instrument which obliged states to respect, protect and fulfill 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 (GBV) and discrimination.

Accordingly, Liberia has an obligation to take all appropriate measures to prevent rape, ensure that there are adequate sanctions for rape in law and in practice, and ensure access to reparation for the victims. CEDAW art. 2(c), for example, provides that states must "establish legal protection of the rights of women on an equal basis with men and ensure through competent national tribunals and other public institutions the effective protection of women against any act of discrimination." The Maputo Protocol, art. 4, paras. 2(a) and (e), explicitly provides that laws prohibiting violence against women must be enforced and perpetrators held accountable. Furthermore, several human rights instruments (i.e. the CEDAW, the Convention on the Rights of the Child (CRC), the Convention on the Rights of Persons with Disabilities (CRPD), the African Charter on the Rights and Welfare of the Child (ACRWC), and the Maputo Protocol) require Liberia to take special measures to protect the rights of individuals who are vulnerable to sexual violence – mainly women, children, and persons with disabilities.

The Government of Liberia enacted legislation in June 1976 to amend the new Penal Code Chapter 14, Section 14.70 and 14.71 (the amendment is known as the Rape Law). This Act states that a person who has sexual intercourse with another person (male or female) without his/her consent has committed rape that is punishable by ten (10) years or lifetime imprisonment depending on the degree of the rape (rape of a minor, rape resulting in serious bodily harm, rape using a weapon, gang rape). This was amended and diluted in 2017 but is likely to be retoughened in 2022.

The United Nations Special Rapporteur on violence against women has provided guidance on states' due diligence obligations in combating sexual violence, noting that it must be implemented at both individual and systemic levels. Individual due diligence focuses on the needs of individual survivors and "places an obligation on the state to assist victims in rebuilding their lives and moving forward," for instance through the provision of psychosocial services. Individual due diligence "requires states to punish not just the perpetrators, but also those who fail in their duty to respond to the violation" (Report of the Special Rapporteur on violence against women, its causes and consequences, para. 70, UN Doc. A/HRC/23/49, 14 May 2013). As for systemic due diligence, it includes ensuring "a

holistic and sustained model of prevention, protection, punishment and reparations for acts of violence against women.

Liberia experienced a high level of GBV during the civil wars, but it appears to be an ongoing issue. The UN Women Global database[30] on violence against women revealed that prevalence of different forms of violence against women in Liberia is as summarized below.

- 39 percent of women aged 15 to 49 have experienced intimate partner physical or sexual violence at least once in their lifetimes, and 35 percent have experienced it in the last 12 months,
- 36 percent of women aged 20 to 24 years were in their first marriage or union before the age of 18.
- 44 percent of women aged 15 to 49 years have undergone female genital mutilation.

Liberia ranks 175th out of 192 countries in the Gender Inequality Index; the higher the GII value the more disparities between females and males and the more loss to human development.[31]

6.4.2 County Setting: Nimba and Grand Gedeh

It appears that marital abuse by men, including insulting, beating and harassment is widely practiced in Nimba and Grand Gedeh Counties. It is considered to be accepted and justified as long as a man believes his wife (or wives) is disobeying him or has done something contrary to what he believes.

Table 6-40 illustrates some of the main causes people believe that a man could use to justify abusive action against a wife. In Nimba, four out of ten girls aged 13-14 have experienced a form of sexual or physical abuse.[32] In addition, according to the UN Response to Rape Group, the county of Grand Gedeh scores the highest rate of known rape incidents, yet only 12.5 percent cases were reported to the police.[33]

Female Genital Multilation (FGM), considered a form of gender-based violence internationally, is still extremely common in rural Liberia, especially in Nimba County as shown in Table 6-41.

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[30] UN Women Global Database on Violence against Women, 2016. Country Profile: Liberia. Available at https://evaw-global-database.unwomen.org/fr/countries/africa/liberia, Retrieved on March 26, 2021

[31] UNDP, 2020. Human Development Reports - Gender Inequality Index (GII). Available at: http://hdr.undp.org/en/content/gender-inequality-index-gii. Retrieved on March 26, 2021.

32 K. Hallman Et Al., May 2016. Evaluating the Girl Empower Program in Nimba County, Liberia.

[33] UN News Service, 2010. UN urges Media in Liberia to highlight Lack of Punishment for Sexual Punishment.

Table 6-40 Justification used to abuse women (Source: Liberia Demographic Household Survey, 2013)

Gender group	Percent believing abuse is justified for:				
	Burns the food	Argues with husband	Goes out without telling husband	Neglects the children	Refuses sexual intercourse
Nimba – women	14	60	53	59	19
Nimba – men	0.4	14	9	7	3
Grand Gedeh - women	10.4	46.2	34.0	35.5	10.3
Grand Gedeh – men	1.0	12.6	9.0	12.4	4.3
National – women	7	33	29	32	11
National – Men	3	18	14	15	4

Table 6-41 Prevalence of female genital mutilation (Source: Liberia Demographic Household Survey, 2020)

County	All women		Among women who heard of female circumcision	
	Women who have heard about female circumcision	Number of women	% of women circumcised	Number of women
Grand Gedeh	**77.9**	**172**	**12.2**	**134**
Nimba	**88.2**	**985**	**41.7**	**869**

Liberia has a rolling four-year National Action Plan (LNAP) for Gender. The LNAP is four-year `living document` that can be adapted according to changes in the Liberian context. Its implementation is not limited only to the actions it highlights but additional activities and measures can be initiated as necessary, bearing in mind the need for coherence and taking full account of the coordination role of the Ministry of Gender, Children and Social Protection (MOGCSP) at central Government level. The MOGCSP has offices at the county level to help mainstream gender issues and increase public awareness on the unacceptability of GBV. In a consultation with the MOGCSP on how to minimize or stop GBV in the project area, a number of suggestions were made on practical measures that have been incorporated into the ESMP.

6.4.3 HIV/AIDS

Nimba and Grand Gedeh have an HIV and AIDS prevalence rate of 1.9 percent and 2.8 percent, according to the 2016 *Liberia HIV&AIDS Response Progress Report* produced by the National AIDS & STI Control Program of the Ministry of Health. The Grand Gedeh prevalence rate of 2.8 percent is above the national average of 2.5 percent. Overall, the HIV prevalence in women is higher (2.4 percent) than in men (1.8 percent), revealing women's higher vulnerability to HIV infection. The difference in HIV prevalence between women and men is particularly strong in the younger age groups, with that in women about three times higher than in men in the 15-to-24-year age group. Prevalence is generally around 0.8 percent

in rural areas, 1.6 percent in urban areas and 3.2 percent in Monrovia. It is therefore likely that the project area will have varying but generally quite low rates.

While the project can contribute significantly in combating HIV/AIDS and other diseases by providing access to health services, the likelihood of the construction phase causing an influx of mainly single male laborers is high. This could give rise to contractors' workers increasing the prevalence of HIV/AIDS, sexually transmitted diseases, sexual harassment of women.

6.4.4 Women's Access to information in Nimba and Grand Gedeh:

According to a study conducted by the Carter Center (NGO) in 2014, women face more difficulties than men while trying to access information. Also, they are less aware of their rights. It has been reported by group leaders in Grand Gedeh County that 80 percent of women do not have equal access to information as men. Many women report having faced many problems while trying to access information that was available for men, and these problems encompass delays and expensive financial costs.

When the employees were asked about this issue, it was the only county that offered evenly distributed answers in which 28.6 percent employees believed that women didn't know the process of acquiring critical information, 28.6 percent thought women were lazy, inattentive and week with an inferiority complex whereas 25 percent believed that information is offered to men and women equally. When the findings were shared with community leaders, they agreed that women should be informed about their rights and should receive information about education. The same study was conducted in Nimba Country, and the results there were different. In Nimba county 93.3 percent reported unequal access to information on the behalf of women.

The surveyed employees showed a sharp difference when asked about women's ability to access information in which 45.6 percent of employees believe that women and men have equal access to information, and 45.6 percent responded that they did not. Also, in this county, the female researcher shares that she was faced with gender-based insults from ministry staff and was banned from accessing information herself. When asked about the reasons of treating women differently, it was said that women don't know how to research or look for information in addition to lacking self-esteem. It is believed that all of these barriers in both Nimba and Grand Gedeh are due to cultural norms, lack of education, illiteracy, lack of awareness about rights, and sexist beliefs.[34] Moreover, in the survey it was believed that women have 32 percent literacy rate whereas men have a 62 percent literacy rate. Daughters

[34] Carter Center, 2014. Women and the Right of Access to Information in Liberia.

are held back from education because it is believed to be important only for boys, and they face difficulties to physically access schools.[35]

6.4.5 Women in Employment

Employment in Liberia is mainly governed by the Constitution and the Liberia Labour Practices Law of 1956, updated in 2020 by the Employment and Labour Laws and Regulations. Under the Constitution, Article 18, Liberian Citizens are entitled to equal opportunity for work regardless of sex, creed, religion, ethnic background, place of origin or political affiliation. Equal pay must be paid for equal work. The Employment and Labour Law sets out requirements and regulations for employment to enforce this in formal employment. Little of these requirements trickle down to women in rural areas.

According to the Household Income and Expenditure Survey (HIES) of 2016, informal employment is higher in rural areas than in urban areas (86.5 versus 72.5% respectively). However, women are more likely to work informally, and the difference between men and women is 24.1 percent. The county of Nimba has 88.9 percent rate of informal employment where Grand Gedeh has 84.6 percent. Notably, women are more vulnerable to low salary levels even when they do the same work as men (Table 6-42).

Table 6-42 Percent distribution of the salary structure

Salary Range	National	Male	Female	Urban	Rural
LD 1-1900	3.0	2.6	4.6	2.1	4.9
LD 2,000-3,499	9.4	8.0	14.5	7.3	13.8
LD 3,500-5,999	13.7	11.7	20.7	12.8	15.6
LD 6,000-9,999	22.4	23.6	18.3	22.9	21.4
LD 10,000-14,999	18.0	18.3	17.0	17.5	19.1
LD 15,000-19,999	10.3	11.1	7.4	9.9	11.0
LD 20,000-29,999	9.6	10.1	8.1	10.3	8.2
LD 30,000+	13.5	14.7	9.4	17.1	6.1[36]

6.4.6 NGOs Supporting Women in Liberia

There are many NGOs working for the empowerment of women in Liberia such as:

- Liberia Female Law Enforcement Association (LIFLEA),
- Liberian Women Empowerment Network (LIWEN),
- Rural Women Rights Structure (RWRS),
- South-Eastern Women Development Association (SEWODA),
- West Africa Network for Peacebuilding (WANEP),

[35] Emile, Hustings, Torori, 2020. Keeping Liberian Women Safe from Violence.

[36] Liberia Institute of Statistics & Geo-Information Services (LISGIS), 2017. Household Income and Expenditure Survey.

- West Point Women for Health and Development Organization (WPWHDO),
- Women Empowerment for Self-Employment (WE4SELF),
- Women NGOs Secretariat of Liberia (WONGOSOL), and Women Rights Watch (WORIWA).

These organizations work towards supporting women who faced GBV, promoting women's participation in decision making, involving male community leaders in efforts for equality, raising awareness of HIV/AIDS among women, and empowering women to become self-sufficient. The mitigations against GBV and discrimination in employment for women proposed for this project will include using one of these agencies to support women raising allegations of discrimination, harassment and GBV.

7 ASSESSMENTS OF IMPACTS

7.1 APPROACH

7.1.1 Regulatory Setting

In line with the EPML 2002 and World Bank 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 measures and any residual negative impacts that cannot be mitigated. It explores opportunities for environmental enhancement. It also identifies and estimates the extent and quality of available data, key data gaps, and uncertainties associated with predictions, and specifies topics that do not require further attention.

The approach adopted is the same approach used by Earthtime for the ESIA of the South Eastern Corridor Road Asset Management Project (SECRAMP) in 2018.

7.1.2 Collection of Baseline Conditions

The impact assessment is based on the collection of data on the existing environmental conditions, as described in chapter 6. For this ESIA, data have mostly been derived from primary sources through field studies and surveys, but additional secondary data have also been used where appropriate. 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.

7.1.3 Determining and Evaluating the Type of Impacts

The project as described in chapter 3, within the environment described in chapter 6, will result in a number of good and bad consequences. These are the environmental impacts identified through the assessment process as being associated with the design and construction of the road. Possible areas of impact have been reviewed in the light of the findings of the public consultations, and then subjected to independent review by the environmental and social specialists.

The potential environmental and social impacts are characterised 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 7-1. The characterization of impacts is undertaken within the context of the necessity of compliance with the legal setting and guidelines that are described in chapter 2.

Table 7-1 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 and watercourses acting as linear vectors can expand local impacts.	Local Project Regional Define area where possible
Duration	The time period over which a resource or receptor is affected.	Temporary Project duration Short-term Long-term Permanent
Frequency	A measure of the constancy, regularity or periodicity of the impact.	Constant Frequent Seasonal Occasional One-off
Magnitude	The seriousness of the impact in its effects on resources or receptors.	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. Examples of these are: the payment of compensation for displacement under the Resettlement Action Plan; compliance with the Liberian national standards on water and air quality and noise; and the implementation of standard road-building practices of good engineering. Additional mitigation measures to reduce significant impacts to acceptable levels are proposed as necessary and appropriate in chapter 8, and defined in operational terms in chapter 9 (the Environmental and Social Management Plan).

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

- Direct: impacts that results 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 to 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.).

7.1.4 Evaluating Impacts

In evaluating the significance of impacts, two main factors have to be taken into consideration.

1. Where quantification of potential impacts is possible, derived severity criteria can be based on numerical values, representing regulatory limits, national standards, or international and project guidelines. An example of these is noise impacts, which can be easily quantified using a sound meter (or even a sound meter application on a smartphone) and reviewed against national standards for the environment being monitored.

2. Some environmental aspects require a more qualitative approach for determination of severity due to the absence of statutory limits or universally applicable standards against which potential impacts can be evaluated. Semi-quantitative methods are therefore used and criteria set on the basis of a combination of the value or sensitivity of the resource or receptor affected and the magnitude of the effect on it. An example of this is the social behaviour of project workers in roadside towns: restrained behaviour is usually welcome, since traders are always happy to sell consumable items to waged workers; but if this leads to excessive drinking and prostitution, then the subjective line of significant impact has been crossed.

The nature, importance and sensitivity to change of the receptors or resources that could be affected have therefore been defined as an outcome of the studies that underlie this ESIA, leading to the crucial functions of impact assessment and mitigation determination.

7.1.5 Evaluation of Significance

To establish the significance of an impact, magnitude and sensitivity are looked at in combination to evaluate whether an impact is significant, and to what degree. A simple matrix, presented in Table 7-2, is used to assign a significance class for each input in the form of an identified potential impact.

Table 7-2 Impact Significance Matrix

	Significance of impact	Sensitivity		
		Low	Moderate	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

7.1.6 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 World Bank's ESS 1, the mitigation hierarchy adopted in this ESIA can be summarized as follows.

- ***Avoid*** adverse impacts and enhance positive impacts and benefits to communities and the physical environment, to the greatest extent feasible. An example of avoidance measures is the re-routing of a road to avoid a wetland.
- Where avoidance is not possible, ***minimise or reduce*** impacts to acceptable levels. An example of reduction could be reducing the generation of wastes throughout the project life cycle.
- Once impacts have been minimized or reduced, ***remedy or mitigate*** the residual adverse impacts to acceptable levels, by establishing specific actions to ensure the project will meet the requirements of applicable ESSs 1-8 and comply with relevant national laws and regulations. An example of remediation is the replacement of vegetation that had to be removed to provide access to a resource.
- Where significant residual impacts remain, ***compensate*** for ***or offset*** them, where technically and financially feasible. In some cases, compensation is the only option, such as when a house must be removed because it is in the road right of way.

It is important to note that more than one option is often required for a particular impact.

7.1.7 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 ESMP, is to help identify them and find corrective actions.

7.2 ASSESSMENT OF IMPACTS

The register matrix in Table 7-3 shows the actual assessment of the identified social and environmental impacts identified as likely to occur as a result of the design and construction of the upgraded Tappita-Toe Town road. This follows the methodology described above, and Table 7-1 and Table 7-2 should be referred to for the definitions of the categories and terms employed in the matrix.

All impacts assessed in this ESIA strictly cover construction activities as per the scope of work assigned to the ESIA team by the IIU. Operation and decommissioning impacts will be covered in a separate ESIA.

Table 7-3 Impact Assessment Matrix

Impact/Risk	Causality	Extent and scale	Duration	Frequency	Magnitude	Sensitivity	Significance	Mitigation strategy (actions defined in ESMP)	Residual significance after mitigation
A. POSITIVE IMPACTS									
Reduced transport costs	Indirect	Road corridor and regional area towards Zwedru and south-eastern Liberia	Long-term	N.A.	Positive	High	Major	N.A.	N.A.
Reduced travel time	Indirect		Long-term	N.A.	Positive	High	Major	N.A.	N.A.
Improved supply of transport services	Indirect		Long-term	N.A.	Positive	High	Major	N.A.	N.A.
Improved access to agricultural markets	Cumulative	Regional – Nimba County, Grand Gedeh County and parts of south-eastern Liberia	Long-term	N.A.	Positive	Medium	Moderate	N.A.	N.A.
Improved opportunities for business with greater movements of people and goods, and reduced transport costs	Cumulative	Cities and towns in road corridor	Long-term	N.A.	Positive	Medium	Moderate	N.A.	N.A.

Impact/Risk	Causality	Extent and scale	Duration	Frequency	Magnitude	Sensitivity	Significance	Mitigation strategy (actions defined in ESMP)	Residual significance after mitigation
Improved access to social services, including health and educational facilities	Cumulative	Regional – better access to Tappita Hospital	Long-term	N.A.	Positive	Medium	Moderate	N.A.	N.A.
Employment opportunities during construction (approximately 300 workers, including for 2 years)	Direct	Road corridor and other parts of Liberia	Project duration	N.A.	Positive	Medium	Moderate	N.A.	N.A.
Reduced dust nuisance from unpaved highway in dry season	Direct	Towns in road corridor	Long-term	N.A.	Positive	Medium	Moderate	N.A.	N.A.
Reduced sediment in roadside watercourses (3 major watercourses and many minor creeks crossed)	Direct	Downstream areas	Long-term	N.A.	Positive	Medium	Moderate	N.A.	N.A.
B. NEGATIVE IMPACTS									
1. Overall Impacts									
1.1 General environmental damage in the form of degraded land, lowered quality of living, reduced quality of resources, etc., mainly in the 28 communities along the road.	Direct, Indirect	Road corridor	Permanent	Constant	Medium	Medium	Moderate	Mitigation And Remediation	Negligible

Impact/Risk	Causality	Extent and scale	Duration	Frequency	Magnitude	Sensitivity	Significance	Mitigation strategy (actions defined in ESMP)	Residual significance after mitigation
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 in the roadside areas of the 28 cities, towns and rural communities.	Direct	Towns in road corridor	Project duration	Constant	Medium	Medium	Moderate	Mitigation	Negligible
2. Environmental Health and Safety Impacts									
2.1 Injuries occur to the public, especially children, during works in the 28 communities along the road.	Direct	Road corridor	Project duration	Frequent	Small	Medium	Minor	Reduction	Negligible
2.2 Injuries occur to the public from exposure to hazardous substances (e.g. cement, diesel) in the 28 communities along the road.	Direct	Road corridor	Project duration	Frequent	Small	Medium	Minor	Reduction	Negligible
2.3 Infectious and contagious diseases are spread amongst the 28 communities near the road.	Indirect	Towns in road corridor	Project duration	Constant, but worse seasonally	Medium	Medium	Moderate	Reduction and Mitigation	Minor
3. Occupational Health and Safety Impacts									
3.1 Workers are unaware of the dangers from the sites (roadline, quarries, batching plants etc.) they are working in, leading to high rates of injury.	Direct	All active work sites	Project duration	Constant	Medium	Medium	Moderate	Mitigation	Minor

Impact/Risk	Causality	Extent and scale	Duration	Frequency	Magnitude	Sensitivity	Significance	Mitigation strategy (actions defined in ESMP)	Residual significance after mitigation
3.2 Injuries due to inadequate provision of safety equipment	Direct	All active work sites	Project duration	Constant	Medium	Medium	Moderate	Avoidance	Negligible
4. Community Impacts									
4.1 Incoming workers do not respect local communities, leading to social disruption, particularly in the rural towns.	Indirect	Towns in road corridor	Project duration	Frequent	Small	Medium	Minor	Reduction and Mitigation	Negligible
4.2 Houses and other structures (264 privately owned structures and 9 public structures according to RAP report) are lost in the road right of way.	Direct	Road corridor	Permanent	One-off	Large	High	**Major**	Compensation	Minor
4.3 Loss of land use and business (106 businesses according to RAP report) sites in the road right of way, particularly in the cities.	Direct	Road corridor	Permanent	One-off	Medium	Medium	Moderate	Compensation	Negligible
4.4 Cultivated land and crops (874 rubber trees and 8 farm owners according to RAP report) are disturbed or destroyed, mainly in the rural areas along the road and in the locations chosen for quarries, borrow areas, camps, batching plants, etc.	Direct	Road corridor	Long-term	Constant, but worse seasonally	Medium	Low	Minor	Compensation and Reduction	Negligible

Impact/Risk	Causality	Extent and scale	Duration	Frequency	Magnitude	Sensitivity	Significance	Mitigation strategy (actions defined in ESMP)	Residual significance after mitigation
4.5 Local people's livelihoods are adversely affected by project activities (628 persons will be affected according the RAP report)	Direct, Indirect	Road corridor	Short-term	Constant	Small	Medium	Minor	Avoidance or Compensation	Negligible
4.6 Cumulative losses are incurred by social groups unable to respond to change. (60 vulnerable people according to RAP report)	Indirect	Road corridor	Long-term	Constant	Small	High	Moderate	Mitigation	Minor
4.7 Local communities (28) are not engaged and consulted in a satisfactory and timely manner or vulnerable groups are not included in community consultations.	Direct, Indirect	Road corridor	Long-term	Long-term	Medium	High	Major	Avoidance	Negligible
5. Traffic Impacts									
5.1 Use of public roads by project vehicles increases the accident rate and generates nuisance levels of dust: mainly the Tappita-Toe Town road, but also between it and other project infrastructure (camps etc.) and Monrovia.	Direct	Mainly the road corridor and surroundings	Project duration	Constant	Medium	Medium	Moderate	Mitigation	Minor

Impact/Risk	Causality	Extent and scale	Duration	Frequency	Magnitude	Sensitivity	Significance	Mitigation strategy (actions defined in ESMP)	Residual significance after mitigation
5.2 Increased traffic on public roads, running at faster speeds, leading to more accidents and more serious accidents: on sections of the Tappita-Toe Town road as they are completed during construction.	Cumulative	Regional	Long-term	Constant	Medium	Medium	Moderate	Reduction	Minor
6. Cultural Heritage Impacts									
6.1 Cultural sites are damaged (9 graves identified in the RAP), anywhere that new land is cleared, such as for diversions, camps, quarries and borrow areas.	Direct	Road corridor	Permanent	Occasional	Medium	Medium	Moderate	Avoidance	Negligible
7. Hazardous Materials									
7.1 Pollution to air, soil or water and danger (illness or injury) from the delivery and handling of hazardous materials (including bitumen, mixed asphalt, fuels, lubricants and cement) at project camps, workshops, plants and construction sites.	Direct	Most work sites	Project duration	Constant	Large	Medium	**Major**	Mitigation and Remediation	Negligible
7.2 Pollution to air, soil or water and danger (illness or injury) from fuel and oil storage at project stores and workshops.	Direct	Most work sites	Project duration	Constant	Large	Medium	**Major**	Mitigation and Remediation	Negligible

Impact/Risk	Causality	Extent and scale	Duration	Frequency	Magnitude	Sensitivity	Significance	Mitigation strategy (actions defined in ESMP)	Residual significance after mitigation
7.3 Pollution to air, soil or water and danger (illness or injury) from refuelling operations at project camps, workshops, plants and construction sites.	Direct	Most work sites	Project duration	Constant	Large	Medium	**Major**	Mitigation and Remediation	Negligible
7.4 Pollution to air, soil or water and danger (illness or injury) from concrete and asphalt batching plants	Direct	Batching plant sites	Project duration	Constant	Large	Medium	**Major**	Mitigation and Remediation	Negligible
8. Construction Materials									
8.1 Damage to the land (degradation, loss of soil and cover, reduced productivity) from borrow pits and quarries	Direct	Material sources	Long-term	Constant	Large	Medium	**Major**	Reduction, Mitigation and Remediation	Minor
8.2 Disturbance (noise, dust and traffic accidents) and danger of injuries from quarry operation – general	Direct	Material sources	Project duration	Constant	Medium	Medium	Moderate	Mitigation and Remediation	Negligible
8.3 Disturbance (noise and dust) and danger (serious injury or death) from quarry operation – explosives and blasting	Direct	Material sources	Project duration	Constant	Medium	Large	**Major**	Mitigation	Negligible
9. Impacts of Waste Materials									
9.1 Pollution of soil or water and ill-health from waste generation and management at camps and construction sites.	Direct, Indirect	Most work sites	Project duration	Constant	Medium	Medium	Moderate	Reduction and Remediation	Negligible

Impact/Risk	Causality	Extent and scale	Duration	Frequency	Magnitude	Sensitivity	Significance	Mitigation strategy (actions defined in ESMP)	Residual significance after mitigation
9.2 Pollution of soil or water and ill-health from waste disposal at camps.	Direct, Indirect	Most work sites	Project duration	Constant	Medium	Medium	Moderate	Mitigation and Remediation	Negligible
9.3 Pollution of soil or water from poor sanitation at work sites – camps and construction sites.	Direct	Most work sites	Project duration	Constant	Medium	Medium	Moderate	Mitigation	Negligible
9.4 Pollution of soil or water from site camps and stores.	Direct, Indirect	Most work sites	Project duration	Constant	Medium	Medium	Moderate	Mitigation and Remediation	Negligible
10. Soil Loss									
10.1 Erosion and physical damage of soils and earthworks – all construction sites, camps and ancillary infrastructure areas.	Direct	Road corridor and most work sites	Permanent	Constant, but worse seasonally	Large	Large	**Major**	Mitigation and Remediation	Minor
11. Pollution of Water									
11.1 Damage to water resources by pollution with sediment or chemicals in runoff in any of the 3 major watercourses and many minor creeks crossed by the road, or nearby wetlands and water supply boreholes.	Direct	Regional	Long-term	Constant, but worse seasonally	Large	Large	**Major**	Mitigation and Reduction	Minor

Impact/Risk	Causality	Extent and scale	Duration	Frequency	Magnitude	Sensitivity	Significance	Mitigation strategy (actions defined in ESMP)	Residual significance after mitigation
11.2 Pollution by entrained sediment from poor drainage systems entering any of the 3 major watercourses and many minor creeks crossed by the road, or nearby wetlands and water supply boreholes.	Direct	Regional	Long-term	Seasonal	Large	Large	**Major**	Mitigation	Minor
12. Air Pollution									
12.1 Dust from construction sites and access tracks to ancillary infrastructure affects local communities and crops	Direct	Road corridor and most work sites	Project duration	Seasonal	Medium	Medium	Moderate	Mitigation	Minor
12.2 Exhaust fumes affect local communities close to the road and all project ancillary infrastructure.	Direct	Road corridor and most work sites	Project duration	Constant	Small	Medium	Minor	Reduction	Negligible
13. Biodiversity Impacts									
13.1 Vegetation other than invasive species (i.e. both natural plants and farm plants) is damaged or destroyed unnecessarily – beyond the agreed boundaries, particularly natural plants in the forested sections along the road.	Direct	Road corridor and most work sites	Long-term	Constant	Medium	Medium	Moderate	Reduction and Remediation	Minor

Impact/Risk	Causality	Extent and scale	Duration	Frequency	Magnitude	Sensitivity	Significance	Mitigation strategy (actions defined in ESMP)	Residual significance after mitigation
13.2 Increased but poorly controlled exploitation of forest resources, including NTFPs, as a result of improved road access, particularly natural plants in the forested sections along the road.	Cumulative	Road corridor	Long-term	Constant	Small	Medium	Minor	Mitigation	Negligible
13.3 Wild animals other than very common or non-native pest species are killed, particularly in the forested sections along the road.	Indirect	Road corridor	Long-term	Constant	Medium	High	**Major**	Mitigation	Minor
14. Noise and Vibration Impacts									
14.1 Noise disturbance at excessive levels from construction activities, quarries, borrow areas and batching plants.	Direct	Towns in road corridor	Project duration	Constant	Medium	Medium	Moderate	Mitigation	Minor
14.2 Vibration disturbance causes stress and damage to buildings, either from trucks and machines on construction sites and access tracks, or from quarry operations.	Direct	Towns in road corridor	Project duration	Frequent	Small	Medium	Minor	Mitigation and Reduction	Negligible
15. Employment Issues and Grievances Management									
15.1 Conditions of employment are unfair to or unequal among workers.	Direct	Project Sites	Project duration	Constant	Medium	Medium	Moderate		Minor

Impact/Risk	Causality	Extent and scale	Duration	Frequency	Magnitude	Sensitivity	Significance	Mitigation strategy (actions defined in ESMP)	Residual significance after mitigation
15.2 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; and /or Vulnerable groups are excluded from employment. -	Direct	Road corridor	Project duration	Constant	Medium	High	Major		Negligible
15.3 Workers are unable to redress their grievances.	Direct	Project Sites	Project duration	Constant	Medium	Medium	Moderate		Negligible
16. Workers' Behaviour Management									
16.1 Workers' behaviour is inappropriate or disrespectful of other workers or local community members, especially of women.	Indirect	Road corridor	Project duration	Constant	Medium	Medium	Moderate		Minor
16.2 Sexual exploitation and gender-based violence increase in the 28 local communities, particularly the rural towns due to the influx of temporary laborers	Indirect	Road corridor	Project duration	Constant	Medium	Medium	Moderate	Reduction and Mitigation	Minor

7.3 IMPACT LOCATIONS

The identified environmental and social impacts will not all occur throughout the project area. Some are general and may occur almost anywhere – such as soil erosion or loss of vegetation. Others are likely only to occur in limited sites: fuel spills, for example, are most likely in fuel stores and refuelling sites. Table 7-4 shows the main locations where the different impact groupings are likely to occur. 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 7-4 Likely locations of the identified environmental and social impacts

Impact category and heading	Location of likely impacts
Overall safeguards	
1. General Environmental Protection	Throughout the project. All work sites on the road, in camps, quarries, batching plants, etc.
Protection of society	
2. Environmental Health and Safety	In all parts of the project where habitation and agricultural land is affected. The areas where the road or ancillary infrastructure are close to the cities and rural towns, or close to farm land.
3. Occupational Health and Safety	Throughout the project. All work sites on the road, in camps, quarries, batching plants, etc.
4. Community Impacts Management	In all parts of the project where habitation and agricultural land is affected. The areas where the road or ancillary infrastructure are close to the cities and rural towns, or close to farm land.
5. Traffic Management	On the Tappita-Toe Town road itself, and on any other road used by the contractor's vehicles.
6. Cultural Heritage Management	Anywhere that new land is cleared, such as for diversions, camps, quarries and borrow areas.
Pollution control	
7. Hazardous Materials Management (including Spill Contingency and Emergency Response)	At all contractors' stores, workshops and refuelling sites.
8. Construction Materials Management	All quarries and borrow pits.
9. Waste Management	At all camps, stores, offices and workshops; and long-term work sites, such as bridge construction sites, batching plants, borrow areas and quarries.
Environmental safeguards	
10. Soil Erosion Control	All roadline and earthworks sites; plus quarries, borrow pits, camps and batching plants.
11. Water Resources Management	All roadline and earthworks sites, plus quarries, borrow pits, camps and batching plants, within about 200 metres of water courses, wetlands, and water supply boreholes and wells
12. Air Emissions Management	All roadline, earthworks and ancillary sites.
13. Ecological Management Plan	Throughout the project. All work sites on the road, in camps, quarries, batching plants, etc.

Impact category and heading	Location of likely impacts
14. Noise and Vibration Management	All active work sites, but especially quarries, borrow pits and bridge construction sites.
Conditions of Employment and Workers Code of Conduct	
15. Employment Issues and Grievances Management	Throughout the project area. All work sites on the road, in camps, quarries, batching plants, etc.
16. Workers' Behaviour Management	All along the road corridor, especially in inhabited areas (cities, towns, villages and hamlets)

7.4 IMPLICATIONS OF THE IMPACT ASSESSMENT

7.4.1 Positive Impacts

A number of positive impacts are identified in the impact register in Table 7-3. These range in type, but the most significant are social and economic:

- some limited local employment opportunities,
- the reduction in travel costs and times,
- the increases in transport services and
- the improved cost setting for business in general.

These together will result in a huge improvement in access to agricultural markets for the local farmers; and from them will derive a number of additional social and local economic benefits, that will, in effect, lead to a step forward in overall development. Several environmental and quality of living benefits are also likely to be derived, particularly through the removal of dusty conditions during the dry season, and of muddy conditions during the wet season.

Upgrading the Tappita-Toe Town road is an enabling action, and other agricultural, commercial and development initiatives will be able to use its key output – a greatly improved transport route – to enhance the overall local and regional advantages.

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.

It is not uncommon for international contractors to bring even bring in unskilled labour forces as they can control these more easily than developing local skills and hiring from affected communities. This practice becomes identified as forced labour and this is not sanctioned on this project, this controlling practice has allowed unfair employment conditions to become

entrenched and is considered a type of trafficking in persons or near slavery. Mitigation to promote fair conditions of contract will be discussed in Section 8.

The employment of child labour is prohibited under the Employment and labour Act and Contractors will be required to maintain records and prove all employees are 18 + years.

7.4.2 Negative Impacts

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. The paragraphs below address these and consider why they cannot be mitigated entirely.

From the impact register matrix in Table 7-3, 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 recommended mitigation are given in chapter 8, with the practical guidance on the implementation of the actual mitigation actions described in the Environmental and Social Management Plan in chapter 9. Those that are identified as being of major significance are given particular consideration in chapter 8.

7.4.2.1 Residual Environmental Impacts

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

- the impact from quarries and borrow pits;
- the soil erosion, and the resulting water pollution by eroded sediments;
- the pollution of the air by generated dust, especially during the dry season;
- the loss of biodiversity, especially that cleared areas cannot be totally restored to their initial status and that bushmeat consumption cannot be fully controlled; and
- the noise, especially that the project is operating in a rural area.

Quarries and borrow pits

The creation and operation of quarries and borrow pits involves an intrusive physical activity which can never be fully restored to its original state, and so by definition cannot be mitigated to a genuinely negligible state of impact. Chapter 8 provides detailed guidance on the siting and management of ancillary infrastructure, including material sources, and the mitigation measures include the resolution of slopes, surfaces and drainage, replacement of topsoil and

restoration of a vegetation cover. Yet because of the extraction involved, the land surfaces will be permanently altered, and on a local scale this is usually not negligible.

Soil Erosion and surface water sediment-pollution

The likely impacts of eroded soil and sediment-polluted watercourses are also areas where it is impossible to provide total restoration. There are 3 major watercourses (Cestos River, Alogashi River and Gwehn Creek) and a number of small creeks and streams crossing the road, any of which may be affected. Once in situ soil is eroded and material lost, it cannot be replaced to the full extent, at least not in a human life timescale. The soil surface can be revegetated and stabilised, but the surface and micro-drainage patterns will be permanently altered. Sediment washed into water bodies cannot realistically be removed completely, especially as some will remain in suspension indefinitely. In addition, given the erodible nature of the deeply weathered residual soils found throughout the project site, and the intense tropical rainfall, even the best efforts to prevent soil from eroding and stop sediment from entering water courses, are never completely effective, however well they are implemented. Consequently, there will still be minor impacts remaining following full mitigation, although the mitigation should lead to the eventual restoration of the ecology affected.

Air pollution

For similar reasons, the control of particulate air pollution is impossible to mitigate fully, and will also have a minor residual impact. This is because the complete absence of rainfall for significant periods in the dry season, and the intensive drying effect when the very low humidity Harmattan is established from the north-east during the northern hemisphere winter, mean that bare surfaces completely lose the moisture that helps to keep clay and silt particles weakly bound together. Wind, traffic and other disturbances then generate dust. The dry season is of crucial importance for construction and so represents the busiest period of the year, with the heaviest traffic levels and the greatest working of dust-generating materials. The mitigation measures described in chapters 8 and 9 are as effective as practically possible, but can never completely remove the dust nuisance from a large construction site. As with soil erosion and sediment pollution of water, the intention must therefore be to bring the nuisance within acceptable limits.

Biodiversity loss

Biodiversity impacts, listed in Table 7-3, can be mitigated to some extent, but when viewed with full scientific rigor it is generally impossible to eradicate all impacts completely. Damage to vegetation can be restored, but it is extremely difficult to replace exactly what was there before, in terms of its total ecological value. It would be wrong to assume that replacing one plant with another completely resolves disturbance to the biological environment. The issue

of safeguarding animals is effectively a matter of controlling bushmeat hunting and consumption as well as controlling speeds by installing speed bumps in high biodiversity sections. Use of some bushmeat species is sustainable and environmentally benign, and permitted under the forest regulations. But the temptation to continue to consume low cost meat is a habit that is very difficult to control amongst large groups of workers in rural areas, and this may well include prohibited species. Also, as many workers will be local, they are likely to continue following their usual practices of bushmeat consumption. It is probably impossible for any project to control bushmeat to negligible levels, and so it is considered that mitigation will lead to a minor residual impact for this aspect.

Noise

7.4.2.2 **Noise disturbance, owing mainly to increased construction vehicle movements, is to be mitigated in line with national standards for noise emissions. However, most of the project site is in rural areas with very low ambient noise levels. For this reason, it is unlikely that the affected receptors – mainly human but also some fauna – will consider or behave as if construction noise is always negligible even if it is within statutory limits. For this reason, it is possible that the residual impact in this respect will still be minor.Residual Social Impacts**

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

- The need to clear the Right of Way, particularly in some towns along the route. Encroachment into the Government owned Right of Way (RoW) has to be removed for the reconstruction causing extensive resettlement and disruption to livelihoods;
- Unfair conditions of employment, which could still happen intentionally or unintentionally by the contractor.
- Poor behaviour by employees, in particular leading to increased sexual harassment and trafficking for sex of women employees and local women and children.
- Traffic accidents; and
- Impacts on community health.

Resettlement

According to the Project's RAP[37], the project activities will affect twenty-two (22) villages/towns in Tappita District Doe District) in Nimba and six (6) villages/towns in Gbarzon District (B'hai District) in Grand Gedeh, with 63% of all structures to be impacted located in three towns: namely, Gbolordeala (Dialah) in Nimba; Pokor (Poker) and Toe Town in Grand Gedeh. The project activities will be implemented in the existing RoW and no additional land acquisition is expected. However, the potential impacts on structures, and other fixed assets within the RoW is substantial.

The clearing of the RoW of the road will have significant impacts on the houses, farms, market stalls and small businesses located in the RoW. The RAP undertaken for this project has assessed the extent of losses and proposes mitigation to World Bank ESS standards. The impacts are summarised here.

The project area is rural with 4 towns and 24 small towns and villages.

- A total of 628 persons will be affected along the Tappita – Toe Town road section by subcomponent 3.1 Roads through the loss of assets and means of livelihood and income.
- Of the 628 affected persons, a total of 60 persons are vulnerable people, who will require special resettlement assistance. The group of vulnerable PAPs includes: i) elderly, ii) disabled, iii) sick and iv) female household heads.
- A total of 9 public owned structures will be affected by the project. Public Structures to be impacted include wells, hand pumps, market stalls and Meeting Centers.
- There are 8 economic tree crop owners (7 males and 1 female) who will be affected by the road project.
- A total of 874 economic trees (Rubber) along the road corridor between Tappita and Toe Town will be affected.
- A total of 106 formal and informal small businesses belonging to 64 males and 42 females along the Tappita-Toe Town road corridor will be affected.
- 9 graves owners will need compensation to relocate the graves.
- The project will impact a total of 86 tenants and 86 landlords. Landlords will lose their rental incomes while tenants will lose their rental shelters.

[37] Ministry of Agriculture and Ministry of Public Works, 2021. Resettlement Action Plan for Tappita-Toe Town Road (40 km). Rural Economic Transformation Project (Draft)

The removal of houses and other properties from the road right of way, and the impacts on livelihoods, will be fully compensated according to national and World Bank's standards as described in the project's Resettlement Action Plan (RAP).

Some social groups are likely to be encountered that are unable to respond to change through lack of resources or incapacity. These are groups defined as vulnerable for a number of reasons. The vulnerable groups are usually:

- Elderly households, those too old to start new livelihoods and/ or build a new house,
- Women headed households lacking capital to relocate and restore livelihoods, and
- Households with income levels below the poverty level.

In outline, the RAP will provide for the compensation of private and public properties, economic crops, business loss of income, movement of graves, tenants, landlords and vulnerable groups needing special assistance. However, it is disingenuous for any project to claim that it can forcibly relocate households and avoid having at least a minor residual impact on the individuals involved.

Unfair Conditions of Employment

A project can have an employment related impact on the community during implementation through the actions of contractors intentionally or unintentionally contributing to unfair employment practices. These practices – usually called Trafficking in Persons - involve the recruitment, harboring, transportation, provision, or obtaining of a person for labor or services, through the use of force, fraud, or coercion for the purpose of subjection to involuntary servitude, peonage, debt bondage, or slavery. A victim needs not be physically transported from one location to another in order for the crime to fall within these definitions.

The most direct way in which this occurs through exploitative recruitment practices and/or labor conditions for workers, particularly construction workers brought in from other countries. These practices involve:

- 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 honouring 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 behaviour and punishments for infringement; and
- Not having a formal grievance system internal to the company for employees to make complaints, particularly for allegations of sexual harassment and gender-based violence.

The mechanism for ensuring that these impacts do not occur arise through requiring all contractors to have written conditions of employment, signed and copy given to each employee. However, Trafficking in Persons can still happen with or without the contractor's intention, especially through sub-contractors. Ensuring fair conditions of employment will reduce this impact to minimal levels however it cannot eradicate it.

Behaviour of Workers

The project offers employees the opportunity to behave inappropriately or to sexually exploit local women and minors unless there are clear and effective measures that can be taken against companies that do not take action against sex trafficking by employees. The behaviour of workers can cause additional negative impacts on both men and women employees and women in the project area. These arise out of unequal gender relations and gender inequity such that women are at additional and ongoing risk of:

- Physical and verbal abuse
- Trafficking of Persons for Sex
- Sexual harassment,
- Gender-based violence

The risk of sex trafficking is present in the practice of project workers offering transport to community members as this opens the possibility that project vehicles could be used in the transporting of trafficking victims (as well as the possibility of direct exploitation of passengers by drivers. The WB's policy in this regard is to prohibit the practice on all projects unless there are compelling reasons to not do so. This must be mandated in the Contracts.

The project is exposed to numerous social risks through the actions of employees of contractors whilst simultaneously being required to ensure compliance with World Bank Environmental and Social Safeguards requirements. These risks and impacts will be reduced to minimal if a Worker Code of Behaviour is implemented through the guidelines in Section 9.9.

HIV/ AIDS, Covid-19, Ebola and Other Communicable Diseases

The area has already suffered with communicable diseases in the recent past – Ebola in the past, ongoing HIV/AIDS and Covid-19 is current in the country. The contractor must have a health programme which will pay for all workers to get appropriate medical assistance and enable them to reach appropriate facilities in order to prevent outbreaks. Additionally, the Contractor must train and equip first aiders in all work gangs to be able to respond to an emergency. Responses to disease should form part of the Contractors Health and Safety and Disaster Preparedness Plans. Enforcing these obligations on Contractors will reduce both employee and community health impacts to marginal levels.

Road Traffic Accidents

The increased risks of accidents from a larger number of vehicles on the roads cannot be completely mitigated, and however well this issue is addressed, a minor impact will always remain. Community concerns focus on road safety and vehicle speeds. Increased traffic is caused during the project implementation period by the large number of journeys that are necessary by the IIU and especially the contractor. As the project is completed, the greatly improved road will encourage more vehicles and faster road speeds. Even with good traffic safety measures and road safety awareness trainings for drivers and other road users, the risk of accidents is always increased on upgraded roads. This can never be fully mitigated, and the increased accident risk is an inevitable consequence of a better road. Because of the potentially serious – perhaps fatal – nature of many road accidents, a residual impact must be recorded in this respect.

8 ENVIRONMENTAL AND SOCIAL MITIGATION MEASURES

8.1 OVERVIEW

The IIU will follow sustainable resource management as to conserving as much of the natural environment as is consistent with development and commercial activity. The IIU 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 IIU must have an Environmental and Social Management System (ESMS) in place for all aspects of its operation to the appropriate level, including:

- 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; and
- Land Acquisition Policy

Additional policies and plans will need to be put in place to cover other environmental and social management issues, as defined in chapter 9 as part of the overarching ESMP.

8.2 APPROACH

Impacts are classified in chapter 7 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 summarised as follows:

- Physical environment: To avoid significant soil erosion and water pollution (primarily suspended solids from infrastructure areas), to limit noise, dust and other alterations to the landscape and to conserve and protect potable water supplies and air quality.
- Biological environment: To avoid significant impacts on habitats and species of

biodiversity value, through minimising the removal of habitat for infrastructure development and consequent degradation of the biodiversity resource of the project area, particularly with regard to downstream effects.

- Socio-economic environment: To minimise the negative and enhance the positive socio-economic impacts on the affected and neighbouring communities, as well as the Nimba and grand Gedeh counties, the region served by the road and the country more specifically. Equally to ensure the health and safety of project staff, and the contractors' 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 (chapter 7) is as follows.

- ***Avoidance*** of adverse impacts and enhancement of positive impacts and benefits to communities and the physical environment, to the greatest extent feasible. An example of avoidance measures is the re-routing of a road to avoid a wetland.
- ***Minimisation or Reduction*** of impacts to acceptable levels where avoidance is not possible.
- ***Remediation or Mitigation*** of the residual adverse impacts to acceptable levels.
- **Compensation or Offset** of significant residual impacts where technically and financially feasible.

It is important to note that more than one option is often required for a particular impact.

The sections below describe how the general mitigation approach is followed for specific impacts. These are then translated into the detailed mitigation actions in the ESMP (chapter 9). Table 8-1 shows how this is done, using an example of an identified impact. In order to keep the ESMP practical, the details of the mitigation strategy and approach are not included in chapter 9 (which is designed to be immediately usable as a self-standing ESIA). Instead, only the mitigation actions are provided there, and the rationale behind them is given in the ESIA chapters.

Table 8-1 Example of the approach to mitigation for identified impacts, leading to practical mitigation measures listed in the ESIA

Chapter 7		Chapter 8	Chapter 9 (ESMP)
Identified impact	**Mitigation strategy**	**Mitigation approach**	**Mitigation measures or actions**
Pollution to air, soil or water and danger (illness or injury) from refuelling operations	Mitigation	Provide detailed protocols to be followed in all refuelling operations	• Follow the hazardous materials management guidelines fully, which include procedures for refuelling vehicles and site plant. • Spill kits are to be carried by all refuelling vehicles.
	Remediation	Define the clean-up and rehabilitation work required in	

		case a spill occurs	• Refuel vehicles only on impermeable hard standings with controlled drainage (traps and interceptors). • Plant refuelling on site is to be carried out according to strict protocols for refuelling in unprotected areas. • Enforce the reporting system for spillage incidents. • In the event of a spill, use the spill kit immediately to catch as much as possible. Do everything necessary to stop a spill from entering a water body. • Call for assistance as soon as possible. • Clean the affected soil or water thoroughly, using EPA-approved methods and remediation products. • Conduct testing of the soil or water to show the complete removal of hydrocarbon contamination before reporting the incident closed.

8.3 MITIGATION MEASURES

8.3.1 Basis of Social Mitigation

Potential social and gender impacts from project activities are described and documented in Chapter 7.

If best social safeguarding practices are in place that avoid or sufficiently reduce the impact of activities evaluated in the ESIA to below the level at which the impact would be significant, 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 minimise the negative and enhance the positive socio-economic impacts of affected and neighbouring communities within the road corridor, as well as in other parts of Nimba and Grand Gedeh counties, and the wider region and national context as affected by the upgrading of a key part of Liberia's highway network. It is also to ensure the health and safety of the local people and communities within the immediate operational area, and of project staff and contractors' employees.

On the positive side, the road offers many benefits, such as increased access for more vehicles, offering more frequent services at lower costs for both people and goods, including agricultural crops. These will contribute to increased economic development and improved livelihoods for farming, and non-farming, communities both locally and regionally.

The immediate project focal comprises the city of Tappita, Toe Town and a number of rural towns, villages and hamlets scattered along the road. Some impacts also need to be mitigated on farmland within the road corridor. The as yet undetermined siting of the ancillary infrastructure (camps, quarries, etc.) means that additional rural settlements might also end up being affected, and so the mitigation measures also cover those aspects.

To achieve this, a number of social mitigation principles are identifiable, as follows:

- The project team (MPW/ IUU) need to have a Social Safeguards Specialist on their team assisted by a Community Liaison Officer who works in the field.
- A full Resettlement Action Plan which pays full and fair compensation for all losses including livelihood restoration which is implemented in full and timely.
- Employment of unskilled labour to be limited to men and women from communities within 5 km of the road will be mandated in the contractor's contract.
- Location of workers camps to be as far as possible from a settlement or school (preferably at least 5 km), with provision of basic facilities in terms of, shelter, water, sanitation, light and food. These camps are as yet unidentified – the camp locations have to be negotiated with the contractor. Most contractors prefer to bring in all labour and have many camps rather than employ local people and have fewer camps.
- Ensure that Contractors have written employment contracts which are Liberian Employment and Labour Law compliant and which offer equal opportunities and conditions and have a demonstrable worker grievance mechanism that enables worker support from a gender experienced NGO when responding to allegations of sexual harassment and violence.
- The contractor must ensure that a team investigating sexual harassment or violence allegations is led by an independent third party contracted from a Liberian NGO with gender experience.
- Ensure that each contractor has a written Code of Conduct for Worker Behaviour which sets out expectations of worker behaviour and sets out penalties for contravention. This is expected to include instant dismissal for proven cases of sexual harassment and violence along with other employee crimes.
- Provision of full Personal Protective Equipment to all staff and laborers.
- Health provision for workers through the establishment of a health clinic at the camp, equipped with certified medical staff, medicine and an ambulance, as well as the provision of first aid training and equipment
- Effective control of site traffic by the contractor's OHS Specialist.

- Provision of sanitation facilities for work groups and camps, separated from men and women where needed.
- Active management and protection of nearby water sources, as described in section 6.1.
- Action to remedy impacts on communities – dust, water sources, noise and vibration. The list of communities directly affected is contained in section 6.3.
- Prohibition of night working within 2km communities.
- Operation of the Project grievance redress mechanism to receive and respond to complaints by affected groups.
- Implementation of a compensation process for contractor damage to property, land and resources.

8.3.2 Basis of Environmental Mitigation

Mitigation of impacts on the bio-physical environment has two main purposes in the upgrading of the Tappita-Toe Town road: the prevention of pollution to soil, water and air; and the avoidance or minimisation of damage to receptors in the form of forests, biodiversity and human society. This is based on the key principles underlying the EPML 2002: 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.

The areas of environmental impact are broad, but are mainly confined to the road corridor. Section 6.1 describes the physical environment and highlights the eleven large creeks and numerous other watercourses and supply wells that must be protected. Section 6.2 describes the biological environment, and particularly the forest habitat.

In order to ensure that the principles summarised above are followed, environmental mitigation includes the following main elements.

- Ensuring that steps are taken to prevent the erosion of soil and the consequent entrainment of sediment into watercourses.
- Taking the measures necessary to ensure that watercourses that are used for consumption do not exceed the national standards as a result of project activities.
- Project activities must minimise the disturbance of vegetation in general, and natural forests in particular.
- Active measures are followed to prevent the unsustainable exploitation of faunal biodiversity, in line with national regulations.

- Topsoil is treated as a resource, and where land is disturbed, it is stockpiled and re-used later in rehabilitation.
- All disturbed sites associated with the project's construction operations are rehabilitated once their use is complete.

Even with the best of intents and the strictest safeguards, it is recognised that a large construction project, with substantial earthworks and material extraction, cannot have a completely negligible impact on the environment. The intention is that strong mitigation measures be employed to endeavour to avoid and minimise pollution and other damage, and that rehabilitation works are then used to help restore the environment.

8.3.3 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 both the bio-physical and socio-economic environments. These include the following.

- Atmospheric emissions: it is necessary to minimise adverse effects on air quality from engine exhausts and dust, and noise pollution from machinery and plant operation. Steps are taken to ensure that operations abide by national standards for air quality (gaseous and particulate) and noise emissions.
- Solid and liquid waste: the production and accumulation of waste materials must be minimised by promoting recycling and ensuring that any waste material created is dealt with appropriately.
- Hazardous materials: the safe storage, handling and ultimate disposal of high risk substances such as petroleum products, explosives, herbicides and cement, which are hazardous both to people and the environment. Particular measures are taken to prevent pollution by hazardous substances, especially hydrocarbons.

8.3.4 Mitigation Approach by Impact

The approach to mitigation is defined for each identified impact in Table 8-2. This is derived from the strategy that was described in chapter 7, taking into account the factors discussed above. The actual mitigation measures to operationalise the approach are given in the ESMP in chapter 9.

The mitigation approach strictly covers design and construction phase impacts as per the scope of work assigned to the ESIA team by the IIU. Mitigation of operation and decommissioning impacts should be covered in a separate ESIA.

Table 8-2 Linkages of impacts, mitigation strategy and mitigation approach

Identified impact	Mitigation strategy	Mitigation approach
1. Overall Impacts		
1.1 General environmental damage in the form of degraded land, lowered quality of living, reduced quality of resources, etc., mainly in the 28 communities along the road.	c) Mitigation d) Remediation	c) The ESMP must contain the structure and information required to ensure that all works are undertaken to high environmental and social standards. d) Monitor the implementation of the ESMP and enforce the rehabilitation of any damage caused during project operations.
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 in the roadside areas of the 28 cities, towns and rural communities.	Mitigation	Require project staff and contractors' workers to be sensitised to environmental and social issues. Require the contractor to prepare and implement a comprehensive Code of Conduct.
2. Environmental Health and Safety Impacts		
2.1 Injuries occur to the public, especially children, during works in the 28 communities along the road.	Reduction	Require the contractors to enforce the exclusion of the public from the active work sites.
2.2 Injuries occur to the public from exposure to hazardous substances (e.g. cement, diesel) in the 28 communities along the road.	Reduction	Require the contractors to enforce the exclusion of the public from the facilities where hazardous substances are stored and used.
2.3 Infectious and contagious diseases are spread amongst the 28 communities near the road.	Reduction and Mitigation	Require the contractors to employ local laborers are far as possible, and to undertake awareness campaigns on public health issues.
3. Occupational Health and Safety Impacts		
3.1 Workers are unaware of the dangers from the sites (roadline, quarries, batching plants etc.) they are working in, leading to high rates of injury.	Mitigation	Require the contractors to prepare and implement an ISO 45001:2018 compliant Occupational Health and Safety Plan (OHS Plan) and recruits an ISO 45001:2018, OHSAS 18001:2007 or similar certified Health and Safety Specialist. Ensure that the supervising engineer recruits its own certified OHS specialist and fulfils its responsibility in supervising the contractor against its ISO compliant OHS Plan. f
3.2 Injuries due to inadequate provision of safety equipment	Avoidance	Set a minimum list of personal protective equipment that must be issued to and used by every person entering the work sites.
4. Community Impacts		
4.1 Incoming workers do not respect local communities, leading to social disruption, particularly in the rural towns.	Reduction and Mitigation	Require the contractors to employ local labourers are far as possible, and to maintain a code of conduct for acceptable behaviour.

Identified impact	Mitigation strategy	Mitigation approach
4.2 Houses and other structures (264 privately owned structures and 9 public structures according to RAP report) are lost in the road right of way.	Compensation	Implement the Resettlement Action Plan to provide full and fair compensation.
4.3 Loss of land use and business (106 businesses according to RAP report) sites in the road right of way, particularly in the cities.	Compensation	Implement the Resettlement Action Plan to provide full and fair compensation.
4.4 Cultivated land and crops (874 rubber trees and 8 farm owners according to RAP report) are disturbed or destroyed, mainly in the rural areas along the road and in the locations chosen for quarries, borrow areas, camps, batching plants, etc.	c) Compensation d) Reduction	c) Implement the Resettlement Action Plan to provide full and fair compensation. d) Enforce the minimisation of land take to the greatest extent possible.
4.5 Local people's livelihoods are adversely affected by project activities (628 persons will be affected according the RAP report).	c) Avoidance d) Compensation	c) Design project activities to be implemented in such a way that livelihoods are little affected; maximise local employment opportunities on the project. d) Implement the Resettlement Action Plan to provide full and fair compensation.
4.6 Cumulative losses are incurred by social groups unable to respond to change. (60 vulnerable people according to RAP report)	Mitigation	Ensure that marginal groups are included in consultations and resettlement provisions.
4.7 Local communities (28) are not engaged and consulted in a satisfactory and timely manner or vulnerable groups are not included in community consultations.	Avoidance and Mitigation	Ensure effective implementation, revision, and update of SEP and make sure IIU and Contractor staffing is adequate.
5. Traffic Impacts		
5.1 Use of public roads by project vehicles increases the accident rate and generates nuisance levels of dust: mainly the Tappita-Toe Town road, but also between it and other project infrastructure (camps etc.) and Monrovia.	Mitigation	c) Contractor's OHS Specialist must develop a comprehensive road safety plan, approved and integrated in the workplan before commencement of work. d) Maintain strict vehicle use and driving rules, and enforce speed controls, for all project vehicles, including contractors' trucks and mobile plant.
5.2 Increased traffic on public roads, running at faster speeds, leading to more accidents and more serious accidents: on sections of the Tappita-Toe Town road as they are completed during construction.	Reduction	Ensure that traffic safety measures are incorporated in engineering designs.
6. Cultural Heritage Impacts		

Identified impact	Mitigation strategy	Mitigation approach
6.1 Cultural sites are damaged (9 graves identified in the RAP), anywhere that new land is cleared, such as for diversions, camps, quarries and borrow areas.	Avoidance	Provide a detailed procedure to be followed for investigating and taking action in the event that a cultural site needs to be affected.
7. Hazardous Materials		
7.1 Pollution to air, soil or water and danger (illness or injury) from the delivery and handling of hazardous materials (including bitumen, mixed asphalt, fuels, lubricants and cement) at project camps, workshops, plants and construction sites.	c) Mitigation d) Remediation	c) Require the contractor to provide detailed protocols to be followed in all refuelling operations as part of its ESMP d) Require the contractor to define the clean-up and rehabilitation work required in case a spill, leak or other form of pollution occurs in an Oil Spill Response Plan.
7.2 Pollution to air, soil or water and danger (illness or injury) from fuel and oil storage at project stores and workshops.	c) Mitigation d) Remediation	c) Require the contractor to provide detailed protocols to be followed in all refuelling operations as part of its ESMP. d) Require the contractor to define the clean-up and rehabilitation work required in case a spill or leak occurs in an Oil Spill Response Plan.
7.3 Pollution to air, soil or water and danger (illness or injury) from refuelling operations at project camps, workshops, plants and construction sites.	c) Mitigation d) Remediation	c) Require the contractor to provide detailed protocols to be followed in all refuelling operations as part of its ESMP d) Require the contractor to define the clean-up and rehabilitation work required in case a spill occurs in an Oil Spill Response Plan.
7.4 Pollution to air, soil or water and danger (illness or injury) from concrete and asphalt batching plants	c) Mitigation d) Remediation	c) Require the contractor to provide detailed protocols to be followed in all refuelling operations as part of its ESMP d) Require the contractor to define the clean-up and rehabilitation work required in case pollution occurs in an Oil Spill Response Plan.
8. Construction Materials		
8.1 Damage to the land (degradation, loss of soil and cover, reduced productivity) from borrow pits and quarries	c) Reduction and Mitigation d) Remediation	c) Enforce strict siting and management criteria for material source sites. d) Require full rehabilitation of material extraction sites once their use is complete.
8.2 Disturbance (noise, dust and traffic accidents) and danger of injuries from quarry operation – general	c) Mitigation d) Remediation	c) Enforce strict management criteria for quarries. d) Require full rehabilitation of quarries once their use is complete, to make them safe.
8.3 Disturbance (noise and dust) and danger (serious injury or death) from quarry operation – explosives and blasting	Mitigation	Enforce strict protocols to be followed for the transport, storage and use of explosives, and for all blasting operations.
9. Impacts of Waste Materials		

Identified impact	Mitigation strategy	Mitigation approach
9.1 Pollution of soil or water and ill-health from waste generation and management at camps and construction sites.	c) Reduction d) Remediation	c) Require the contractor to prepare and implement a comprehensive Waste Management Plan. d) Stipulate the requirements for rehabilitation following any pollution event.
9.2 Pollution of soil or water and ill-health from waste disposal at camps.	c) Mitigation d) Remediation	c) Require the contractor to prepare and implement a comprehensive Waste Management Plan. d) Stipulate the requirements for rehabilitation following any pollution event.
9.3 Pollution of soil or water from poor sanitation at work sites – camps and construction sites.	Mitigation	Require sanitation facilities to be created at all work sites.
9.4 Pollution of soil or water from site camps and stores.	c) Mitigation d) Remediation	c) Define sound management guidelines for the storage and use of polluting substances, and for sanitation in particular. d) Stipulate the requirements for rehabilitation following any pollution event.
10. Soil Loss		
10.1 Erosion and physical damage of soils and earthworks – all construction sites, camps and ancillary infrastructure areas.	c) Mitigation d) Remediation	c) Define the erosion control measures that must be put in place on all bare soil surfaces. d) Define the rehabilitation that must be undertaken if erosion occurs.
11. Pollution of Water		
11.1 Damage to water resources by pollution with sediment or chemicals in runoff in any of the 3 major watercourses and many minor creeks crossed by the road, or nearby wetlands and water supply boreholes.	c) Mitigation d) Reduction	e) Define the erosion control measures that must be put in place on all bare soil surfaces to stop the supply of entrained sediment, and the safeguards to prevent chemical pollution. f) Define the measures that must be used to reduce the likelihood of work sites and facilities affecting watercourses.
11.2 Pollution by entrained sediment from poor drainage systems entering any of the 3 major watercourses and many minor creeks crossed by the road, or nearby wetlands and water supply boreholes.	Mitigation	Define the drainage measures that must be put in place, plus the erosion control measures required on all bare soil surfaces to stop the supply of entrained sediment.
12. Air Pollution		
12.1 Dust from construction sites and access tracks to ancillary infrastructure affects local communities and crops	Mitigation	Provide detailed guidelines on the abatement of dust at all work sites.
12.2 Exhaust fumes affect local communities close to the road and all project ancillary infrastructure.	Reduction	Require compliance with national vehicle emission regulations.
13. Biodiversity Impacts		

Identified impact	Mitigation strategy	Mitigation approach
13.1 Vegetation other than invasive species (i.e. both natural plants and farm plants) is damaged or destroyed unnecessarily – beyond the agreed boundaries, particularly natural plants in the forested sections along the road.	a) Mitigation b) Reduction c) Remediation	a) Conduct floral biodiversity studies and, if needed, prepare and implement a Biodiversity Management Plan (BMP). b) Enforce strict respect for agreed site boundaries. c) Require full rehabilitation of any damaged vegetation, on and off the sites.
13.2 Increased but poorly controlled exploitation of forest resources, including NTFPs, as a result of improved road access, particularly natural plants in the forested sections along the road.	Mitigation	Conduct floral biodiversity studies and, if needed, prepare and implement a Biodiversity Management Plan (BMP). Raise awareness of environmental threats and encourage local communities to improve their management of local forest resources.
13.3 Wild animals other than very common or non-native pest species are killed, particularly in the forested along the road.	Mitigation	Conduct faunal biodiversity studies and, if needed, prepare and implement a Biodiversity Management Plan (BMP). Raise awareness of the regulations on bushmeat and ensure that workers have access to meat from domesticated livestock.
14. Noise and Vibration Impacts		
14.1 Noise disturbance at excessive levels from construction activities, quarries, borrow areas and batching plants.	Mitigation	Require contractors to comply with the national regulations at all times.
14.2 Vibration disturbance causes stress and damage to buildings, either from trucks and machines on construction sites and access tracks, or from quarry operations.	c) Mitigation d) Reduction	c) Provide strict protocols for the use of trucks and mobile equipment close to habitation. d) Ensure that crushers and quarries are located well away from habitation, and that blasting follows strict rules.
15. Employment Issues and Grievances Management		
15.1 Conditions of employment are unfair to or unequal among workers.	Avoidance,Reduction and Mitigation	Prepare Labour Management Procedures and require the contractor to prepare a Labour Management Plan. Require contractors to have all employees sign contracts and Worker Code of Conduct prior to start of work..
15.2 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; and /or Vulnerable groups are excluded from employment. -	Avoidance and Reduction	Prepare Labour Management Procedures and require the contractor to prepare a Labour Management Plan.
15.3 Workers are unable to redress their grievances.	Mitigation	Contractor to set-up and implement an effective GRM for its employees and train them on its use.
16. Workers' Behaviour Management		

Identified impact	Mitigation strategy	Mitigation approach
16.1 Workers' behaviour is inappropriate or disrespectful of other workers or local community members, especially of women.	Reduction and Mitigation	c) Require contractors to have all employees to sign Worker Code of Conduct. d) Train employees on Code of Conduct and good behaviour
16.2 Sexual exploitation and gender-based violence increase in the 28 local communities, particularly the rural towns due to the influx of temporary laborers	Reduction and Mitigation	Require the contractors to comply with the World Bank's ESS2 and the national laws on sexual exploitation, and to undertake awareness campaigns on GBV/SEA.

8.4 SITING OF ANCILLARY INFRASTRUCTURE

8.4.1 Introduction

All road upgrading projects require a certain amount of ancillary infrastructure and facilities. These usually cannot be located in detail before the project starts and the contractor mobilises. This is for a variety of reasons, but the main one is that each contractor bids for the work on the assumption that it has some degree of flexibility in the siting of its facilities, which in turn are driven by and affect the operating logistics. The other key reason is that material sources are frequently not identified before a project starts. Construction earthfill and rock must meet strict engineering standards, but must also be available as close to the site as possible, to reduce transport costs. The selection of materials in this project will be the responsibility of the contractor and the construction engineer, who will undertake prospecting, sampling and testing of the materials. Once appropriate materials have been found, the identified sites for sourcing of materials will be screened for their environmental and social impacts and appropriate mitigation measures, as required by the World Bank's ESS, will be applied by the contractor, within the provisions of the ESIA and ESMP.

To allow the project to go forward with the uncertainty of the locations of the various elements of ancillary infrastructure, this section lists the criteria that must be met to ensure that the environment and society are safeguarded. The standards and guidelines that must be followed are provided in the ESMP (chapter 9).

It is important to note that, when any element of ancillary infrastructure is closed, its site must be fully rehabilitated. Facilities can only be left if the landowner makes a written request and produces a valid Environmental Permit from the EPA; without this, leaving any structure would mean that the contractor has infringed the terms of the project's Environmental Permit.

8.4.2 Diversions

During construction, diversions may be required so that traffic can still use the route while the road is being repaired. The normal practice in Liberia is for the contractor to make a temporary earth track close to the actual road alignment, and divert traffic on it for one to two

months, while the embankment, road formation and surfacing are constructed. Longer term diversions are required at culverts and bridge sites, and through city areas, where concrete drains and walkways also have to be built. For the purposes of the ESIA, and with the implementing contractor not selected, it is assumed that diversions will be needed along the entire road length for certain periods. It is expected that the plans for diversions will only become known once the contractor is mobilised. It will then be necessary for detailed construction management plans to be presented to the IIU for approval. The diversion sites will be screened by the IIU for environmental and social impacts and the contractor will be responsible to apply the appropriate mitigation measures identified.

The following rules must be followed by the contractor when creating diversions.

- Wherever possible, avoid the need to create diversions. The contractor's OHS Specialist must find ways to schedule the works in such a way that part of the road remains useable, with traffic signals and alternating single-flow traffic as necessary.
- Where diversions cannot be avoided, every effort must be made to keep them within the existing RoW. In rural areas this must be achieved in every case, with exceptions only where culverts and bridges are being reconstructed, or where steep terrain or a nearby watercourse requires a wider deviation. In these cases, there should be additional measures in the RAP. Where land is required for the diversion out of the right of way, the access to the land required must be negotiated with the community or owner and a temporary compensation rate agreed and paid and the land restored after use.
- In urban areas, diversions may be required around back roads. For these cases, a range of impacts and consequent mitigation measures will be necessary. These should be assessed for each site and the appropriate mitigation measures and guidelines used as described in the ESMP for similar impacts.
- All diversions must be managed carefully, and used for the shortest possible duration. Careful management involves the control of speed and dust emissions, and ensuring segregation of pedestrians and livestock from traffic.
- No tree that is bigger than 200 mm diameter at breast height may be felled in the creation of a diversion outside the RoW.
- All diversions must be fully rehabilitated following completion of use. In urban areas this will involve the repair of the back roads used to a standard that is better than before it was used (as partial compensation to local residents for the disruption they have suffered). In rural areas, the compacted route must be ripped using the tines on a bulldozer, topsoil replaced, drainage resolved and a full vegetation cover installed.

8.4.3 Quarries and Borrow Pits

Quarries and borrow pits will be needed to provide the necessary materials for the construction works. For this ESIA, it is estimated that there will be one quarry for the crushed stone and sand required in construction, and up to 8 borrow pits to obtain the gravels and engineering fills required in the road formation. Information on the numbers, designs and exact locations of these features is not yet available. It is possible that existing quarries could be used, but it is most likely that new quarries will be required. It is expected that the sites for material sources will only become known once the contractor is appointed and presents the IIU with detailed operational plans. The IIU will screen the sites identified for the establishment of quarries to identify the associated environmental and social impacts and appropriate mitigation measures, which must be applied by the contractor.

The criteria stated below are to be followed.

- The extraction of sand from rivers will not normally be allowed. Sand should be derived from crusher runs.
- Materials may only be extracted from existing sources if a valid Environmental Permit can be produced that covers at least the planned extraction volume plus the quarry's other normal production. The use of existing material sources is also subject to the engineering quality of the material, and an environmental and social review of the site by the IIU's safeguards specialists.
- For new sources, or the re-opening of former material sources, considerable care is required because of the intrusive nature of quarrying. Biological surveys should be conducted and areas of significant biodiversity value should be avoided.
- Quarries must be no more than 5 km from the road (or within 5 km of a connecting road). Borrow pits must be within 1 km of the road. No part of an extraction site may be within 50 metres of a watercourse, borehole or well. Borrow pits must be on gently sloping land.
- Quarries must be at least 500 metres from the nearest house. If dwellings are closer, they will need to be evacuated during blasting, and suitable compensation agreed. If possible, quarries should have a belt of trees at least 200 metres wide.
- The area to be used for the quarry or borrow pit must be agreed with the landowner and compensation paid in line with the project's RAP before access to the site is permitted. The land required for the access track must be included in the compensation measures.
- No tree that is bigger than 200 mm diameter at breast height may be felled in the creation of an access track or borrow pit. At quarries, large trees must be retained if at

all possible.

- Topsoil must be removed and stockpiled for later re-use.
- The surface must be graded smooth and compacted as necessary. A surface water drainage system must be installed, that leads to a series of sediment collection ponds before discharge from the site. Access tracks must have suitable drains and culverts installed, according to standard road building practices.
- At quarries, where workers will be present for many months, a sanitation system must be installed, usually involving a septic tank and soakaway system. Pit latrines should be installed at borrow pits.
- Any buildings erected must be serviceable for the purposes of use, but must also be readily removable.
- The contractor must enforce good management of the quarry or borrow pit, to ensure that the surrounding environment is safeguarded.
- Quarries and borrow pits are intrinsically dangerous. Their perimeters must be secure to ensure that no unauthorised people enter the site. Stores for detonators and explosives components must have additional security, in compliance with the contractor's explosives and blasting permit.
- Drilling and blasting operations at quarries must follow the guidelines provided in the ESMP (chapter 9). Blasting may only be undertaken at times advertised in advance and when protocols have been followed to make certain that no one is within a 500-metre flyrock zone around the quarry.
- Crushers must comply with international safety standards and must only be operated during the hours of daylight (excluding Sundays and religious holidays). Noise abatement and dust suppression measures must be in place to ensure that national standards are achieved.
- The washing of sand and aggregates must be done using a closed loop system.
- Following the completion of extraction, quarry faces must be cleaned, to remove all loose, fractured and overhanging blocks and to ensure that no rockfalls can occur. Borrow pit edges must be graded back to a stable angle, which is defined as the angle used in the project's engineering design for a road cut in the same material.
- Once its use has been completed, the quarry or borrow pit and any access track must be rehabilitated. All plant, buildings, foundations and hard-standings must be removed. Any septic tank must be pumped out by a certified waste disposal company, removed and the hole backfilled. All waste materials must be disposed of according to

the guidelines provided in the ESMP (chapter 9). All compacted ground must be ripped using the tines on a bulldozer, the topsoil replaced, surface drainage resolved and a full vegetation cover installed.

8.4.4 Concrete Batching Plants and Hot Mixing Plants

Concrete batching and asphalt hot mixing plants will be needed to support the construction works. For the ESIA, it is assumed that the selected project implementation contractor will require one of each of these plants. Poorly sited or managed, they can create significant environmental impacts. As information is not yet available on the numbers, designs and exact locations of these facilities, the following rules must be adhered to. It is expected that the sites for the plants will only become known once the contractor is appointed and presents the IIU with detailed operational plans. As for other ancillary facilities, the sites will be screened by the IIU, and environmental and social impacts identified, and corresponding mitigation measures will be applied by the contractor.

- Batching plants must be within 1 km of the Tappita-Toe Town road, on gently sloping land. No part of a site may be within 50 metres of a watercourse, borehole or well.
- Batching plants must be at least 200 metres from the nearest house. If possible, they should have a belt of trees at least 200 metres wide.
- The area to be used for the batching plant must be agreed with the landowner and compensation paid in line with the project's RAP before access to the site is permitted. Any land required for an access track must be included in the compensation measures.
- No tree that is bigger than 200 mm diameter at breast height may be felled in the creation of an access track or plant site.
- The surface of the working area must be graded smooth and compacted as necessary. A surface water drainage system must be installed, that leads to a series of sediment collection ponds before discharge from the site. Access tracks must have suitable drains and culverts installed, according to standard road building practices.
- Since workers will be present for many months, a sanitation system must be installed, usually involving a septic tank and soakaway system.
- Use of provided sanitation systems at all parts of the work sites must be enforced and the subject of toolbox talks.
- Any buildings erected must be serviceable for the purposes of use, but must also be readily removable.
- Stores of bitumen and other hazardous substances must be fully bunded, with drains that discharge through an oil-water separator.

- The contractor must enforce good management of the batching plant, to ensure that the surrounding environment is safeguarded.
- Batching plants are significant industrial facilities and as such are intrinsically dangerous. Their perimeters must be secure to ensure that no unauthorised people enter the site.
- Batching plant equipment must comply with international safety standards and must only be operated during the hours of daylight (excluding Sundays and religious holidays). Noise abatement and dust suppression measures must be in place to ensure that national standards are achieved.
- Once its use has been completed, the plant site and any access track must be rehabilitated. All plant, buildings, foundations and hard-standings must be removed. Any septic tank must be pumped out by a certified waste disposal company, removed and the hole backfilled. All waste materials must be disposed of according to the guidelines provided in the ESMP (chapter 9). All compacted ground must be ripped using the tines on a bulldozer, the topsoil replaced, surface drainage resolved and a full vegetation cover installed.

8.4.5 Stores, Laydown Areas, Parking Lots, Workshops and Offices

The contractor will need to create areas for the storage and management of equipment (heavy machinery, trucks, vehicles, engines, etc.) as well as materials (paving material, lubricants, fuel, chemicals, etc.), explosives and solid waste. Pollution can be a significant problem where machines, fuels and lubricants are involved, and so special measures are essential to ensure that the environment and society are properly protected. As with the other ancillary facilities, information on the number, design and exact locations of these areas is not yet available because the contractor has not been selected and there are no other established locations for these activities that can be designated on the road section. Once identified, the sites will be screened by the IIU for environmental and social impacts, and corresponding mitigation measures will be applied by the contractor.

The stores, laydown areas, parking lots, workshops and offices are collectively referred to as "industrial service facilities". The following rules must be observed in their siting, management and removal.

- All industrial service facilities must be within 1 km of the Tappita-Toe Town road, on gently sloping land. No part of a site may be within 50 metres of a watercourse, borehole or well.
- The facilities must be at least 200 metres from the nearest house. If possible, they should have a belt of trees at least 200 metres wide.

- The area to be used for any industrial service facility must be agreed with the landowner and compensation paid in line with the project's RAP before access to the site is permitted. Any land required for an access track must be included in the compensation measures.

- No tree that is bigger than 200 mm diameter at breast height may be felled in the creation of an access track or industrial service facility site.

- The surface of the working area must be graded smooth and compacted as necessary. A surface water drainage system must be installed, that leads to a series of sediment collection ponds before discharge from the site. Access tracks must have suitable drains and culverts installed, according to standard road building practices.

- Since workers will be present for many months, a sanitation system must be installed, usually involving a septic tank and soakaway system.

- Use of provided sanitation systems at all parts of the work sites must be enforced and the subject of toolbox talks.

- Any buildings erected must be serviceable for the purposes of use, but must also be readily removable.

- The contractor must enforce good management of the facility, to ensure that the surrounding environment is safeguarded.

- Workshops, stores containing hydrocarbons or other hazardous liquids, parking areas and refuelling points must be fully bunded, with drains that discharge through an oil-water separator.

- All hydrocarbon storage tanks and drums must be roofed and fully bunded to at least 110 percent of the maximum volume of hydrocarbon stored.

- Stores containing hazardous materials in dry form (such as cement) must be securely protected from rain and wind.

- The contractor must have strict and accountable management systems in place for all industrial service facilities. These must ensure that there is no contamination of air, soil or water.

- Once its use has been completed, the facility site and any access track must be rehabilitated. All plant, buildings, foundations and hard-standings must be removed. Any septic tank must be pumped out by a certified waste disposal company, removed and the hole backfilled. Any soil contaminated with hydrocarbons must be fully remediated and all traces of contamination removed. All waste materials must be disposed of according to the guidelines provided in the ESMP (chapter 9). All

compacted ground must be ripped using the tines on a bulldozer, the topsoil replaced, surface drainage resolved and a full vegetation cover installed.

8.4.6 Camp Sites

As with the other ancillary facilities, the construction of temporary camps will be required to accommodate the project employees and provide offices for the management and administrative staff. Apart from land disturbance and the risk of pollution, residential and work camps can have significant impacts on the socio-economic environment. Again, information on the number, design and exact locations of these areas is not yet available because the contractor has not yet been selected and there are no clearly definable locations. It is expected that the sites for camps will only become known once the contractor is appointed and presents the IIU with detailed operational plans. The identified sites will be screened by the IIU for environmental and social impacts, and corresponding mitigation measures will be applied by the contractor.

The following criteria must be used in the siting of work camps to house staff or workers. The results from the socio-economic baseline survey (section 6.3) provide details on the distribution of the population in the road corridor.

- The camp must be located as far from the nearest town or city as possible, and preferably at least 5 km away). This is to prevent disruption to local communities due to an influx of mainly male staff and workers.
- The area to be used for the camp must be agreed with the landowner and compensation paid by the contractor before access to the site is permitted.
- The location chosen must be within 1 km of the highway, on gently sloping land. No part of it may be within 50 metres of a watercourse, borehole or well.
- No tree that is bigger than 200 mm diameter at breast height may be felled in the construction of a camp.
- Topsoil must be removed and stockpiled for later re-use.
- The surface must be graded smooth and compacted as necessary. A surface water drainage system must be installed, that leads to a series of sediment collection ponds before discharge from the site.
- A borehole may be installed to provide a clean water supply.
- A full sanitation system must be installed, usually involving a septic tank and soakaway system.
- Use of provided sanitation systems at all parts of the work sites must be enforced and

the subject of toolbox talks.

- The buildings erected must be serviceable for the purposes of use, and must comply with Liberian labor accommodation requirements. However, they must also be readily removable.
- The contractor must enforce good management of the camp, to ensure reasonable behaviour, and clean, healthy living conditions. Adequate supplies of food and cooking fuel must be provided. The contractor must prepare and implement a Camp Management Plan three (3) months prior to the start of construction.
- The contractor is to make every effort to prevent the establishment of markets around the camp.
- Once its use has been completed, the camp must be fully rehabilitated. All buildings, foundations and hard-standings must be removed. The septic tank must be pumped out by a certified waste disposal company, removed and the hole backfilled. All waste materials must be disposed of according to the guidelines provided in the ESMP (chapter 9). All compacted ground must be ripped using the tines on a bulldozer, the topsoil replaced, surface drainage resolved and a full vegetation cover installed. The rehabilitation plan must be part of the Camp Management Plan.

9 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

9.1 OBJECTIVES

The Environmental and Social Management Plan (ESMP) is to ensure that the environment and society will be safeguarded during the implementation of the proposed project, in compliance with all 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.

Therefore, the objectives of the ESMP are to:

- Draw together the measures required to mitigate environmental and social impacts, and group them logically into components with common themes;
- Define the specific actions to be taken, responsibilities for these actions, timetables for implementation and associated incremental costs; and
- Describe the arrangements for capacity building, monitoring and resourcing.

The ESMP will be strictly implemented without ignoring any detail.

The ESMP has clearly defined actions, targets and timeframes, as well as precisely allocated responsibilities among the different organisations and personnel working on the project. The ESMP is to ensure the systematic and prompt recognition of problems and the effective actions to correct them.

Briefly, the execution of an ESMP is to facilitate the efficient implementation of mitigation measures to minimize impacts, prevent accidents and maximise the effectiveness of construction, in a context of good management and information sharing among project personnel.

9.2 PROJECT ACTIVITIES

9.2.1 Design Phase

The design phase includes the following activities:

- Surveying
- Geotechnical Investigations
- Design of pavements

- Design of other structures

The design phase includes mainly design activities. However, some on-site activities will also be carried. These include, but are not limited to:

- Measuring activities, during topographical surveying;
- Collection of sub-grade and soil samples from test pits as well as some in-situ testing of some samples, during soil surveys;
- Geotechnical explorations at quarries and borrow pits;
- Pegging, borehole drilling and rock core sampling, if rocks were found, in the locations where new bridges are to be constructed.

9.2.2 Construction Phase

The construction phase will include mainly the following activities:

- Construction of offices and residential premises
- Vegetation clearing along the RoW;
- Earthworks: strengthening and widening of the embankment or cut formations;
- Installation of borrow pits, quarries, crushers, hot mix plants, concrete batching and wash plants;
- Construction and installation of culverts and drainage works;
- Construction of the asphalt carriageway and shoulders;
- Construction and rehabilitation of bridges: reinforcing concrete approach slabs for existing bridges, construction of guardrails over embankments and approaches to bridges, and construction of new bridges;
- Desilting of existing drainage lines;
- Slope protection;
- Quadrant pitching;
- Ancillary works such as road lane marking and installation of traffic sign boards.

9.2.3 Operation Phase

This phase is not covered by this ESIA and ESMP. Following the completion of the construction phase, the highway will be operated under an Operate, Maintain and Transfer

arrangement. Details of the activities, environmental impacts and mitigation measures for this phase, are covered by different project documentation.

9.3 PROJECT PARTICIPANTS

Project participants are the following:

- The World Bank, which is the lending entity,
- The Project Financial Management Unit (PFMU) under the Ministry of Finance and Development Planning (MFDP), which is responsible for the project's financial management
- The Infrastructure Implementation Unit (IIU) under the Ministry of Public Works, which is responsible for the implementation of the project in terms of technical matters and procurement. The IIU will have an Environmental safeguards Specialist, an an ISO 45001:2018, OHSAS 18001:2007 certified Health and Safety Specialist and a Social safeguards Team consisting of a Social Safeguards Specialist and two Community Liaison Assistants. The IIU will establish an Environmental and Social Management System and appoint a contractor to implement the project.
- The contractor, which is responsible for the actual upgrading of the road. The contractor will prepare and implement its Contractor ESMP and a Contractor OHS Plan, to be approved by the IIU and the World Bank. The contractor will establish an Environmental and Social Management System and recruit an Environmental safeguards Specialist, an ISO 45001:2018, OHSAS 18001:2007 certified Health and Safety Specialist, a Social Safeguards Specialist and a Community Liaison Assistant. These specialists will be required to be full-time present at the construction sites during working hours.
- The supervising engineer, who is responsible for the technical designs, including the siting, of the project and its ancillary facilities. The Supervising Engineer will be responsible to ensure the quality and adequate implementation of the Contractor ESMP and Contractor OHS Plan. For this purpose, the Supervising Engineer establishes an Environmental and Social Management System (ESMS) and recruits a qualified Environmental Specialist and a Social Specialist and an ISO 45001:2018, OHSAS 18001:2007 certified Health and Safety Specialist. These specialists will be required to be full-time present at the construction sites during working hours.
- The Environmental Protection Agency (EPA), which is the regulator that provides the necessary environmental permits and makes sure that the project abides by the national regulations.
- The Nimba County and Grand Gedeh County local authorities, which include the

Superintendents, the Assistant Superintendents for Development and the counties' Inspectors as well as the district level authorities. It also includes the counties' Engineers, who are the counties' representative of the Ministry of Works and Transport.

9.4 ESMP COMPONENTS

The ESMP is designed as a cover-all, one-stop mitigation and monitoring plan for all social and environmental impacts and health and safety aspects. 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.

This ESMP therefore works through a series of different subject elements. These are listed below as 14 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 4.

The safeguard categories and impact mitigation headings are as follows.

Overall safeguards

1. General Environmental Protection

Protection of society

2. Environmental Health and Safety
3. Occupational Health and Safety
4. Community Impacts Management
5. Traffic Management
6. Cultural and Archaeological Heritage Management

Pollution control

7. Hazardous Materials Management (including Spill Contingency and Emergency Response)
8. Construction Materials Management

9. Waste Management

Environmental safeguards

10. Soil Erosion Control
11. Water Resources Management
12. Air Emissions Management
13. Ecological Management Plan
14. Noise and Vibration Management

Conditions of Employment and Workers Code of Conduct

15. Employment issues and grievances management
16. Worker Behaviour Management

9.5 IMPACTS AND MITIGATION

9.5.1 Appropriate Mitigation for the Identified Impacts

All impacts and corresponding mitigations in this ESIA/ESMP strictly cover construction activities as per the scope of work assigned to the ESIA/ESMP team by the IIU. Operation and decommissioning impacts and mitigations should be covered in a separate ESIA/ESMP.

The impacts identified in the ESIA are listed in Table 9-1, along with the appropriate mitigation measures, the mitigation costs and the residual impacts that may still occur after mitigation measures are applied or as a result of the mitigation measures themselves.

Table 9-1 Environmental impacts and mitigation measures, with the potential impacts from the mitigation measures

Anticipated environmental impact	Mitigation measures	Residual environmental impact	Resources required or approximate costs
1. General environmental Protection			
1.1 General environmental damage in the form of degraded land, lowered quality of living, reduced quality of resources, etc., mainly in the 28 communities along the road.	• Avoid damage to any part of the environment (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.	Negligible	Not applicable: this category should be covered by the design process and by responsible contract management.
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 in the roadside areas of the 28 cities, towns and rural communities.	• 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 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.	Negligible	Appropriately prepared and targeted training materials on environmental and social awareness for managers, site supervisory staff, machine operators, drivers and workers. These will include the environmental and social components of the weekly and daily site toolbox talks. The contractor must employ qualified Environmental and Social Specialists and a certified Health and Safety Specialist, who must prepare and give these trainings as part of their job. The training material should be reviewed and approved by the Supervising Engineer Environmental and Social Specialist and Health and Safety Specialist.

Anticipated environmental impact	Mitigation measures	Residual environmental impact	Resources required or approximate costs
			Additional costs should therefore not be necessary.Subsequent cascaded trainings and toolbox talks to be undertaken by supervisors. This provision also covers a number of the other identified impacts listed below.
2. Environmental Health and Safety			
2.1 Injuries occur to the public, especially children, during works in the 28 communities along the road.	• Ensure full separation of the public from working sites. • Fence off working areas so that people cannot be injured by things dropped on them or falling into excavations. • Maintain a clean site so that dangerous articles are not left lying around near the work site, especially at night.	Negligible	Talk programmes and messages on local radios. 3 x community safety awareness days per community (28) by a national NGO providing community theatre. Cost estimate: US$ 75,000.
2.2 Injuries occur to the public from exposure to hazardous substances (e.g. cement, diesel) in the 28 communities along the road.	• Ensure full separation of the public from storage facilities. • Enforce the exclusion of non-project personnel from all sites with hazardous substances.	Negligible	Not applicable. Awareness of the importance of implementing exclusion will be included in awareness trainings. Costs are then implicit in contract implementation.
2.3 Infectious and contagious diseases are spread amongst the 28 communities near the road.	• 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 trainings 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.	Infectious and contagious disease could still get out of control, even with appropriate mitigation in-place.	Health training as part of toolbox talks (see above). Cost estimate for nets is US$ 5 per worker; allow for US$ 21,500 in total

Anticipated environmental impact	Mitigation measures	Residual environmental impact	Resources required or approximate costs
3. Occupational Health and Safety			
3.1 Workers are unaware of the dangers from the sites (road line, quarries, batching plants etc.) they are working in, leading to high rates of injury.	• Ensure that workers are given safety inductions, toolbox talks and full daily and weekly briefings. • Develop a culture of admonishment for unsafe acts. • Obligate managers to set good examples for respecting safety on site.	Minor	Covered under the same programme as for 1.2 above.
3.2 Injuries due to inadequate provision of safety equipment	• Provide all workers with safety equipment appropriate to the work that they are doing. • Do not allow workers on to a site unless they are wearing the appropriate safety gear. • 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 who know what to do if there is an accident and how to use the first aid kit.	Negligible	Provision of the minimum set of safety equipment per worker (helmet, high visibility waistcoat, boots, gloves and goggles. Ear protection for workers in noisy locations. Training in the use of PPE to be covered in the programme for 1.2 above. Cost estimate for bulk purchases of safety equipment is US$ 25 per worker, for each of two construction seasons; allow US$ 15,000 in total.

Anticipated environmental impact	Mitigation measures	Residual environmental impact	Resources required or approximate costs
4. Community Impacts Management (including land acquisition impacts)			
4.1 Incoming workers do not respect local communities, leading to social disruption, particularly in the rural towns.	• Use and update the Stakeholder Engagement Plan and matrix • Employ local labour as much as possible. • Ensure that the Worker Code of Conduct is implemented (See 15.4) • 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.	Negligible	Covered under the same programme as for 1.2 above.
4.2 Houses and other structures (264 privately owned structures and 9 public structures according to RAP report) are lost in the road right of way.	• Pay the full and fair compensation as agreed following the procedures given in the Resettlement Action Plan. • Assist the affected persons to relocate and re-establish their lives and livelihoods. • Do not allow any work to commence on a site before full resettlement compensation has been completed and verified.	Affected families should end up at least as well off, with fully restored livelihoods, but emotional trauma may remain.	Resources and costs should be covered in the Resettlement Action Plan**.**
4.3 Loss of land use and business (106 businesses according to RAP report) sites in the road right of way, particularly in the cities.	• Pay the full and fair compensation as agreed following the procedures given in the Resettlement Action Plan. • Assist the affected persons to relocate and re-establish their livelihoods. • Do not allow any work to commence on a site before full compensation has been completed.	Negligible. The Resettlement Action Plan includes provision for full livelihood restoration.	Resources and costs should be covered in the Resettlement Action Plan**.**
4.4 Cultivated land and crops (874 rubber trees and 8 farm owners according to RAP report) are disturbed or destroyed, mainly in the rural areas along the road and in the locations chosen for quarries, borrow areas, camps, batching plants, etc.	• Avoid the use of cultivated land wherever possible. This includes fallow agricultural land, rubber and other tree plantations. • Where use of such land is required, check with the IIU's Community Liaison Assistant (CLA) at last four weeks prior to commencement of activities (ideally earlier) that mitigation measures have been agreed and implemented. • Do not start using cultivated land before the occupier has fully agreed the compensation strategy, all amounts have been paid and this is confirmed by the CLA and verified. • Avoid damage crops or land beyond agreed boundaries.	Reduced agricultural productivity in the area. Affected families may take time to recover livelihoods.	Resources and costs should be covered in the Resettlement Action Plan**.**

Anticipated environmental impact	Mitigation measures	Residual environmental impact	Resources required or approximate costs
4.5 Local people's livelihoods are adversely affected by project activities (628 persons will be affected according the RAP report).	• Establish an equitable and fair employment strategy. Liaise with the CLA 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 who used to earn livelihoods on land in the RoW. • Pay the usual accepted County wage rates. • Do not demand unpaid work by local farmers or others.	Affected families may take time to recover livelihoods.	Resources and costs should be covered in the Resettlement Action Plan.
4.6 Cumulative losses are incurred by social groups unable to respond to change. (60 vulnerable people according to RAP report)	• Give priority to local men and women in labour crews, and those who used to earn livelihoods on land in the RoW. • 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 local farmers or others.	The Resettlement Action Plan includes provision for support to vulnerable groups, but sometimes economic support is inadequate.	Resources and costs should be covered in the Resettlement Action Plan.
4.7 Local communities (28) are not engaged and consulted in a satisfactory and timely manner or vulnerable groups are not included in community consultations.	• Revise, update and implement the Stakeholder Engagement Plan for the project. • MPW/ IIU (project team) to expand Social Safeguards team in relation to the increase in supervision and monitoring of contractors. Mandate each contractor to have a Social Safeguards Officer and a Community Liaison Officer in their core team. • Each contractor must have a Stakeholder Engagement Plan agreed with the project team specialists and coordinate with the project SEP. • MPW/ IIU (project team) monitor and supervise stakeholder engagement activities of contractors. • MPW/ IIU (project team) Social Safeguard Specialist undertake community information dissemination according to the SEP, conduct community meetings and undertake media activities to keep project information flowing effectively. • Social Safeguard Team to introduce contractors' specialists to communities and monitor and supervise contractors contacts with communities. All activities to be documented in the Stakeholder Engagement matrix for the project.	Negligible	Covered under the same programme as for 1.2 above.

Anticipated environmental impact	Mitigation measures	Residual environmental impact	Resources required or approximate costs
5. Traffic Management			
5.1 Use of public roads by project vehicles increases the accident rate and generates nuisance levels of dust: mainly the Tappita-Toe Town road, but also between it and other project infrastructure (camps etc.) and Monrovia.	• Minimise vehicle movements. • Enforce transport rules and regulations rigorously. • Conduct driving safety awareness campaigns. • 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.	Risk of road accidents and some dust will always remain.	Appropriately prepared and targeted training materials on driving safety and mitigation of impacts from trucks and machines for managers, site supervisory staff, machine operators and drivers. The contractor must employ a certified Health and Safety Specialist, who must prepare and give these trainings as part of their job. The training material should be reviewed and approved by the Supervising Engineer Health and Safety Specialist. Additional costs should therefore not be necessary. Subsequent cascaded trainings and toolbox talks to be undertaken by managers. This provision also covers machine and truck vibrations under impact 14.2 below.
5.2 Increased traffic on public roads, running at faster speeds, leading to more accidents and more serious accidents: on sections of the Tappita-Toe Town road as they are completed during construction.	• Maintain strict transport rules and regulations. • Undertake community safety awareness campaigns. • Undertake regular driving safety awareness campaigns to ensure safe driving. • Maintain close liaison with Liberian National Police traffic control units.	Risk of road accidents will always remain.	To be covered by the IIU OHS Specialist during Operation Phase.

Anticipated environmental impact	Mitigation measures	Residual environmental impact	Resources required or approximate costs
6. Cultural Heritage Management			
6.1 Cultural sites are damaged (9 graves identified in the RAP), anywhere that new land is cleared, such as for diversions, camps, quarries and borrow areas.	• Check with local people, through the CLA, as to whether any activities will affect sites of cultural or religious importance, including roadside graves • Avoid any works where cultural sites might be affected, as far as possible. • Ensure removal of graves using the process defined in the RAP. • If an unexpected archaeological site is discovered, use the chance find guideline. • If damage to cultural sites cannot be avoided, agree compensation measures with the local community, through the CLA.	Negligible	Allow for one chance find investigation, with an estimated total cost of US$ 10,000.
7. Hazardous Materials Management			

Anticipated environmental impact	Mitigation measures	Residual environmental impact	Resources required or approximate costs
7.1 Pollution to air, soil or water and danger (illness or injury) from the delivery and handling of hazardous materials (including bitumen, mixed asphalt, fuels, lubricants and cement) at project camps, workshops, plants and construction sites.	• 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. • Maintain supplies of spill kits and granules in all vehicles and at all offloading locations. • Ensure competent drivers and close supervision. • Provide emergency training to all personnel involved in the movement and handling of hazardous materials. • Use international labelling for identifying hazardous substances. • Maintain emergency response / fire-fighting teams trained for a spillage event and appropriate equipment at each facility.	The risk of accidental leakages or spills will always remain.	Appropriately prepared and targeted training materials on hazardous materials and waste handling and management for managers, site supervisory staff, machine operators, drivers and workers in stores, workshops, refuelling stations, camps, etc. These will include the environmental components of the weekly and daily site toolbox talks for these areas. The contractor must employ a qualified Environmental Specialist and a certified Health and Safety Specialist, who must prepare and give these trainings as part of their job. The training material should be reviewed and approved by the Supervising Engineer Environmental and Health and Safety Specialists. Additional costs should therefore not be necessary. This provision also covers a number of the other identified impacts listed below.

Anticipated environmental impact	Mitigation measures	Residual environmental impact	Resources required or approximate costs
7.2 Pollution to air, soil or water and danger (illness or injury) from fuel and oil storage at project stores and workshops.	• Follow the hazardous materials management guidelines fully. • 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 spillages. • Ensure that there is hard standing, with a drainage system that includes oil/water separators. • Ensure spill kits and granules are available, and if used, dispose of waste appropriately. • Check facilities, safeguards and procedures for any potential for explosions to occur. • Maintain emergency response / fire-fighting teams trained for a spillage event and appropriate equipment at each facility. • Provide training for all personnel handling fuel and oil. • Take rapid action if uncontained spills and leakages to occur, to prevent soil, and ground and surface water contamination • Do not allow soils to become contaminated and effectively sterilised, or for water courses to be affected by runoff carrying toxic substances, affecting community water supplies, aquatic biodiversity and wildlife. • Have controls in place to minimise opportunities for fuel pilferage.	The risk of accidental leakages or spills will always remain.	Covered under the same programme as for 7.1 above.
7.3 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 management guidelines fully, which include procedures for refuelling vehicles and site plant. • 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 out according to strict protocols for refuelling in unprotected areas. • Enforce the reporting system for spillage incidents.	The risk of accidental leakages or spills will always remain.	Covered under the same programme as for 7.1 above.

Anticipated environmental impact	Mitigation measures	Residual environmental impact	Resources required or approximate costs
7.4 Pollution to air, soil or water and danger (illness or injury) from concrete and asphalt batching plants	• Follow the hazardous materials management guidelines fully. • Use of cement, ready-mix concrete, asphalt, etc. at plants is to be carried out according to strict protocols. • Enforce the reporting system for spillage incidents.	The risk of accidental leakages or spills will always remain.	Covered under the same programme as for 7.1 above.

Anticipated environmental impact	Mitigation measures	Residual environmental impact	Resources required or approximate costs
8. Construction Materials Management			
8.1 Damage to the land from borrow pits and quarries	• Identify borrow pits and quarry areas as early as possible, and conduct specific impact assessment and mitigation on these areas. • Allow adequate time for the consultation, resettlement and compensation of people whose land is affected. • Ensure that only the approved borrow pits and quarries are used. • Install sediment control measures to prevent runoff from causing contamination and siltation of water bodies. • Take appropriate measures to prevent emissions and dust from affecting the ambient air quality outside the immediate site boundaries. • Ensure proper geotechnical management so that excavation and tips do not trigger slope instability. • All road construction-related activities are to be covered by the detailed, site specific and project specific components of the ESMP.	Land surfaces can never be fully restored following extraction, but revegetation can be undertaken to begin the process of ecological restoration.	Appropriately prepared and targeted training materials on the management of quarries and borrow areas for managers, site supervisory staff, machine operators, drivers and workers in these sites. These will include the environmental components of the weekly and daily site toolbox talks for these areas. The contractor must employ qualified Environmental and Social Specialists and a certified Health and Safety Specialist, who must prepare and give these trainings as part of their job. The training material should be reviewed and approved by the Supervising Engineer Environmental and Social Specialist and Health and Safety Specialist. Additional costs should therefore not be necessary.This provision also covers a number of the other identified impacts listed below. It might also be linked to the programme for impact 10.1 below.

Anticipated environmental impact	Mitigation measures	Residual environmental impact	Resources required or approximate costs
8.2 Disturbance and danger from quarry operation – general	• Ensure that only the approved quarry areas are used throughout the re-opening and operation period. • Ensure quarry plans include drainage assessment and water management controls, to prevent the contamination and siltation of water bodies. • Maintain the quarry area in a clean, safe and efficient condition. • Ensure proper geotechnical management so that excavation and tips do not trigger slope instability. • Take appropriate measures to prevent excessive noise and emissions from crushers at road material quarries. • Rehabilitate the quarry to a fully stable and vegetated condition after work has ceased.	The risk of accidents is always present in quarries, even with good management systems in place.	Covered under the same programme as for 8.1 above.
8.3 Disturbance and danger from quarry operation – explosives and blasting	• Obtain formal licensing from the government. • Abide by Liberian laws and regulations, and UNMIL guidelines, regarding the handling, storage and use of explosives. • Be particularly strict in enforcing safety regulations when using explosives. • Follow the detailed specifications for blasting provided in this ESMP. • Ensure that quarry blasting does not create excessive noise and vibration disturbance to wildlife and communities. • Do not allow any unauthorised person to have access to explosives. • Do not allow anyone to use welding equipment, smoke, cook food or light any fire within 50 metres of an explosives store.	The risk of accidents is always present when using explosives, even with good management systems in place.	The contractors must employ qualified and certified quarry masters, Environmental and Social Specialists and Health and Safety Specialists, who must be responsible for compliance with these mitigation measures as part of their job. The Supervising engineer must employ qualified Environmental and Social Specialists and a certified Health and Safety Specialist, whose responsibility is to ensure the contractor's implementation of measures. Additional costs should therefore not be necessary. These provisions should also cover the mitigation of vibrations listed in impact 14.2 below.
9. Waste Management			

Anticipated environmental impact	Mitigation measures	Residual environmental impact	Resources required or approximate costs
9.1 Pollution of soil or water and ill-health from waste generation and management at camps and construction sites.	• Operate a waste management strategy based on principles of reduction, recovery, recycle and reuse. • Collect and segregate waste into hazardous and non-hazardous at the source. • Avoid waste spills during storage and handling. • Dispose of all waste in an appropriate manner. • Conduct recycling and waste reduction campaigns. • Ensure use of PPE by staff when handling all forms of waste. • Ensure that waste collection, segregation, storage and disposal systems avoid environmental degradation, contamination, and hazards to human and animal health. • Do not allow an increase in disposable income among employees to create more waste, both quantity and type, without challenging perceptions.	Negligible	Covered under the same programme as for 7.1 above.
9.2 Pollution of soil or water and ill-health from waste disposal at camps.	• Dispose of wastes in the most environmentally sound manner possible. • Never burn waste, creating air pollution. • Dispose of wastes to EPA-authorised facilities. • If there are no alternatives, design and construct a landfill site that is lined and to international standards. This should be in an area that is not prone to slippage, cannot leach to surface water and groundwater, and is a suitable distance from settlement. It should be located down gradient of any water supply boreholes. • Ensure that the landfill site is in a secure compound and that its operation conforms to international standards. • Deal with hazardous waste according to international best practice and EPA guidelines.	Negligible	Covered under the same programme as for 7.1 above.

Anticipated environmental impact	Mitigation measures	Residual environmental impact	Resources required or approximate costs
9.3 Pollution of soil or water from poor sanitation at work sites – camps and construction sites.	• 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. • 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 tool box talks	Negligible	Covered under the same programme as for 7.1 above.
9.4 Pollution of soil or water from site camps and stores.	• Ensure that all potentially hazardous materials (i.e. fuel, oil, other chemicals, sewage) are stored or disposed of in appropriate ways. • Devise on-site emergency spillage plans and train staff in their implementation. • Remove all debris and litter from site. • Take active measures to prevent pollution to the soil or water courses.	Negligible	Covered under the same programme as for 7.1 above.
10 Soil Erosion Control			
10.1 Erosion and physical damage of soils and earthworks – all construction sites, camps and ancillary infrastructure areas.	• Only disturb the soil where it is necessary to do so for the agreed works. • Use existing tracks and previously disturbed areas as far as possible. • Do not make access tracks wider or other cleared areas larger than is absolutely necessary. • Do not allow erosion to happen without taking rapid control measures: install erosion and sediment controls as the very first physical site activity. • Grade any newly formed slopes to the minimum angle possible. • Cut slopes to grades appropriate to the material found. • Level surfaces to prevent erosion as soon as works have been completed. • Keep earth piles away from the edges of steep slopes and watercourses.	In an environment of highly erodible soils and intense tropical rainfall, erosion can be reduced to acceptable limits but cannot be stopped entirely.	Appropriately prepared and targeted training materials on the management of earthworks, drainage systems and erosion control for managers, site supervisory staff, machine operators, drivers and workers in these sites. These will include the environmental components of the weekly and daily site toolbox talks for these areas. The contractor must employ qualified Environmental Specialist who must prepare and give these trainings as part of their job. The

Anticipated environmental impact	Mitigation measures	Residual environmental impact	Resources required or approximate costs
	• Allow small plants to grow back on the edges of tracks. • Where it is present, top soil to a depth of 200 mm should be removed and stockpiled for later site restoration use. • Undertake soil erosion and sediment controls as necessary, to protect areas from slips and erosion. All soil slopes steeper than 10° must be revegetated. • Avoid compaction of the soil in temporary use areas by limiting machine and vehicle access. • Deep-rip compacted soil using the tines on a bulldozer at the start of site rehabilitation.		training material should be reviewed and approved by the Supervising Engineer Environmental Specialist. Additional costs should therefore not be necessary.trainings. Subsequent cascaded trainings and toolbox talks to be undertaken by managers and supervisors. Cost estimate: US$ 40,000. This provision also covers a number of the other identified impacts listed below. It might also be linked to the programme for impact 8.1 above.

Anticipated environmental impact	Mitigation measures	Residual environmental impact	Resources required or approximate costs
11. Water Resources Management			
11.1 Damage to water resources by pollution with sediment or chemicals in runoff in any of the 3 major watercourses and many minor creeks crossed by the road, or nearby wetlands and water supply boreholes.	• Do not dispose of anything into any kind of water body. • Keep earthworks, tracks and other cleared areas as far as possible from watercourses or bodies. • Where earthworks, tracks, roads and other cleared areas are within 50 metres of watercourses or bodies, take special care to ensure that fuel, oil and other hazardous substances, and any earthworks, are properly contained. • Ensure that all community water supplies are safeguarded. Confirm the location of local water supplies with the CLO. Be prepared to bring inn clean water for communities where the works have polluted their water sources • Do not extract so much water from a supply source that the normal users do not have enough. • Schedule major earthworks only in the dry season. • Use surface protection measures to control soil erosion and protect watercourses. • Regulate water discharge and run off using sediment ponds. • Monitor downstream water quality routinely.	In an environment of highly erodible soils and intense tropical rainfall, sediment influxes to watercourses can be reduced to acceptable limits but cannot be stopped entirely.	Covered under the same programme as for 10.1 above.
11.2 Pollution by entrained sediment from poor drainage systems entering any of the 3 major watercourses and many minor creeks crossed by the road, or nearby wetlands and water supply boreholes..	• Provide culverts wherever water needs to flow across the road or an access track. • Ensure water from culverts and other drains is discharged at low energy via drop structures and aprons. • Avoid long gaps between culverts or turnouts, so that a lot of water flow builds up. • Make temporary drains as necessary to avoid waterlogging or erosion. These must be adequate for accumulated runoff water as well as rainfall. • Discharge drains into well vegetated areas. Provide mini silt collection ponds if drains must discharge straight into water courses. Never allow sediment from bare eroding surfaces to be washed into water courses.	In an environment of highly erodible soils and intense tropical rainfall, sediment influxes to watercourses can be reduced to acceptable limits but cannot be stopped entirely.	Covered under the same programme as for 10.1 above.
12. Air Emissions Management			

Anticipated environmental impact	Mitigation measures	Residual environmental impact	Resources required or approximate costs
12.1 Dust from construction sites and access tracks to ancillary infrastructure affects local communities and crops.	• Enforce dust control measures during the dry season. • Enforce strict speed limits on earth tracks by placing speed bumps. • Spray water to dry earth surfaces. • Stop work in very windy, dry weather. • Fit crushers with water sprays.	Dust can never be totally eliminated, but it can be reduced to acceptable levels.	Covered under the same programme as for 10.1 above.
12.2 Exhaust fumes affect local communities close to the road and all project ancillary infrastructure.	• Use only vehicles and equipment with engines that comply with national emissions standards. • Maintain engines in good working order.	Negligible	Not applicable. This should be covered automatically through the contractors' good management of its resources.
13. Ecological Management Plan			
13.1 Vegetation other than invasive species (i.e., both natural plants and farm plants) is damaged or destroyed unnecessarily – beyond the agreed boundaries, particularly natural plants in the forested sections along the road.	• Prior to the commencement of the project, conduct floral biodiversity studies to identify endemic, endangered, threatened or vulnerable floral species as per the IUCN redlist as well as critical and natural habitats -as defined in the world bank's ESS6- at all project sites. • If critical habitats are identified: o prepare a Biodiversity Management Plan (BMP) that includes floral species identified in the floral biodiversity surveys, 3 months prior to the start of construction. o Implement the BMP throughout the lifetime of the project. • Only cut vegetation that is in the way. This means plants that are in the direct area required for the agreed works. • Do not cut any more vegetation than is necessary for site access and working. • Do not use fire to remove vegetation. • Do not burn cut vegetation.	Vegetation can be planted to replace that lost, but restoring species assemblages and the associated ecology takes a long time and may not always be achievable.	Biodiversity consultants' fees and survey equipment Cost estimate: US$ 350,000
13.2 Increased but poorly controlled exploitation of forest resources, including NTFPs, as a result of improved road access, particularly	• Prior to the commencement of the project, conduct floral biodiversity studies to identify endemic, endangered, threatened or vulnerable floral species as per the IUCN redlist as well as critical and natural habitats -as defined in the world bank's ESS6- at all project sites.	The elimination of the use of forest products, including NTFPs is unlikely, but its use needs to be limited to sustainable levels.	Covered under the same programme as for 13.1 above.

Anticipated environmental impact	Mitigation measures	Residual environmental impact	Resources required or approximate costs
natural plants in the forested sections along the road.	• If critical habitats are identified: o prepare a Biodiversity Management Plan (BMP) that includes floral species identified in the floral biodiversity surveys, 3 months prior to the start of construction. o Implement the BMP throughout the lifetime of the project. • Instruct workforce not to collect or purchase NTFPs on site or in local markets. • Avoid all use of fire. • Provide workers with food from domesticated plants when they are living in places where there is no market source of it.		
13.3 Wild animals other than very common or non-native pest species are killed, particularly in the forested sections along the road.	• Prior to the commencement of the project, conduct faunal biodiversity studies to endemic, endangered, threatened or vulnerable faunal species as per the IUCN redlist including mammals, birds, fish, amphibians, reptiles, important invertebrates, such a endemic, endangered butterflies, etc. as well as critical and natural habitats -as defined in the world bank's ESS6- at all project sites. • If critical habitats are identified: o prepare a Biodiversity Management Plan (BMP) that includes faunal species identified in the floral biodiversity surveys, 3 months prior to the start of construction. o Implement the BMP throughout the lifetime of the project. • Instruct workforce not to hunt, deal in or transport bush meat on site. • Provide meat from domestic animals if there is no alternative. • Avoid all use of fire. • Provide workers with workers meat from domesticated animals when they are living in places where there is no market source of it.	The complete elimination of the use of proscribed bush meat is unlikely, although its consumption can be limited.	Covered under the same programme as for 13.1 above.

Anticipated environmental impact	Mitigation measures	Residual environmental impact	Resources required or approximate costs
14. Noise and Vibration Management			
14.1 Noise disturbance at excessive levels from construction activities, quarries, borrow areas and batching plants.	• Minimise site-generated noise to the greatest possible extent. • Do not allow works to occur during the hours of darkness (6 pm to 6 am), on Sundays and religious holidays, other than in exceptional circumstances (such as casting bridge slabs). • Provide warnings of blasting, starting at least 24 hours ahead, and ensure no one is within the 500-metre clearance zone. • Provide communities, through the CLO, with details of the works programme. • Do not deviate from the agreed timing of works. • Provide all site workers exposed to noise over 70 dB(A) with ear protection. • Do not allow any person to come close to a machine without having ear protection in place.	Construction noise will inevitably be disturbing in rural areas with low ambient noise levels, although it should be feasible to keep it within legal limits.	Covered under the same programme as for 1.2 above. It should also be covered through the contractors automatically following good management practices.
14.2 Vibration disturbance causes stress and damage to buildings, either from trucks and machines on construction sites and access tracks, or from quarry operations.	• Minimise heavy truck and machine operations within 200 metres of buildings. • During blasting operations, ensure staggered charge sequences to minimise ground vibrations and air overpressure. • Provide warnings of blasting, starting at least 24 hours ahead, and ensure no one is within the 500-metre clearance zone.	Negligible	Truck and machine issues should be covered by the programme to mitigate impact 5.1 above. Blasting issues should be covered under the same provisions as for impact 8.3 above.
15. Employment Issues and Grievances Management			
15.1 Conditions of employment are unfair to or unequal among workers.	• Contractor to prepare and implement Labour Management Plan in accordance with the IIU's Labour Management Procedures. • Ensure that written conditions of contract is checked by the MPW/ IIU Social Safeguards Specialist (SSS) 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 Labour Law 2011 and/or the Bank's ESS2, whichever more stringent. • The contract has to specify a Worker Code of Conduct and the penalties for contravention.	The risk of Trafficking in Persons remain with or without the contractor's intention, especially through sub-contractors.	Covered under the same programme as for 1.2 above.

Anticipated environmental impact	Mitigation measures	Residual environmental impact	Resources required or approximate costs
15.2 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; and /or Vulnerable groups are excluded from employment. -	• Contractor to prepare and implement Labour Management Plan in accordance with the IIU's Labour Management Procedures. • 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.	Negligible	Covered under the same programme as for 1.2 above.
15.3 Workers are unable to redress their grievances.	• Contractor to have in place an internal grievance process 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.	Negligible	Covered under the same programme as for 1.2 above.
16. Worker Behaviour Management			
16.1 Workers' behaviour is inappropriate or disrespectful of other workers or local community members, especially of women.	• Contractor to design and implement a Worker Code of Conduct that has to be signed by employees on recruitment. • Full time and temporary labour have to read and sign the Code of Conduct. • Each employee must be given a signed copy. • The Contractor must reinforce these requirements through briefings, trainings and toolbox talk.	The risk of some workers still behaving in a wrong manner remain.	4 trainings on Code of Conduct and the respect of the local culture Responsibility of PIU, Contractor and Supervising Engineer Social Specialists.. No additional cost is therefore required.

Anticipated environmental impact	Mitigation measures	Residual environmental impact	Resources required or approximate costs
16.2 Sexual exploitation and gender-based violence increase in the 28 local communities, particularly the rural towns due to the influx of temporary laborers	• 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 recognises confidentiality of complainants. • Include awareness raising on these issues in trainings and site briefings. • Publicise the GRM process. • Ensure complainants receive support. • Operate the Mitigation measure 15.3 above.	The risk of sexual exploitation and GBV remain, especially that the majority of the workforce are males.	12 trainings with Nimba and Grand Gedeh Ministry of Gender programme on GBV / SEA. Cost estimate: US$ $12,000.

9.6 RESPONSIBILITIES

9.6.1 Environmental Mitigation

The application of mitigation measures required under this ESMP is the responsibility of the Ministry of Public Works (MPW) through its Infrastructure Implementation Unit (IIU) and its contractor. The MPW should require its contractor to develop their own ESMPin accordance with this ESMP. The contractor should also prepare and implement their own OHS Plan and establish an Environmental and Social Management System (ESMS). The contractor's ESMP and OHS Plan will be reviewed by the IIU Environmental and Social Safeguards Specialists and approved by the IIU Project Manager. The IIU should require the contractor to recruit an Environmental Safeguards Specialist, an ISO 45001:2018 certified OHS Specialist and a Social Safeguards Specialist assisted by a Community Liaison Assistant. The IIU is responsible to instruct, observe and monitor its contractors against his ESMP and OHS Plan provisions. The IIU should make sure that corrective actions are applied by the contractors, when necessary.

9.6.2 Environmental Monitoring

The environmental monitoring is the responsibility of the MPW/IIU and the Supervising Engineer. The MPW should require the Supervising Engineer to continuously monitor the contractor against its ESMP and OHS Plan. For this purpose, the Supervising Engineer should recruit its own Environmental and Social Specialists and an ISO 45001:2018 certified OHS Specialist who will be responsible to monitor the contractor and report monthly to the IIU. However, present and past experiences in road construction projects in Liberia revealed that the Supervising Engineers are usually focused on the technical and design aspects of the project, in most cases neglecting their responsibility in monitoring the contractors against environmental compliance. This has resulted in a multitude of incidents, some of which were fatal.The monitoring responsibility of the Supervising Engineer has to be enforced by the IIU. For this purpose, the IIU must recruit for the project an Environmental Safeguards Specialist, an ISO 45001:2018 certified OHS Specialist and a Social Safeguards Team consisting of a Social Safeguards Specialist and two Community Liaison Assistants. The IIU's Specialists must monitor the contractor's compliance with their ESMP and OHS Plan provisions and the Supervising Engineer's monitoring performance. The IIU is responsible to ensure that the monitoring program is carried out fully and on-time by the Supervising Engineer. The IIU's Environmental and Social Safeguards Specialists and OHS Specialist are responsible to review the monitoring reports when submitted. The IIU's specialists should performregular and surprise inspections. The IIU can also undertake the monitoring itself if deemed necessary. Every 6 months an integrated Environmental, Social and Health and Safety Audit should be carried out by an independent Auditor to assess compliance with the Contractor ESMP and Contractor OHS Plan.The IIU will request for any violations to be corrected by the contractor and monitor the contractor actions and undertakings in correcting violations.

9.6.3 Terms of Reference

The Infrastructure Implementation Unit (IIU) is charged by MPW with the responsibility for implementing the project on behalf of MPW and its financing partner, the World Bank.

The MPW is the owner of the project and takes the ultimate responsibility for all actions in its implementation.

The IIU must have an Environmental Safeguards Specialist who has the following responsibilities with respect to environmental management.

- Ensuring that sufficient resources are provided to meet the requirements of this ESMP;
- Ensuring that relevant environmental elements of the ESMP are incorporated into the contracts held with individual contractors;
- Monitoring the standard of environmental compliance.
- Direction of the contractors regarding environmental compliance requirements and other matters of environmental importance;
- Communication of site environmental issues with regulators and other interested parties;
- Liaison with World Bank management on overall issues relating to environment, environmental performance data, environmental incident reports, etc.;
- Co-ordination, via nominated agents, of compensation schemes for land clearance in cultivated areas, etc.;
- Review of valid contractors' plans for emergencies;
- Participation in environmental Compliance Reviews;
- Review of conditions following completion of site works;
- Enforcement of all environmental mitigation measures;
- Enforcement of the implementation of the environmental control measures in this plan, and any other corrective measures;
- Monitoring and reporting all issues of environmental compliance.

The IIU must have an ISO 45001:2028, OHSAS 18001:2007 certified Health and Safety Specialist who has the following responsibilities with respect to occupational health and safety (OHS).

- Ensuring that sufficient resources are provided to meet the OHS requirements of this ESMP;
- Ensuring that relevant OHS elements of the ESMP are incorporated into the contracts held with individual contractors;
- Monitoring the standard of OHS compliance;
- Direction of the contractors regarding OHS compliance requirements;
- Liaison with World Bank management on overall issues relating to OHS performance and incident reports;
- Review of contractor's OHS plan;
- Participation in OHS Compliance Reviews;
- Enforcement of all OHS mitigation measures;
- Monitoring and reporting all issues of OHS compliance.

The MPW/ IUU project team must include a Social Safeguards Team consisting of a suitably experienced Social Safeguards Specialist with resettlement experience and of management of social issues in construction. The Specialist must be supported by two Community Liaison Assistants to work at the local level, one per District. The responsibilities of the Team are:

- Management, update and implementation of the Stakeholder Engagement Plan;
- Plan and lead community consultation meetings;
- Ensure the design and delivery effective information campaigns using all media;
- Liaison with the County and District Development Teams and Land Office re the land acquisition and compensation process in resettlement;
- Liaise with both County and District administrations, Chiefdom systems and Community groups and contractors to implement and assist in resolution of grievances;
- Inform community members of employment opportunities, assist local people to apply;
- Liaise with contractors to encourage and promote local employment over imported labour and emphasise the contractual obligations to aim for 30% of unskilled and semi-skilled jobs to go to women;
- Liaise with experienced Liberian NGOs to find those able to design training courses

on aspects of employee behaviour, sexual harassment and gender-based violence, gender equity, conflicts over employment opportunities and foreign workers, cultural awareness and chance finds processes;

- Monitor and supervise contractor compliance with training, grievance systems internally and with the MPW/ IIU project team; and
- Monitor achievement of resettlement, review completion and recommend further measures if households fail to reinstate their livelihoods.

Contractors are responsible for complying with environmental and social requirements for all field activities covered by this ESMP and their own Contractor ESMP and Contractor OHS Plan. Contractors are also responsible for the actions of any sub-contractors they may engage.

Each contractor's Site Manager is responsible for:

- 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 Environmental Protection Agency under the provisions of the Environmental Protection and Management Law (2002);
- 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 awareness issues, and ensuring that the key messages are passed on to the laborers 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 employ local people in the work crews with at least 30% women, particularly those whose livelihoods have been adversely affected by the Project;
- Ensuring an internal contractor confidential employee grievance mechanism is in place, is communicated to employees and is implemented.
- Make arrangements with a Liberian-based violence NGO to lead investigations into allegations of sexual harassment and gender based violence as and when they arise.
- 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 ESMP implementation, by maintaining appropriate records and communications on site environmental issues and the status of compliance, and making these available to representatives of the IIU and the World Bank as required;
- Participation in Environmental Compliance Reviews;
- Participation in Community Consultative Meetings;
- Identification of significant matters pertaining to environmental compliance;
- Liaise with the IIU's Environmental Safeguards Specialist and Social Safeguards Specialist on the need for corrective action in the event of unexpected environmental or community problems emerging during the course of operations.

Each Contractor mut have Environmental Safeguards Specialist who supports the Site Manager in all environmental matters and has the following duties.

- Communication 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;
- With the Social Safeguards Team, supporting staff in planning for action to be taken in the event of accidents and other emergencies threatening human welfare;
- 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 OHS Specialist an the Social Safeguards Team, supporting staff in the provision of environmental awareness and community interaction training;
- Leading of Environmental Compliance Reviews;
- With the Social Safeguards Team, review of conditions following completion of works on site;
- Liaison with staff for the implementation of all environmental mitigation measures;
- Identification of additional environmental mitigation or corrective measures that are deemed to be necessary in the course of operations;

- Implementation of the control measures in this plan and any other corrective measures;
- Preparation for the Site Manager of reports on all aspects of environmental compliance.
- Support the Supervising Engineer and Monitoring Consultants and provide them with all the necessary information required for the monitoring program and reporting.

Each Contractor mut have an ISO 45001:2018 certified OHS Specialist who supports the Site Manager in all OHS matters and has the following duties.

- Implementation of the contractor's OHS Plan;
- Communication with all of the contractor's staff regarding OHS compliance requirements and other matters of OHS importance;
- Keeping contractor management informed on overall issues relating to the project's OHS standards and compliance;
- With the Environmental Safeguards Specialist and the Social Safeguards Team, supporting staff in planning for action to be taken in the event of accidents and other emergencies threatening human welfare;
- Supporting the Environmental Safeguards Specialist in planning for action to be taken in the event of spills or leakages of hazardous materials, and other emergencies;
- Leading of OHS Compliance Reviews;
- Liaison with staff for the implementation of all OHS mitigation measures;
- Identification of additional OHS mitigation or corrective measures that are deemed to be necessary in the course of operations;
- Implementation of the OHS control measures in this plan and any other corrective measures;
- Preparation for the Site Manager of reports on all aspects of OHS compliance.
- Support the Supervising Engineer and Monitoring Consultants and provide them with all the necessary information required for the monitoring program and reporting.

Each Contractor must have a responsible Social Safeguards Specialist (ideally with someone who has gender experience), who supports the Site Manager in all social matters and has the following duties. The Contractor's Social Safeguards Specialist should ideally be supported by a Community Liaison Assistant (CLA).

- Communication 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 Community Liaison Assistant, supporting staff in planning for action to be taken in the event of emergencies threatening human welfare;
- With the Community Liaison Assistant, supporting staff in the provision of social awareness and community interaction training;
- Leading of Social Compliance Reviews;
- With the Community Liaison Assistant, review of conditions following completion of works on site;
- Liaison with staff for the implementation of all social mitigation measures;
- Identification of additional social mitigation or corrective measures that are deemed to be necessary in the course of operations;
- Implementation of the control measures in this plan and any other corrective measures;
- Preparation for the Site Manager of reports on all aspects of social compliance.

The Contractor's Community Liaison Assistant (CLA) supports the Site Manager, the Social Safeguards Specialist and other staff in all matters of relations with, and the welfare and support of, local communities. He or she has the following duties.

- Community liaison, 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;
- Communication 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;
- Supporting of compensation and resettlement for land clearance in all areas;
- With the Environmental staff, supporting staff in planning for action to be taken in the event of accidents and other emergencies threatening human welfare;

- With the Environmental staff, supporting staff in the provision of environmental awareness and community interaction training;
- Participation in Environmental Compliance Reviews;
- Active involvement in Community Consultative Meetings;
- With the Environmental staff, review of conditions following completion of works on site;
- Liaison with staff for the implementation of all community support measures;
- Identification of additional community mitigation or corrective measures that are deemed to be necessary in the course of operations;
- Implementation of the community support measures in this plan and any other corrective measures; and
- Preparation for the Site Manager of reports on all aspects of community relations.

The Supervising Engineer must recruit Environmental and Social Specialists and an ISO 45001:2018 certified OHS Specialist whose responsibilities are to continuously monitor the contractor against its ESMP and OHS Plan provisions.

9.6.4 Capacity Building and Training

The proper implementation of the ESMP is highly dependent on the available existing capacity and awareness of the IIU,'s, the contractors' and the Supervising Engineer's staff, the surrounding community and the concerned stakeholders.

Training workshops are required to increase environmental 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.

9.6.4.1 Environmental Awareness Workshop

The IIU personnel and the contractors' 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 actual 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.

9.6.4.2 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 behavior expected on the environmental and social levels;
- Proper handling and storage of hazardous material and wastes;
- Spill contingency plans
- Accidents and emergency plans

This could be achieved by small workshops conducted during the construction phase for one or two days on a quarterly basis.

9.7 MANAGEMENT OF MITIGATION AND MONITORING

9.7.1 Mitigation and Monitoring Matrix

Table 9-2 lays out the arrangements for safeguarding the environment and society through the practical mitigation of identified impacts according to identified responsibilities, the monitoring of this and the identification of the measures to be taken, again with the defined responsibilities for action. This matrix forms the core of the ESMP, since it shows exactly what must be done, by whom, when and to what standard; and also it shows who will monitor its implementation, and when. The locations for the implementation of mitigation measures are summarized in Table 7-4.

All impacts and corresponding mitigations in this matrix strictly cover construction activities as per the scope of work assigned to the ESIA/ESMP team by the IIU. Operation and decommissioning impacts and mitigations should be covered in a separate ESIA/ESMP.

Table 9-2 Environmental mitigation and monitoring table, with responsibilities

Potential impacts	Mitigation measures	Responsibility for implementation	Standard to be met	Monitoring			
				Check timing	Responsibility for checking	Assessment of condition and additional cost	Action required
1. General Environmental Protection							
1.1 General environmental damage in the form of degraded land, lowered quality of living, reduced quality of resources, etc., mainly in the 28 communities along the road.	• Avoid damage to any part of the environment (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 Environmental and Social Safeguards Specialists	All standards and guidelines	• Before starting work. • Monthly during site operations. • After completion of site operations.	Supervising Engineer's Environmental and Social Specialists., supported by Contractor's Environmental and Social Safeguards Specialists	• Visual inspection • Documentation • To be completed at each check.	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.

Potential impacts	Mitigation measures	Responsibility for implementation	Standard to be met	Monitoring			
				Check timing	Responsibility for checking	Assessment of condition and additional cost	Action required
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 in the roadside areas of the 28 cities, towns and rural communities.	• 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 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.	Contractor's Environmental Safeguards Specialist	All standards and guidelines	• Monthly during site operations.	Supervising Engineer's Environmental Specialist., supported by Contractor's Environmental Safeguards Specialist	• Interviews with the site-workers • To be completed at each check.	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.
2. Environmental Health and Safety							
2.1 Injuries occur to the public, especially children, during works in the 28 communities along the road.	• Ensure full separation of the public from working sites. • Fence off working areas so that people cannot be injured by things dropped on them or falling into excavations. • 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	Contractor's OHS Specialist	Not applicable	• Before starting work. • Monthly during site operations • After completion of site operations.	Supervising Engineer OHS Specialist, supported by Contractor's OHS Specialist	• Visual inspection • Documentation • To be completed at each check.	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.

Potential impacts	Mitigation measures	Responsibility for implementation	Standard to be met	Monitoring			
				Check timing	Responsibility for checking	Assessment of condition and additional cost	Action required
2.2 Injuries occur to the public from exposure to hazardous substances (e.g. cement, diesel) in the 28 communities along the road.	• Ensure full separation of the public from storage facilities. • Enforce the exclusion of non-project personnel from all sites with hazardous substances. • Ensure Ambulance services are available for use in an emergency.	Contractor's OHS Specialist	Not applicable	• Before starting work. • Monthly during site operations. • After completion of site operations.	Supervising Engineer OHS Specialist, supported by Contractor's OHS Specialist	• Visual inspection • Documentation • To be completed at each check.	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.

Potential impacts	Mitigation measures	Responsibility for implementation	Standard to be met	Monitoring			
				Check timing	Responsibility for checking	Assessment of condition and additional cost	Action required
2.3 Infectious and contagious diseases are spread amongst the 28 communities near the road.	• 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 trainings 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.	Contractor's Site Manager, assisted by the Contractor's Social Safeguards Specialist and CLA	Not applicable	• Before starting work. • Weekly during site operations.	Supervising Engineer's Social Specialist, supported by Contractor's Social Safeguards Specialist	• Visual inspection • Documentation • Interviews with workers • To be completed at each check.	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.

Potential impacts	Mitigation measures	Responsibility for implementation	Standard to be met	Monitoring			
				Check timing	Responsibility for checking	Assessment of condition and additional cost	Action required
3. Occupational Health and Safety							
3.1 Workers are unaware of the dangers from the sites (roadline, quarries, batching plants etc.) they are working in, leading to high rates of injury.	• Ensure that workers are given safety inductions, toolbox talks and full daily and weekly briefings. • Develop a culture of admonishment for unsafe acts. • Obligate managers to set good examples for respecting safety on site.	Contractor's OHS Specialist	Not applicable	Weekly during site operations	Supervising Engineer OHS Specialist	• Interviews with workers • To be completed at each check.	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.
3.2 Injuries due to inadequate provision of safety equipment	• Provide all workers with safety equipment appropriate to the work that they are doing. • Do not allow workers on to a site unless they are wearing the appropriate safety gear. • 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 who know what to do if there is an accident and how to use the first aid kit.	Contractor's OHS Specialist	Guideline 9.9.1	Weekly during site operations.	Supervising Engineer OHS Specialist	• Visual inspection • Documentation • Interviews with workers • To be completed at each check.	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.

Potential impacts	Mitigation measures	Responsibility for implementation	Standard to be met	Monitoring			
				Check timing	Responsibility for checking	Assessment of condition and additional cost	Action required
4. Community Impacts Management							
4.1 Incoming workers do not respect local communities, leading to social disruption, particularly in the rural towns.	• Use and update the Stakeholder Engagement Plan and matrix • Employ local labour as much as possible. • Ensure that the Worker Code of Conduct is implemented (See 15.4) • 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.	Contractor's Social Safeguards Specialist and CLA	Guideline 9.9.4	Monthly during site operations.	Supervising Engineer's Social Specialist , supported by Contractor's Social Safeguards Specialist	• Interviews with staff • To be completed at each check.	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.
4.2 Houses and other structures (264 privately owned structures and 9 public structures according to RAP report) are lost in the road right of way.	• Pay the full and fair compensation as agreed following the procedures given in the Resettlement Action Plan. • Assist the affected persons to relocate and re-establish their lives and livelihoods. • Do not allow any work to commence on a site before full resettlement compensation has been completed and verified.	IIU's Community Liaison Assistants, supported by contractor's CLA	Resettlement Action Plan and ESS 5	• Before starting work.	IIU's Social Safeguards Specialist	• Documentation • To be completed at special checks before construction is permitted to start.	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.

Potential impacts	Mitigation measures	Responsibility for implementation	Standard to be met	Monitoring			
				Check timing	Responsibility for checking	Assessment of condition and additional cost	Action required
4.3 Loss of land use and business (106 businesses according to RAP report) sites in the road right of way, particularly in the cities.	• Pay the full and fair compensation as agreed following the procedures given in the Resettlement Action Plan. • Assist the affected persons to relocate and re-establish their livelihoods. • Do not allow any work to commence on a site before full compensation has been completed.	IIU's Community Liaison Assistants, y contractor's CLA	Resettlement Action Plan and ESS 5	• Before starting work. • Monthly during site operations.	IIU's Social Safeguards Specialist	• Visual inspection • Documentation • To be completed at each check.	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.
4.4 Cultivated land and crops (874 rubber trees and 8 farm owners according to RAP report) are disturbed or destroyed, mainly in the rural areas along the road and in the locations chosen for quarries, borrow areas, camps, batching plants, etc.	• Avoid the use of cultivated land wherever possible. This includes fallow agricultural land, rubber and other tree plantations. • Where use of such land is required, check with the IIU's Community Liaison Assistant (CLA) at last four weeks prior to commencement of activities (ideally earlier) that mitigation measures have been agreed and implemented. • Do not start using cultivated land before the occupier has fully agreed the compensation strategy, all amounts have been paid and this is confirmed by the CLA and verified. • Avoid damage crops or land beyond agreed boundaries.	Contractor's Site Manager, assisted by Contractor's Social Safeguards Specialist and CLA	Resettlement Action Plan and ESS 5	• Before starting work. • Monthly during site operations.	Supervising Engineer's Social Specialist, supported by Contractor's Social Safeguards Specialist	• Visual inspection • Documentation • To be completed at each check.	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.

Potential impacts	Mitigation measures	Responsibility for implementation	Standard to be met	Monitoring			
				Check timing	Responsibility for checking	Assessment of condition and additional cost	Action required
4.5 Local people's livelihoods are adversely affected by project activities (628 persons will be affected according the RAP report).	• Establish an equitable and fair employment strategy. Liaise with the CLA 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 who used to earn livelihoods on land in the RoW. • Pay the usual accepted County wage rates. • Do not demand unpaid work by local farmers or others.	Contractor's Site Manager, assisted by Contractor's Social Safeguards Specialist and CLA	Resettlement Action Plan and ESS 5	Monthly during site operations.	Supervising Engineer's Social Specialist, supported by Contractor's Social Safeguards Specialist	• Interviews with communities • To be completed at each check.	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.
4.6 Cumulative losses are incurred by social groups unable to respond to change. (60 vulnerable people according to RAP report)	• Give priority to local men and women in labour crews, and those who used to earn livelihoods on land in the RoW. • 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 local farmers or others.	Contractor's Site Manager, assisted by Contractor's Social Safeguards Specialist and CLA	Resettlement Action Plan and ESS 5	Monthly during site operations.	Supervising Engineer's Social Specialist, supported by Contractor's Social Safeguards Specialist	• Interviews with communities • To be completed at each check.	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.

4.7 Local communities (28) are not engaged and consulted in a satisfactory and timely manner or vulnerable groups are not included in community consultations.	• Revise, update and implement the Stakeholder Engagement Plan for the project. • MPW/ IIU (project team) to expand Social Safeguards team in relation to the increase in supervision and monitoring of contractors. Mandate each contractor to have a Social Safeguards Officer and a Community Liaison Officer in their core team. • Each contractor must have a Stakeholder Engagement Plan agreed with the project team specialists and coordinate with the project SEP. • MPW/ IIU (project team) monitor and supervise stakeholder engagement activities of contractors. • MPW/ IIU (project team) Social Safeguard Specialist undertake community information dissemination according to the SEP, conduct community meetings and undertake media activities to keep project information flowing effectively. • Social Safeguard Team to introduce contractors' specialists to communities and monitor and supervise contractors contacts with communities. All activities to be documented in the Stakeholder Engagement matrix for the project.	IIU Project Manager, IIU's Social Safeguards team	Stakeholder Engagement Plan and ESS 10	Monthly during site operations.	IIU's Social Safeguards Specialist	• Interviews with communities, including vulnerable groups. • To be completed at each check.	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.

Potential impacts	Mitigation measures	Responsibility for implementation	Standard to be met	Monitoring			
				Check timing	Responsibility for checking	Assessment of condition and additional cost	Action required
5. Traffic Management							
5.1 Use of public roads by project vehicles increases the accident rate and generates nuisance levels of dust: mainly the Tappita-Toe Town road, but also between it and other project infrastructure (camps etc.) and Monrovia.	• Minimise vehicle movements. • Enforce transport rules and regulations rigorously. • Conduct driving safety awareness campaigns. • 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.	Contractor's OHS Specialist	Not applicable	• Before start of work. • Monthly during site operations.	Supervising Engineer's OHS Specialist, supported by Contractor's OHS Specialist	• Visual inspection • Documentation • Interviews with workers • To be completed at each check.	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.

Potential impacts	Mitigation measures	Responsibility for implementation	Standard to be met	Monitoring			
				Check timing	Responsibility for checking	Assessment of condition and additional cost	Action required
5.2 Increased traffic on public roads, running at faster speeds, leading to more accidents and more serious accidents: on sections of the Tappita-Toe Town road as they are completed during construction.	• Maintain strict transport rules and regulations. • Undertake community safety awareness campaigns. • Undertake regular driving safety awareness campaigns to ensure safe driving. • Maintain close liaison with Liberian National Police traffic control units.	Contractor's OHS Specialist	Not applicable	• Monthly during site operations.	Supervising Engineer's OHS Specialist, supported by Contractor's OHS Specialist	• Visual inspection	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.

Potential impacts	Mitigation measures	Responsibility for implementation	Standard to be met	Monitoring			
				Check timing	Responsibility for checking	Assessment of condition and additional cost	Action required
6. Cultural Heritage Management							
6.1 Cultural sites are damaged (9 graves identified in the RAP), anywhere that new land is cleared, such as for diversions, camps, quarries and borrow areas.	• Check with local people, through the CLA, as to whether any activities will affect sites of cultural or religious importance, including roadside graves. • Avoid any works where cultural sites might be affected, as far as possible. • Ensure removal of graves using the process defined in the RAP. • If an unexpected archaeological site is discovered, use the chance find guideline. • If damage to cultural sites cannot be avoided, agree compensation measures with the local community, through the CLA.	Contractor's Site Manager, assisted by Contractor's Social Safeguards Specialist and CLA	Guideline 9.9.3	• Before starting work. • As required thereafter.	Supervising Engineer's Social Specialist, supported by Contractor's Social Safeguards Specialist and CLA	• Visual inspection • Documentation • Interviews with communities • To be completed at each check.	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.

Potential impacts	Mitigation measures	Responsibility for implementation	Standard to be met	Monitoring			
				Check timing	Responsibility for checking	Assessment of condition and additional cost	Action required
7. Hazardous Materials Management							
7.1 Pollution to air, soil or water and danger (illness or injury) from the delivery and handling of hazardous materials (including bitumen, mixed asphalt, fuels, lubricants and cement) at project camps, workshops, plants and construction sites.	• 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. • Maintain supplies of spill kits and granules in all vehicles and at all offloading locations. • Ensure competent drivers and close supervision. • Provide emergency training to all personnel involved in the movement and handling of hazardous materials. • Use international labelling for identifying hazardous substances. • Maintain emergency response / fire-fighting teams trained for a spillage event and appropriate equipment at each facility.	Contractor's Site Manager, assisted by Contractor's Environmental Safeguards Specialist	Guideline 9.9.13	• Before start of work. • Monthly during site operations.	Supervising Engineer's Environmental Specialist	• Visual inspection • Documentation • To be completed at each check	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.

7.2 Pollution to air, soil or water and danger (illness or injury) from fuel and oil storage at project stores and workshops.	• Follow the hazardous materials management guidelines fully. • 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 spillages. • Ensure that there is hard standing, with a drainage system that includes oil/water separators. • Ensure spill kits and granules are available, and if used, dispose of waste appropriately. • Check facilities, safeguards and procedures for any potential for explosions to occur. • Maintain emergency response / fire-fighting teams trained for a spillage event and appropriate equipment at each facility. • Provide training for all personnel handling fuel and oil. • Take rapid action if uncontained spills and leakages to occur, to prevent soil, and ground and surface water contamination • Do not allow soils to become contaminated and effectively sterilised, or for water courses to be affected by runoff carrying toxic substances, affecting	Contractor's Site Manager, assisted by Contractor's Environmental Safeguards Specialist	Guidelines 9.9.13 and 9.9.15	• Before start of work. • Monthly during site operations.	Supervising Engineer's Environmental Specialist	• Visual inspection • Documentation • Interviews with workers • To be completed at each check • Sampling of surface water, groundwater and/or soil when accidents occur.	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.

Potential impacts	Mitigation measures	Responsibility for implementation	Standard to be met	Monitoring			
				Check timing	Responsibility for checking	Assessment of condition and additional cost	Action required
	community water supplies, aquatic biodiversity and wildlife. • Have controls in place to minimise opportunities for fuel pilferage.						
7.3 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 management guidelines fully, which include procedures for refuelling vehicles and site plant. • 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 out according to strict protocols for refuelling in unprotected areas. • Enforce the reporting system for spillage incidents.	Contractor's Site Manager, assisted by Contractor's Environmental Safeguards Specialist	Guideline 9.9.15	• Before start of work. • Monthly during site operations.	Supervising Engineer Environmental Specialist and OHS Specialist	• Visual inspection • Documentation • To be completed at each check • Sampling of surface water, groundwater and/or soil when accidents occur.	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.
7.4 Pollution to air, soil or water and danger (illness or injury) from concrete and asphalt batching plants	• Follow the hazardous materials management guidelines fully. • Use of cement, ready-mix concrete, asphalt, etc. at plants is to be carried out according to strict protocols. • Enforce the reporting system for spillage incidents.	Contractor's Site Manager, assisted by Contractor's Environmental Safeguards Specialist	Guidelines 9.9.13 and 9.9.14	• Before start of work. • Monthly during site operations.	Supervising Engineer Environmental Specialist and OHS Specialist	• Visual inspection • Documentation • To be completed at each check • Sampling of surface water, groundwater and/or soil when accidents occur.	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.

Potential impacts	Mitigation measures	Responsibility for implementation	Standard to be met	Monitoring			
				Check timing	Responsibility for checking	Assessment of condition and additional cost	Action required
8. Construction Materials Management							
8.1 Damage to the land from borrow pits and quarries	• Identify borrow pits and quarry areas as early as possible, and conduct specific impact assessment and mitigation on these areas. • Allow adequate time for the consultation, resettlement and compensation of people whose land is affected. • Ensure that only the approved borrow pits and quarries are used. • Install sediment control measures to prevent runoff from causing contamination and siltation of water bodies • Take appropriate measures to prevent emissions and dust from affecting the ambient air quality outside the immediate site boundaries • Ensure proper geotechnical management so that excavation and tips do not trigger slope instability • All road construction-related activities are to be covered by the detailed, site specific and project specific components of the ESMP.	• Supervising engineer • Contractor's Site Manager, assisted by Contractor's Environmental and Social Safeguards Specialists.	Guidelines 9.9.2, 9.9.6 and 9.9.7	• Before start of work • Monthly during site operations. • After closure of quarries and pits.	Supervising Engineers Environmental and Social Specialists, supported by Contractor's Environmental and Social Safeguards Specialists	• Visual inspection • Documentation • Interviews with the communities • Air quality monitoring with meters • Weather monitoring • Slope stability testing • To be completed at each check • Total approximate cost for required equipment is US$ 95,000: air quality meters (2 handheld and 2 stationary) US$ 90,000 + weather stations (2 units) US$ 5,000.	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.

Potential impacts	Mitigation measures	Responsibility for implementation	Standard to be met	Monitoring			
				Check timing	Responsibility for checking	Assessment of condition and additional cost	Action required
8.2 Disturbance and danger from quarry operation – general	• Ensure that only the approved quarry areas are used throughout the re-opening and operation period. • Ensure quarry plans include drainage assessment and water management controls, to prevent the contamination and siltation of water bodies. • Maintain the quarry area in a clean, safe and efficient condition. • Ensure proper geotechnical management so that excavation and tips do not trigger slope instability. • Take appropriate measures to prevent excessive noise and emissions from crushers at road material quarries. • Rehabilitate the quarry to a fully stable and vegetated condition after work has ceased.	• Contractor's site manager • Contractor's Site Manager, assisted by Contractor's Environmental Safeguards Specialist and OHS Specialist	Standards 9.8.2 and 9.8.4	• Before start of work • Monthly during site operations. • After closure of quarries and pits.	Supervising Engineer OHS Specialist, supported by Contractor's Environmental Safeguards Specialist	• Visual inspection • Documentation • Interviews with the communities • Air quality monitoring with meters • Slope stability testing • To be completed at each check • Additional cost is covered under 8.1 above.	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.

Potential impacts	Mitigation measures	Responsibility for implementation	Standard to be met	Monitoring			
				Check timing	Responsibility for checking	Assessment of condition and additional cost	Action required
8.3 Disturbance and danger from quarry operation – explosives and blasting	• Obtain formal licensing from the government. • Abide by Liberian laws and regulations, and UNMIL guidelines, regarding the handling, storage and use of explosives. • Be particularly strict in enforcing safety regulations when using explosives. • Follow the detailed specifications for blasting provided in this ESMP. • Ensure that quarry blasting does not create excessive noise and vibration disturbance to wildlife and communities. • Do not allow any unauthorised person to have access to explosives. • Do not allow anyone to use welding equipment, smoke, cook food or light any fire within 50 metres of an explosives store.	Contractor's Site Manager, OHS, Environmental and Social Safeguards Specialists	Standards 9.8.4 and 9.8.5; Guidelines 9.9.18 and 9.9.19	• Before start of work. • Monthly during site operations.	Supervising Engineer OHS and Environmental and Social Specialists	• Visual inspection • Documentation • Interviews with the workers • Noise measurements • To be completed at each check. • Total approximate cost for required noise meter (1 unit) is US$ 10,000	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.

Potential impacts	Mitigation measures	Responsibility for implementation	Standard to be met	Monitoring			
				Check timing	Responsibility for checking	Assessment of condition and additional cost	Action required
9. Waste Management							
9.1 Pollution of soil or water and ill-health from waste generation and management at camps and construction sites.	• Operate a waste management strategy based on principles of reduction, recovery, recycle and reuse. • Collect and segregate waste into hazardous and non-hazardous at the source. • Avoid waste spills during storage and handling. • Dispose of all waste in an appropriate manner. • Conduct recycling and waste reduction campaigns. • Ensure use of PPE by staff when handling all forms of waste. • Ensure that waste collection, segregation, storage and disposal systems avoid environmental degradation, contamination, and hazards to human and animal health. • Do not allow an increase in disposable income among employees to create more waste, both quantity and type, without challenging perceptions.	Contractor's Site Manager, assisted by Contractor's Environmental Safeguards and OHS Specialist	Guideline 9.9.12	• Before start of work. • Monthly during site operations.	Supervising Engineer Environmental Specialist and OHS Specialist	• Visual inspection • Documentation • Interviews with the workers • To be completed at each check	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.

Potential impacts	Mitigation measures	Responsibility for implementation	Standard to be met	Monitoring			
				Check timing	Responsibility for checking	Assessment of condition and additional cost	Action required
9.2 Pollution of soil or water and ill-health from waste disposal at camps.	• Dispose of wastes in the most environmentally sound manner possible. • Never burn waste, creating air pollution. • Dispose of wastes to EPA-authorised facilities. • If there are no alternatives, design and construct a landfill site that is lined and to international standards. This should be in an area that is not prone to slippage, cannot leach to surface water and groundwater, and is a suitable distance from settlement. It should be located down gradient of any water supply boreholes. • Ensure that the landfill site is in a secure compound and that its operation conforms to international standards. • Deal with hazardous waste according to international best practice and EPA guidelines.	Contractor's Site Manager, assisted by Contractor's Environmental Safeguards Specialist	Guideline 9.9.12	• Before start of work. • Monthly during site operations. • After completion of site operations	Supervising Engineer Environmental Specialist	• Visual inspection • Documentation • To be completed at each check	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.

Potential impacts	Mitigation measures	Responsibility for implementation	Standard to be met	Monitoring			
				Check timing	Responsibility for checking	Assessment of condition and additional cost	Action required
9.3 Pollution of soil or water from poor sanitation at work sites – camps and construction sites.	• 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. • 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 tool box talks	Contractor's Site Manager, assisted by Contractor's Environmental Safeguards Specialist	Guideline 9.9.17	Monthly during site operations.	Supervising Engineer Environmental Specialist	• Visual inspection • Documentation • To be completed at each check	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.
9.4 Pollution of soil or water from site camps and stores.	• Ensure that all potentially hazardous materials (i.e. fuel, oil, other chemicals, sewage) are stored or disposed of in appropriate ways. • Devise on-site emergency spillage plans and train staff in their implementation. • Remove all debris and litter from site. • Take active measures to prevent pollution to the soil or water courses.	Contractor's Environmental Safeguards Specialist	Guideline 9.9.17	• Before starting work. • Monthly during site operations. • After completion of site operations.	Supervising Engineer Environmental Specialist	• Visual inspection • Documentation • Interviews with housekeeping staff • To be completed at each check	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.

Potential impacts	Mitigation measures	Responsibility for implementation	Standard to be met	Monitoring			
				Check timing	Responsibility for checking	Assessment of condition and additional cost	Action required
10. Soil Erosion Control							
10.1 Erosion and physical damage of soils and earthworks – all construction sites, camps and ancillary infrastructure areas.	• Only disturb the soil where it is necessary to do so for the agreed works. • Use existing tracks and previously disturbed areas as far as possible. • Do not make access tracks wider or other cleared areas larger than is absolutely necessary. • Do not allow erosion to happen without taking rapid control measures: install erosion and sediment controls as the very first physical site activity. • Grade any newly formed slopes to the minimum angle possible. • Cut slopes to grades appropriate to the material found. • Level surfaces to prevent erosion as soon as works have been completed. • Keep earth piles away from the edges of steep slopes and watercourses. • Allow small plants to grow back on the edges of tracks. • Where it is present, top soil to a depth of 200 mm should be removed and stockpiled for later site restoration use. • Undertake soil erosion and sediment controls as necessary, to	Contractor's Site Manager, assisted by Contractor's Environmental Safeguards Specialist	Guidelines 9.9.6, 9.9.8, 9.9.9, 9.9.10, 9.9.11	• Before starting work. • Monthly during site operations. • After completion of site operations.	Supervising Engineer Environmental Specialist	• Visual inspection • Documentation • To be completed at each check	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.

Potential impacts	Mitigation measures	Responsibility for implementation	Standard to be met	Monitoring			
				Check timing	Responsibility for checking	Assessment of condition and additional cost	Action required
	protect areas from slips and erosion. All soil slopes steeper than 10° must be revegetated. • Avoid compaction of the soil in temporary use areas by limiting machine and vehicle access. • Deep-rip compacted soil using the tines on a bulldozer at the start of site rehabilitation.						

Potential impacts	Mitigation measures	Responsibility for implementation	Standard to be met	Monitoring			
				Check timing	Responsibility for checking	Assessment of condition and additional cost	Action required
11. Water Resources Management							
11.1 Damage to water resources by pollution with sediment or chemicals in runoff in any of the 3 major watercourses and many minor creeks crossed by the road, or nearby wetlands and water supply boreholes.	• Do not dispose of anything into any kind of water body. • Keep earthworks, tracks and other cleared areas as far as possible from watercourses or bodies. • Where earthworks, tracks, roads and other cleared areas are within 50 metres of watercourses or bodies, take special care to ensure that fuel, oil and other hazardous substances, and any earthworks, are properly contained. • Ensure that all community water supplies are safeguarded. Confirm the location of local water supplies with the CLO. Be prepared to bring inn 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. • Schedule major earthworks only in the dry season. • Use surface protection measures to control soil erosion and protect watercourses. • Regulate water discharge and run off using sediment ponds. • Monitor downstream water quality routinely.	Contractor's Site Manager, assisted by Contractor's Environmental Safeguards Specialist	Standard 9.8.3	• Before starting work. • Monthly during site operations. • After completion of site operations.	Supervising Engineer Environmental Specialist	• Visual inspection • Documentation • Interviews with the communities • Surface water monitoring • Groundwater monitoring • To be completed at each check. • Total approximate cost for required water quality monitoring equipment (4 multiparameter trolls) is US$ 60,000	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.

Potential impacts	Mitigation measures	Responsibility for implementation	Standard to be met	Monitoring			
				Check timing	Responsibility for checking	Assessment of condition and additional cost	Action required
11.2 Pollution by entrained sediment from poor drainage systems entering any of the 3 major watercourses and many minor creeks crossed by the road, or nearby wetlands and water supply boreholes	• Provide culverts wherever water needs to flow across the road or an access track. • Ensure water from culverts and other drains is discharged at low energy via drop structures and aprons. • Avoid long gaps between culverts or turnouts, so that a lot of water flow builds up. • Make temporary drains as necessary to avoid waterlogging or erosion. These must be adequate for accumulated runoff water as well as rainfall. • Discharge drains into well vegetated areas. Provide mini silt collection ponds if drains must discharge straight into water courses. Never allow sediment from bare eroding surfaces to be washed into water courses.	Contractor's Site Manager, assisted by Contractor's Environmental Safeguards Specialist	Standard 9.8.3	• Before starting work. • Monthly during site operations. • After completion of site operations.	Supervising Engineer Environmental Specialist	• Visual inspection • Documentation • Surface water monitoring • To be completed at each check. • Additionnal cost is covered under 11.1 above.	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.

Potential impacts	Mitigation measures	Responsibility for implementation	Standard to be met	Monitoring			
				Check timing	Responsibility for checking	Assessment of condition and additional cost	Action required
12. Air Emissions Management							
12.1 Dust from construction sites and access tracks to ancillary infrastructure affects local communities and crops	• Enforce dust control measures during the dry season. • Enforce strict speed limits on earth tracks by placing speed bumps. • Spray water on to dry earth surfaces. • Stop work in very windy, dry weather. • Fit crushers with water sprays.	Contractor's Site Manager, assisted by Contractor's Environmental Safeguards Specialist	Standard 9.8.2	Monthly during site operations.	Supervising Engineer Environmental Specialist	• Visual inspection • Documentation • Air quality monitoring using dust meters • To be completed at each check. • Additional cost is covered under 8.1 above.	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.
12.2 Exhaust fumes affect local communities close to the road and all project ancillary infrastructure.	• Use only vehicles and equipment with engines that comply with national emissions standards. • Maintain engines in good working order.	Contractor's Site Manager, assisted by Contractor's Environmental Safeguards Specialist	Standard 9.8.2	Monthly during site operations.	Supervising Engineer Environmental Specialist	• Visual inspection • Documentation • Air quality monitoring using gas analysers • To be completed at each check. • Additional cost is covered under 8.1 above.	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.
13. Ecological Management Plan							
13.1 Vegetation other than invasive species (i.e. both natural plants and farm plants) is damaged or destroyed	• Prior to the commencement of the project, conduct floral biodiversity studies to identify endemic, endangered, threatened or vulnerable floral species as per the IUCN redlist as well as critical and natural habitats -as defined in the	Biodiversity studies and preparation of the BMP is the responsibility of the IIU Environmental Safeguards Officer. Implementation of the BMP is the	ESS 6 and Guideline 9.9.2	• Before starting work. • Monthly during site operations. • After completion	Supervising Engineer Environmental and Social Specialists	• Visual inspection • Documentation • To be completed at each check.	Only to be completed at check if compliance is not satisfactory. State who is

Potential impacts	Mitigation measures	Responsibility for implementation	Standard to be met	Monitoring			
				Check timing	Responsibility for checking	Assessment of condition and additional cost	Action required

unnecessarily – beyond the agreed boundaries, particularly natural plants in the forested sections along the road.	world bank's ESS6- at all project sites.
	• If critical habitats are identified:
	  ○ prepare a Biodiversity Management Plan (BMP) that includes floral species identified in the floral biodiversity surveys, 3 months prior to the start of construction.
	  ○ Implement the BMP throughout the lifetime of the project.
	• Only cut vegetation that is in the way. This means plants that are in the direct area required for the agreed works.
	• Do not cut any more vegetation than is necessary for site access and working.
	• Do not use fire to remove vegetation.
	• Do not burn cut vegetation.
		responsibility of the IIU's, the contractor's and the Supervising Engineer's Environmental and Social Safeguards Specialists		of site operations.			responsible for action.

Potential impacts	Mitigation measures	Responsibility for implementation	Standard to be met	Monitoring			
				Check timing	Responsibility for checking	Assessment of condition and additional cost	Action required

13.2
Increased but poorly controlled exploitation of forest resources, including NTFPs, as a result of improved road access, particularly natural plants in the forested sections along the road.
	• Prior to the commencement of the project, conduct floral biodiversity studies to identify endemic, endangered, threatened or vulnerable floral species as per the IUCN redlist as well as critical and natural habitats -as defined in the world bank's ESS6- at all project sites.
	• If critical habitats are identified:
	  ○ prepare a Biodiversity Management Plan (BMP) that includes floral species identified in the floral biodiversity surveys, 3 months prior to the start of construction.
	  ○ Implement the BMP throughout the lifetime of the project.
	• Instruct workforce not to collect or purchase NTFPs on site or in local markets.
	• Avoid all use of fire.
	• Provide workers with food from domesticated plants when they are living in places where there is no market source of it.
		Biodiversity studies and preparation of the BMP is the responsibility of the IIU Environmental Safeguards Officer. Implementation of the BMP is the responsibility of the IIU's, the contractor's and the Supervising Engineer's Environmental and Social Safeguards Specialists	ESS6 and Guideline 9.9.2	• Before starting work.
				• Monthly during site operations.
				• After completion of site operations.
					Supervising Engineer Environmental and Social Specialists	• Visual inspection
						• Documentation
						• To be completed at each check.
							Only to be completed at check if compliance is not satisfactory. State who is responsible for action.

13.3 Wild animals other than very common or non-native pest species are killed, particularly in the forested sections along the road.	• Prior to the commencement of the project, conduct faunal biodiversity studies to endemic, endangered, threatened or vulnerable faunal species as per the IUCN redlist including mammals, birds, fish, amphibians, reptiles, important invertebrates, such as endemic, endangered butterflies, etc. as well as critical and natural habitats -as defined in the world bank's ESS6- at all project sites. • If critical habitats are identified: o prepare a Biodiversity Management Plan (BMP) that includes faunal species identified in the floral biodiversity surveys, 3 months prior to the start of construction. o Implement the BMP throughout the lifetime of the project. • Instruct workforce not to hunt, deal in or transport bushmeat on site. • Provide meat from domestic animals if there is no alternative. • Avoid all use of fire. • Provide workers with workers meat from domesticated animals when they are living in places	Biodiversity studies and preparation of the BMP is the responsibility of the IIU Environmental Safeguards Officer. Implementation of the BMP is the responsibility of the IIU's, the contractor's and the Supervising Engineer's Environmental and Social Safeguards Specialists	ESS 6 and Standard 9.8.1	Monthly during site operations.	Supervising Engineer Environmental and Social Specialists, supported by Contractor's Environmental and Social Safeguards Specialists	• Visual inspection • Documentation • Interviews with workers • To be completed at each check.	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.

Potential impacts	Mitigation measures	Responsibility for implementation	Standard to be met	Monitoring			
				Check timing	Responsibility for checking	Assessment of condition and additional cost	Action required
	where there is no market source of it.						
14. Noise and Vibration Management							
14.1 Noise disturbance at excessive levels from construction activities, quarries, borrow areas and batching plants.	• Minimise site-generated noise to the greatest possible extent. • Do not allow works to occur during the hours of darkness (6 pm to 6 am), on Sundays and religious holidays, other than in exceptional circumstances (such as casting bridge slabs). • Provide warnings of blasting, starting at least 24 hours ahead, and ensure no one is within the 500-metre clearance zone. • Provide communities, through the CLO, with details of the works programme. • Do not deviate from the agreed timing of works. • Provide all site workers exposed to noise over 70 dB(A) with ear protection. • Do not allow any person to come close to a machine without having ear protection in place.	Contractor's Site Manager, assisted by Contractor's Environmental and Social Safeguards Specialists	Standard 9.8.4	• Before starting work. • Monthly during site operations.	Supervising Engineer Environmental and Social Specialists, supported by Contractor's Environmental and Social Safeguards Specialist	• Visual inspection • Documentation • Interviews with workers • Interviews with communities • Noise measurements • To be completed at each check. • Additional cost is covered under 8.3 above.	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.

Potential impacts	Mitigation measures	Responsibility for implementation	Standard to be met	Monitoring			
				Check timing	Responsibility for checking	Assessment of condition and additional cost	Action required
14.2 Vibration disturbance causes stress and damage to buildings, either from trucks and machines on construction sites and access tracks, or from quarry operations.	• Minimise heavy truck and machine operations within 200 metres of buildings. • During blasting operations, ensure staggered charge sequences to minimise ground vibrations and air overpressure. • Provide warnings of blasting, starting at least 24 hours ahead, and ensure no one is within the 500-metre clearance zone.	Contractor's Site Manager, OHS, Environmental and Social Specialists	Standard 9.8.5	• Before starting work. • Monthly during site operations.	Supervising Engineer OHS, Environmental and Social Specialists	• Visual inspection • Documentation • Interviews with communities • To be completed at each check.	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.

Potential impacts	Mitigation measures	Responsibility for implementation	Standard to be met	Monitoring			
				Check timing	Responsibility for checking	Assessment of condition and additional cost	Action required
15. Employment Issues and Grievances Management							
15.1 Conditions of employment are unfair to or unequal among workers.	• **Contractor to prepare and implement a Labour Management Plan in accordance with the IIU's Labour Management Procedures.** • Ensure that written conditions of contract are checked by the MPW/ IIU Social Safeguards Specialist (SSS) 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 Labour Law 2011 and/or the Bank's ESS2, whichever more stringent. • The contract has to specify a Worker Code of Conduct and the penalties for contravention.	The IIU's and Contractor's Social Specialists	Guidelines 9.9.20	• Before starting work. • Quarterly during site operations.	Supervising Engineer Social Specialist	• Documentation and evidence of signed copies. • Interviews with workers. • To be completed at each check.	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.

Potential impacts	Mitigation measures	Responsibility for implementation	Standard to be met	Monitoring			
				Check timing	Responsibility for checking	Assessment of condition and additional cost	Action required
15.2 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; and /or Vulnerable groups are excluded from employment. -	• **Contractor to prepare and implement Labour Management Plan in accordance with the IIU's Labour Management Procedures.** • 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's Site Manager, assisted by Contractor's Social Safeguards Specialist and CLA and the IIU's Social Safeguards Team	9.9.21	• Before starting work. • Quarterly during site operations	Supervising Engineer's Social Specialist, supported by Contractor's Social Safeguards Specialist	• Visual inspection • Documentation • Interviews with communities and workers • To be completed at each check.	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.

Potential impacts	Mitigation measures	Responsibility for implementation	Standard to be met	Monitoring			
				Check timing	Responsibility for checking	Assessment of condition and additional cost	Action required
15.3 Workers are unable to redress their grievances.	• Contractor to have in place an internal grievance process 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 as noted in Section 6.4, to lead investigations of allegations of sexual harassment and gender- based violence.	Contractor's Site Manager, assisted by Contractor's Social Safeguards Specialist and CLA and the IIU's Social Safeguards Specialist	World Bank ESS2	• Before starting work. • Quarterly during site operations	Supervising Engineer's Social Specialist, supported by Contractor's Social Safeguards Specialist	• Documentation (Employee GRM) • Interviews with workers • To be completed at each check.	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.
16. Worker Behaviour Management							
16.1 Workers' behaviour is inappropriate or disrespectful of other workers or local community members, especially of women.	• Contractor to design and implement a Worker Code of Conduct that has to be signed by employees on recruitment. • Full time and temporary labour have to read and sign the Code of Conduct. • Each employee must be given a signed copy. • The Contractor must reinforce these requirements through briefings, trainings and toolbox talk.	Contractor's Site Manager, assisted by Contractor's Social Safeguards Specialist and CLA and the IIU's Social Safeguards Team	World Bank ESS2 and Employment and Labour Law 2011	• Before starting work. • Quarterly during site operations	Supervising Engineer's Social Specialist, supported by Contractor's Social Safeguards Specialist and CLA	• Visual Inspection • Documentation (Community GRM). • Interviews with communities. • To be completed at each check.	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.

Potential impacts	Mitigation measures	Responsibility for implementation	Standard to be met	Monitoring			
				Check timing	Responsibility for checking	Assessment of condition and additional cost	Action required
16.2 Sexual exploitation and gender-based violence increase in the 28 local communities, particularly the rural towns due to the influx of temporary laborers	• 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 recognises confidentiality of complainants. • Include awareness raising on these issues in trainings and site briefings. • Publicise the GRM process. • Ensure complainants receive support. • Operate the Mitigation measure 15.3 above.	Contractor's Site Manager, assisted by Contractor's Social Safeguards Specialist and CLA and the IIU's Social Safeguards Team.	Guideline 9.9.4	• Before starting work. • Monthly during site operations.	Supervising Engineer Social Specialist, supported by Contractor's Social Safeguards Specialist	• Visual Inspection • Documentation (Community GRM). • Interviews with communities. • To be completed at each check.	Only to be completed at check if compliance is not satisfactory. State who is responsible for action.

9.7.2 Consolidation of Biological Information

As frequently occurs in Liberia, the biological investigations undertaken in the preparation of the ESIA revealed potentially high rates of biodiversity found quite close to the project sites, and the chance that rare species might remain in or pass through the road corridor. The environmental baseline given in chapter 6 shows that further primary data collection is required to create a more robust management plan for biodiversity than can be achieved with current knowledge. The information on faunal and floral species in the region is limited. Field surveys must therefore be conducted in order to provide a stronger baseline on key aspects of both flora and fauna along the road corridor. The topics to be covered include the following.

- A rapid review of botanical assemblages close to the road reserve to ensure that no Black Star or Gold Star species of trees will be affected by the project. Reference material for this will be: Woody Plants of Western African Forests (A Guide to the Forest Trees, Shrubs and Lianes from Senegal to Ghana) by W. Hawthorne and C. Jongkind, published in 2006 by the Royal Botanic Gardens, Kew, London.

- Structured observations of the extent of dust coverage on the leaves of bush, forest and agricultural plants in transects perpendicular to the road. There is no reference for this, but the consultant should devise a simple survey format and undertake a transect approximately every 5 km along the road.

- A survey of NTFP usage, and bushmeat hunting and consumption in the road reserve, to follow up on specific questions from the biological perspective that remain unanswered by the socio-economic surveys under this ESIA. This should particularly focus on the species involved, their prevalence and the approximate offtake in collection and hunting. The socio-economic baseline section (6.3) of the draft ESIA provides some background. A series of semi-structured interviews should be held in a sample of rural towns and villages to ascertain more information about bushmeat.

- A fauna and flora biological assessment of a series of representative sample locations should be undertaken to identify key fauna and flora species in the different areas of land cover crossed by the Tappita-Toe Town road as well as in potential quarries and borrow pit locations. The assessment should cover the presence of IUCN redlist identify endemic, endangered, threatened or vulnerable species including and identify the occurrence of critical and natural habitats. The faunal assessment should include large and small mammals (e.g. bats, etc.), birds, fish, reptiles, amphibians, important and endemic invertebrate and insects such as dragonflies, damselflies, butterflies.

- Special surveys should be conducted to assess the presence of the the western chimpanzee, *Pan troglodytes verus*.

- Particular surveys to assess the likelihood of encountering Nimba otter shrews in the

watercourses crossed by the road. The reference document for this is ArcelorMittal's 2013 document *Conservation Status of the Nimba Otter Shrew Micropotamogale lamoteii (Afrosoricida) within the ArcelorMittal Concession*.

- Surveys of selected invertebrate species as indicators of habitat quality at a series of representative locations along the road section and at potential quarries and borrow pit locations. This might use the jewelwings of the closely related genera Sapho and Umma, which offer a simple way to monitor stream condition, as the four species are conspicuous, easy to identify and indicate discrete ecological conditions. The reference for this is ArcelorMittal's 2011 report *Dragonfly and Damselfly Survey of the ArcelorMittal Concession, Yekepa, Liberia)*.

These focal areas must be developed into the scope of work for a further biological survey and published as an addendum to the ESIA. It will then be used to inform the interventions under this ESMP, refine the mitigation activities and define whether a Biological Management Plan is required. The surveys should cover both dry and rainy seasons to allow the understanding of the impact of seasonality. The scope of work for the proposed biodiversity studies should also include consultation with stakeholders relevant to wildlife.

Inventory of forest trees. The number of forest trees that will need to be cleared by the project is not yet known. These are native, naturally growing trees rather than planted crop trees such as rubber. The reason for this gap in knowledge at ESIA stage is that all the details of landtake are not yet determined. Forest trees might need to be cleared for a number of reasons: (a) to clear areas in the right of way that have never been cleared before, but now require it for the upgrading of the road; (b) to clear land for ancillary infrastructure, such as camps, quarries, etc.; and (c) to clear land for access tracks to ancillary infrastructure. In practice it is unlikely that the number of forest trees to be felled in the right of way will be significant, but the ancillary infrastructure may have greater impact.

A detailed inventory of the forest trees must therefore be undertaken once the contractor has finalised the land required for ancillary infrastructure and this has been approved by the IIU. This listing must be completed and felled trees must be compensated by planting other trees in consultation with the local communities. Additional mitigation measures agreed should be added to the ESMP if those already included in this ESMP are deemed to require enhancing. The IIU will review the inventory and any additional mitigation measures before giving approval for any land clearance.

9.7.3 Environmental and Social Reporting

In order to ensure the effectiveness of the environmental monitoring plan, monthly environmental monitoring reports will be prepared by the contractor and sent to the Supervising Engineer for review. The reports should be reviewed and approved by the IIU.

Quarterly monitoring reports will be sent to the EPA and a compilation of these reports must be sent to the World Bank every six months, as part of the overall progress reports.

Every 6 months an integrated Environmental, Social and Health and Safety Audit should be carried out by an independent Auditor to present the results of the monitoring activities carried out throughout the construction phase and evaluate the adequacy of environmental control measures.

Each monitoring report 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 sampling operations for surface water, groundwater, soil, air, noise and slopes. 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 exceed standards, when they occur.

In case of complaints, non-compliance and/or standards being exceeded, notifications will be issued to the contractor in order to take specific immediate corrective actions.

9.7.4 Grievance Redress Mechanism

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.

9.7.4.1 Internal Process

The process for responding to a complaint within the contractor is described in Table 9-3.

Table 9-3 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 Social Safeguards Specialist (SSS), Community Liaison Assistant (CLA) or Contractor or sub-Contractor employee	Day of receipt	All complaints are registered into the matrix The receiving person must ensure that all the facts: • Complainant(s), group, body • Details of the complaint • Accompanying papers if any • Date and place of complaint delivery Are recorded on the complaint matrix form
2. Forwarding the complaint	The recipient of the complaint	Day of receipt	The complaint materials and complaint details form should be forwarded to the Construction Manager depending on site and nature of the complaint
3. Allocating responsibility for investigation	Site Manager	Within 24 hours of receipt	The Construction Manager will allocate responsibility to a named team member – usually the CLA - for leading the investigation, setting the time frame for response and analysing the facts
4. Recording the Process	Responsible Investigator (SSS or CLA)	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 SSS/CLA is responsible for keeping records of such complaints on the stakeholder engagement grievance matrix and including details in monthly reports.
5. Contacting the complainant	Responsible Investigator (CLA)	Within 48 hours of receipt by Responsible Investigator	The designated investigator 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 CLA can lead or assist.
6. Determination of the facts	Responsible Investigator (CLA)	Within 14 days	The responsible investigator must conduct a balanced inquiry into the allegations bearing in mind the rights, responsibilities and obligations of all parties. The investigator shall record the facts and outline appropriate lines of action and report to the Construction manager.
7. Agreeing on action	Construction Manager	7 days of receipt of report	The Construction Manager will determine the response required, agree actions to be taken and assign responsibility for implementation and for communication of the result to the complainant
8. Informing the complainant	Nominated Informing Officer (CLA)	Within 48 hours of instruction	The nominated informing officer will contact the complainant and inform them of the outcome of the complaint. Where action is

Step	Responsibility	Timeframe	Action
		from the Construction Manager	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	Nominated Informing Officer/ CLA	14 days	In the event that the complainant is unsatisfied with the analysis or outcome, the complaint should be referred to the Community Liaison Assistants to assist in negotiations. The issue may well be escalated to discussion with the Community, District and County Grievance Redress Committees if no local resolution is possible.
10. Implementing action	Nominated Informing Officer/ CLA/ contractor unit	14 days from agreement by Construction Manager	The officer, contractor 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	Nominated Informing Officer/ CLA	7 days	The nominated informing officer is responsible for following up with the complainant to ascertain satisfaction with the works and for informing the Construction Manager if the remedial action is unacceptable.
12. Monitoring and evaluating the outcome	CLA	After follow up	Responsibility for monitoring and evaluating the outcome of the Grievance Process is by the CLA and recorded in the Stakeholder Engagement Matrix by the CLA and included in that Department's reporting.
13. Ensuring transparency through the Stakeholder Engagement Policy	Site Manager	Monthly report	The Manager will ensure transparency in making the process and outcome of the complaint investigation transparent and making public the findings using appropriate media.

9.7.4.2 External Process

In general, the process for resolving a complaint has a number of tiers, the last of which, Tier 5, is entry into the judicial system. At all levels, the complainant can include witnesses or traditional authorities or an NGO or other civil society representative to assist and support them. It is in every person's interest to avoid the complaint being escalated to the High Court as this involves costs and delays to all proceedings. Once a plot of land is subject to a legal action, no work can take place on that plot.

- *Tier 1* Complainant discusses the issue with the CLA and sees if detailed explanation can resolve the complaint.
- *Tier 2* Complainant and CLA discuss with the Site Manager to seek a resolution.
- *Tier 3* Complainant and CLA can discuss with the Community, District or County level Grievance committee.
- *Tier 4* Complainant can escalate the issue to County Superintendent's Office who will delegate an enquiry to the County Officers to investigate and resolve if the issue is not related to construction. If a complaint is of a sufficiently serious and extensive nature, the County Superintendent can call the Grievance Committee consisting of line ministry Officers of the County and includes a Civil Society representative.
- *Tier 5* Complainant can file a complaint with the High Court.

9.7.4.3 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.

9.7.4.4 Monitoring

It is the responsibility of the IIU to monitor the nature of complaints and outcomes/ resolutions on a monthly basis as part of the normal reporting process. It is very common for local NGOs and CBOs (Community Based Organisations) to voluntarily monitor construction projects and to present themselves as intermediaries. If the management structure is aware of the complaints coming in, making measured responses that can be proven is vital. It is likely that the Counties Offices and Development Superintendents will come to discuss grievances and like to be aware of resolutions.

9.8 REFERENCE STANDARDS

9.8.1 Bushmeat Hunting, Dealing, Transporting and Use

9.8.1.1 Statutory Regulations

The Draft Hunting Regulations of Liberia, drawn up under the National Forestry Law (2006) proposed the following provisions.

1. A person with a valid hunting license issued by the Forestry Development Authority may hunt during the Open Hunting Season, from 1 October to 31 March.
2. No hunter may take more than 3 wild animals per week.
3. No bush meat trader may carry more than 20 pieces (quarters) of meat at a time.

9.8.1.2 Permitted Bushmeat

No person is permitted to hunt for bushmeat on project land, including the road right-of-way.

The legally permitted take per licensed hunter on non-project land of common non-protected species is in Table 9-4.

Table 9-4 Legally Permitted Take Per Licensed Hunter

Animal	Number per week
Black deer (black duiker)	2
Blue tongue (Maxwell's duiker)	2
Red deer (bush buck)	1
Black backed (bay duiker)	2
Porcupine (crested porcupine)	3
Hedge hog (brush-tailed porcupine)	3
Ground hog (cane rat)	3
Opossum (giant rat)	3
Ground squirrel	3

9.8.1.3 Prohibited Bushmeat

The following animals are fully protected and may not be hunted at all. All project staff and contractors' employees are absolutely forbidden from hunting, dealing in, transporting and using these animals or any products associated with them (including eggs).

1. Baboon (West African chimpanzee)
2. Ant bear (tree pangolin)
3. King monkey (black and white colobus)
4. Sea cow (West African manatee)
5. Red monkey (red colobus)
6. Alligator (Nile crocodile)
7. Olive colobus
8. Alligator (African slender-snouted crocodile)
9. Diana monkey
10. Crocodile (African dwarf crocodile)
11. Jackal (sooty mangabey)
12. Boa constrictor (rock python)

13. Lesser galago	14. Boa constrictor (ball python)
15. Clawless otter	16. All sea turtles
17. Bosman's potto	18. All birds of prey (ospreys, falcons, buzzards, kestrels)
19. Forest elephant	20. All hornbills
21. Elk deer (bongo)	22. Bare-headed rockfowl
23. Bush galago (Demidoff's dwarf galago)	24. Grey-necked rockfowl
25. Black back (Ogilby's duiker)	26. White-necked rockfowl
27. White antelope (Jentink's duiker)	28. Guineafowl (white-breasted guineafowl)
29. Marking deer (zebra duiker)	30. Little egret
31. Water deer (water chevrotain)	32. Cattle egret
33. Water cow (pygmy hippopotamus)	34. Secretary bird
35. Leopard	36. Jabiru or saddle bill
37. Liberian mongoose	38. Sacred ibis
39. Bush cat (golden cat)	40. Hadada
41. Big ant bear (giant pangolin)	42. Goliath heron
43. Ant bear (long-tailed pangolin)	

9.8.1.4 Partially Protected Animals

The following animals are fully protected between 1st August and 1st December in any year and may not be hunted during this period. The young and adults with young of these species are fully protected at all times. All project staff and contractors' employees are absolutely forbidden from hunting, dealing in, transporting and using these animals or any products associated with them (including eggs) except in accordance with these rules.

1. Mona monkey	2. Serval
3. Lesser spot-nosed monkey	4. African civet
5. White coloured mangabey	6. Two spotted palm civet
7. Bush cow (forest buffalo)	8. African python
9. Yellow back (yellow-backed duiker)	10. All turacos
11. Tricky jack (royal antelope)	12. All bushfowl
13. Bay duiker	14. Stone partridge
15. Red hog (red river hog)	16. All parrots
17. Black hog (giant forest hog)	18. All doves and pigeons
19. Forest genet	20. Hartlaub's duck
21. Bush genet	22. White faced duck
23. Wild cat	24. Fulvous duck
25. Gambian mongoose	26. Pygmy goose
27. Side striped jackal	28. Knob billed goose
29. Lynx	

9.8.2 Standard for Air Pollution Prevention and Control

9.8.2.1 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, ore bunkers, 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, quarry benches and other working areas 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 metres 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.

9.8.2.2 Ambient Air Quality Tolerance Limits

Operations involving any dust- or gaseous-generating activity must not exceed the standards given in Table 9-5 and Table 9-7. 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.

Table 9-5 and Table 9-7 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.

Table 9-5 International Ambient Air Quality Standards

Pollutant	Averaging period	Standard	Standard derivation	Sources
Dust deposition	30 days	600 mg/m²/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/m³ (99th percentile)	IFC (adopted from WHO Guidelines, Interim Target 1)	Earthworks and quarry operations, vehicle exhausts, power generation
	Annual mean	70 µg/m³		
$PM_{2.5}$	24 hours	75 µg/m³ (99th percentile)		
	Annual mean	35 µg/m³		
Nitrogen dioxide (NO_2)	1 hour	200 µg/m³	IFC (adopted from WHO Guidelines)	Vehicle exhausts, power generation
	Annual mean	40 µg/m³		
Sulphur dioxide	10 min mean	500 µg/m³	IFC (adopted from WHO Guidelines)	Heavy plant
	24 hours	125 µg/m³	IFC (adopted from WHO Guidelines, Interim Target 1)	
Carbon monoxide	8 hours	10 mg/m³	IFC (adopted from WHO Guidelines)	Vehicle exhausts, power generation

PM_{10} and $PM_{2.5}$ are fine particulate matter with an aerodynamic diameter of less than 10 and 2.5 micrometres respectively.

Table 9-6 National Ambient Air Quality Standards (Source: adapted from EPML- Air Quality and Standards Regulations, 2009)

No.	Pollutant	Time weighted average	Industrial areas	Residential, rural and other areas	Controlled areas***
1.	Sulphur oxides (SO_X)	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 50µg/m3	
		24 Hours		0.048ppm 125µg/m³	
		Instant Peak		500 µg/m³	
		Instant Peak (10 min)		0.191 ppm	
2.	Nitrous Oxides (NO_X)	Annual Average*	80 µg/m³	60 µg/m³	15 µg/m³
		24 hours**	120 µg/m³	80 µg/m³	30 µg/m³
		Annual Average		0.2 ppm	
		Month Average		0.3 ppm	

No.	Pollutant	Time weighted average	Industrial areas	Residential, rural and other areas	Controlled areas***
		24 Hours		0.4 ppm	
		One Hour		0.8 ppm	
		Instant Peak		1.4 ppm	
3.	Nitrogen Dioxide	Annual Average		0.05 ppm	
		Month Average		0.08 ppm	
		24 hours		0.1 ppm	
		1 hour		0.2 ppm	
		Instant Peak		0.5 ppm	
4.	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	
5.	Suspended particulate matter (<10µm) (RPM)	Annual Average*	120 µg/m³	60 µg/m³	50 µg/m³
		24 hours**	150 µg/Nm³	100 µg/Nm³	75 µg/Nm³
6.	Lead (Pb)	Annual Average*	1.0 µg/Nm³	0.75 µg/Nm³	0.50 µg/m³
		24 hours**	1.5 µg/m³	1.00 µg/m³	0.75 µg/m³
		Month Average		2.5 µg/m³	
7.	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
8.	Ozone	1 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-hour limit may not be exceeded more than three times in one year;
** 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.
** 24-hour limit may not be exceeded more than three times in one year micrograms/m3
*** Not to be exceeded more than once per year average concentration

9.8.3 Standards for Water Quality

The IIU and contractor are to ensure that the standards in Table 9-7 are maintained as far as is possible in any water flows affected by its operations. Where the ambient water quality is lower than the standard, then the water shall be restored to the ambient quality.

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 also gives the World Health Organisation (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.

Table 9-7 Water Quality Standards

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
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

9.8.4 Standard for the Limitation of Noise Emissions

9.8.4.1 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). Table 9-8 lists the sound pressure level in dB (A) for common situations.

Table 9-8 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 metres
50	Quiet office, no machinery; boiling kettle at 0.5 metre
60	Normal conversation
70	Telephone ringing at 2 metres; vacuum cleaner at 3 metres
80	General factory noise level
100	Pneumatic drill at 5 metres
120	Discotheque – 1 metre 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.

9.8.4.2 Acceptable Noise Levels

No operations of the project or its contractors should exceed the levels of, or exposures to, noise as given in Table 9-9, Table 9-10, Table 9-11, Table 9-12, Table 9-13 and Table 9-14.

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.

Table 9-9 Maximum permissible noise levels for the general environment

Facility	Noise Limits B (A) (Leq)	
	Day	Night
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	70

Note: Day: 6 am to 10 pm. Night 10 pm to 6 am.

Table 9-10 Maximum permissible noise levels for construction sites

Zone	Sound Level dB (A) (Leq)	
	Day	Night
Residential	55	45
Commercial	75	50
Industrial	85	85

Note: Day: 6 am to 10 pm. Night 10 pm to 6 am.

Table 9-11 Maximum permissible noise levels from a factory or workshop

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

Note: Continuous or intermittent noise

Noise Levels shall not exceed a Leq of:

- Factory/Workshops 85 dB (A)
- Offices 50 dB (A)
- Factory/Workshop Compound 75 dB (A).

Table 9-12 Maximum permissible noise levels for impact or impulsive noise

Sound Level dB (A) (Lmax)	Permitted number of impulses or impacts per day
140	100
130	1,000
120	10,000

9.8.4.3 Noise Standards for Automobiles

Table 9-13 Noise limits for automobiles at a distance of 7.5 metres at the time of manufacture

No.	Vehicle	dB(A)
1	Motorcycle, scooters and three wheelers	80
2	Passenger cars	82
3	Passenger or commercial vehicles up to 4 tonnes	85
4	Passenger or commercial vehicles between 4 and 12 tonnes	89
5	Passenger or commercial vehicles exceeding 12 tonnes	91

Table 9-14 Maximum permissible noise levels for accelerating vehicles

No.	Vehicle	dB(A)
1	Vehicles intended for carriage of passengers and equipped with not more than nine seats, including the driver's seat	78
2	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
3	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
4	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

9.8.5 Standard for the Limitation of Vibrations and Air Overpressure

9.8.5.1 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 (mms-1) and acceleration (mms-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 (T);
- 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; and
- The peak particle velocity (ppv) is the maximum instantaneous velocity of a particle at a point during a given time interval.

9.8.5.2 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.

9.8.5.3 Transient Vibration Levels for Cosmetic Dammage

The vibration velocities given in Table 9-15 must be adhered to in relation to project activities.

Table 9-15 Vibration Velocities

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 mms^{-1} at 4 Hz and above	
Un-reinforced or light framed structure Residential or light commercial buildings	15 mms^{-1} at 4 Hz increasing to 20 mms^{-1} at 15 Hz	20 mms^{-1} at 15 Hz increasing to 50 mms^{-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%.

9.8.5.4 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 metres from the blast site (the standard evacuation zone) or at the nearest non-quarry-related structure if closer.

9.8.5.5 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 project, 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.

9.9 GUIDELINES

9.9.1 Personal Protective Equipment Provision to Site Staff and Workers

The assigned contractor's OHS Specialist 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 to 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 site in-charge or 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 metres 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.

9.9.2 Bush Clearance

The clearance of vegetation is permitted in certain areas in preparation of earthworks or for access to facilities. The swathe that may be cut is limited to the minimum required for the purpose. In the case of roads, the swathe is to cover only the width of the road and its immediate drainage works.

No vegetation may be cleared unless it is explicitly covered in the conditions of the relevant Environmental Permit. This may be allowed for in the ESIA Report or the Environmental and Social Management Plan.

Vegetation shall normally be cleared only by cutting. The use of fire, herbicides or other poisons is not permitted. The use of earth-moving equipment is permitted only if the works require the grubbing out of plant roots. Otherwise all roots and stumps shall be left in the ground.

Vegetation may be cut using either hand or machine tools. In all cases, appropriate personal protective equipment shall be used by the workers involved.

The vegetative debris shall be laid down to rot, thereby acting as mulch and helping to mitigate damage to the soil. Where clearance is for construction, then the debris may be removed to a suitable approved dump site or provided to local communities if they can make use of it.

If a bare sloping area is created by vegetation clearance, then appropriate erosion control measures shall be implemented. Separate guidelines are provided to cover this.

No tree of more than five metres in height should be felled using a standard bulldozer or excavator. An axe or saw should be used. Chainsaws should only be used by trained operators (see guidance below). Even with manual saws, trees taller than 8 metres in height should be felled only by experienced workers. Where specialist large machines (see below) are available and slopes are less than 20 degrees and tree roots are to be grubbed out, then trees more than five metres in height may be felled by machine. However, no tree greater than 25 metres in height may be felled except by use of a chainsaw.

9.9.3 Procedure for Relocating Graves or Managing Unexpected Cultural Sites and Archaeological Finds

9.9.3.1 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 finds procedure is to ensure that a protocol is in place for identification, data collection, reporting; and, if necessary, relocation of recent graves or salvage of significant chance finds. The National Museum of Liberia, in consultation with the IIU will determine the level of significance for purposes of preservation.

In its ESIA studies, the IIU'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.

9.9.3.2 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 sires 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 metres 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.

9.9.3.3 Action Required

The contractor's Social Safeguards Team (SSS and CLA) 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 Project 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 concession area and associated works.

9.9.3.4 Procedure

Step		Responsibility	Action
1.	Realisation	Worker	Report find to supervisor.
2.	Halt action	Contractor's Site Manager/ Engineer	1. Assess find.
			2. Report to IIU representative.
			3. Stop any action by workers or machinery that may affect the integrity of the find within at least 10 metres of the find.
			4. Post a guard.
			5. Record his inspection in the responsible contractor's daybook.
3	Investigate nature of find	IIU representative	Require the IIU Social Safeguards Specialist to visit the find, check and report back on the type of find.
4	Site Visit	IIU Social Safeguards Specialist	Visit, inspect, and locate the site by GPS, and report to the IIU representative.
			Report the find in the cultural heritage database and Community Engagement Matrix.
5.	**Action**	IIU representative	Call in the Liberian National Police 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.
	a) In the case of human remains		
	b) In the case of a clearly identifiable grave	IIU Social Safeguards Specialist	The IIU Social Safeguards Specialist must try to identify relatives through community leaders or the Contractor's Community Liaison Officer 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	IIU representative	1. Contact the University of Liberia, Liberia College of Social Science and Humanities, Anthropology Department

Step		Responsibility	Action
	archaeologically significant		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	IIU Social Safeguards Specialist	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	IIU Cultural Heritage Resource Assistant with all involved officers	Enter appropriate information into the cultural heritage database and Community Engagement Matrix: a) Location – GPS co-ordinates. b) Conditions in which the discovery occurred. c) Type – principle 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.

9.9.4 Code of Conduct for Staff, Worker and Visitor Behaviour

Introduction

All contractors' managers must ensure that their staff uphold this Code of Practice at all times.

Project 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 project area for only short periods. Cultural differences and poor behaviour of workers can lead to tension between local communities and workers housed in camps. This Code of Practice demands moderate and tolerant behaviour of all people associated with the project.

All project staff, the employees of contractors and visitors to camps and work sites, 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 and camps.
- Behave in a moderate, modest and tolerant manner.
- Avoid causing disturbance or undertaking any unruly or anti-social behaviour 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 into the towns, camps or work sites.
- Use vehicles safely at all times.
- Use security passes as required for different areas.

All employers shall further maintain a zero tolerance policy towards the following.

- Infringement of any Liberian law.
- Bribery, fraud or attempts at these.
- Racist or anti-religious behaviour.
- Involvement in prostitution on project property or in project vehicles.
- Any form of sexual harassment, exploitation, gender based violence or abuse.
- Involvement in violence of any sort.
- Child Labour.
- Forced labour.
- Repeated excessive consumption of alcohol.
- Intoxication on any work site.
- Dealing with proscribed bush meat during working hours or in the camps.
- The use of any non-prescribed or illegal narcotic substance.

Operation

The Contractor will formulate a Worker Code of Conduct to manage these expectations. The Worker Code of Conduct must be in place prior to work starting. The MPW/ IIU SSS will vet the proposed Code of Conduct and agree its contents before workers may start. The Contractor will provide regular reinforcement of the requirements during the work. The

MPW/ IIU SSS will monitor complaints from the community via the GRM and require the Contractor to take appropriate action especially for zero tolerance activities.

The Contractor will require all employees to sign a Worker Code of Conduct.

9.9.5 Control of Water Pollution

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 licence for effluent discharge; or
- 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.

9.9.5.1 Prevention of Water Pollution

Surface run-off from earthworks, waste dumps 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.

Re-vegetation 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 re-use and re-cycle 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 contactor shall be responsible for monitoring this, but the IIU can undertake monitoring on its behalf, whenever they need. Where camps are operated by contractors, then the operator is responsible for monitoring outfalls.

Workshops, fueling 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.

9.9.5.2 Protection and conservation of riparian 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. Although this zone varies, a practical guideline is to take it as occupying 50 metres on each side of a watercourse. In specific conditions, where there is a strong case for a narrower width, this may be reduced to a minimum of 15 metres.

The following activities shall not be permitted on riparian 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.

Where it is essential that tracks or roads must cross the riparian zone, they shall be aligned to cross at right angles, thereby minimising 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.

If any of the above activities must take place within the 50-metre riparian 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.

Riparian 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.

9.9.5.3 Spillage

No person shall willfully and deliberately allow any substance to spill out into any water resource or on to land where such spillage may contaminate either soil or a body of surface or groundwater.

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 Site Manager of the accident.
- The Site Manager shall take immediate and adequate measures to prevent spread of the spillage and its likely adverse effects to soil and water resources, and inform the Environmental Manager.
- The Environmental Manager shall take measures to cause action to be taken to deal with the spillage.
- The Environmental Manager shall inform the Community Liaison Assistant CLA, who will notify the public of the spillage.
- The Environmental Manager shall immediately report the spillage to the IIU Environmental Specialist and to the EPA.
- The IIU Environmental Specialist should, or send a representative to, check the spillage site and make sure all needed actions are taken and the spillage is cleaned up.

9.9.6 Topsoil Stripping, Stockpiling and Restoration

9.9.6.1 Overview

This guideline provides guidance on the management of topsoil and subsoil in engineering operations. Topsoil is an important resource, both ecologically and economically, since it is

the source of all terrestrial life. Topsoil is therefore classed as an asset and must be treated as a living entity. Under no circumstances is topsoil a waste material. Subsoil is an essential foundation to topsoil and where possible should also be saved to aid later rehabilitation.

The recommended sequence for stripping, stockpiling and restoring of topsoil from a borrow area or other site, is as follows. The paragraphs below give details on how each step should be undertaken.

1. Delineate borrow (or other) area.
2. Delineate topsoil storage area.
3. Complete land access procedure.
4. Construct access tracks.
5. Clear vegetation and dispose.
6. Install drainage and silt traps.
7. Grub roots and stumps.
8. Strip topsoil from borrow area.
9. Place topsoil on designated storage.
10. Stockpile unusable subsoil if present.
11. Remove approved earthfill to construction site.
12. Replace subsoil if available.
13. Replace topsoil and rehabilitate.
14. Undertake revegetation works to restore habitat.

9.9.6.2 Field Identification of Topsoil

Topsoil is the darker coloured surface layer that varies in depth depending on location, but in general is 100 to 150 mm in depth. It is the soil layer with the greatest proportion of organic matter (in the form of fine roots, decomposing plant material and microbial animals). In the Nimba forests, the organic carbon component in the surface horizon ranges from 4 to 10 percent, usually with higher levels under better-developed forest. Where there is any leaf litter on the soil surface, this should be considered part of the topsoil. Topsoil depth and quality generally increases from a hilltop to the toe of a slope. Swamps may contain considerable thicknesses of topsoil that are highly fertile if managed correctly.

With depth in the soil profile, the material becomes increasingly less weathered and thus of decreasing value as plant-growing material. This is the subsoil. The downward change is often gradual and thus it is a matter of judgement as to where to make the cut-off. However, the subsoil horizon from 150 to 500 or 600 mm contains soil that is of value in restoration, as it contains some organic material and raised nutrient levels, and is weathered to a consistency that will help facilitate later regrowth when it is re-laid as a foundation below the topsoil. Note, however, that lack of cleared land for storage space means that the contractor will not normally need to take subsoil for storage unless it is found between the topsoil and the approved borrow material.

Identification of topsoil and subsoil

Topsoil is the darker surface layer of soil. It is usually from the surface to a depth of 150 mm (6 in) or slightly more. It may include decaying plant material on the surface (dead leaves and sticks).

Subsoil is the weathered layer below the topsoil. This almost always extends to 500 mm (20 in) below the surface and sometimes much more. In most of the borrow areas, subsoil will be classed as approved engineering earthfill material and removed to the construction sites.

The illustrations below show typical soil profiles in Nimba. In all of them, the topsoil layer is visible.

		
Distinct topsoil 200 mm thick Subsoil to 600 mm depth Seasonally waterlogged swamp soil	Distinct topsoil 230 mm thick Subsoil to 800 mm depth Well-developed forest soil	Indistinct topsoil about 120 mm deep Subsoil to 1000 mm depth Iron-rich steep mountain soil

9.9.6.3 Storage of Topsoil

The location for a soil stockpile shall be in a place where it will not erode, block drainage, or interfere with work on the site. The stockpile location must be selected to avoid steep slopes (gentler than 1:4 to avoid slippage), flood plains and natural channels. It shall be at least 30 metres from a water course, pond or swamp to prevent sedimentation and damage to riparian habitat.

Topsoil should not be stored on another topsoil or subsoil of highly contrasting texture. Sandy topsoil over clay subsoil is a particularly poor combination, especially on slopes: water may creep along the junction between the soil layers and cause the topsoil layer to slip or slough.

Subsoil should not be stored on top of topsoil. If necessary, the topsoil at a stockpile location must be stripped off and the subsoil laid down, before the topsoil is replaced on top of it.

On large sites, re-spreading may be easier and more economical when soil is stockpiled in small piles located near the areas where it will be re-used. One approach appropriate for some borrow areas, is for removal and replacement of topsoil in successive strips as the borrowing moves across the area.

Before any topsoil is stored in a designated area, vegetation must be cut and a full drainage and sediment control system installed. The grubbing of stumps and roots may also be

necessary to aid the processes of topsoil placement, management and later recovery for use in rehabilitation works.

As far as the terrain allows, storage areas should be gently convex in design so that run-off is managed and does not lead to erosion and instability. The slopes used should be at a maximum angle of 18 to 20º to enable working, and subject to final assessment and sign-off by the authorised engineer to ensure that the slopes are stable in the short and long term.

Where stockpiles are on slopes, the downward slope shall be adapted to retard run-off water and prevent erosion. Erosion control berms and appropriate drainage channels may be used to achieve this. An alternative is to create "moonscape" indentations to retard run-off, placed in a staggered manner to ensure they do not form continuous lines

9.9.6.4 Management of Topsoil (and Subsoil) Stores

The management of topsoil storage areas shall be determined on an area-by-area basis and an appropriate plan agreed. All storage areas will be in approved locations, with sites prepared as described above. The main management options are as follows.

- Temporary storage of topsoil, with it replaced to site within the same dry season.
- Longer term storage requiring management interventions, including revegetation, periodic aeration, erosion controls and other work.
- Initial stabilisation followed by handover for approved use by the landowner under an agreement in line with the Resettlement Action Plan.

Topsoil stockpile height shall not exceed 1 metre. If space permits, where topsoil is being stockpiled on areas where agriculture will remain active as part of the management plan, then it should be limited in height to 0.5 m to retain topsoil characteristics (significant biological activity really continues only to a depth of 300 mm). Gentle compaction is necessary, but should be as light as possible, such as one pass by a tracked excavator or small bulldozer; but never by a roller or vibrating compactor.

Soil stockpiles shall be protected against erosion and soil loss by temporarily planting or seeding with a locally collected species of grass. This must be done as soon as possible, but only when there is enough moisture in the soil for germination and growth. In the wet season, no stockpile shall be unprotected for more than 30 days after its formation. While vegetation is becoming established, the stockpile may need additional protection by a silt fence or other sediment barrier on the down-gradient sides.

If stockpiles will not be removed within the same dry season as they were created, they should be stabilised with permanent vegetation to control erosion and weed growth. This will involve the planting of fast-growing pioneer shrubs or trees.

No seeds or plants from sources outside Nimba County may be used on any revegetation sites. Invasive plants also must not be used. This is on account of the need to protect the local biodiversity to the greatest extent possible.

Fine-textured topsoil may need aeration periodically if there is a risk of waterlogging and the generation of anaerobic conditions. This can be achieved by turning down the stockpiles once a year, or using a chisel plough or tines on a small bulldozer, but the most suitable method will be dependent on the height of the stockpile. Revegetation may be required after the aeration operations.

The depth of a subsoil stockpile is limited by stability concerns. As it is laid, the soil should be compacted in layers of 1 metre thickness. Usually a height of 3 metres is the maximum that should be permitted without stabilisation measures being required. Compaction is to ensure integrity, not to create a full engineering fill specification, and should be achieved using a few passes by a tracked machine.

9.9.6.5 Replacement of Topsoil (and Subsoil) on Borrow Areas

Before spreading soil back on to a site, erosion and sedimentation control practices such as run-off water diversions, berms, and sediment basins shall be put in place. The slopes and elevations should be graded smooth for the receipt of soil. Slopes steeper than 1v:3h should not normally be considered for re-soiling, but instead should be protected by direct planting with suitable pioneer species.

Topsoil shall be spread evenly over freshly laid subsoil in a layer of 150 to 200 mm depth (or as otherwise approved by the appropriate IIU representative). When the soil is dry, light compaction shall be provided, such as by one pass by a tracked excavator or small bulldozer. When the soil is moist or wet, then it should be harrowed using standard agricultural implements, or raked by hand, to form a fine tilth. No topsoil operations shall be undertaken while it is muddy or when the subgrade is saturated. The running of vehicles over newly spread topsoil shall be minimised to avoid excessive compaction.

Where embankments are being constructed (such as part of a permanent drainage system), the slope, ground and climatic conditions may reduce the ability of the topsoil layer to bind well with the subsoil layer. In these situations, offsetting lifts of material to create an uneven surface prior to topsoil placement should be considered.

Where subsoil is available, its use should be considered as part of the rehabilitation process. Where the substrate has the characteristics of subsoil, particularly in terms of allowing root penetration and plant growth (i.e. similar physical and chemical properties to natural subsoil in a similar site), then it may be appropriate only to add topsoil and not to expend energy and resources in re-laying subsoil unnecessarily. Available subsoil may be better retained for the rehabilitation of sites with very poor substrate.

Immediately prior to spreading any available subsoil, the subgrade should be loosened by disking or scarifying to a depth of at least 150 mm to ensure bonding between the layers.

Subsoil shall be distributed uniformly to a minimum compact depth of 500 mm and compaction achieved using a few passes by a tracked machine. No soil shall be spread while it is muddy or when the subgrade is saturated. Any irregularities in the surface shall be corrected that result from stockpiling or other operations, to prevent the formation of depressions or water pockets.

9.9.6.6 Placement of Topsoil on Engineered Structures

The placement of topsoil on engineered structures shall be at the discretion of the appropriate IIU representative. In some cases, especially on embankment slopes, it is better to plant vegetation straight on to the earthfill structure rather than to attempt to stabilise a veneer of topsoil. This is because unconsolidated topsoil can become saturated in heavy rain due to the discontinuity below it to a compacted and impermeable substrate; in extreme conditions this can lead to a small mud flow of the topsoil. In some cases topsoil may be specified in porous bags, especially at the toe of a slope, to allow vegetation to grow, while the bags provide temporary stability and protection from scour erosion.

9.9.6.7 Rehabilitation of Topsoil

Simply replacing topsoil back on top of an altered surface does not constitute rehabilitation. In the best cases, following topsoil placement, the only rehabilitation required is revegetation using planted grasses, as described in the next sub-section, and tending for a period of a few years to allow the processes of nature to aid the rehabilitation process. But in certain cases other work may be needed to ensure that the topsoil returns to a good condition. After stockpiling for periods of more than about six months, the topsoil characteristics will have altered so that only the surface 300 mm or so retains real topsoil characteristics, and the lower 700 mm or so starts to have characteristics more like subsoil.

In many site rehabilitation cases it is difficult to establish the right drainage regime for the soil. Sometimes it may be necessary to alter the compaction or the drainage system to achieve this. Compaction can be reduced by ripping or ploughing the soil, or increased by running machines over it. Frequently the problem lies in the discontinuity between a relatively loose replaced topsoil and the hard substrate below, which does not have the same physical characteristics of naturally occurring subsoil, or the same physical continuity with the topsoil. Therefore the surface conditions and drainage network in a re-engineered site may need to be quite different from what was there before disturbance.

Compost or manufactured organic soil amendments can be added to topsoil to increase its organic content and assist in rebuilding soil micro-organism populations. Undecomposed organic materials such as wood bark or fibre, grass hay or grain straw should not be mixed

into topsoil unless nitrogen fertiliser is included (organic material uses nitrogen to break down and decompose the fibres). Compost derived from livestock or green urban waste (cut brush) is far superior to non-composted manure or wood fibre.

Some borrow areas may be utilised to introduce improved agricultural methods with members of the local communities. If this is done, an agreement may be made to take the area under the control of the livelihoods restoration component of the Resettlement Action Plan before rehabilitation is complete.

9.9.6.8 Revegetation of Topsoil

All topsoil surfaces must be revegetated as soon as there is enough moisture at the start of the rainy season to allow plant growth. In many cases, the seeds and residual plant parts in the topsoil will grow, giving the initiation of natural revegetation. However, some areas of topsoil require special treatment. These include, but may not be limited to, the following.

- Alongside drains.
- Alongside roads.
- On slopes above water courses.
- On steep slopes.
- Around the crest of cut slopes.

In these locations, intensive revegetation measures are essential. The appropriate IIU representative will make a specific instruction as to the extent of revegetation on site, but as a general rule, at least four lines of planted grasses are required on all peripheries of topsoil stockpiles and rehabilitated borrow areas.

The use of hydro-seeding or other mechanical applications of seeds or plants is not permitted. This is because abundant native species of grass are available locally, and their planting by hand is an excellent way to increase local employment opportunities. The main revegetation technique is therefore the use of planted grass slips (see appropriate guideline). Other revegetation techniques that may be required are as follows.

- Brush layers, made of hardwood cuttings of certain shrubs or small trees. These can be used to create stronger, more substantial barriers to erosion where run-off tends to be concentrated. This technique is described in a separate guideline below.
- Tree or shrub seedling planting. Plants raised from seed in a nursery are planted on to a site to start the process of restoration of the forest vegetation community. This technique is described in a separate guideline below.

9.9.7 Constructing and Maintaining Earth Access Tracks

Earth tracks shall be aligned to follow the best possible route. Wherever feasible, they shall avoid steep slopes and swamps. The amount of cut and fill shall be minimised.

The adequate provision of culverts shall be ensured, both for capacity and frequency, and scour protection shall be provided as necessary. Catch pits shall be used to capture sediment at pipe culvert inlets and turnouts. The routine emptying of the catch pit sumps shall be included in the maintenance schedule.

Soil conservation measures shall be provided as appropriate, including grassed and vegetated cut and fill slopes, grassed longitudinal road drains, check dams in drains for shallow gradients, and concrete or masonry lined drains for steep gradients.

The creation of flattening gradients along roadside drains shall be avoided. A reduction in gradient causes sediment to settle and block the drain: this particularly applies in dips approaching an outfall to a watercourse because the gradient of the vertical alignment of the road flattens here. As far as it is possible ditches shall be formed with a constant or increasing gradient moving downstream.

Silt traps shall be used where required on drainage outfalls.

When carrying out machine maintenance, particularly when a grader is used, it must be ensured that vegetated drains are left intact, and silt is removed from the drains using an appropriate ditching machine or by hand.

Graders and dozers must not be used to push waste material on to surrounding land (windrow). This material shall be recycled on to the track or disposed of at a suitable waste dump.

Routine environmental monitoring shall be undertaken of the water quality downstream of all earth tracks.

9.9.8 Selection of Revegetation Techniques for Erosion Prevention

9.9.8.1 Selection of Technique

Revegetation techniques should normally be used to cover bare soil slopes, to begin the process of restoring the natural habitat, to control soil erosion or to stabilise or prevent shallow landslips (i.e. where the depth to the sliding surface is shallow, up to 0.5 m).

Table 9-16 summarizes the best available techniques for different situations.

Table 9-16 Revegetation Techniques

Location	Technique	Advantages	Disadvantages
Road cut slope in soil	Grass planting in lines, using rooted slips.	Rapid and complete surface cover.	Requires a soil slope without too many stones. Slow to establish on hard cut slopes.
Road edge or shoulder in soil			
Fill slopes and backfill above walls	Brush layers using hardwood cuttings from trees or shrubs.	Instant physical barrier that interrupts runoff. Stronger than grass. Often successful on stony debris.	Can only be installed on slopes of 1V:1.25H or less, on unconsolidated materials.
Small erosion gullies or small seasonal stream channels			
Other bare areas	Tree planting using potted seedlings from a nursery.	Allows a long term forest mix of trees to be restored.	Takes a long time to establish a complete cover. Seedlings are vulnerable to grazing for a few years.

9.9.8.2 Materials for Revegetation

Grass slips are small sections of a grass plant, made by splitting up a large clump. The stems are cut down to a height of 100 to 200 mm and the roots cut back to 40 to 80 mm. There should be 2 or 3 stems per slip

Hardwood cuttings are taken from the branches of certain types of small trees. They are cut to be between 450 and 600 mm long, and the diameter should be between 20 and 40 mm in diameter. Shoots and leaves are trimmed off.

It is very important that plant materials for revegetation works are kept cool and damp when they are being moved and prepared.

9.9.9 Revegetation using Planted Grasses

Function. Grass slips (rooted cuttings), rooted stem cuttings or clumps grown from seed are planted in lines on the slope. This form of revegetation uses large clump grasses.

Grasses planted in contour or horizontal lines protect the slope with their roots and, by providing a surface cover, reduce the speed of runoff and catch debris, thereby armouring it.

Grasses planted in diagonal lines protect the slope with their roots and by providing a surface cover, while at the same time helping to drain surface water. They have limited functions of catching debris and draining surface water. The main engineering functions are to armour and reinforce the soil surface, with secondary functions to catch debris and drain moisture. This technique offers the best compromise of the grass line planting systems in many situations.

Sites. Almost any slope less than 50º.

Contour or horizontal lines are used on all slopes less than 35º. Also on steep (35º to 50º) dry sites, where moisture needs to be conserved. They are most widely used on well-drained materials where increased infiltration is unlikely to cause problems. On cultivated slopes, horizontal lines of grass planted at intervals across a field can be used to avoid loss of soil and to help conserve moisture, as a standard soil conservation measure.

Diagonal lines are used on poorly drained materials on steep slopes (35º to 50º) where an increase in infiltration can lead to liquefaction of the soil. It is also useful on damp sites, where moisture needs to be shed.

Timing. Planting work should only be done in the wet season. The slope should be moist when the planting is done. If it does not rain within 24 hours of the work being done, water the plants every day until it does rain. On small sites this may be done by hand but on large sites it will require a water truck and spray cannon.

Spacing of plants. Line spacing depends largely on the steepness of the slope.

- Within rows: plants at 100-mm centres.
- Row spacings: rows at 500-mm centres for diagonal lines;
- for contour lines:
    - slope < 30º: 1000 mm;
    - slope 30-45º: 500 mm;
    - slope > 45º: 300 mm.

Materials. Grass slips are small sections of a grass plant, made by splitting up a large clump. The stems are cut down to a height of 100 to 200 mm and the roots cut back to 40 to 80 mm. There should be 2 or 3 stems per slip. The clumps must be obtained locally (i.e. from similar terrain within 15 km of the planting site) where their loss will not cause soil erosion to start. The source location should have similar environmental characteristics (altitude and soil particularly) to the destination site. The material must be between 6 and 18 months old. Grass clumps must be dug up and brought to site on the same day that the slips are made and planted, and kept cool and moist.

Construction. Prepare the site well in advance of planting. Slopes should be trimmed to an even grade. Trimming should achieve a slope that meets the appropriate design for the material. If there is no design, it should be cut or finished with a straight profile, without undulations that give over-steep portions that are steeper than the grade appropriate for the material.

After slope trimming, remove all debris and either remove or fill in surface irregularities so that there is nowhere for erosion to start. If the site is on backfill material, it should be thoroughly compacted, preferably when moist.

Always start grass planting at the top of the slope and work downwards.

Mark out the lines with string, using a tape measure and spirit level. Make sure the lines run exactly as required by the specification.

Split the grass plants out to give the maximum planting material. Trim off long roots and cut the shoots off at about 100-mm above ground level. Wrap the plants in damp hessian to keep them moist until they are planted.

With a planting bar (typically a 500-mm section of re-bar with a flattened end), make a hole just big enough for the roots. Place the grass into the hole, taking care not to tangle the roots or have them curved back to the surface. Fill the soil in around them, firming it gently with your fingers. Take care to avoid leaving an air pocket by the roots.

If it looks dry and there is no prospect of rain for a day or two, consider watering the plants by hand.

Example illustration. Grass slips are planted in lines across the slope. The best results usually come from lines that are at 45º to the maximum slope. Start from the top and work downwards. Mark out the lines on the slope and then plant the grass slips to the original depth and gently firm the soil back around them.	

9.9.10 Revegetation using Hardwood Cuttings (Brush Layers)

Function. Woody (or hardwood) cuttings are laid in lines across the slope, usually following the contour. Brush layers protect and reinforce a slope in weak soil. They catch debris and provide a strong and low-cost barrier to erosion, especially on debris slopes, however loose.

Sites. This technique can be used on a wide range of sites up to about 45º. It is particularly effective on debris sites, fill slopes and high embankments.

Timing. Planting work should only be done in the wet season. The slope should be moist when the planting is done. If it does not rain within 24 hours of the work being done, water the plants by hand every day until it does rain.

Spacing. Spacing between brush layers depends on the steepness of the slope. The following spaces should be used.

- Slope less than 30º 2-m interval;
- Slope 30 to 45º 1-m interval.

Within the brush layers, cuttings should be at 50 mm centres, in the double layer described below.

Materials. Cuttings made from woody material of shrubs or trees that coppice well. They must be obtained locally (i.e. within 3 km of the planting site). The material must be between 6 and 18 months old. Cuttings shall be 20 to 40 mm in diameter and 450 to 600 mm long. When taking the cuttings, cut the top at right angles to the stem and the bottom at 45º to make it clear as to which way they should be inserted. Cuttings must be taken the same day that they are to be planted, and kept cool and moist.

Construction. Prepare the site well in advance of planting. Slopes should be trimmed to an even grade. Trimming should achieve a slope that meets the appropriate design for the material. If there is no design, it should be cut or finished with a straight profile, without

undulations that give over-steep portions that are steeper than the grade appropriate for the material.

After slope trimming, remove all debris and either remove or fill in surface irregularities so that there is nowhere for erosion to start. If the site is on backfill material, it should be thoroughly compacted, preferably when moist.

Using string, mark the lines to be planted, starting 500 mm from the base of the slope.

Always install brush layers from the bottom of the slope, and work upwards. Form a small terrace, with a 20% fall back into the slope. The terrace should be 400 mm wide. If you are brush layering a gravel-filled road embankment you should lay a 50-mm thick layer of soil along this terrace to improve rooting conditions.

Lay the first layer of cuttings along the terrace, with a 50-mm interval between the cuttings. Leave at least one bud and up to 1/3 of the cuttings sticking beyond the terrace edge and the rest inside. The branch growing tips should point towards the outside of the terrace.

Lay a 20 mm-thick layer of soil in between the cuttings to provide a loose cushion.

Lay a second layer of cuttings on top of this, staggered with the first layer. On a gravel-filled embankment slope lay an 80-mm layer of soil over the cuttings before you do any backfilling.

Partly backfill the terrace with the excavated materials. This should not be more than 50 mm thick.

Mark a line 1 metre above the first brush layer and set the string for the next layer.

Repeat the process. As the next terrace is cut, always fill the lower bench with the material excavated from above and compact it reasonably well by gentle foot pressure.

Good site supervision is essential to ensure that lines run along the contours and do not concentrate runoff; also to make sure that cuttings are not allowed to dry in the sun. Well-buried cuttings have a higher survival rate.

Example illustration. Mark out horizontal lines every 2 metres down the slope. Start from the bottom and work upwards. Dig shallow trenches along the lines, 350 to 450 mm wide. Lay the cuttings across the trenches with the bottom inwards and 80 to 100 mm of the top protruding from the slope. The cuttings should be 50 mm apart. Place a small amount of soil over the cuttings and then lay another line of cuttings. Replace all the soil and firm it down gently.	

9.9.11 Revegetation using Shrub and Tree Seedlings

Function. Shrubs or trees are planted at regular intervals on a bare area of soil. As they grow, they create a dense network of roots in the soil, helping to reinforce it against erosion or mass failure. It helps to re-establish a vegetation cover on disturbed areas.

Sites. This method can be used without adverse effects on almost any slope up to 30º. With care, it can be used on slopes between 30º and 45º. It can be used on any material and site other than bare rock.

Timing. Planting work should only be done in the wet season. The slope should be moist when the planting is done. If it does not rain within 24 hours of the work being done, water the plants by hand every day until it does rain.

Spacing. The spacing of plants is important. The main considerations are cost and the speed with which a full cover is required. In typical forestry sites, a spacing of 2 × 1 metres is normal, requiring 2,500 plants per hectare. However, in revegetation sites a spacing of 1 × 1 metre is usually necessary, requiring 10,000 plants per hectare. Plants should be planted in off-set rows unless a different pattern is needed for specific erosion control or landscaping effects.

Construction. Prepare the site well in advance of planting. Remove all debris and remove or fill surface irregularities. If the site is on backfill material, thoroughly compact it, preferably when it is moist. Cut all weeds.

If possible, dig pits for the shrubs or trees in advance of the planting programme, but refill them the same day. Pits should be 300-mm deep and 300-mm in diameter if this is possible without causing excessive damage to the slope.

When the ground is wet enough to support reasonable growth, plant out good quality seedlings from a nursery. The bigger the hole made, the better it is for the plant; but there

must be a compromise between helping the plant and avoiding excessive disturbance to the slope.

Carefully remove the pot. If it is a polythene bag, do this by slicing it down the side with a razor blade. Take care not to cut the roots.

Plant the seedling in the pit, filling the soil carefully around the cylinder of roots and soil from the pot. Ensure there are no cavities. Firm the soil all around the seedling with gentle foot pressure.

If available, mix a few handfuls of well-rotted compost with the soil around the roots when you are backfilling the hole. Remove any weeds around the plant. Add mulch around the seedling, but with a slight gap so that it does not touch the stem.

Main advantages. Planting shrubs and trees reinforces and restores a slope by establishing a community of larger plants.

Main limitations. Seedlings take about 5 years (or more) to provide a canopy, produce useful materials or contribute significantly to slope strengthening. Care and protection are required in the first three years.

9.9.12 Management of Waste

9.9.12.1 Waste management in general

The principles of pollution prevention includes 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.

Landfill sites should be selected with care and the location and details approved by the Environmental Protection Agency. 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.

9.9.12.2 Waste Materials that are Assets

Topsoil. Waste topsoil generation should be minimised by disturbing the soil only where it is necessary to do so. Topsoil is to be removed carefully, by scraping it off in thin layers. It will be stored in shallow stockpiles, which must not be compacted. Stockpiles shall be planted with grass to prevent erosion and maintain soil quality. Once the work has been completed, the topsoil must be returned to rehabilitated areas.

Under no circumstances shall topsoil be sent to spoil tips, allowed to erode or be contaminated with other substances. Traffic must not be allowed to run on topsoil, causing it to become compacted, either in its natural state or in stockpiles. Topsoil is the source of almost all food, and its protection means the protection of life itself.

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. Aluminum 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, 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.

9.9.12.3 Non-Asset Waste

Vegetation. The cutting of vegetation shall be minimised by only cutting plants or plant parts that are in the way of approved activities. This means plants that are in the direct area required for access tracks, quarry areas or other purposes. Vegetation shall be cut into small pieces and stacked beside the working area to decompose slowly. It shall not be burnt, either standing or cut.

Plantation trees and agricultural plants shall not be cut without following the procedures given in the Resettlement Action Plan.

Spoil (overburden). Damage to land and wasted energy shall be minimised by removing spoil only where it is essential to do so. Spoil shall be placed only in designated and approved spoil tip sites, which must be prepared in advance. Preparation shall include the installation of drainage blankets and slope toe retaining walls as necessary to ensure permanent stability. Spoil shall be placed in shallow layers, not more than 2 metres in thickness, compacted and shaped as they are developed. Erosion protection shall be provided as necessary to ensure that there is no sediment washed into water courses; this will usually be done using planted grasses. The water regime and stability of spoil tips shall be monitored and action taken as required to resolving any problems that are identified. Spoil tips will be kept away from watercourses and seasonal drainage channels unless adequate through-flow has been provided. The use of any spoil tip will be discontinued when the designated area has been used up.

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 from workshops and fueling stations. Industrial oil-water separators shall be installed as part of the drainage system at every mechanical workshop and every fueling 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 open water courses 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 workshop 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. The use of throw-away plastic bags shall be discouraged inside the concession. Households shall be given 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 Environmental Protection Agency.
- 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 by ensuring that canteens do not over-cook. Canteen staff shall be encouraged to use uneaten food for themselves and their families if it is still safe. 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.

Clinic waste. All biomedical waste shall be stored in appropriate sealed containers. Wastes shall be segregated in the hospital or clinic 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^{o}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 wastes 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.

9.9.12.4 Recording hazardous waste management and disposal

Workshops, operational departments and contractors are 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, 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 as part of environmental audits.

9.9.12.5 Burning or Burial of Rubbish at Temporary Camps

This guideline shall apply only to domestic rubbish at temporary site camps and not to permanent establishments, which shall have formal, long term procedures for waste disposal. All industrial and hazardous waste shall be sent to an EPA-approved waste management facility for proper disposal. This shall include batteries, waste oil, tyres, used vehicle parts, and any form of hazardous chemicals or their containers.

All rubbish that is combustible shall be burnt. This shall be done only in a designated area, one per camp, on the downwind side of the living and working areas.

Before starting a bonfire, all vegetation shall be cleared in a radius of 5 metres around the fire site. If possible, rocks shall be placed in a circle to mark the location of the fire.

Burning shall be for a limited and defined period each day (e.g. 8 to 10 am).

One individual shall be made responsible for burning, and for ensuring that the fire is completely dead before he leaves it. The individual shall be provided with the means to control the fire if it starts to spread (e.g. buckets of water ready at the burning site).

Residues of bonfires and non-combustible items (e.g. glass) shall be buried in a designated and approved landfill site. When finished, the buried material shall be underneath at least one metre of soil.

9.9.13 Storage, Dispensing and Disposal of Hazardous Materials

The contractor shall take full responsibility for the use and effects of any hazardous materials that are required for operations that are part of the project. The contractor is further responsible for complying with the IIU's policies and procedures as may from time to time be

communicated, and will ensure that all aspects of the spill clean-up plan are followed in the event of a spill (see appropriate guideline).

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 waste water.

Approval by the IIU 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 metres from the sea, a water course, spring, swamp, drain or well, and at least 400 metres 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 contractor's personnel.

Fuelling 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 fuelling nozzles during refuelling operations. Designated fuelling 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 contractor shall prepare a disposal plan and seek the approval of the IIU before implementing it. In general, hazardous solids that need to be disposed shall be buried in a location proposed by the contractor and approved by the IIU. Disposal sites must be situated at least 400 metres from any dwelling and at least 400 metres from a water body or water course. They should not be on cultivated land. Wherever possible, they should be on a permeable but not sandy soil. Holes shall be a minimum of 2 metres deep when first excavated and all materials must be buried under at least 1 metre of soil.

Sewage disposal: Sewage and foul waste water 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 metres from a water body or water course. The contractor shall present his plans for such facilities to the IIU for approval prior to their implementation.

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 nearest representative of the IIU. The substance will then be cleaned up immediately, disposed of in an approved manner and the contaminated environment cleaned to the satisfaction of the IIU. A separate guideline covers this in detail.

9.9.14 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 all contractors to the IIU, and any Sub-contractors that may be engaged by the contractors. Before bringing any hazardous materials to the site, the contractor must prepare a spill clean-up plan in accordance with this guideline and gain the approval of the IIU.

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 contractor must 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 minimise 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 neutralise hazardous substances; (e) the IIU representative 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 contractor 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 contractor 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 IIU's representative 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 minimise 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.

9.9.15 Prevention of Pollution from Refuelling Facilities

9.9.15.1 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 refueling facilities and should be consulted regardless of the type of facility.

9.9.15.2 Types of drainage system

Clean water. All clean, uncontaminated rainwater should be channeled 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, refueled 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 refueling 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. Wetlands 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;
- odours 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.

9.9.15.3 Fuel tank bund rain water 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, rain water 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 rain water 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.

9.9.15.4 Re-fuelling 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 1 and 2 metres 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.

9.9.16 Pollution Prevention in Vehicle and Plant Workshops

9.9.16.1 Introduction

Workshops and service centres 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 tyres. Unless the site drainage is correct, waste is properly managed and spillage control procedures are in place, environmental harm could occur.

9.9.16.2 Vehicle 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 authorised contractor. Storage can be minimised by the use of one-for-one exchange schemes, whereby old batteries are collected when new ones are delivered.

Tyres and other discarded dry parts. Tyres 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. Tyres should be disposed of by a suitably licensed tyre 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 wastes. 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.

9.9.16.3 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.

Refueling facilities. These are covered by a separate guideline. The risk of pollution from refueling 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.

9.9.16.4 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.

9.9.17 Sewage Disposal

9.9.17.1 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 metres from a water course or water body of any description.
- At least 100 metres 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 metres from a house.

- Where neither surface nor ground water is likely to collect in the pit.

Holes should be around 1.5 metres deep, and certainly not less than 1 metre, and approximately 1 metre 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; and
- A vertical vent pipe at least 2 metres 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 2 to 3 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.

9.9.17.2 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 metres down gradient, at least 250 metres laterally and at least 500 metres up gradient of any boreholes or water supplies.
- Excavate a trench for the underground soakaway (2 metres deep by 1.5 metres wide by 50 metres 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 metre 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 metre below ground level.
- Place a sheet of permeable geotextile over the stone and then backfill the trench to ground level with 1 metre 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.

9.9.17.3 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 m2 of reed bed surface area per person using the system, with an outlet pipe height of 0.5 metre.

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.

9.9.17.4 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 metres from any dwelling and at least 100 metres from a water

course, spring or well. Wherever possible, it should be on a permeable but not sandy soil. Holes shall be two metres 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 metre of depth remaining, it shall be completely filled and a new hole started.

9.9.18 Use of Explosives in Quarries

9.9.18.1 Legislative Background

The Minerals and Mining Act (2000) makes the following provisions, which must be complied with under all circumstances.

"The conditions for the import, export, manufacture, storage, handling, purchase, sale and use of explosives shall be as strictly prescribed by the laws of Liberia." [Section 16.11]

"All Quarry operators shall apply to the Ministry of State for Presidential Affairs, or to such other agency of Government as required by the laws of Liberia, for permission to import, export, buy, sell, manufacture, store handle, purchase, use, dispose of or otherwise deal in or with explosives." [Section 16.12]

9.9.18.2 Meanings of Terms

In this guideline, the following meanings shall apply.

a. "Operator" in relation to a site where blasting is taking place means the person in overall control of the working of the quarry.

b. "Shot" means a single shot or a series of shots fired as part of one blast.

c. "Shotfirer" means a person appointed to be responsible for shotfiring operations.

d. "Shotfiring operations" include:

    i. checking to ensure that the blasting specification is still appropriate for the site conditions at the time the blasting is to take place;

    ii. mixing explosives;

    iii. priming a cartridge;

iv. charging and stemming a shothole;

v. linking or connecting a round of shots;

vi. withdrawal and sheltering of persons;

vii. inspecting and testing a shotfiring circuit;

viii. firing a shot; and

ix. checking for misfires.

9.9.18.3 Transport and Storage of Explosives

Explosives shall be transported in police-escorted convoys, in accordance with all prevailing transport and safety rules.

Explosives shall be stored in locked shipping containers in a secure compound sealed from the rest of the quarry site, and with permanent guards to ensure no unauthorised access. Separate containers shall be used for different components (detonators, fuses, charges etc.) and shall be placed at least 10 metres apart with earthen bunds in between.

9.9.18.4 Clearance of the Site and Safety Zone

a. The contractor shall not permit any blasting to take place without a 500-metre safety zone cleared around the site. This zone shall be cleared of people, structures and all other infrastructure.

b. A photo database of property within 1000 meter from the blasting site should be established before the commencement of works in the quarry. This will allow the assessment of the structures' conditions before blasting and help deal with future damage claims.

c. Warning notices shall be posted around the site, giving at least 24 hours warning of a blast.

d. The Operator shall notify the Community Liaison Assistant in good time to allow deployment of its staff at least one week before a blast or series of blasts, to prepare communities for the blasting and to notify them of the times of blast(s). The signalling system shall also be explained.

e. A siren shall be sounded 30 minutes, 10 minutes, 5 minutes and 1 minute before a blast takes place. The siren shall be loud enough to be heard clearly throughout the site and safety zone. This shall include persons operating machines or required to use ear protection.

f. Where farms occur within the 500-metre safety zone, patrols shall be sent out to ensure they are cleared of people in good time. The warning signal sequence for the blast

shall not be started until the patrols have reported that the farms are clear to the best of their knowledge and that they themselves are in places of safety.

g. Where a footpath runs into the safety zone, guards shall be posted at least one hour before the blast to prevent people from entering the safety zone.

h. The site is to be cleared of personnel as soon as the first warning siren is sounded.

9.9.18.5 Operator's duties

a. The operator shall:

   i. ensure, so far as is reasonably practicable, that all explosives are stored, transported and used safely and securely;

   ii. appoint one or more competent individuals to organise and supervise all work involving the use of explosives ("the Explosives Supervisor");

   iii. ensure that at no time is there more than one person acting as the Explosives Supervisor at the site; and

   iv. keep a copy of the written statement of duties of the person or persons appointed under paragraph (a)(ii) for at least twelve months after the date on which the appointment ceased to have effect.

b. It shall be the duty of the operator to ensure that:

   i. there are suitable and sufficient written rules and procedures for:

      - shotfiring operations;
      - appointing shotfirers and storekeepers;
      - authorising other persons who will be involved with the storage, transport or use of explosives;
      - dealing with misfires; and
      - ensuring, so far as is reasonably practicable, that such rules and procedures are complied with;

   ii. an adequate written specification (whether produced by or for the operator) is prepared for each shotfiring operation to ensure, so far as is reasonably practicable, that when such firing occurs it will not give rise to danger; and

   iii. a copy of the specification referred to in sub-paragraph (b) is given to any person upon whom it imposes duties.

c. The operator shall ensure that operations involving the storage, transport or use of explosives are carried out by

   i. a duly authorised and competent person; or

   ii. a trainee under the close supervision of a duly authorised and competent person.

d. The operator shall ensure that:

   i. such facilities and equipment as are necessary to enable shotfiring operations to be carried out safely are provided;

   ii. any vehicle which is provided for use in relation to shotfiring operations is so marked as to be readily identifiable from a distance;

   iii. detonators are stored in separate containers from other explosives; and

   iv. explosives are kept at all times either in a locked explosives store or under the constant supervision of a suitable person.

e. The operator shall ensure, so far as is reasonably practicable, that each shotfiring operation is carried out safely and in accordance with the rules required to be made in pursuance of paragraph (b)(i) and any specification required to be prepared in pursuance of paragraph (b)(ii).

9.9.18.6 Supervision of Shotfiring and Records of Appointment

a. The operator shall take all reasonable steps to ensure that:

   i. a trainee shotfirer does not fire shots and is not required to fire shots, except when he is under the close personal supervision of a shotfirer, until the operator is satisfied that he has completed a suitable period of training and has appropriate practical experience; and

   ii. all shotfiring operations are carried out under the close personal supervision of the shotfirer.

b. The operator shall ensure that a record of the appointment of any shotfirer or trainee shotfirer is kept at a suitable place until three years after that shotfirer's employment or trainee shotfirer's employment ends.

9.9.18.7 Shotfirer's duties

Before a shot is fired, a shotfirer shall:

i. check that the procedure has been followed for clearing the site and the 500-metre safety zone;

ii. check the shotfiring system or circuit to ensure that it has been connected correctly;

iii. where electrical detonators are used, ensure that they have been correctly connected to the shotfiring system or circuit and that the shotfiring system or circuit is tested with an instrument suitable for the purpose from a position of safety;

iv. where appropriate, ensure that the electrical integrity of the shotfiring system or circuit is such as to make a misfire unlikely; and

v. ensure that the shot is fired from a safe place.

9.9.18.8 Misfires

In the event of a misfire the operator shall ensure, so far as is reasonably practicable, that:

i. apart from himself, no person other than the Explosives Supervisor, shotfirer, trainee shotfirer or any other person authorised by him enters the danger area until a period of five minutes has elapsed since the misfire and any shotfiring apparatus has been disconnected from the shot;

ii. appropriate steps are taken to determine the cause of and to deal with the misfire;

iii. a suitable record is kept of the misfire for at least three years; and

iv. appropriate steps are taken to prevent theft of the explosives and detonators or their initiation by an unauthorised person.

9.9.18.9 Use of ANFO

Where an ANFO (ammonium nitrate / fuel oil) mixture is used, special precautions shall be taken to ensure that there is no pollution. Both of the ingredients can be extremely damaging if they are leached into water courses. For this reason, the following precautions shall be taken when ANFO is used as an explosive.

a. Ammonium nitrate shall be stored in sealed bags in a dry location.

b. Fuel oil shall be stored and transported as per the fuel guidelines.

c. Mixing of ANFO shall be done in such a way that there is no spillage or contamination of the ground. Should any spillage occur, then the spilt material shall be cleaned immediately and all contaminated soil shall be removed for remediation.

d. The filling and blasting of holes shall be done in the same day to avoid the leaching of ANFO into the water table and polluting of groundwater.

9.9.18.10 Prohibited Activities

a. A person other than a person appointed by the Ministry of Lands, Mines and Energy as an Explosives Inspector, a person engaged in the transport of explosives to or from the work site, a shotfirer, a trainee shotfirer, a person authorised to handle explosives at a work site or a person appointed to be in charge of the explosives store shall not handle explosives.

b. A person shall not bring any substance or article (other than explosives) likely to cause an unintended explosion or fire within ten metres of any explosives or take any naked flame within ten metres of any explosives.

c. A person shall not forcibly remove any detonator lead or other system for initiating shots from a shothole after the shothole has been charged and primed.

d. A person shall not charge or fire a shot:

    i. unless there is sufficient visibility to ensure that work preparatory to shotfiring, the shotfiring operation and any site inspection after the shot is fired can be carried out safely;

    ii. in a shothole which has previously been fired, unless he is dealing with a misfire; or

    iii. in any tunnel or other excavation (not being merely a shothole) in the face or side of the quarry wall for the purpose of extracting rock.

e. A person shall not fire a shot:

    i. unless he is a shotfirer or trainee shotfirer; and

    ii. other than by means of a suitable exploder, and the purpose of these guidelines, a safety fuse shall not be deemed to be a suitable exploder.

f. No person shall be in possession of a mobile telephone when:

    iii. within 50 metres of a charged blast hole;

    iv. inside an explosive storage compound; or

v. on a vehicle transporting detonators.

9.9.19 Warning of Blasting at Quarries

Blasting causes considerable concerns locally and can damage the structures of poorly-built houses nearby. The obligatory procedure given below is to be followed for this activity.

Obligatory Procedure for Blasting at Quarries

1. Never blast on Sundays, national public holidays, nor at night (6 pm to 7 am).
2. Blasting shall be announced at least 60 hours in advance and the timing agreed with the Community Liaison Officer.
3. The blasting warning news shall be broadcast on local radio for a minimum of two days in advance: this shall be done in all local languages as well as English and on at least two radio stations.
4. Communities shall be fully informed of the blast at least 48 hours in advance. To achieve this, workers shall be sent out to carry the blasting notices to all the villages and farms within 2 km from the quarry, to inform the precise time of the blasting operation. The workers shall post the notices on specially appointed notice boards at prominent locations at the nearby villages, the quarry access road and other approaches to the area. The notices shall explain the siren signals (1 hour, 15 minutes and 5 minutes before, and all-clear afterwards) and the grievance redress mechanism.
5. The workers shall also discuss the significance of the blast with the Village Chief or other community representative.
6. The day before any blasting, the Quarry Manager and the Community Liaison Officer shall visit all households judged to be close enough to the 500-metre fly rock exclusion zone as to require warning of evacuation.
7. On the day of any blasting, additional security shall be deployed around the quarry, and patrols made to enforce the exclusion of people from the 500-metre safety zone.
8. The Blast Operator will sound a loud double siren (15 seconds each with a 15-second gap) 1 hour, 15 minutes and 5 minutes before the blasting shots are fired.
9. Workers equipped with radios for communication shall be sent in all directions from the blasting area to enforce the clearance within the 500-metre fly rock danger zone 1 hour in advance, and keep watching every path leading to the blasting area until the blasting has finished.
10. The Blast Operator shall separately ensure that all workers and security guards are removed to an approved safe location before the blast.
11. At the last minute, the Blast Operator shall confirm the safety one more time through the radios, and then does the blasting.
12. After the blast, the Blast Operator shall check that all shots have fired and that the site is now safe. The all-clear shall then be sounded (a single siren of 30 seconds).
13. After the all-clear has sounded, the Community Liaison Team is sent to the villages to do the investigation for any possible damage.
14. A grievance process including a guidance form for all complaints shall be established, and a reporting mechanism to reach resolution.
15. In the event of a postponement for any reason, the all-clear shall be sounded. The Quarry Manager shall arrange a new time of blasting, which shall be not less than 48 hours ahead. The affected communities shall be informed of the reasons for postponement and updates provided every 24 hours until the blast takes place.

9.9.20 Procedure for Preventing Unfair Conditions of Worker Contract

The Contractor must present their employment contract for Labour to the project owner after signing the contract and prior to commencing work. The project owner 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 project owner's team 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 honouring 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 behaviour and punishments for infringement; and
- Not having a formal grievance system internal to the company 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 project owner's team is responsible for checking employment contract records.

The IIU has the right to require intoxication or controlled substance testing at any time.

9.9.21 Procedure for Managing Complaints of Sexual Harassment or Gender Based Violence

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 behaviour and the lack of social sanctions on violence. The World Bank 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 behaviours 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.

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 require 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 SSS must be informed immediately
    c. The Contractor's SSS must ensure the complainant is safe and if they are in need of support
    d. The Contractor's SSS will meet the Contractor's GRM investigation team and implement the deployment of the expert Liberian NGO lead investigator.
    e. The Contractor's SSS will invite the support of the MPW/ IIU SSS 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 SSS 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.

9.10 PERFORMANCE INDICATORS FOR MONITORING THE ESMP IMPLEMENTATION

The ESMP has been developed as a holistic management and monitoring tool for identified safety, environmental and social aspects of the project. It encompasses a wide range of protection and mitigation measures. Recording of compliance is through a formal reporting system. The indicators for performance are national standards where they exist, appropriately selected international standards where Liberian standards are not yet in place, and a series of practical guidelines. The simple but comprehensive monitoring system allows the standard of compliance and responsibility for further work to be identified and reported for action in a clear and accessible format. The following specific indicators will be used to monitor the overall implementation of the ESMP:

A. Evidence of contractor's Environmental and Social Management System including the contractor's ESMP, OHS Plan, Labour Management Plan, Waste Management Plan, Risk Assessment and Emergency Response and Preparedness Plan, Oil Spill response plan, and possibly Biological Management Plan, approved by the IIU prior to commencement of civil work;

B. Contractor's recruitment of an Environmental Specialist, a Social Specialist, Community Liaison Assistant, and an ISO 45001:2018, OHSAS 18001:2007 or similar certified Health and Safety Specialist.

C. Evidence of Worker Code of Conduct signed by all project workers and staff;

D. Evidence of contractor's adherence to siting guidelines for ancillary facilities and structures, including labour camps, quarries, and borrow pits;

E. Evidence of a functioning GRM at all levels of the project;

F. Evidence of contractor's Workers GRM;

G. Effective GBV/ sexual exploitation and abuse prevention measures; Evidence of the Supervising Engineer's Environmental and Social Management System and Supervising Engineer's recruitment of an Environmental Specialist, a social Specialist and an ISO 45001:2018, OHSAS 18001:2007 or similar certified Health and Safety Specialist.

H. The Supervising Engineer's monthly environmental, social, health and safety

monitoring report approved by the IIU, and quarterly monitoring report approved by the IIU and the EPA.

9.11 ACTION PLAN FOR THE IIU

Prior to the finalisation of the road design and the commencement of the works the IIU should ensure the following:

A. An ESIA/ESMP for the project operation and decommissioning phase is prepared and owned by the IIU. It should also be included, in addition to the construction ESIA, in any ToR or bidding documents related to the hiring of contractor and owner's engineer.

B. Affected communities are consulted regarding the project's impacts and proposed mitigations related to both construction and operational phases.

C. The surveys and assessments necessary for the consolidation of biological data as described in Section 9.7.2 are performed. The scope of work for the proposed biodiversity study should also include consultation with stakeholders relevant to wildlife. These surveys should be used to inform the interventions under this ESMP, refine the mitigation activities and define whether a Biological Management Plan is required. The results should be published as an addendum to the ESIA. The surveys should cover both dry and rainy seasons to allow the understanding of the impact of seasonality.

D. The siting of the ancillary facilities is in line with the criteria set out in Section 8.4 and that critical habitats are avoided.

E. A detailed inventory of the forest trees is undertaken once the contractor has finalised the land required for ancillary infrastructure and this has been approved by the IIU. This listing must be completed and trees to be felled must be compensated.

F. The contractor has a comprehensive ESMS that is satisfactory to the provisions of this ESMP and the World Bank ESF.

G. The IIU should recruit full-time Environmental Safeguards Specialist, a Social Safeguards Team (consisting of a Social Specialist and two Community Liaison Assistants and an ISO 45001:2018, OHSAS 18001:2007 or similar certified Health and Safety Specialist to continuously monitor the project's environmental, social and health and safety performance.

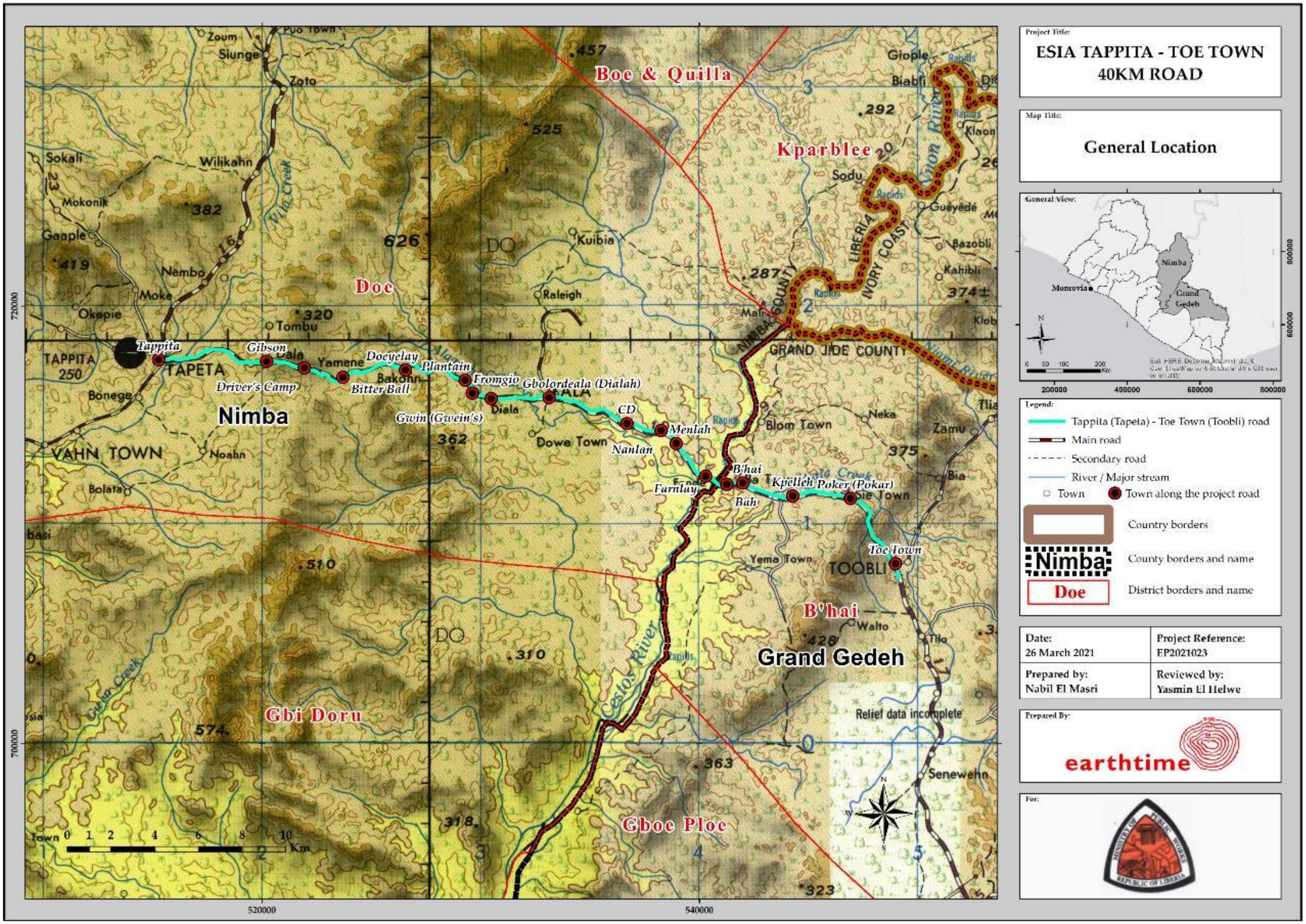
During works, the IIU must ensure the following:

F. The contractor establishes its ESMS and implements its ESMP and OHS Plan.

G. The Supervising Engineer is performing its duties in monitoring the contractor against its ESMP and OHS Plan

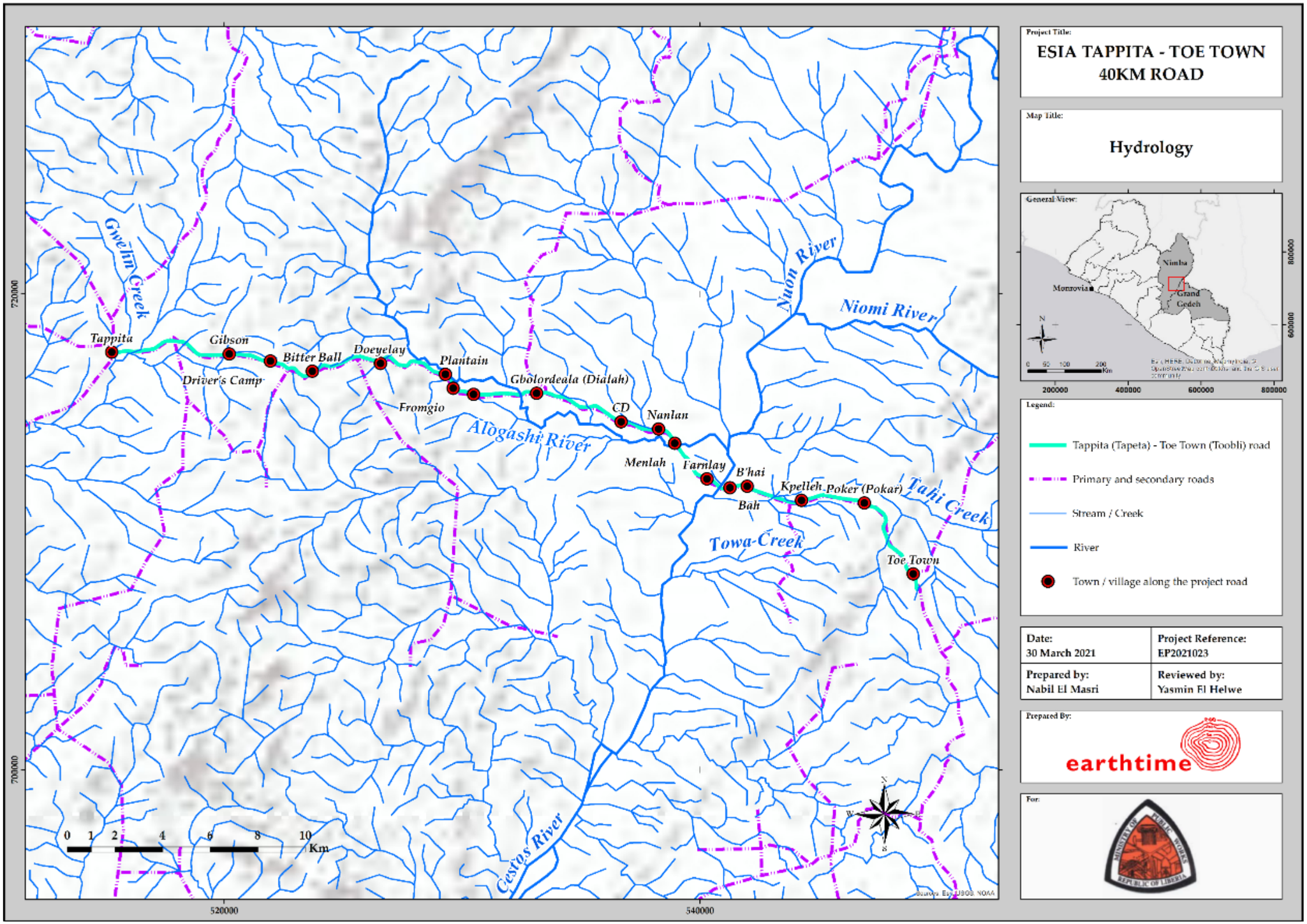
H. The contractor's and Supervising Engineer's Environmental, Social and Health and Safety Staff are assigned and present on the sites.

APPENDIX A MAPS

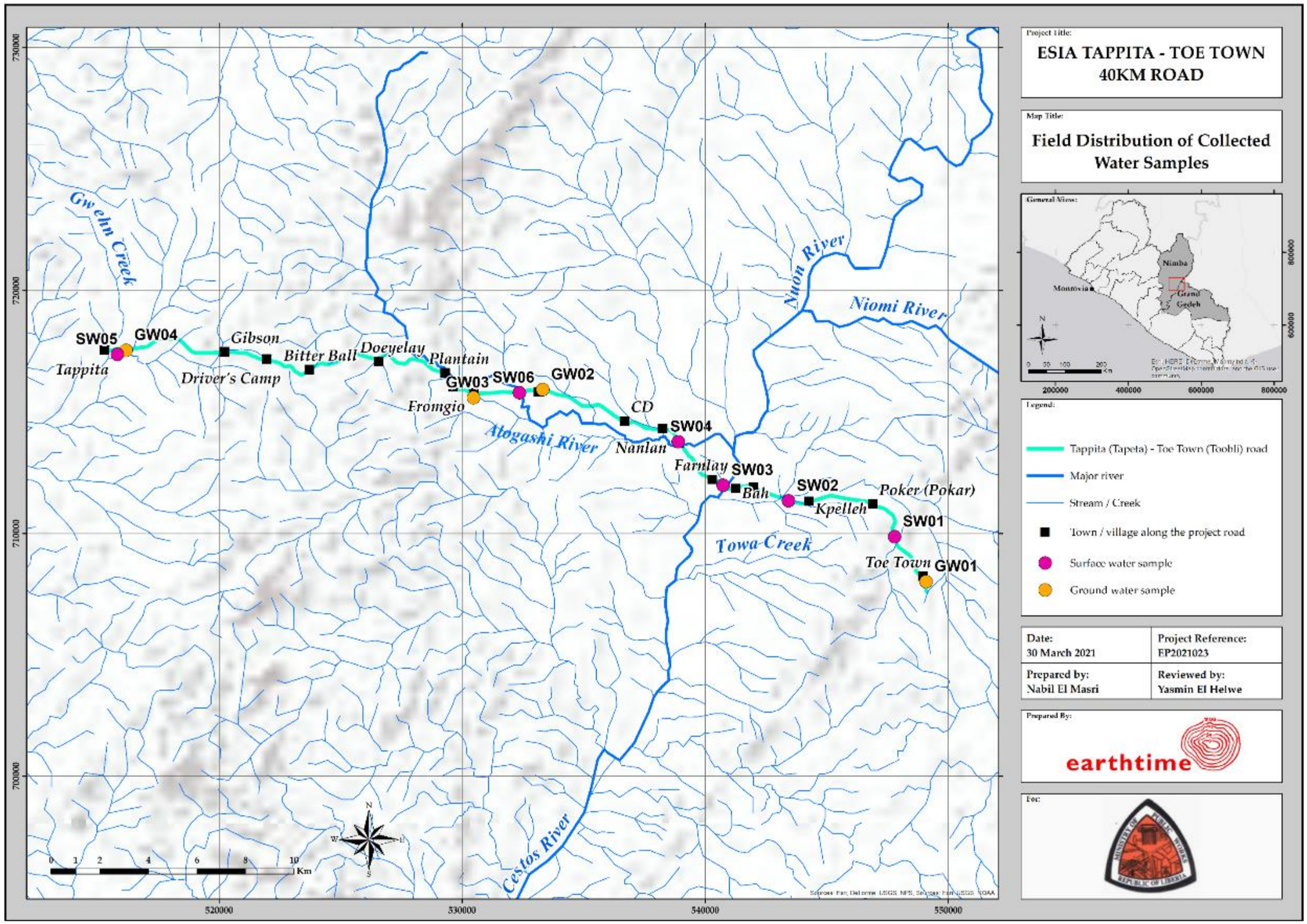


Project location

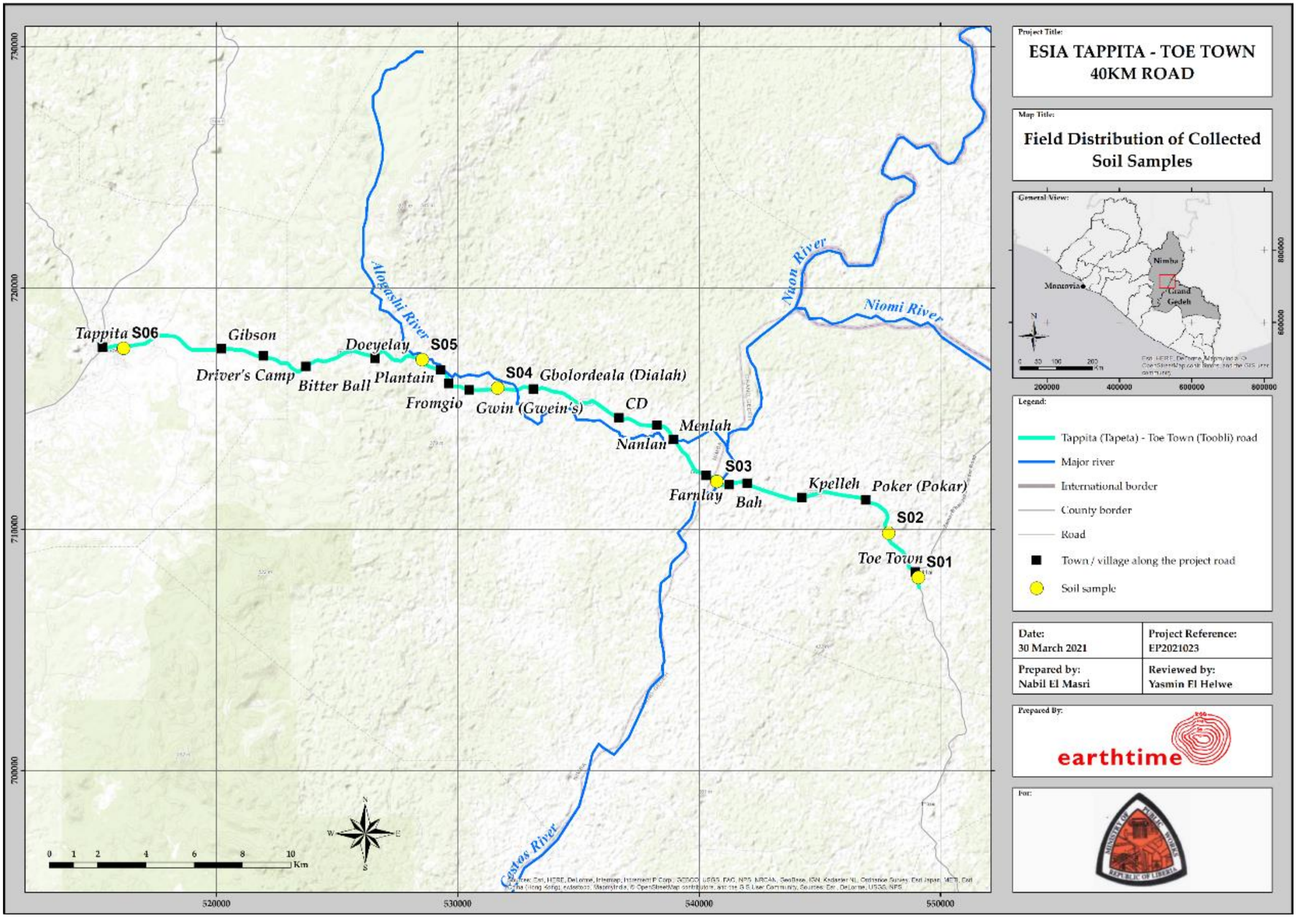
Project location with respect to the general elevation map of Liberia



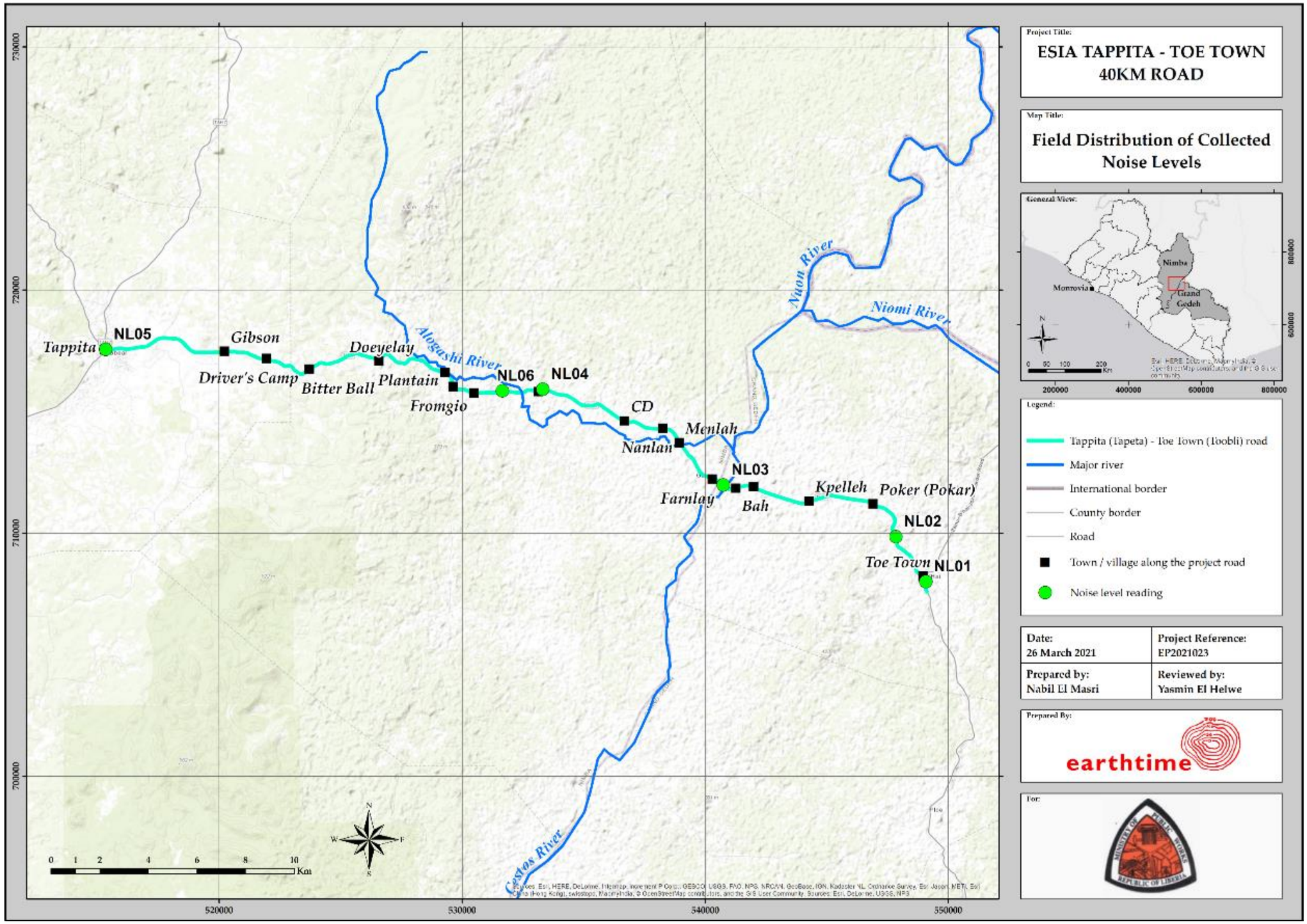
Hydrology in the project area



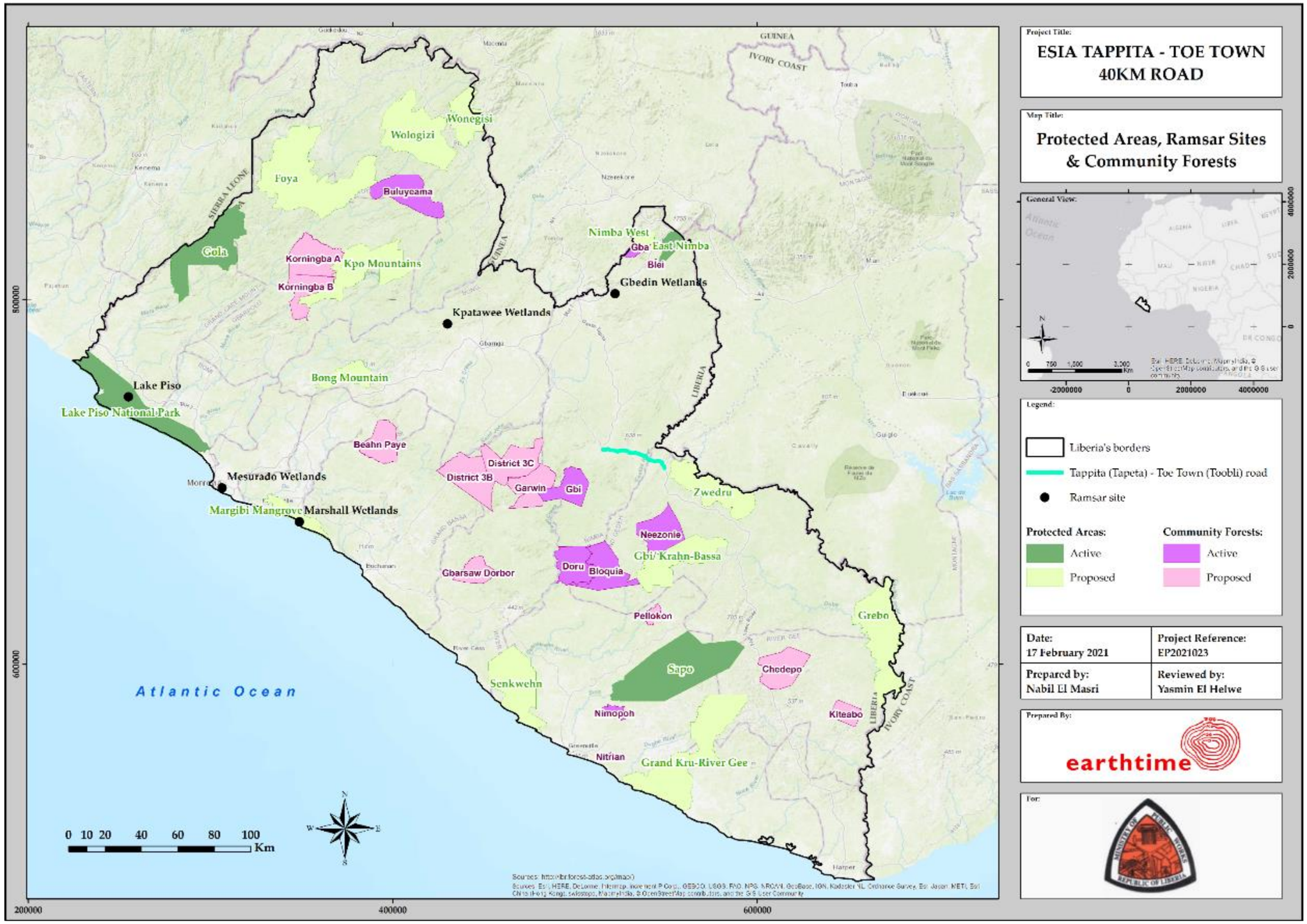
Surface and groundwater sampling location



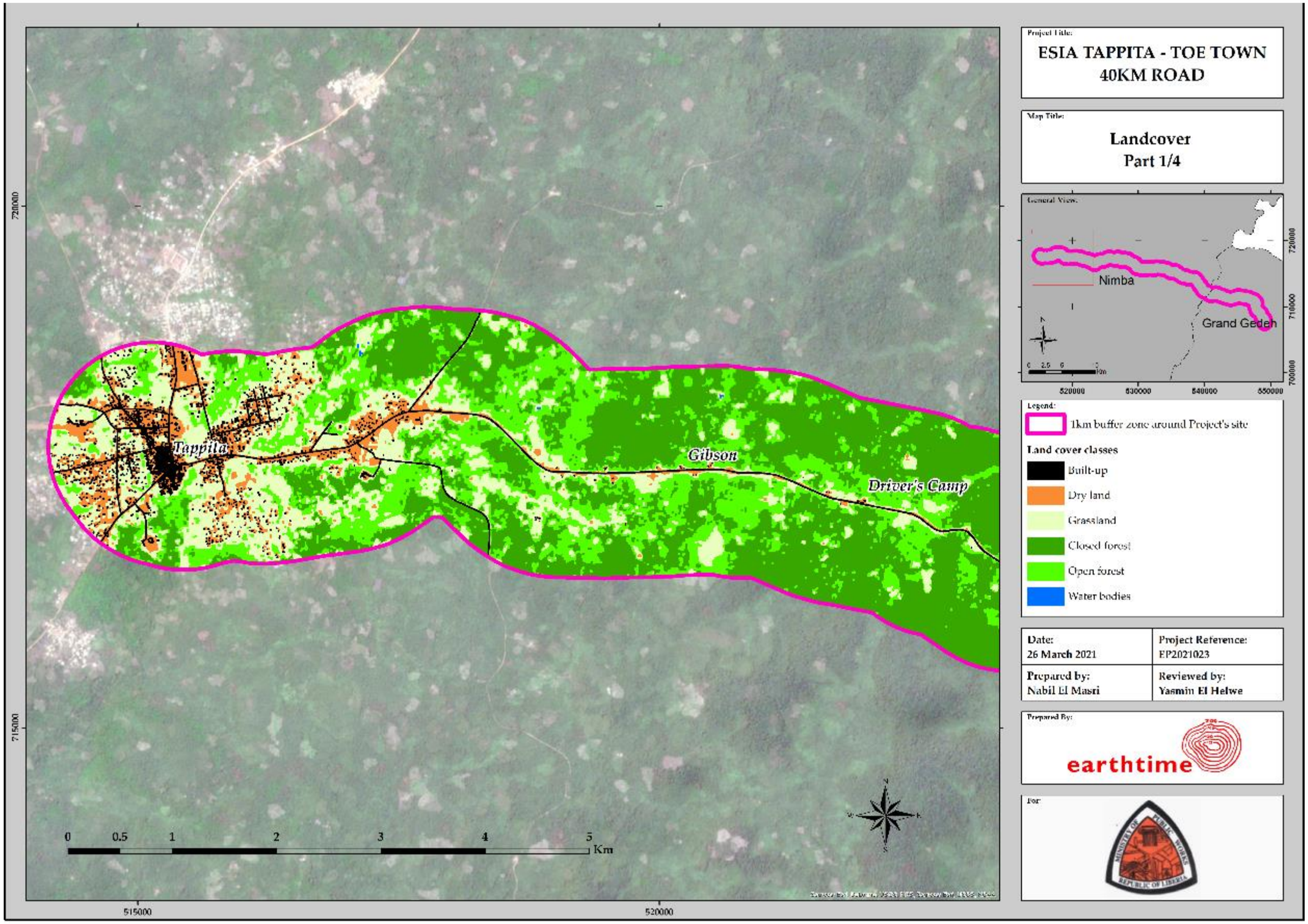
Soil sampling locations



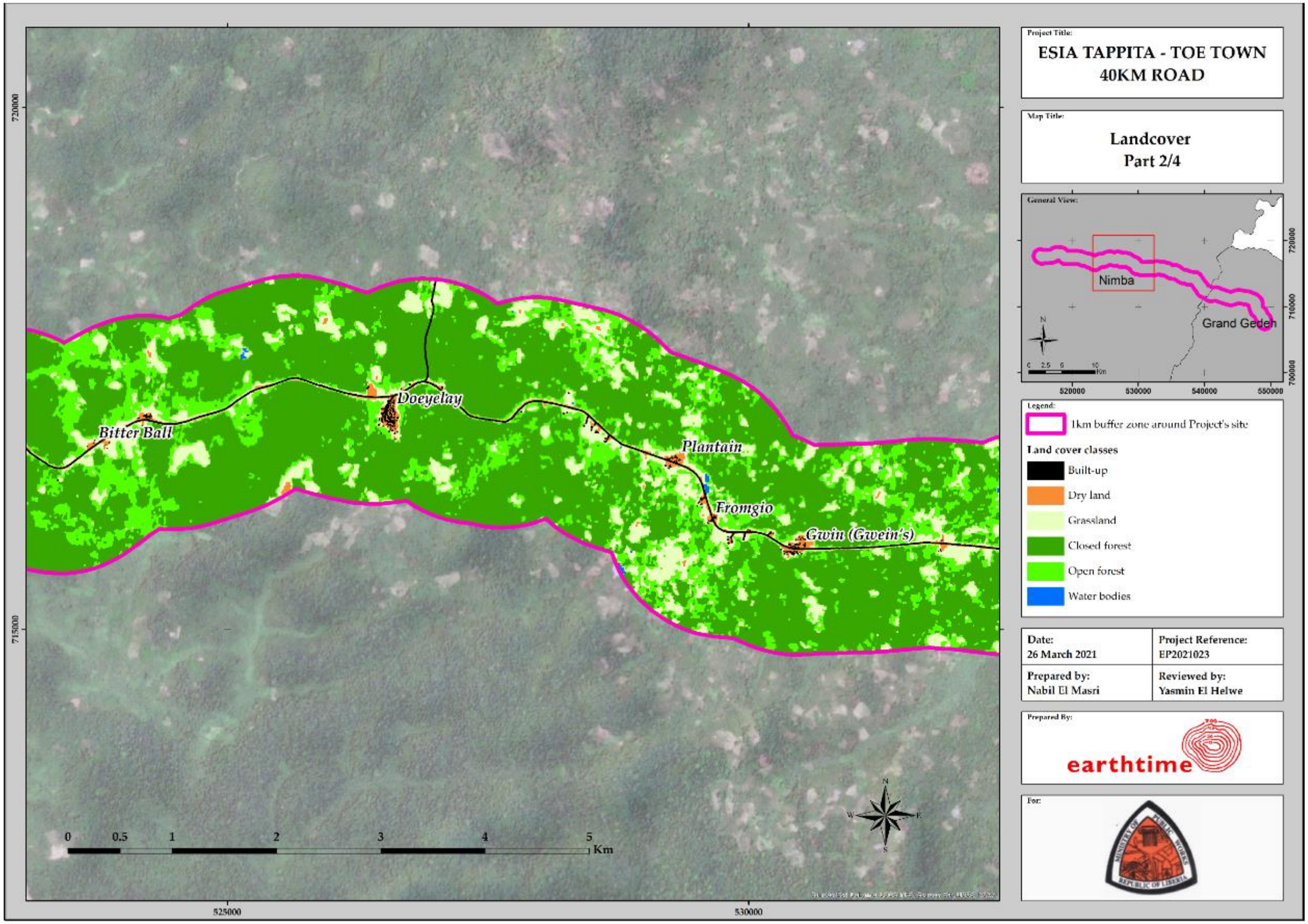
Noise sampling locations



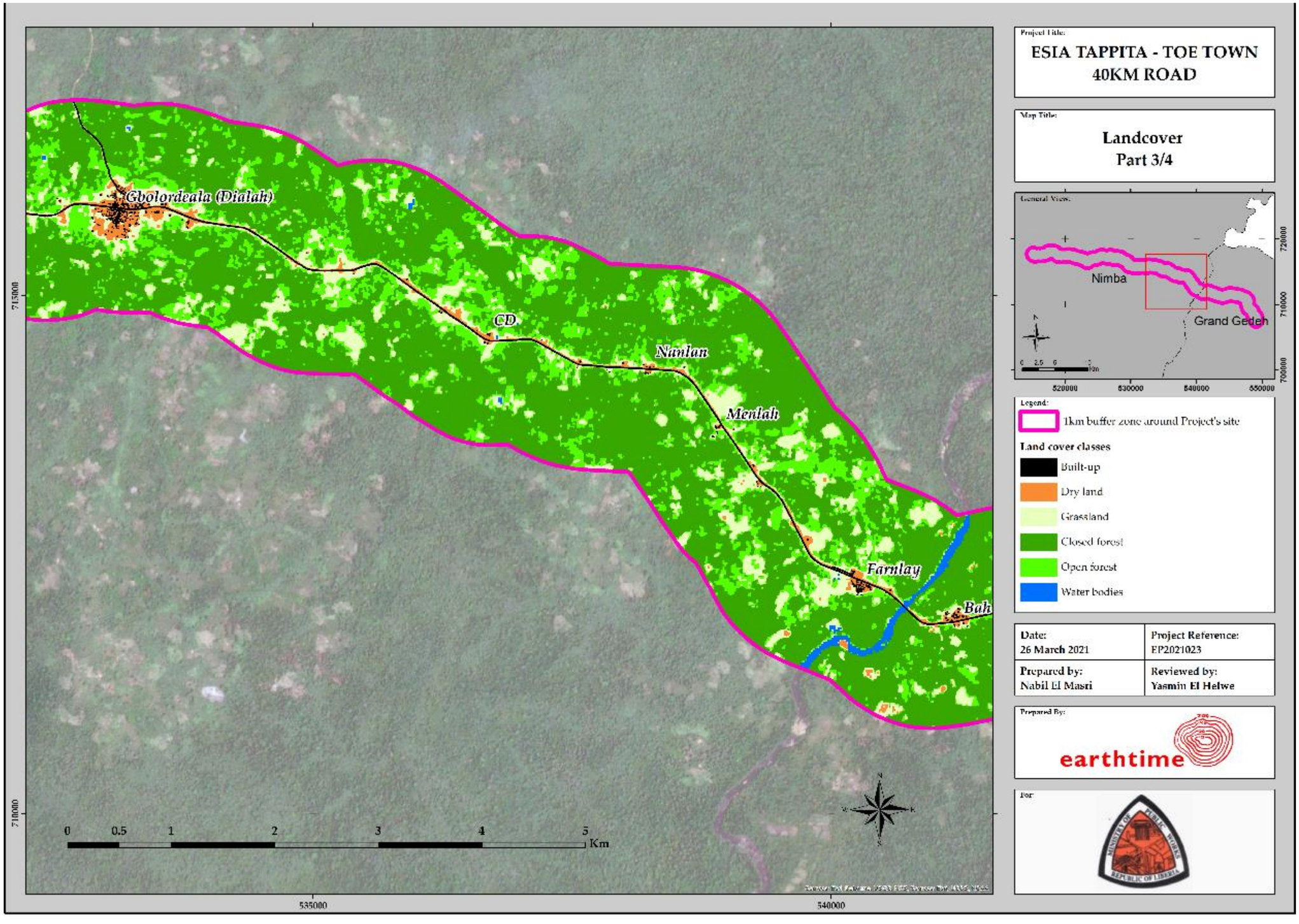
Protected areas, designated Ramsar sites and community forests in Liberia



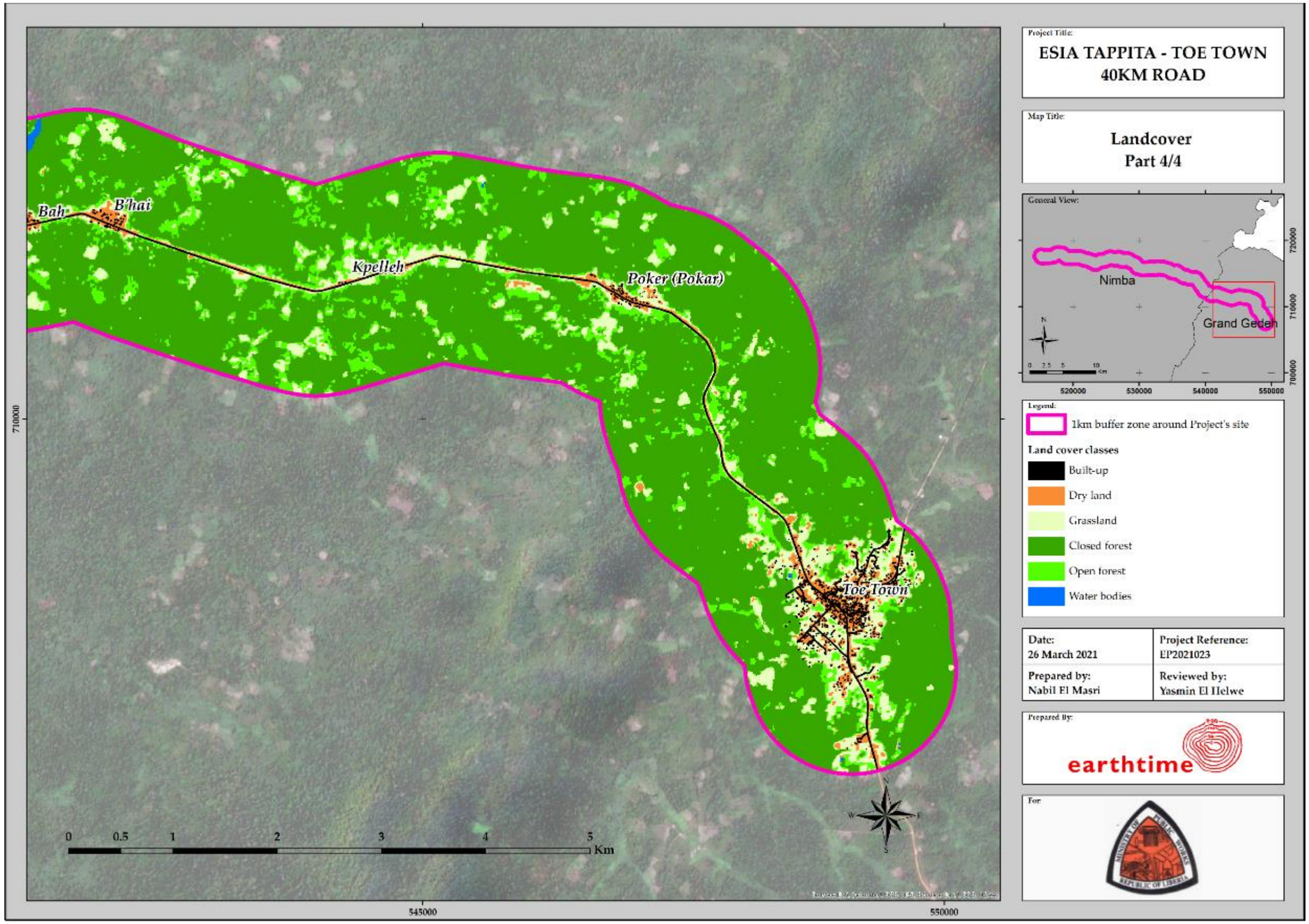
Land cover map (Section 1) of the road corridor (1 km each side of the road)



Land cover map (Section 2) of the road corridor (1 km each side of the road)



Land cover map (Section 3) of the road corridor (1 km each side of the road)



Land cover map (Section 4) of the road corridor (1 km each side of the road

APPENDIX B LABORATORY RESULTS

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Company Name	Earthtime Inc
Contact Person	Basma Shamas Environmental Consultant bshamas@earthtimegroup.com
Laboratory Name	Liberlab
Quote No	LBQ-E-2021008
Liberlab's Contact	Wafaa Alhalabi Lab manager wafaa.alhalabi@liberlab.com
Analyzed by	Wafaa Alhalabi
Report No	014-01
Report Issue Date	25 February 2021

Certificate of Analysis

Liberlab received (7) surface water, (4) groundwater, (7) soil samples on Friday, 12th February 2021, these samples were scheduled for analysis which was completed on Tuesday, 23rd February 2021.

Accredited laboratory tests are defined within the report, out 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

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			Sample ID	SW00	SW01	SW02	SW03	SW04	SW05	SW06
			Sample type	SW	SW	SW	SW	SW	SW	SW
			Date sampled	11/02/2021	11/02/2021	11/02/2021	11/02/2021	11/02/2021	12/02/2021	12/02/2021
Method	**LoD**	**Unit**	**Parameter**							
TM043	<2	mg/l	Alkalinity, Total as CaCO3	32.8	20.5	20.1	32.6	29.2	29.1	27.3
TM095	<0.2	mg/l	Ammoniacal Nitrogen as N	0.357	<0.2	0.273	0.324	<0.2	<0.2	<0.2
TM184	<2	mg/l	Chloride	<2	<2	2.2	<2	2	2.2	2
TM107	<7	mg/l	COD, unfiltered	13.4	46.3	13.2	11.1	16.6	15.4	9.48
TM120	<0.020	mS/cm	Conductivity @ 20deg.C.	0.0611	0.0485	0.0588	0.0623	0.0402	0.0535	0.0481
TM124	<5	mg/l	Dissolved solids, Total	43.7	33.7	32.3	43.8	39.4	32.2	43.8
TM184	<0.3	mg/l	Nitrate as NO3	<0.3	2.25	0.58	<0.3	0.412	<0.3	0.508
TM184	<0.05	mg/l	Nitrite as NO2	0.07	0.282	<0.05	0.056	0.081	0.057	0.08
TM046	<0.3	mg/l	Oxygen, dissolved	9.56	9.48	10.3	9.91	9.79	9.53	9.35
TM256	<1.00	pH Units	pH	7.77	7.23	7.16	7.76	7.3	7.08	7.18
TM184	<2	mg/l	Sulphate	<2	<2	<2	<2	<2	<2	<2
TM022	<2	mg/l	Suspended solids, Total	<2	3.3	5.8	<2	4.75	10.8	<2
TM195	<0.1	NTU	Turbidity	4.64	6.84	18.5	4.48	13.7	22.1	7.68
TM152	<0.5	µg/l	Arsenic (diss.filt)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
TM152	<0.019	mg/l	Iron (Dis.Filt)	0.483	0.569	0.732	0.623	0.492	1.37	0.335
TM152	<0.2	µg/l	Lead (diss.filt)	<0.2	<0.2	<0.2	<0.2	<0.2	0.308	0.223
TM152	<0.036	mg/l	Magnesium (Dis.Filt)	2.03	1.78	1.53	2.02	1.87	1.09	2.03
TM152	<10	µg/l	Phosphorus (diss.filt)	<10	<10	<10	<10	<10	<10	<10
TM152	<0.2	mg/l	Potassium (Dis.Filt)	1.53	0.528	1.71	1.89	1.51	1.56	1.52
TM184	<0.01	µg/l	Mercury (diss.filt)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
			Determination of EPH (DRO) (C10-C40)							
TM172	<100	µg/l	EPH Range >C10 - C40 (aq)	<100	<100	<100	<100	<100	<100	<100
			Determination of EPH CWG (Aliphatic fraction)							
TM174	<10	µg/l	Aliphatics >C12-C16 (aq)	<10	<10	<10	<10	<10	<10	<10
TM174	<10	µg/l	Aliphatics >C16-C21 (aq)	<10	<10	<10	<10	<10	<10	<10
TM174	<10	µg/l	Aliphatics >C16-C35 Aqueous	<10	<10	<10	<10	<10	<10	<10
TM174	<10	µg/l	Aliphatics >C21-C35 (aq)	<10	<10	<10	<10	<10	<10	<10
TM174	<10	µg/l	Total Aliphatics >C12-C35 (aq)	<10	<10	<10	<10	<10	<10	<10
			Determination of EPH CWG (Aromatic fraction)							
TM174	<10	µg/l	Aromatics >EC12-EC16 (aq)	<10	<10	<10	<10	<10	<10	<10

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			Sample ID	SW00	SW01	SW02	SW03	SW04	SW05	SW06
			Sample type	SW	SW	SW	SW	SW	SW	SW
			Date sampled	11/02/2021	11/02/2021	11/02/2021	11/02/2021	11/02/2021	12/02/2021	12/02/2021
Method	**LoD**	**Unit**	**Parameter**							
TM174	<10	µg/l	Aromatics >EC10-EC21 (aq)	<10	<10	<10	<10	<10	<10	<10
TM174	<10	µg/l	Aromatics >EC21-EC35 (aq)	<10	35	<10	<10	<10	<10	<10
TM174	<10	µg/l	Total Aromatics >EC12-EC35 (aq)	<10	35	<10	<10	<10	<10	<10
			Determination of Total Gasoline Range Organic Hydrocarbons including BTEX and MTBE							
TM245	<10	µg/l	Aliphatics >C10-C12	<10	<10	<10	<10	<10	<10	<10
TM245	<10	µg/l	Aliphatics >C5-C6	<10	<10	<10	<10	<10	<10	<10
TM245	<10	µg/l	Aliphatics >C6-C8	<10	<10	<10	<10	<10	<10	<10
TM245	<10	µg/l	Aliphatics >C8-C10	<10	<10	<10	<10	<10	<10	<10
TM245	<10	µg/l	Aromatics >EC10-EC12	<10	<10	<10	<10	<10	<10	<10
TM245	<10	µg/l	Aromatics >EC5-EC7	<10	<10	<10	<10	<10	<10	<10
TM245	<10	µg/l	Aromatics >EC7-EC8	<10	<10	<10	<10	<10	<10	<10
TM245	<10	µg/l	Aromatics >EC8-EC10	<10	<10	<10	<10	<10	<10	<10
TM245	<7	µg/l	Benzene	<7	<7	<7	<7	<7	<7	<7
TM245	<100	µg/l	EPH (C6-C10)	<100	<100	<100	<100	<100	<100	<100
TM245	<5	µg/l	Ethylbenzene	<5	<5	<5	<5	<5	<5	<5
TM245	<10	µg/l	GRO >C5-C10	<10	<10	<10	<10	<10	<10	<10
TM245	<50	µg/l	GRO >C5-C12	<50	<50	<50	<50	<50	<50	<50
TM245		%	GRO Surrogate % recovery	80	110	84	92	96	75	97
TM245	<8	µg/l	m,p-Xylene	<8	<8	<8	<8	<8	<8	<8
TM245	<3	µg/l	Methyl tertiary butyl ether (MTBE)	<3	<3	<3	<3	<3	<3	<3
TM245	<3	µg/l	o-Xylene	<3	<3	<3	<3	<3	<3	<3
TM245	<28	µg/l	Sum of detected BTEX	<28	<28	<28	<28	<28	<28	<28
TM245	<11	µg/l	Sum of detected Xylenes	<11	<11	<11	<11	<11	<11	<11
TM245	<4	µg/l	Toluene	<4	<4	<4	<4	<4	<4	<4
			Determination of TPH CWG							
TM174	<10	µg/l	Total Aliphatics & Aromatics >C5-35 (aq)	<10	35	11	<10	<10	<10	<10
			Total EPH, Determination of EPH (C6-C65), Total EPH (C6-C40) and EPH (C8-C12)							
TM172	<100	µg/l	Total EPH (C6-C40) (aq)	<100	<100	<100	<100	<100	<100	<100
			Determination of Volatile Organic Compounds							
TM208	<1	µg/l	Benzene	<1	<1	<1	<1	<1	<1	<1

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			Sample ID	SW00	SW01	SW02	SW03	SW04	SW05	SW06
			Sample type	SW	SW	SW	SW	SW	SW	SW
			Date sampled	11/02/2021	11/02/2021	11/02/2021	11/02/2021	11/02/2021	12/02/2021	12/02/2021
Method	**LoD**	**Unit**	**Parameter**							
TM208	<1	µg/l	Ethylbenzene	<1	<1	<1	<1	<1	<1	<1
TM208	<1	µg/l	m,p-Xylene	<1	<1	<1	<1	<1	<1	<1
TM208	<1	µg/l	Methyl tertiary butyl ether (MTBE)	<1	<1	<1	<1	<1	<1	<1
TM208	<1	µg/l	o-Xylene	<1	<1	<1	<1	<1	<1	<1
TM208	<5	µg/l	Sum of BTEX	<5	<5	<5	<5	<5	<5	<5
TM208	<1	µg/l	Toluene	<1	<1	<1	<1	<1	<1	<1
TM208		%	Toluene-d8**	98.5	97	98.1	99.3	98.9	98.1	98.2

Page **4** of **8**

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			Sample ID	GW01	GW02	GW03	GW04
			Sample type	GW	GW	GW	GW
			Date sampled	11/02/2021	11/02/2021	12/02/2021	12/02/2021
Method	**LoD**	**Unit**	**Parameter**				
TM043	<2	mg/l	Alkalinity, Total as CaCO3	33	20.8	13	5
TM095	<0.2	mg/l	Ammoniacal Nitrogen as N	<0.2	<0.2	<0.2	<0.2
TM184	<2	mg/l	Chloride	16.7	9.3	2	14.1
TM107	<7	mg/l	COD, undiluted	<7	<7	<7	<7
TM120	<0.020	mS/cm	Conductivity @ 20 deg.C.	0.19	0.136	0.0295	0.0824
TM124	<5	mg/l	Dissolved solids, Total	148	113	21.3	65.3
TM184	<0.3	mg/l	Nitrate as NO3	71.7	53.1	0.778	19.6
TM184	<0.05	mg/l	Nitrite as NO2	0.217	0.234	0.085	0.077
TM046	<0.3	mg/l	Oxygen, dissolved	9.27	8.23	8.99	9.69
TM256	<1.00	pH	pH	5.16	6.36	5.83	5.73
TM184	<2	mg/l	Sulphate	<2	<2	<2	<2
TM022	<2	mg/l	Suspended solids, Total	<2	<2	3.15	8.55
TM195	<0.1	mu	Turbidity	0.441	0.636	5.55	11.5
TM152	<0.5	µg/l	Arsenic (diss.filt)	<0.5	<0.5	<0.5	<0.5
TM152	<0.019	mg/l	Iron (Dis.Filt)	<0.019	<0.019	0.0471	<0.019
TM152	<0.2	µg/l	Lead (diss.filt)	6.96	0.554	0.395	0.748
TM152	<0.036	mg/l	Magnesium (Dis.Filt)	2.19	3.63	0.483	0.46
TM152	<10	µg/l	Phosphorus (diss.Filt)	<10	18.2	<10	<10
TM152	<0.2	mg/l	Potassium (Dis.Filt)	10.2	1.69	0.795	1.44
TM184	<0.01	µg/l	Mercury (diss.Filt)	<0.01	<0.01	<0.01	<0.01
			Determination of EPH (DRO) (C10-C40)				
TM172	<100	µg/l	EPH Range >C10 - C40 (aq)	<100	<100	<100	<100
			Determination of EPH CWG (Aliphatic fraction)				
TM174	<10	µg/l	Aliphatics >C12-C16 (aq)	<10	<10	<10	<10
TM174	<10	µg/l	Aliphatics >C16-C21 (aq)	<10	<10	<10	<10
TM174	<10	µg/l	Aliphatics >C16-C35 Aqueous	<10	<10	<10	<10
TM174	<10	µg/l	Aliphatics >C21-C35 (aq)	<10	<10	<10	<10
TM174	<10	µg/l	Total Aliphatics >C12-C35 (aq)	<10	<10	<10	<10
			Determination of EPH CWG (Aromatic fraction)				
TM174	<10	µg/l	Aromatics >EC12-EC16 (aq)	<10	<10	<10	<10

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			Sample ID	GW01	GW02	GW03	GW04
			Sample type	GW	GW	GW	GW
			Date sampled	11/02/2021	11/02/2021	12/02/2021	12/02/2021
Method	**LoD**	**Unit**	**Parameter**				
TM174	<10	µg/	Aromatics >EC16-EC21 (aq)	<10	<10	<10	<10
TM174	<10	µg/	Aromatics >EC21-EC35 (aq)	<10	<10	<10	<10
TM174	<10	µg/	Total Aromatics >EC12-EC35 (aq)	<10	<10	<10	<10
			Determination of Total Gasoline Range Organic Hydrocarbons including BTEX and MTBE				
TM245	<10	µg/	Aliphatics >C10-C12	<10	<10	<10	<10
TM245	<10	µg/	Aliphatics >C5-C6	<10	<10	<10	<10
TM245	<10	µg/	Aliphatics >C6-C8	<10	<10	<10	<10
TM245	<10	µg/	Aliphatics >C8-C10	<10	<10	<10	<10
TM245	<10	µg/	Aromatics >EC10-EC12	<10	<10	<10	<10
TM245	<10	µg/	Aromatics >EC5-EC7	<10	<10	<10	<10
TM245	<10	µg/	Aromatics >EC7-EC8	<10	<10	<10	<10
TM245	<10	µg/	Aromatics >EC8-EC10	<10	<10	<10	<10
TM245	<7	µg/	Benzene	<7	<7	<7	<7
TM245	<100	µg/	EPH (C6-C10)	<100	<100	<100	<100
TM245	<5	µg/	Ethylbenzene	<5	<5	<5	<5
TM245	<10	µg/	GRO >C5-C10	<10	<10	<10	<10
TM245	<50	µg/	GRO >C5-C12	<50	<50	<50	<50
TM245		%	GRO Surrogate % recovery	96	85	91	112
TM245	<8	µg/	m,p-Xylene	<8	<8	<8	<8
TM245	<3	µg/	Methyl tertiary butyl ether (MTBE)	<3	<3	<3	<3
TM245	<3	µg/	o-Xylene	<3	<3	<3	<3
TM245	<28	µg/	Sum of detected BTEX	<28	<28	<28	<28
TM245	<11	µg/	Sum of detected Xylenes	<11	<11	<11	<11
TM245	<4	µg/	Toluene	<4	<4	<4	<4
			Determination of TPH GWG				
TM174	<10	µg/	Total Aliphatics & Aromatics >C5-35 (aq)	<10	<10	<10	<10
			Total EPH, Determination of EPH (C6-C35), Total EPH (C6-C40) and EPH (C8-C12)				
TM172	<100	µg/	Total EPH (C6-C40) (aq)	<100	<100	<100	<100
			Determination of Volatile Organic Compounds				
TM208	<1	µg/	Benzene	<1	<1	<1	<1

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			Sample ID	GW01	GW02	GW03	GW04
			Sample type	GW	GW	GW	GW
			Date sampled	11/02/2021	11/02/2021	12/02/2021	12/02/2021
Method	**LoD**	**Unit**	**Parameter**				
TM208	<1	µg/	Ethylbenzene	<1	<1	<1	<1
TM208	<1	µg/	m,p-Xylene	<1	<1	<1	<1
TM208	<1	µg/	Methyl tertiary butyl ether (MTBE)	<1	<1	<1	<1
TM208	<1	µg/	o-Xylene	<1	<1	<1	<1
TM208	<5	µg/	Sum of BTEX	<5	<5	<5	<5
TM208	<1	µg/	Toluene	<1	<1	<1	<1
TM208		%	Toluene-d8**	98.6	98.7	97.8	97.5

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			Sample ID	500	501	502	503	504	505	506
			Sample type	S	S	S	S	S	S	S
			Date sampled	12/02/2021	11/02/2021	11/02/2021	11/02/2021	12/02/2021	12/02/2021	12/02/2021
Method	LoD	Unit	Parameter							
			Colour	Light Brown	Light Brown	Light Brown	Light Brown	Light Brown	Light Brown	Light Brown
			Description	Sandy Loam	Sandy Clay	Sandy Loam	Sand	Sand	Sandy Silt	Sandy Silt
			Inclusions 1)	None	Stones	Stones	None	Vegetation	None	Vegetation
			Inclusions 2)	None	Vegetation	Vegetation	None	None	None	None
		%	Moisture Content Ratio (% of as received sample)	13	12	14	10	7.7	13	8.9
TM132	<0.2	%	Organic Carbon, Total	0.313	0.32	0.667	0.3	0.375	0.298	0.457
TM184	<20	mg/kg	Acidity as HCl	30.7	<20	<20	29.9	39.9	<20	30.6
TM240	<10	mg/kg	Alkalinity, Total as CaCO3	<10	17.4	11.7	14	24.4	<10	16.5
TM294	<0.014	mS/cm	Conductivity @ 20 deg C	1.74	1.69	1.71	1.93	1.86	1.74	1.83
TM024	<12	mg/kg	Exchangeable Ammonia as N	<12	<12	<12	<12	<12	<12	<12
TM248	<1	mg/kg	Nitrate as NO3, 2:1 water soluble	5.53	18.4	24.3	41	8.63	3	28.6
TM248	<0.1	mg/kg	Nitrite as NO2, 2:1 water soluble	<0.1	0.16	0.15	<0.1	0.25	<0.1	0.12
TM108	1	pH Units	pH	4.84	5.74	4.86	5.63	5.65	4.89	6.06
TM248	<1	mg/kg	Phosphate (ortho) as PO4	<1	<1	<1	<1	<1	<1	<1
TM248	<0.004	g/l	Water Soluble Sulphate as SO4 2:1 Extract	<0.004	0.0045	0.0035	0.0072	0.0014	<0.004	0.0114
TM181	<0.1	mg/kg	Aluminium	12300	23900	23600	1740	5370	12600	8950
TM181	<0.7	mg/kg	Boron	<0.7	<0.7	<0.7	<0.7	0.807	<0.7	<0.7
TM181	<0.02	mg/kg	Cadmium	0.0041	<0.02	<0.02	<0.02	0.0012	<0.02	<0.02
TM181	<1000	mg/kg	Iron	9230	113000	108000	5140	4430	8960	10500
TM181	<0.7	mg/kg	Lead	2.51	1.94	1.33	2.2	4.85	3.03	4.66
TM181	<0.13	mg/kg	Manganese	20.5	60.6	237	78.2	63.3	19.7	69.9
TM181	<1	mg/kg	Phosphorus	36.6	108	194	124	81.4	30.8	115
TM181	<1.9	mg/kg	Zinc	5.61	18.1	30.6	12.6	7.73	5.74	12.5
TM224	<21	mg/kg	Calcium	100	218	418	904	2340	42.6	412
TM224	<8	mg/kg	Magnesium	140	123	213	353	255	136	213
TM224	<16	mg/kg	Potassium	147	201	129	202	246	93.7	160
TM224	<7	mg/kg	Sodium	38.6	46.1	28.6	38.6	45.5	11.9	20
TM415	<35	mg/kg	EPH >C10-C40	<35	<35	<35	<35	<35	<35	<35
TM415		%	EPH Surrogate % recovery	49	47.2	50.8	53.6	46.1	46.9	53.7

APPENDIX C NOISE LEVEL DATA

Appendix C.1 Noise Level Data at NL01

ID	da474ae5-548f-47c0-a8f0-12871cb37470	LZSMINTIME	02/11/2021 14:45
RESULTID	d894ce18-f40e-4fcc-9b43-845174ac5bfe	LAPK	112.8
BATTERYLOW	FALSE	LAPKTIME	02/11/2021 14:36
DURATIONSEC	1800	LCPK	111.6
ENDDATETIME	02/11/2021 15:06	LCPKTIME	02/11/2021 14:36
NOTES		LZPK	114.3
OVERLOAD	FALSE	LZPKTIME	02/11/2021 14:36
PAUSEDURATIONSEC	0	LAE	91.7
RESPONSE	0	LAEQ	59.1
RUNNO	1	LAEQT80	53.9
STARTDATETIME	02/11/2021 14:36	LAFTM3	67.5
OCTAVECOUNT	24	LAFTM5	68.7
LAFMAX	87.2	LAIEQ	67.1
LAFMAXTIME	02/11/2021 14:40	LAITM3	71.4
LAFMIN	37	LAITM5	72.8
LAFMINTIME	02/11/2021 14:44	LCEQ	66
LAIMAX	91	LCEQSUBLAEQ	6.9
LAIMAXTIME	02/11/2021 14:36	LEPD	0
LAIMIN	41	LEX8H	0
LAIMINTIME	02/11/2021 14:36	LZEQ	67.4
LASMAX	80.1	LAVGQ4	57.3
LASMAXTIME	02/11/2021 14:40	LAVGTHRESHOLD	0
LASMIN	40.4	TWAQ4	0
LASMINTIME	02/11/2021 14:36	LAVGQ5	56.3
LCFMAX	88.6	TWAQ5	0
LCFMAXTIME	02/11/2021 14:58	CRITERIONTIMESEC	0
LCFMIN	48.6	LZF10	69.5
LCFMINTIME	02/11/2021 14:44	LZF50	62
LCIMAX	89.6	LZF90	58.5
LCIMAXTIME	02/11/2021 14:36	LZF95	57.5
LCIMIN	53.4	LZFVAR	56
LCIMINTIME	02/11/2021 14:44	LCF10	67.5
LCSMAX	86.2	LCF50	59.5
LCSMAXTIME	02/11/2021 14:58	LCF90	56
LCSMIN	52.7	LCF95	55
LCSMINTIME	02/11/2021 14:44	LCFVAR	53
LZFMAX	88.8	LAF10	60
LZFMAXTIME	02/11/2021 14:58	LAF50	51
LZFMIN	50.9	LAF90	45
LZFMINTIME	02/11/2021 14:51	LAF95	43.5
LZIMAX	90.2	LAFVAR	41.5
LZIMAXTIME	02/11/2021 14:36	OVERLOADTIMESEC	0
LZIMIN	57.8	VARLN	99
LZIMINTIME	02/11/2021 14:45	LEPDVAL	0
LZSMAX	86.4	LEX8HVAL	0
LZSMAXTIME	02/11/2021 14:58		
LZSMIN	55.8		

Appendix C.2 Noise Level Data at NL02

ID	20f3238e-3886-4fe2-940b-d37285657517	LZSMINTIME	02/11/2021 16:14
RESULTID	d7d711c7-a1d7-4f7b-9bbd-2188a26a612a	LAPK	111.7
BATTERYLOW	FALSE	LAPKTIME	02/11/2021 16:17
DURATIONSEC	1800	LCPK	109.5
ENDDATETIME	02/11/2021 16:21	LCPKTIME	02/11/2021 16:17
NOTES		LZPK	111.5
OVERLOAD	FALSE	LZPKTIME	02/11/2021 16:17
PAUSEDURATIONSEC	0	LAE	83.4
RESPONSE	0	LAEQ	50.9
RUNNO	1	LAEQT80	45.7
STARTDATETIME	02/11/2021 15:51	LAFTM3	59.9
OCTAVECOUNT	24	LAFTM5	60.8
LAFMAX	83.5	LAIEQ	59.9
LAFMAXTIME	02/11/2021 16:17	LAITM3	65
LAFMIN	26.1	LAITM5	65
LAFMINTIME	02/11/2021 16:12	LCEQ	57.8
LAIMAX	88.6	LCEQSUBLAEQ	6.9
LAIMAXTIME	02/11/2021 16:17	LEPD	0
LAIMIN	28.4	LEX8H	0
LAIMINTIME	02/11/2021 16:13	LZEQ	61
LASMAX	74.8	LAVGQ4	48.3
LASMAXTIME	02/11/2021 16:17	LAVGTHRESHOLD	0
LASMIN	28.1	TWAQ4	0
LASMINTIME	02/11/2021 16:13	LAVGQ5	46.8
LCFMAX	81.9	TWAQ5	0
LCFMAXTIME	02/11/2021 16:17	CRITERIONTIMESEC	0
LCFMIN	28.1	LZF10	64.5
LCFMINTIME	02/11/2021 16:14	LZF50	55.5
LCIMAX	86.9	LZF90	43.5
LCIMAXTIME	02/11/2021 16:17	LZF95	40.5
LCIMIN	30.5	LZFVAR	36.5
LCIMINTIME	02/11/2021 16:13	LCF10	61
LCSMAX	75.5	LCF50	48
LCSMAXTIME	02/11/2021 16:08	LCF90	36.5
LCSMIN	30.1	LCF95	33.5
LCSMINTIME	02/11/2021 16:13	LCFVAR	31
LZFMAX	82.5	LAF10	51.5
LZFMAXTIME	02/11/2021 16:17	LAF50	39
LZFMIN	32.5	LAF90	31.5
LZFMINTIME	02/11/2021 16:13	LAF95	30.5
LZIMAX	87.5	LAFVAR	28.5
LZIMAXTIME	02/11/2021 16:17	OVERLOADTIMESEC	0
LZIMIN	35.8	VARLN	99
LZIMINTIME	02/11/2021 16:14	LEPDVAL	0
LZSMAX	76.6	LEX8HVAL	0
LZSMAXTIME	02/11/2021 16:08		
LZSMIN	35.2		

Appendix C.3 Noise Level Data at NL03

ID	b95ac499-19d9-4ba8-8994-a1a707a31adf	LZSMINTIME	44502.72986
RESULTID	47866257-5969-4038-b74c-05fc0e7fbd73	LAPK	04/27/1900 19:12
BATTERYLOW	FALSE	LAPKTIME	44502.73681
DURATIONSEC	1800	LCPK	04/27/1900 19:12
ENDDATETIME	44502.74514	LCPKTIME	44502.73681
NOTES		LZPK	04/27/1900 19:12
OVERLOAD	FALSE	LZPKTIME	44502.73681
PAUSEDURATIONSEC	0	LAE	04/10/1900 9:36
RESPONSE	0	LAEQ	68.8
RUNNO	1	LAEQT80	68.7
STARTDATETIME	44502.72431	LAFTM3	80.8
OCTAVECOUNT	01/24/1900 0:00	LAFTM5	82.7
LAFMAX	108.2	LAIEQ	80.4
LAFMAXTIME	44502.73681	LAITM3	86.1
LAFMIN	02/10/1900 16:48	LAITM5	87
LAFMINTIME	44502.725	LCEQ	69.3
LAIMAX	04/20/1900 0:00	LCEQSUBLAEQ	0.5
LAIMAXTIME	44502.73681	LEPD	0
LAIMIN	02/10/1900 19:12	LEX8H	0
LAIMINTIME	44502.725	LZEQ	69.3
LASMAX	04/09/1900 21:36	LAVGQ4	60.7
LASMAXTIME	44502.73681	LAVGTHRESHOLD	0
LASMIN	02/11/1900 4:48	TWAQ4	0
LASMINTIME	44502.73958	LAVGQ5	55.1
LCFMAX	04/17/1900 16:48	TWAQ5	0
LCFMAXTIME	44502.73681	CRITERIONTIMESEC	0
LCFMIN	02/11/1900 9:36	LZF10	56.5
LCFMINTIME	44502.73542	LZF50	49.5
LCIMAX	04/20/1900 12:00	LZF90	45.5
LCIMAXTIME	44502.73681	LZF95	45
LCIMIN	02/11/1900 19:12	LZFVAR	44.5
LCIMINTIME	44502.74375	LCF10	56
LCSMAX	04/10/1900 7:12	LCF50	48
LCSMAXTIME	44502.73681	LCF90	44
LCSMIN	02/12/1900 2:24	LCF95	43.5
LCSMINTIME	44502.73542	LCFVAR	43
LZFMAX	04/17/1900 16:48	LAF10	51.5
LZFMAXTIME	44502.73681	LAF50	44.5
LZFMIN	02/12/1900 19:12	LAF90	43
LZFMINTIME	44502.73681	LAF95	42.5
LZIMAX	04/20/1900 12:00	LAFVAR	42.5
LZIMAXTIME	44502.73681	OVERLOADTIMESEC	0
LZIMIN	02/13/1900 4:48	VARLN	99
LZIMINTIME	44502.72986	LEPDVAL	0
LZSMAX	04/10/1900 7:12	LEX8HVAL	0
LZSMAXTIME	44502.73681		
LZSMIN	02/13/1900 14:24		

Appendix C.4 Noise Level Data at NL04

ID	9268b9a3-d38f-4ebb-921b-b653f87257fd
INSTRUMENTID	e343e034-3c41-4baf-87ac-5cfe9221ce85
INSTRUMENTSERIESID	aa808c62-dd1b-4564-944b-c64ff2bcf7f2
INSTRUMENTMODELID	b1w60o7d-227z-4aee-2323-71d79f830677
BATTERYLOW	FALSE
DURATIONSEC	1800
ENDDATETIME	02/11/2021 19:17
NOTES	
OVERLOAD	FALSE
PAUSEDURATIONSEC	0
RESPONSE	0
RUNNO	4
SERIALNO	2206883
STARTDATETIME	02/11/2021 18:47
CALAFTERDATE	0001-01-01 00:00:00
CALBEFOREDATE	02/09/2021 14:47
CALBEFOREOFFSETDB	12.8
CALBEFORESPL	114
CALDRIFTDB	-12.8
OCTAVECOUNT	2
PROFILECOUNT	0
LAFMAX	86.4
LAFMAXTIME	02/11/2021 19:05
LAFMIN	41.8
LAFMINTIME	02/11/2021 18:48
LAIMAX	87.8
LAIMAXTIME	02/11/2021 19:05
LAIMIN	43.2
LAIMINTIME	02/11/2021 18:48
LASMAX	80
LASMAXTIME	02/11/2021 19:05
LASMIN	43.6
LASMINTIME	02/11/2021 18:48
LCFMAX	86.2
LCFMAXTIME	02/11/2021 19:05
LCFMIN	42.8
LCFMINTIME	02/11/2021 18:48
LCIMAX	88.1
LCIMAXTIME	02/11/2021 19:04
LCIMIN	44.6
LCIMINTIME	02/11/2021 18:48
LCSMAX	80.1
LCSMAXTIME	02/11/2021 18:57
LCSMIN	44.3
LCSMINTIME	02/11/2021 18:48
LZFMAX	87.9
LZFMAXTIME	02/11/2021 19:14

LZFMIN	44.6
LZFMINTIME	02/11/2021 18:48
LZIMAX	91.7
LZIMAXTIME	02/11/2021 19:14
LZIMIN	46.2
LZIMINTIME	02/11/2021 18:48
LZSMAX	80.1
LZSMAXTIME	02/11/2021 18:57
LZSMIN	45.6
LZSMINTIME	02/11/2021 18:48
LAPK	96.3
LAPKTIME	02/11/2021 18:58
LCPK	98.7
LCPKTIME	02/11/2021 19:17
LZPK	98.2
LZPKTIME	02/11/2021 19:14
LAE	94.3
LAEQ	61.7
LAEQT80	53
LAFTM3	68
LAFTM5	69.4
LAIEQ	67
LAITM3	70.7
LAITM5	72.1
LCEQ	64.1
LCEQSUBLAEQ	2.4
LEPD	61.7
LEX8H	61.7
LZEQ	64.9
LAVGQ4	60.6
LAVGTHRESHOLD	0
TWAQ4	60.6
LAVGQ5	60
TWAQ5	60
CRITERIONTIMESEC	28800
LZF10	67.5
LZF50	59.5
LZF90	51
LZF95	49
LZFVAR	47
LCF10	67
LCF50	58
LCF90	50
LCF95	48
LCFVAR	46
LAF10	64
LAF50	57
LAF90	47.5
LAF95	46
LAFVAR	44.5
VARLN	99
LDN	0
LDEN	0
CNEL	0
DAYSTARTHR	7
EVENINGSTARTHR	19
NIGHTSTARTHR	23
DAYPENALTY	0
EVENINGPENALTY	5
NIGHTPENALTY	10
DOWNLOADSTATUS	FALSE
DELETED	FALSE
SITEID	Tappita - Toe Town Road
LOCATIONID	Biallah Town
PERSONID	Unallocated
PROCESSID	Unallocated
RESULT	C
PERIODCOUNT	1
OVERLOADTIMESEC	0
LEPDVAL	49.7
LEX8HVAL	49.7
EVENTMARKERCOUNT	0
EVENTSUMMARYCOUNT	1
EVENTCOUNT	0
AUDIONOTES	FALSE
CALBEFORECHANGE	0.3
CALBEFOREPOT	81
CALBEFOREGAIN	FALSE
CALBEFOREVALIDATION	TRUE
CALAFTERSPL	0
CALAFTERCHANGE	0
CALAFTEROFFSETDB	0
CALAFTERPOT	0
CALAFTERGAIN	FALSE
CALAFTERVALIDATION	FALSE
PERIODNOTESCOUNT	0
PROFILENOTESCOUNT	0

Appendix C.5 Noise Level Data at NL05

ID	da1ee99a-3f56-4444-8645-aa65d9a03292	LZSMINTIME	02/12/2021 9:37
RESULTID	611ea6fc-25d3-45a0-811e-4933cf64fbd0	LAPK	109.7
BATTERYLOW	FALSE	LAPKTIME	02/12/2021 9:14
DURATIONSEC	1800	LCPK	107.3
ENDDATETIME	02/12/2021 9:43	LCPKTIME	02/12/2021 9:14
NOTES		LZPK	108.4
OVERLOAD	FALSE	LZPKTIME	02/12/2021 9:14
PAUSEDURATIONSEC	0	LAE	101.5
RESPONSE	0	LAEQ	69
RUNNO	1	LAEQT80	64.6
STARTDATETIME	02/12/2021 9:13	LAFTM3	75.2
OCTAVECOUNT	24	LAFTM5	76.7
LAFMAX	96.6	LAIEQ	74.1
LAFMAXTIME	02/12/2021 9:16	LAITM3	77.9
LAFMIN	49.3	LAITM5	79.2
LAFMINTIME	02/12/2021 9:41	LCEQ	73.1
LAIMAX	98.5	LCEQSUBLAEQ	4.1
LAIMAXTIME	02/12/2021 9:16	LEPD	0
LAIMIN	52.9	LEX8H	0
LAIMINTIME	02/12/2021 9:40	LZEQ	74
LASMAX	92.2	LAVGQ4	67.8
LASMAXTIME	02/12/2021 9:16	LAVGTHRESHOLD	0
LASMIN	52.2	TWAQ4	0
LASMINTIME	02/12/2021 9:37	LAVGQ5	67.2
LCFMAX	95	TWAQ5	0
LCFMAXTIME	02/12/2021 9:16	CRITERIONTIMESEC	0
LCFMIN	56	LZF10	77
LCFMINTIME	02/12/2021 9:37	LZF50	71.5
LCIMAX	96.8	LZF90	66.5
LCIMAXTIME	02/12/2021 9:16	LZF95	64.5
LCIMIN	58	LZFVAR	61.5
LCIMINTIME	02/12/2021 9:37	LCF10	76
LCSMAX	90.6	LCF50	70.5
LCSMAXTIME	02/12/2021 9:16	LCF90	65
LCSMIN	58.6	LCF95	62.5
LCSMINTIME	02/12/2021 9:37	LCFVAR	60
LZFMAX	95.6	LAF10	71
LZFMAXTIME	02/12/2021 9:16	LAF50	64.5
LZFMIN	58.7	LAF90	58.5
LZFMINTIME	02/12/2021 9:41	LAF95	56
LZIMAX	97.4	LAFVAR	53
LZIMAXTIME	02/12/2021 9:16	OVERLOADTIMESEC	0
LZIMIN	61.2	VARLN	99
LZIMINTIME	02/12/2021 9:37	LEPDVAL	0
LZSMAX	91.2	LEX8HVAL	0
LZSMAXTIME	02/12/2021 9:16		
LZSMIN	61		

Appendix C.6 Noise Level Data at NL06

ID	e7c8805f-d58a-493f-bb38-0b2bbaf07809	LZSMINTIME	02/12/2021 12:22
RESULTID	1c0218c6-e3e1-4d49-ad9d-0184a05fa868	LAPK	89.9
BATTERYLOW	FALSE	LAPKTIME	02/12/2021 12:16
DURATIONSEC	1800	LCPK	88.8
ENDDATETIME	02/12/2021 12:46	LCPKTIME	02/12/2021 12:16
NOTES		LZPK	92.5
OVERLOAD	FALSE	LZPKTIME	02/12/2021 12:18
PAUSEDURATIONSEC	0	LAE	77.5
RESPONSE	0	LAEQ	44.9
RUNNO	1	LAEQT80	27.8
STARTDATETIME	02/12/2021 12:16	LAFTM3	52.2
OCTAVECOUNT	24	LAFTM5	54.7
LAFMAX	76.8	LAIEQ	51.5
LAFMAXTIME	02/12/2021 12:16	LAITM3	55.1
LAFMIN	29.7	LAITM5	57
LAFMINTIME	02/12/2021 12:22	LCEQ	52.4
LAIMAX	78.5	LCEQSUBLAEQ	7.5
LAIMAXTIME	02/12/2021 12:16	LEPD	0
LAIMIN	32.5	LEX8H	0
LAIMINTIME	02/12/2021 12:22	LZEQ	65.1
LASMAX	71.9	LAVGQ4	42.4
LASMAXTIME	02/12/2021 12:16	LAVGTHRESHOLD	0
LASMIN	31.9	TWAQ4	0
LASMINTIME	02/12/2021 12:22	LAVGQ5	41.4
LCFMAX	78.4	TWAQ5	0
LCFMAXTIME	02/12/2021 12:16	CRITERIONTIMESE	0
LCFMIN	32.9	LZF10	67.5
LCFMINTIME	02/12/2021 12:27	LZF50	53
LCIMAX	79.9	LZF90	43
LCIMAXTIME	02/12/2021 12:16	LZF95	42
LCIMIN	34.8	LZFVAR	40.5
LCIMINTIME	02/12/2021 12:36	LCF10	55.5
LCSMAX	73.9	LCF50	43.5
LCSMAXTIME	02/12/2021 12:16	LCF90	38
LCSMIN	35.3	LCF95	37
LCSMINTIME	02/12/2021 12:36	LCFVAR	35.5
LZFMAX	87.8	LAF10	44
LZFMAXTIME	02/12/2021 12:18	LAF50	39
LZFMIN	37.7	LAF90	35.5
LZFMINTIME	02/12/2021 12:22	LAF95	34.5
LZIMAX	90.5	LAFVAR	33
LZIMAXTIME	02/12/2021 12:18	OVERLOADTIMESE	0
LZIMIN	39.2	VARLN	99
LZIMINTIME	02/12/2021 12:22	LEPDVAL	0
LZSMAX	81.9	LEX8HVAL	0
LZSMAXTIME	02/12/2021 12:18		
LZSMIN	39.3		

APPENDIX D SOCIO-ECONOMIC HOUSEHOLD BASELINE SURVEY FORM

LIBERIA Tappita – Toetown link	Q. No. : .....

Socio-Economic Baseline Survey

Integrated Social Survey Form for Baseline Survey, Census and Socio-Economic Survey of Affected Households

01.	Name of interviewer.....	02.	Date of interview.....
03.	Name of reviewer.....	04.	Date of review .....

1. General Information

1.1 County.....[ ] 1.2 District .....[ ]

1.3 Clan..... [ ] 1.4 Town ..... [ ]

1.4.1 Urban [1} Rural { 2 }

1.5 Name of Head of Household.....

Where were you born?.....County [ ]

What is your wife (wives) name(s) and where were they born?

..... Born at.....County [ ]

..... Born at..... County [ ]

..... Born at..... County [ ]

1.6 Father's Name: .....

1.7 Respondent's Name: .....

1.8 Reason why person is household head

Ring code

Oldest person? (1)
Owner? (2)
Biggest earner? (3)

1.9 Ethnicity of head.....(and wives if different)

Code Krahn { 1 } Mano { 2 } Gio { 3 } Others add code on checking

1

2. Total number of household members who currently live in your household : ……..

S.N.	Name of person 2.1	Sex 2.2	Age 2.3	Education 2.4	Economic activity 2.5	Relationship to HHH 2.6
1						HHH
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						

Code: Circle the S No if the person is handicapped in some way.

Sex: 1 = Male, 2 = Female

Education: 1 = Illiterate, 2= Can read and write and primary level (grade 5) not completed, 3 = Elementary level (grade 6) completed, 4= Junior High level (grade 9) completed, 5= Senior High level (grade 12) completed, 6= Graduate and above, 7= Vocational training, 8= Infant, 0-5 years, 9= Not attending school but of school age, 5-18 years

Economic Activity: 1 = Farm work own land, 2 = Farm work own land and sharecropping, 3 = Sharecropping only, 4 = Agriculture labour, 5 = Public service, 6 = Private service, 7 = Children, 8 = Business, 9 = Livestock raising, 10 = Forest products, 11 = Student, 12 = Hunting, 13 = Working away, 14 = Retired, 15= None 15= Disabled and unable to work, 17= Other, please specify

Relation to head: 1 = Household Head, 2 = Wife, 3 = Husband, 4 = Son, 5 = Daughter, 6 = Brother, 7 = Sister, 8 = Grandchild, 9 = Daughter in law, 10 = Sister in law, 11 = Cousin, 12= Parents, 13= Others (specify)

2

3. Land Ownership

3.1 How many different farms? List all farms and state tenure in this last agricultural season.
(Use following codes)

Name of the farmer and sex 3.1.1 M 1 F 2		Size / Unit 3.1.2	Crop/ land type 3.1.3	Tenure system 3.1.4	Remarks
1					
2					
3					

Code:
Crop/ Land type: 1 = House plot 2 = Backyard 3 = Upland Farm, 4 = Lowland swamp, 5 = Tree crops, rubber, 6 = tree crops cocoa/ coffee 7 = Private Forest, 8=Other (Specify)
Tenure system: 1 = Own cultivated, 2 = Share cropped (out), 3 = Share cropped (in), 4 = Tenant, 5 = Leased/ Contracted, 6 = Managed on behalf of owner

3.2 How many months does the household rice and cassava production cover?
Circle correct response
1) More than 12 months
2) Months the household provide its own rice……months ;cassava……months
3) No production, buys rice and cassava using income
4) How much does it cost to buy food (rice and cassava) per month in the months with no production when there is no food grown at home. …… Lib$

3.4 What do you do to get food in the rainy season? *Circle one or two strategies*

1)	Wage labour (local)	2)	Wage labour outside the village
3)	Sold animals/ other household property	4)	Sold other assets
5)	Credit	6)	Remittance/Pension
7)	Formal employment earnings	8)	Business
9)	Loan on future coffee or other cash crops against earnings		
10)	Others (Specify)……	11)	Agricultural work for food

3.5 How often does someone in your household hunt for bushmeat? *Circle code*
No hunting [1] Daily [2] Weekly [3] Special occasions [4] Other [5] ……

3.6 How often do you consume bushmeat in your household? *Circle code*
Never [1] Daily [2] Weekly [3] Twice a month [4] Occasionally [5]
Special occasions [6] Other [7] ……

3.7 Do you buy bushmeat? Yes ? No [0] *Circle code*
If yes, how often Daily [3] Weekly [4] Special occasions [5] ……

3.8 Which type of bushmeat you often buy? Circle Code:
1. Deer 2. Birds 3. Monkey 4. Bats 5. Other .....

4. Sources of Income and Expenditure

4.1 Household income sources

Particulars	Mainly who
	Use code *1 Male 2 Female 3 Children*
4.1.1a. Subsistence crops: rice	
4.1.1b cassava	
4.1.1c plantain	
4.1.2. Cash crops	
4.1.3. Livestock/poultry	
4.1.4. Vegetables and fruit	
4.1.5. Horticulture/ seeds (e.g. Bitter kola etc)	
4.1.6. Agriculture wage labour	
4.1.7. Non-farm wage labour	
4.1.8. Professional fees/charge	
4.1.9. Formal employment	
4.1.10. Income from micro enterprises	
4.1.11. Business	
4.1.12. Pension/ remittance	
4.1.13. Rent/ interest	
4.1.14. Asset sale	
4.1.15. Other	
4.1.16. Mining income	
4.1.17. Selling firewood	
4.1.15. Selling charcoal	
4.1.19. Selling Bushmeat	

4.2 Household expenditure

Particulars	Mainly who ? *Use code 1. Male 2. Female*
4.2.1. Foods	
4.2.2. Bushmeat	
4.2.3. Clothing	
4.2.4. Education/Reading material	
4.2.5. Medicine/Doctor/Hospital charges	
4.2.6. Lighting and cooking fuel	
4.2.7. Livestock	
4.2.8. Farm inputs: seed, fertiliser, pesticides	
4.2.9. Transportation/ Communication	
4.2.10. Donation for social action	
4.2.11. Religious & cultural expenses	
4.2.12. Marriage & Funeral expenses	
4.2.13. Alcohol / Palm wine	
4.2.14. Expenditure for income generation activities	
4.2.15. Saving/Loan and interest payment/ Susu	
4.2.16. Taxes/Fees/ Fines etc.	
4.2.17. Other	
4.2.18. Firewood	
4.2.19. Charcoal	

4.3 Is there any work or employment done by household members likely to be affected by the loss of land to the project? *Circle code*

[1] Yes [0] No

4.3.1 If yes, describe what the impact will be.

Code:

1. Loss of head loading
2. Rubber tapping etc.
3. Loss of business etc.
4. Farm inside RoW,
5. Move market stall
6. Move house or other structure

7. Other.....

4.4 Is there any family member not living in your household at the moment but who helps support it?

Circle code [1] Yes [0] No

4.4.1 If yes, where do they live, what to they do and how much or what did he/she/they send last year?

.....

.....

.....US$ .....Lib$

5

5. Ownership of Livestock and Trees

5.1 What trees does the household own? *Add total numbers and then tick use code box*

Types of trees	Code	Grows Code: 1. Yes 0. No 5.1.1	Household use code 1 Used for income code 2 Both code 3 5.1.2
Timber trees Building wood Fire wood	1		
Bamboo stump	2		
Rubber	3		
Cocoa	4		
Coffee	5		
Kola	6		
Oil Palm	7		
Citrus/ Orange	8		
Avocado/ Butter pear	9		
Breadfruit	10		
Plantain	11		
Pineapple	12		
Sugar cane	13		
Banana	14		
Mango/ Plum	15		
Other	16		

6

5.2 List all animals owned.

Animal Number	Code	Yes /No Code: 1 Yes 0 No	Does a woman privately own any of these? *Use code 1 Yes 0 No*
1. Oxen	1		
2. Calf	2		
3. Sheep	3		
4. Goat/ Kids	4		
5. Poultry/ chickens/ hens	5		
6. Ducks	6		
7. Rabbits	7		
8. Pigs	8		
9. Bee-keeping hives	9		
10. Dog	10		
11. Any other	11		

6. Other physical assets

				Circle code	
6.1	Does the household own?				
6.1.1	Radio	[1]	Yes	[0]	No
6.1.2	T.V. and generator	[1]	Yes	[0]	No
6.1.3	Fishing nets	[1]	Yes	[0]	No
6.1.4	Sewing machine	[1]	Yes	[0]	No
6.1.5	Weaving loom	[1]	Yes	[0]	No
6.1.6	Cart	[1]	Yes	[0]	No
6.1.7	Pestle and Mortar	[1]	Yes	[0]	No
6.1.8	Shotgun	[1]	Yes	[0]	No
6.1.9	Any other transport	[1]	Yes	[0]	No
6.1.10	Mobile phone	...[1]	Yes	[0]	No

7. Skills and Training

7.1 What skills or cottage industry experience do family members have? *Tick box*

Skills or cottage industry experience		
Activity	*Code 0 for none or 1 for Men having skill*	*Code 0 for none or 2 for Women having skill*
7.1.1 Bamboo construction		
7.1.2 Mats – reeds etc		
7.1.3 Carpentry		
7.1.4 Masonry		
7.1.5 House construction		
7.1.6 Food Processing for income earning		
7.1.7 Other		

7.2 Has any member of the household participated in any skills or training. Record number of family members only for each group

Skills / Training *Describe*	Duration days / months	*Organizer codes*	*Sex of participant* *Code 0 = No or by sex of participant*	
			1 Male	*2 Female*
7.2.1		*NGO 1*		
7.2.2		*INGO 2*		
7.2.3		*Church group 3*		
7.2.4		GoL 4		

7.3 Are they using this training for income generating projects? *Circle code*
[1] Yes [0] No

If Yes, provide details

If No, why not .....

8. Division of labour on the farm

8.1 Who mostly does which tasks on the farm? *Enter one code for worker in box if they do this activity*

Activity	Dry Season			If children involved			Hired
	1 Husband	2 Wife	3 Both	4 Boys	5 Girls	6 Both	13
1. Brushing							
2. Felling							
3. Burning							
4. Land preparation							
5. Sowing							
6. Seed nursery							
7. Transplantation							
8. Weeding							
9. Fencing							
10. Manuring							
11. Harvesting							
12. Transportation							
13. Cleaning/ Processing							
14. Storing							
15. Marketing							

Enter here details of hiring in of labour for farm work, numbers, types of work, which months, tasks, whether this is Kuu or paid or any other variation?

.....

.....

8

8.2 Who does the following tasks mostly? *Enter code for worker in box if they do this activity*

Household Activities	Children			Adults		
	1 Man	2 Woman	3 Both	4 Son	5 Daughter	6 Equal
1. Collecting firewood						
2. Fetching drinking water						
3. Grinding grains						
4. Washing clothes						
5. Cooking and cleaning						
6. Child care						
7. Care of the elderly						
8. Other						

9. Use of Resources

9.1 Please provide the details of the following resources use pattern and time needed.

Sources	Types *Circle most used type*	Walking time needed	Where *Use code below*	1 Male 2 Female *use code*
9.1.1 Cooking fuel	1. Fire wood			
	2. Kerosene 3. Electricity			
9.1.2 Lighting	4. Kerosene lamp			
	5. Candles 6. Electricity			
9.1.3 Drinking water	7. Well			
	8. Spring			
	9. River			
	10. Hand pump 11. Town supply 12. Local Tap			
9.1.4 Near road service (highest level service)	13. Foot track			
	14. Earthen			
	15. Gravel			
	16. Coal Tar			

'Where' Code: 1= Around house 2= Town 3= Outside the Town 4= Outsice Clan

9.2 Do you collect other plants or honey? *Circle code*
[1] Yes [0] No
If yes, where from? [ ] *Use "Where" codes as above*

9

9.3 Do you need to get permission to harvest common property resources in your town? If yes, who do you need to ask and what are the restrictions?

(1) Family
(2) Households in quarter
(3) Town Chief/ Elders
(4) Others
(5) No

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10. Community Involvement

10.1 Does any member of the household belong to a community group? *Circle code*
[1] Yes [0] No

10.2 If yes, who belongs to which ones? enter *number of family members only, code 0 if no one in this category*

Code	Membership	Sex	General member	Executive member	Position
1	Church	Male			
		Female			
2	Hand pump Group	Male			
		Female			
3	Saving and Credit/ local Susu club	Male			
		Female			
4	Youth club	Male			
		Female			
5	Women/Mother group	Male			
		Female			
6	Children group	Boys			
		Girls			
7	Other groups	Male			
		Female			
8	Kuu group (farming)	Male			
		Female			

If there are User Groups in Town, *please list*

1.....
2.....
3.....
4.....
5.....

10

10.2 Does anyone in your household participate in community meetings?
Enter number of participants if any – for coding enter 0 or the number

Code	Social activities	Sex	Number of household member participants
1	Social/Religious work	Male	
		Female	
2	Community gathering/meetings	Male	
		Female	
3	Political gathering/meetings	Male	
		Female	
4	Charity/club	Male	
		Female	
5	Community construction works	Male	
		Female	
6	Any other works (Specify)	Male	
		Female	

10.3 If no, why not? .....

10.4 Do women participate in meetings? *Circle code*
[1] Yes [0] No

10.5 Are there difficulties about the participation of women? *Circle code*
[1] Yes [0] No

If yes, please describe

.....

.....

.....

10.6 Does your Town have following social mobilisation activities? *Enter code*

Awareness raising programme	**Yes 1**	**No 0**	**Income generating Programme**	**Yes 1**	**No 0**
1. Empowerment			7 Formal Saving and Credit		
2. Health and sanitation			8 Informal savings/ SuSu		
3. Women and reproductive health			9 Co-operative		
4. Women literacy			10 Agriculture extension		
5. Adult literacy			11 Livestock raising		
6 Other IG			12 Bee-keeping		
			13 Goat raising		
			14 Poultry		
			15 Other		

11

11. Use of facilities

11.1 Where do the education, health and market facilities. How long does it take to go and back?

Facilities	Where (Name of town)	Where Code	Time needed (Round trip)	Generally who makes the trip						
				1 Man	2 Woman	3 Both	4 Son	5 Daughter	6 Both	7 All
1. Elementary school										
2. Junior High school										
3. Senior High Schoo										
4. Traditional Healer										
5. Health Post										
6. Clinic										
7. Hospital										
8. Post Office										
9. Police Depot										
10. Agriculture centre										
11. Local Market										
12. Big Market										
13. Big Town										

Where Code: 1= Village 2= Town 3= Clan 4= Outside Clan

11.2 How do you get to the District Headquarters? …… (Fill in town name)

[1] Walking [2] Bus [3] Cycle
[4] Motorcycle [5] Tractor [6] Truck
[7] Car [8] Taxi [9] Other Transport (Specify)

11.3 How much does it cost one-way Lb$ …… *(Enter 0 if walks)*

11.4 How often does someone from your household go to the District Headquarters? *Ring code*

[1] Every day [2] 1 –2 times per week [3] 3-7 times per week
[4] 1 times per month [5] 2 times per month [6] 3-8 times per month
[7] More often, describe… ……

11.5 Do you use the cell phone to find out market price information? *Ring code*

[1] Yes [0] No

If yes, How often? *(Ring code* daily(1) / weekly (2) / monthly (3) / annually (4)

11.6 How do you sell your farm produce (subsistence crops)? *Circle where applicable*

[1] Local merchant purchases at farm gate [2] Market in this town
[3] Head-load to sales point out of town [4] Take by vehicle to a sales point out of town
[5] Other ……

12

11.7 How do you sell your farm produce (cash crops)? *Circle where applicable*

[1] Local merchant purchases at farm gate [2] Market in this town
[3] Head-load to sales point out of town [4] Take by vehicle to a sales point out of town
[5] Other

12. Health Services

12.1 Do women of the household go for antenatal check ups? *Circle code*
[1] Yes [0] No

12.2 Where do women of the household give birth (delivery)? *Circle code*
[1] Home [2] Other but not clinic or hospital [3] Clinic or hospital

12.3 Are you vaccinating your children? *Circle code*
[1] Yes [0] No

12.4 Did any member of your family become sick last year? *Circle code*
[1] Yes [0] No

If yes, did you check up/ take medicine? *Circle code*
[1] Yes [0] No

12.5 Did any member of your family at this household die in the last year? *Circle code*
[1] Yes [0] No

If yes, Please provide the details

S.N.	Sex *1 Male 2 Female*	Age at death	Causes of death (if possible)	Code *later*
1.				
2.				
3.				

12.6 Does your household have a toilet facility? *Circle code*

[ ] Yes (*no code*) [0] No If yes, mention the type e.g.

[3] Pit latrine [4] Permanent materials

13. Skills and Future interests

13.1 Has any family member any skills or skills for employment outside farming for household survival
Circle skill codes for men and women separately

Men [1] Yes [0] No

If yes, *please circle as many as apply*

[1] Rubber [2] Cocoa [3] Coffee [4] Other tree crop [5] Vegetables for market
[6] Driving vehicles [7] Mechanic [8] Office work [9] Professional qualification
[10] Chef/ cook [11] Nurse [12] Day wage labourer [13] Tailor
[14] Other

Women [1] Yes [0] No *Circle code*

If yes, *please circle as many as apply*

[1] Rubber [2] Cocoa [3] Coffee [4] Other tree crop
[5] Vegetables for market [6] Driving vehicles [7] Other 1 .....
[8] Office work [9] Professional qualification [10] Chef/ cook
[11] Nurse [12] Other 2 ..... [13] Tailor [14] Other

13.2 Does this person have social security registration? *Please circle*
Men [1] Yes [0] No
Women [1] Yes [0] No

13.3 What expectations do you have about the road upgrading project

[1] Easier to travel – more vehicles [6] Lose market stall

[2] Cheaper to travel [7] Rebuild house

[3] Able to make more business [8] .....

[4] Easier to get health care [9] .....

[5] Lose farming plot .....

13.4 Will you? *Code later*

[ ] Move farm plot elsewhere [ ] Travel more
[ ] Use town facilities more [ ] Other .....

13.5 What is your fear about the upgrading of the road?
[1] The influx of criminals
[2] The importation of more narcotic substances
[3] Danger from faster traffic
[4]

13.5 Record here any other information which is interesting about what people think will be the outcome of an improved road which doesn't fit in anywhere else.

.....

.....

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14

APPENDIX E TOWN KEY INFORMANT SURVEY

TOWN SURVEY LIST

City/ Town/ Village/ Hamlet .....

Location in relation to Ganta – Tappita Highway On road ..... Off road .....by ... Km

Date reviewed .....

Key informants – Name/ organisation etc.

1. .....
2. .....
3. .....

B. Location – Nimba County

1. District .....
2. Paramount Chief .....Clan Chief .....
3. Town Chief ..... No of quarters. .....
4. Tribal origins?
   i. Mano .....
   ii. Gio .....
   iii. Others .....
5. What community action groups are there – women's groups, youth groups etc

   .....

C. Facilities

1. Location of Elementary Schools and approximate walking time

   i. ……

   ii. ……

   iii. ……

2. Location of Secondary Schools

   i. ……

   ii. ……

3. Location of Health Posts

   i. ……

   ii. ……

Location of Hospitals

   iii. ……

   iv. ……

4. Location of Churches

   i. ……

   ii. ……

   iii. ……

   iv. ……

5. Other cultural organisations? ……

   i. Poro/ Sande ……

ii. Others ……

6. Location of nearest Bank ……..

7. District Offices……

i. Which offices are available ……..

……

8. Police Post ……

9. Which markets do people attend?

i. ……day ……..

ii. ……day ……..

iii. ……day ……..

10. Is there a Liberian Marketing Association/ market hall/ ground Yes / No

11. Are there any marketing cooperatives in this town

i. ……..

ii. ……..

12. Are there any NGOs/ CBOs in town

i. ……..

ii. ……..

13. Is there cell coverage in this town Yes / No

i. Which networks

……

ii. How do people charge their phones?

……

iii. Are there generators in town?

.....

14. What services are in town?

i. Fuel supply .....

ii. Transport union? .....

1. Bus stop .....

2. Taxi stop .....

iii. Tyre repair .....

iv. Hardware store .....

v. Food shops .....

vi. Food stalls all week .....

vii. Tailor/ Seamstress .....

viii. Shoe repairers .....

15. Where do people get or go for:

i. Firewood .....

ii. Kerosene .....

iii. Building materials .....

iv. Drinking water .....

v. Clothes washing .....

vi. Hunting .....

vii. Honey or medicinal herbs/ non timber forest products

16. Where do people sell produce?
    i. Farm gate or along road……
    ii. Local market ……
    iii. Transport to bigger town? ……
    iv. Other ……

17. What problems do people mention as issues for this community please write as much detail as possible.

APPENDIX F FOCUSED GROUP QUESTIONNAIRE AND ATTENDANCE SHEETS

Appendix F.1 Focus Group Questionnaire

Social Impact Assessment

Focus Group Questionnaire/ Community Consultation

Name of Community: _____

Location: Clan _____ Chiefdom _____ District _____

Attendance Disaggregated

Elder's _____ Women _____ Youth _____ Disabled _____ Total _____

Interview conducted by: _____ and _____

Date of Interview: _____

Introduction:

I am Vaanii Kiazolu and my colleague is .....

We are conducting a study to get feedback from people in 10 or more communities in Grand Gedeh and Nimba Counties on what would be their reaction to the proposed upgrading of the main road Tappita to Toetown, constructed near or through their communities?

Socioeconomic Activities

What are those activities that you do to earn your living?

Which of these activities do you depend on to earn cash income?

What do you spend your money on mainly?

Where do you sell these products and how far is it from here?

Do you raise livestock? If yes, how and where?

What are the major needs of this community and why?

Which of these needs you would say is first, second, third .....?

Political Economy

Who makes decision for the community?

Why?

How many times do you meet to discuss town matters?

Who are those invited to the discussion?

Who decides on land issues?

Is there anyone who owns private/deeded land in this community?

Is anyone in the community living, farming or having a market stall inside the RoW??

What would be good about this project?

What would you fear or see happening as a result of this project?

What would you expect??

Appendix F.2 Attendance Sheets

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Public Consultation Meeting
Tappita – Toetown 40 km Road ESIA-ESMP
Attendance Sheet

Date: March 4, 2021 Time: 10:30 AM Location: Toetown

№	Name	Organization	Position	Phone No./Email	Signature
1.	Archibald Sual	Earthtime	supervisor	0886483035	
2.	Mike Lee Isaac	Earthtime		0776681108	
3.	Levi Wardo	Business	Chairman	0777706686	
4.	Abel Bento				
5.	Hon Moses B. Monroe	MIA	City Mayor	0777393171	
6.	MR. Martin Saye	Governor	Chairman	0776943064	
7.	Susana Tiah	Justic ministry	Cliner	0777679545	
8.	Adra Molonel	Business Man		0777751617	
9.	Yeria Myers	Business Woman		0777711718	
10.	Randall Jerue	Business		0776655[illegible]	
29	Teta Baryogar	Business		0777078109	
30	Peter Kagbayer	Youth		0776426292	
31	[illegible]			09708-99	

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№	Name	Organization	Position	Phone No./Email	Signature
11.	Gabriel Youtee	Media	Manager	0776293138 [illegible]@gmail.com	
12.	Rita Paye	Business		0775183789	
13.	Esther Baryou	Justice ministy			
14.	Anna V. Weazen	Cross Border Trader	Chairperson	0777397062	
15.	J. Skannie Banto	MOC		0777543024	
16.	Moses Zakpa	Business		0776 822-957	
17.	Garty Zarway	M.I.A	Cemetery Director	0773154677	
18.	Peter Kamara	Business	Tribal head	0775730731	
19.	Hon Felix Z. Dio	M I A	Administrative Assistant	0777982852	
20.	Garty K. Samu	Business		0775-62-82-65	
21.	Emmance / Newey	Heatory	Business	0771884523	
22.	Lee Romeo	business		0778631131	
23.	Laso Kamara			0776293033	
24.	Layee Kamara			0777640056	
25	Jerry Kou			0777017512	
26	Abel Burgess	business		0778296277	
27	Felecia Mjolo	Business		0777017138	
28	Ruth Zarway	"		0777710465	

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Public Consultation Meeting
Tappita – Toetown 40 km Road ESIA-ESMP
Attendance Sheet

Date: March 4, 2020 **Time:** 10:30 Am **Location:** Toe town

№	Name	Organization	Position	Phone No./Email	Signature
1.	Sarah Bajibe				
2.	Peter N. Toe	District platform for Dialogue	Community Engagement	0776246994 / petertoe914356gmail	[signature]
3.	Jerrylyn Saydee	~~Toe Town~~ Youth	Youth member	0776-79-06-151	[signature]
4.	Emmett Soe	TOE Youth		0777878400	[signature]
5.	Emmanuel Kpakai	Church (Harvest)	Pastor	0770742874	[signature]
6.	John Wea	Youth		0777359760	[signature]
7.	Amelia Simi	youth group	Member	0778603635	A–
8.	Maybe Paye	Women wing	member	0776878912	MP
9.	Victoria Gaye	women wing	Member	077546158	[signature]
10.	Martina Koung	Business		0776531363	[signature]

1

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№	Name	Organization	Position	Phone No./Email	Signature
11.	Amede Sow	Business		0770017624	[signature]
12.	Abrahams Kromah	Peace FM	Finance officer	0777305703	[signature]
13.	Adama Kromah	Business		0776174654	[signature]
14.	BAILO BA	BISNESS		0776790571	
15.	Janet N. Pour	~~Bus~~ MOE		0776367860	[signature]
16.	Viola Tarpeh	Business		0776069623	V.T
17.					
18.					
19.					
20.					
21.					
22.					
23.					
24.					

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Public Consultation Meeting
Tappita – Toetown 40 km Road ESIA-ESMP
Attendance Sheet

Date: March 5 2021 **Time:** 9:16 Am **Location:** Pokor Town

№	Name	Organization	Position	Phone No./Email	Signature
1.	Arretha K. Blawu		Farmer		A.B
2.	Titta Tenly		Farmer		T.T
3.	Patience Saily		Farmer		P.S
4.	Sarah Willie		Farmer		S.W
5.	Prince S. Karr		Farmer		P.S.K.
6.	George Soe		A. Clan chief		[signature]
7.	HENRY W. SOHN		Principal	0777764151/0881822682	[signature]
8.	Robert C. Karr		Elder		
9.	Harrison Saiyee		Farmer		H.S
10.	Cynthia Roberts		Farmer		C.R

1

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№	Name	Organization	Position	Phone No./Email	Signature
11.	Beatric Karr		Farmer		B.K
12.	SHADRICK K. BLAWOU	MOE	Class room teacher	0777857702/0880820067	[signature]
13.	ROMEO KARR Jr.		Town chief	0778528229/0881517742	[signature]
14.	Anthony Q. Blawu	MOE	Class room teacher	0776699274/0887553908	[signature]
15.	Cathrine Weegbeah		Farmer	0777533433	C.W
16.	Hawa Karr		Farmer	0770346112	H.K
17.	Janet Goyour		Farmer		J.G
18.	Terry Kayee		Farmer	0770237507	[signature]
19.	PaPa Solo		Farmer	0776649882	
20.	Alvin Karr		Farmer	0779204971	A.K
21.	Peterson Dennis		Student	0775231824	[signature]
22.	George D. Gbarwon		Farmer	0777533433	[signature]
23.	Esther Gbeadolo		Farmer		
24.	Comfort Sohn		Business		[signature]

2

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Public Consultation Meeting
Tappita – Toetown 40 km Road ESIA-ESMP
Attendance Sheet

Date: March 5, 2021 Time: 9:00 AM Location: POKOR TOWN

№	Name	Organization	Position	Phone No./Email	Signature
1.	Mike Leo Jallah	earthtime		0776811108	
2.	Sampson Gbahe, Jr	Farmer	Farmer	0777909263	
3.	Emmanuel S. Geor	Youth President	Youth president farmer	0881149578	
4.	EUGINE SAYEE			0775550452	
5.	Jerome [illegible]		Farmer		
6.	Elizabeth Bawa		Mother	0775077301	
7.	J. Emily Archie		farmer	0778496448	
8.	Decontee Sandy		Farmer	0776122818	D.S
9.	Allegrias Saygbeh		Student	0776296214	
10.	Evelyne Charue		Farmer	0775433123	E.C

1

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№	Name	Organization	Position	Phone No./Email	Signature
11.	Teta Sackey		Farmer		T.S
12.	Hawa Sayee		Farmer	0776954377	H.S
13.	Cecelia Willie		Farmer		
14.	Sofiah Sayee		Farmer		
15.	William Charue		Farmer		W.C
16.	Milton Nyeaday	MOE	Teacher	0888577670 0777949945	
17.	Tommy Karr		Farmer	0775108333	T-K
18.	Thomas Sayee	MOE	Teacher		
19.	Robert Karr		Farmer		R.K
20.	George Quiah		Farmer	0778750054	G.Q
21.	Ramcy Flah		Farmer		R. F
22.	Julia Nyeaday		Farmer		J. N
23.	Rebecca Tenle		Farmer		R.T
24.	Bessy Nyeaday		Farmer		B N

2

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Public Consultation Meeting
Tappita – Toetown 40 km Road ESIA-ESMP
Attendance Sheet

Date: March 7, 2021 **Time:** 9:00 Am **Location:** Kpelleh Village

№	Name	Organization	Position	Phone No./Email	Signature
1.	Abel G. Barto	Earthtime	Interpreter	0770477018	
2.	John C. Wamah		Town chief	0779204920	
3.	Joshua D. Kerkulah			0770067043	
4.	Old lady Togbah		Chairlady	0770286101	S.K
5.	Emmanuel Kollie				
6.	Beatrice Kollie				
7.	Mercy Kerkulah				
8.	Koko Loobon			0778895063	K.L
9.	Morris Wamah			0776388210	
10.	Flomo Kerkulah				

1

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№	Name	Organization	Position	Phone No./Email	Signature
11.	Moses Gartor				
12.	Junior Nelson				
13.	Noahwah Wamah				
14.	John Flomo				
15.	Modawal Togbah				
16.	Nowah Kollie				
17.					
18.					
19.					
20.					
21.					
22.					
23.					
24.					

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Public Consultation Meeting
Tappita – Toetown 40 km Road ESIA-ESMP
Attendance Sheet

Date: March 7, 2021 **Time:** 11:30 AM **Location:** B-bar Tarwey

№	Name	Organization	Position	Phone No./Email	Signature
1.	Mike Leo Ishmael	earthtime		0776681108	
2.	Eric S. Gbaker	Earth time	Driver	0776622144	
3.	Abel G. Barto	Earth-time	Interpreter	0770472018	
4.	Henson K. Gaye		principal	0770638825	
5.	Marcus Nyanyee		Town-chief	—	
6.	Henry Myers		Elder	—	
7.	Cynthia Myers		Farmer		
8.	Orutha Dowen		"		
9.	Annie Nyanyee		Chairlady		
10.	Ruth Glaweah		Farmer		

earthtime

№	Name	Organization	Position	Phone No./Email	Signature
11.	Liberty Sharty		Farmer	0778346213	
12.	Gaye Oliver		Mechanic		
13.	Piajeba Ocuwu		Farmer		
14.	Chester Glaweah		Business	0775570782	
15.	David V. Nyanyea		farmer		
16.	Oliver B. Weagba		Teacher	0770955692	
17.	Helen P. Robert		Business	0775748509	
18.	Andrew Kar		Farmer		
19.	Gisco Blod		Fisherman		
20.	Oliver M. Gaye		Farmer		
21.	Lucy Kar		Farmer		
22.	William Kar		Chief-elder		
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earthtime

Public Consultation Meeting
Tappita – Toetown 40 km Road ESIA-ESMP
Attendance Sheet

Date: March 3, 2021 Time: 12:14 Pm Location: Bah Town – Grand Gedeh

№	Name	Organization	Position	Phone No./Email	Signature
1.	Mike Lee Jlhead	earthtime		0776681108	
2.	Eric S Gbahee	Earth time	Driver	0776622144	
3.	Abel Banto	Earth time	Interpeeter	0770472018	
4.	M. Eddie Batuna			0775947584	
5.	Saye Kortee	W. T		0775106052	
6.	Prince Troub		CHA	0777049376	
7.	George Troub		Town Chief	0779129687	
8.	Amelia Nyanty			0775490478	
9.	Evon George				
10.	Pauline Cooper			0770[illegible]760	P.C.

earthtime

№	Name	Organization	Position	Phone No./Email	Signature
11.	Teta Shanty				
12.	Emmanuel Kraty			0775211150	
13.	Faye Cooper		P C	0778618876	
14.	Hellena Cooper		T T M		
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Public Consultation Meeting
Tappita – Toetown 40 km Road ESIA-ESMP
Attendance Sheet

Date: March 6 2021 Time: 11:30 AM Location: Fahnlay

№	Name	Organization	Position	Phone No./Email	Signature
1.	Sunday Bar Locker	Youth	Youth Chair	0886216810	
2.	Doco Tish	Youth	Youth advisor	0881851614	
3.	Abraham Fahn	Youth	Member	—	
4.	Nohn Flamo	Women Group	Chair Lady	0778849210	
5.	Charles Gonkaray	Citizen	Citizen	—	
6.	Josephus Whapoe	Community Watch Forum	Acting Chair	—	
7.	James Flama	Citizen	Elder	0778849210	
8.	Morris Quewon	✓	Elder	0880 023 210	
9.	Mark Gbilhapoe	✓	Town Chief	0778 29 67 38	
10.	Stanley Nuahn	Citizen	Elder		

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№	Name	Organization	Position	Phone No./Email	Signature
11.	Victoria Quaellie	sr. citizen	Elder		
12.	Jefferson Whapoe	citizen	Youth	0778 00 8617	
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Public Consultation Meeting
Tappita – Toetown 40 km Road ESIA-ESMP
Attendance Sheet

Date: March 6, 2021 Time: 1:38 pm Location: Nenla Village

№	Name	Organization	Position	Phone No./Email	Signature
1	Paul K Leabah	School	V.P.A	0777784158	P. Leabah
2	Orando G. Leabah	Health	C.H.W.	0778558356/0886936159	O. L.
3	Thomas Dopoe	Schoo	P.T.A.C.	0776058097/0880830964	Th.
4	Daniel T. Leabah	Farmer	Town Chief	0776801201	D.L.
5	Mary Dopoe	//	Elder	—	M.D.
6	Lase Freemen	//	//	—	L. F.
7	Hawa Goodridge	//	Youth	0880825870	H. G.
8	Pauline Leabah	Student	//	—0777839567	P. L.
9	Rose Daybloe	//	//	0776800764.	R. Daybloe
10	Edwine Cooper	School	Teacher	—	E. Cooper

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№	Name	Organization	Position	Phone No./Email	Signature
11.	Bondu Kruah	Farmer	—	—	Bondu K.
12.	Martha Gibson	//	//	—	Martha G.
13.	Philip Leabah	//	Youth-Chairman	—	P. L.
14.	Peterson Mose	//	//	—	P. M.
15.	Amiel Mose	//	//	—	A. M.
16.	Loufee Dennis	School	Student	—	L. D.
17.	Emmanuel Leabah	Farmers	—	—	E. L.
18.	Janet Gray	//	//	—	J. G.
19.	Mose Kruah	//	Elder	—	M. Kr.
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Public Consultation Meeting
Tappita – Toetown 40 km Road ESIA-ESMP
Attendance Sheet

Date: March 5, 2021 Time: 10:38 AM Location: Dialah

№	Name	Organization	Position	Phone No./Email	Signature
1.	Prince T. [illegible]				
2.	Pa A.E. [illegible] (Alfred)		Acting chair	0886978123/0775685570	A.E. [illegible]
3.	Ambro Kpali			0886695772	
4.	John Tarlon			0888095108	
5.	Obson Gongbeye			0555964338	O. Gongbeye
6.	E. [illegible]	youth Speaker		0555914463	[illegible]
7.	T-max Dahnkuan		Community Watch Forum Chair	0886125709	T. Dahnkuan
8.	Joe Wahtee		Eder		
9.	Abednego Teer		Youth chairman	0886969359	[illegible]
10.	Harrison Wonseah		Elder		H. W

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№	Name	Organization	Position	Phone No./Email	Signature
11.	David Q. Beaie		Elder	0881859901	Beaie
12.	Gbeanue [illegible]		T.C	0881147406	[illegible]
13.	Martha K. Dahn		Women [illegible]	0880739959	MKDahn
14.	Annie Boakai		" "	0881985184	A.B.
15.	Bob Dennis		Youth	0881053294	BDennis
16.	Lincoln Klee		Youth	0888029008	L.K
17.	T. Neaten Dehnue		Youth	0880523083	[illegible]
18.	Gartaye Guy		Zone chief		G.G
19.	Arthur Beaie		citizen	0888415853	A.Beaie
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Public Consultation Meeting
Tappita – Toetown 40 km Road ESIA-ESMP
Attendance Sheet

Date: March 4, 2021 Time: 10:28 Location: Doyelay Town

№	Name	Organization	Position	Phone No./Email	Signature
1.	John Kohnway	Local Leader	General TC	0880 972297	J.K
2.	Patricia David	CHC	Inspector	0555 902221	P. David
3.	Johnson Vaye	Local Government	Acting TC	0775824474	J. Vaye
4.	Mather Wonteah	CHC	Food Inspector	—	M.W
5.	Mamie Vaye	CHC	Chairlady	0888028272	M. Vaye
6.	Marie Dahn		Midwife	—	M.D
7.	Oldma Mary Beah	Farmer	—	—	O.M
8.	Betty Bah	Farmer	—	—	B.B
9.	J. Lee Grayon	Local Govt.	Quarter Chief	0555364006	[illegible]
10.	John Gbaban	Farmer	—	—	[illegible]

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№	Name	Organization	Position	Phone No./Email	Signature
11.	Mency Duffin	Farmer	—	[illegible]	
12.	Flex Singo Cop	Farmer	—	08887185 22	
13.	Sunday Gbawolo	Farmer	—	0881276154	
14.	Patricia Suanie	Farmer	—	—	
15.	Grace Merson	Farmer	—	0555783994	
16.	Alice Zuo	Farmer	—	0880534323	
17.	Eleven Gbar	Farmer		—	
18.	Otis David	Farmer	CWT.	—	
19.	Target Dahn	Farmer	—	0888936140	
20.	Arthur Gbaken	Farmer	—	—	
21.	Mina Kohway	Farmer	—	-	
22.	Haren Gokpah	Farmer		0886128062	
23.	Mary Denone	Farmer		0888817028	
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Public Consultation Meeting
Tappita – Toetown 40 km Road ESIA-ESMP
Attendance Sheet

Date: March 3, 2021 **Time:** 11:45 Am **Location:** Bitter Ball Town

№	Name	Organization	Position	Phone No./Email	Signature
1.	Jerry Gaye				
2.	John P. Saye				J.P. Saye
3.	Charles Vesselee		TC/Elder		
4.	Maydess David				M.D
5.	Kerbeh Mulbah				
6.	Esther Mulbah		Chair Lady		
7.	Kruba Vesselee			0778 60 27 03	
8.	Beatrice Mulbah				B.M
9.	Pinky Saye				
10.	Vivian Vesselee				

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№	Name	Organization	Position	Phone No./Email	Signature
11.	Tu Mulbah				
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Public Consultation Meeting
Tappita – Toetown 40 km Road ESIA-ESMP
Attendance Sheet

Date: March 8, 2021   Time: 6:30 pm   Location: ~~Gibson Town~~ Drivers Camp

№	Name	Organization	Position	Phone No./Email	Signature
1.	Alex Watngh		[illegible] Chief		A. Walung
2.	B. Mark Towah		Security	0888903926	[illegible]
3.	Augustine Teh		Inspector	0881-51-57-53	[illegible]
4.	Paye Zumba				
5.	Joseph Mulbah		farmer		J.M.
6.	Mather Kerneh		farmer		M.K.
7.	Tucker Weezeh		missional	0555914964	TK
8.	Richard G. Gotogbo		Teacher	0888398850	[illegible]
9.	Albertha mulbah				
10.	Mary Davis				

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№	Name	Organization	Position	Phone No./Email	Signature
11.	Richard G.	page	Constrane/	0888460252	R. page
12.	Harris N. Kwaboy	Youth		0886-24 3580	[illegible]
13.	Jerry Kpeah	Zimhaf ass	Constrantional	0776 36 8580	J.K.
14.	Willam Tuloe	Ewlke furfore	~~[illegible]~~ Advisior	0881892932	W.T.
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Public Consultation Meeting
Tappita – Toetown 40 km Road ESIA-FSMP
Attendance Sheet

Date: March 1, 2021 Time: 9:50 AM Location: Tappita City

№	Name	Organization	Position	Phone No./Email	Signature
1.	Mike Leo Ihmad	ESIA ESMP	Data Clerk	0776681108	[signature]
2.	Hon. Nathaniel K. Dean	Supt office Tappita	Special Assistant	0775577940/0886473096	[signature]
3.	Ansu S. Kamara			0775589403	
4.	Samuel Kollie	P/C		0776332049	
5.	David Lassana	Supt office		0778540897 088060211 9	
6.	Justin M. Wehyee	LNP		0880738610	
7.	James Gaye			0777334965	
8.	Leona S. Thomas	Supt office		0886626249	
9.	Aaron Siaway	Supt office		0881246585	
10.	George Fiah	SG		077252693	
(26)	Anthony S. Wailah		Farmer	0886668081/0776392362	
(27)	Johnny Gibson		Farmer	0886474909	

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№	Name	Organization	Position	Phone No./Email	Signature
11.	Linda Morgan	–		0886415682	
12.	Betty K. Pennoh			0888855490	[signature]
13.	Regina Yarris			0880303333	
14.	Eric B. Myers			0886817378	
15.	Aries Nam Bargar Sr.	CDP	Dep.	0881778403	[signature]
16.	Oretha Quahie	L		0888026142	OtQ
17.	Harrison T. Reeves	LIS		0886573136	[signature]
18.	Emmanuel Larsana				[signature]
19.	Rita Wailah			0886933572	RW
20.	Grandma Leaba			0777119822	
21.	Steve Demey			0886768528	[signature]
22.	Sunny Gibson	Press	Reporter	088130119 3	[signature]
23.	Paul N. Harris		PTA Focal	0886-479148	[signature]
24.	Abraham Gbeh	Business	Elder	0886880054	[signature]
25.	Wilmot Z. Gould	FDA staff	–	0888341874	[signature]
(28)	Archibald Suah	Earthtime		0886480035	[signature]
(29)	Prince Y. Broh Jr.			0886482176	[signature]

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APPENDIX G TOR FOR BIODIVERSITY ASSESSMENT AND SURVEY OF CHIMPANZEES WITHIN THE AREA OF INFLUENCE OF THE PROPOSED 40KM ROAD BETWEEN TAPPITA AND TOETOWN

BACKGROUND

The Government of Liberia (GoL) considers agricultural growth to be critical for reducing poverty has developed a five-year National Development Plan referred to as the Pro-Poor Agenda for Prosperity and Development (PAPD). As stated in the PAPD, the government recognizes the need for inclusive and sustainable economic diversification to achieve structural transformation and growth, the urgency of facilitating private sector participation in the economy, and the importance of the agri-food sector as an important engine of growth. Subsequently, during 2018, the Ministry of Agriculture produced the second generation of the Liberia Agriculture Sector Investment Program (LASIP II), opening windows of investment opportunities in the sector. In recent times, government recognizes that achieving sustained economic development and national prosperity requires addressing binding challenges in the agriculture sector.

The GoL has also prioritized the agriculture sector in their commitment to diversify the economy and has identified eight priority value chains requiring support under the PAPD 2018–23. These include rice, oil palm, horticulture, cocoa, rubber, and cassava, poultry, and pig husbandry. Within the framework of its Pro-Poor Agenda for Prosperity and Development, the GoL is focusing on three fundamental issues:

- improved national food and nutrition security with the objective to increase food availability and production in order to spur local economic development and food security;
- enhanced agricultural productivity, competitiveness, and linkages to markets; focusing on strengthening efficiency, promoting innovation, fostering sustainability, and leveraging opportunities in national and external markets; broadening and strengthen private sector participation; increasing public investments (mainly in rural infrastructure); and creating an enabling macroeconomic environment; and
- Strengthened human and institutional capacities with the thrust to establish effective and efficient public sector frameworks in agricultural planning and coordination; reduce risks and improve coping mechanisms; mainstream gender and youth in agriculture and rural development and ensure sustainable use of natural resources.

In line with the PAPD and LASIP II, the GoL has requested for World Bank funding to support the implementation of Rural Economic Transformation Project (RETRAP - P175263). RETRAP, among other interventions, will support the rehabilitation of a 40km road corridor which strategically links food production areas to market centres. The proposed road will start from Tappita and end at the Toe-town. The draft Environmental and Social Impacts Assessment (ESIA) for the road works found potential population of critically endangered chimpanzees within less than 10km of the road corridor and the report has recommended further

biodiversity assessment to inform preparation of subsequent E&S instruments e.g. a Biodiversity Management Plan (BMP) which will guide against potential adverse project impacts on the chimpanzees and biodiversity in general. The results of the biodiversity study and the subsequent biodiversity management measures will be published as an addendum to the project's ESIA for Design and Construction and will inform both it and the Operation and Maintenance ESIA, which will be prepared by the Infrastructure Implementation Unit (IIU) of the Ministry of Public Works (MPW) prior to the finalisation of designs and the commencement of works. The IIU will contractually oblige the construction contractor and the owner's engineer to comply with the management plan drawn out of the proposed study. This may imply a modification of the road designs and incorporation of safety measures to safeguard chimpanzees and biodiversity in general.

STUDY OBJECTIVES

A. Overall Objective

The objective of the assignment is to undertake a detailed and comprehensive assessment of the impact of construction and operation of Tappita – Toe town road on the population of Chimpanzees and biodiversity in general within the project boundaries and to develop appropriate mitigation measures for the protection and conservation of the species during the construction and operational phases of the Project.

B. Specific objectives

The specific objectives of the study are to:

i. Identify the species and prepare an inventory (determining where possible population size, sex, age, etc.) of the population of Chimpanzees species resident in the tappita – toe town road Project area. Other biodiversity of conservation concerned must be identify and included in the inventory.

ii. Describe particular behavioural patterns of the resident Chimpanzees species and other biodiversity that may be adversely impacted by the project.

iii. Identify the immediate habitats, source of food and the movement patterns of the resident Chimpanzees in and out of the road work zone habitat and beyond.

iv. Identify potential impacts during the construction and operational phases of the road on Chimpanzees and other concerned biodiversity.

v. Propose mitigation measures, budgets and monitoring plan for the management of the species of Chimpanzees identified and other biodiversity.

DETAILED SCOPE OF SERVICES

***Task 3-1 Review of existing documentation and field reconnaissance*.**

The Consultant will review available reports and documents from other studies done on the same species of Chimpanzees. The Consultant will carry out necessary field reconnaissance to the project areas to understand the project ecosystem and request all relevant basic information of the project site. The consultant will hold meetings with the local communities and other key stakeholders to understand the dynamics of the resident Chimpanzees species.

Task 3-2. Identification and inventory of Chimpanzees within the project boundaries

The Consultant will identify the species of Chimpanzees that occupy the road zone habitat and beyond and conduct an inventory of the species by estimating the population size by age and sex.

Task 3-3. Analysis of the behavior, habitats and movement of the Chimpanzees

The Consultant will investigate the habitat (size, configuration, quality, support systems, etc.) and behaviour patterns of the Chimpanzees, including interactions with and towards humans and other mammals, vehicles using the road, and other physical obstacles that may have been erected. The Consultant will also determine the sources, quality and availability of food for the resident Chimpanzees within the project boundaries.

Task 3-4. Identification of potential impacts of the construction and operation of the road on the population of Chimpanzees

The Consultant will identify potential impacts of the infrastructure construction phase and the operational phase of the road on the population of Chimpanzees. For the identified negative impacts, the Consultant will propose appropriate mitigation measures, including non-conventional measures, to manage the negative impacts on the resident Chimpanzees population within the boundaries of the project and identifies the cost of implementation of such measures. The Consultant will also propose a monitoring plan including the cost for executing such a plan.

EXPECTED OUTPUTS

The principal output will be a report highlighting Chimpanzees inventory, potential adverse impacts, appropriate and cost-effective mitigation measures, monitoring plan and cost of mitigation and monitoring, to ensure the protection and conservation of the Chimpanzees in their current habitat. The report will also provide guidance on how the communities along the 40km stretch road could be actively involved in the protection and conservation of the Chimpanzees.

METHODOLOGY

The Consultant will be expected to employ the most effective methodology to achieve the desired results, i.e. identification of potential threat factors from the project and the appropriate mitigation measures, including possible steps for managing any residual impacts and risks. This may involve the Consultant: (i) using existing secondary sources of information such as the ESIA prepared under the project, the available biodiversity and ecology studies and various other regional and global publications; and (ii) collecting primary data.

CONSULTANT REQUIREMENTS

The Consultant should demonstrate extensive experience in the protection and conservation of mammals, particularly Chimpanzees. The Consultant's minimum qualifications will be:

i. At least a bachelor's degree in Biology or other natural sciences (Natural Resources Management, Environmental Science/Management, Wildlife Management) or any related fields from a recognized university;

ii. Extensive experience in wildlife protection and conservation and having undertaken related consultancies within the last 5 years;

iii. Knowledge of the sub-region;

iv. Excellent analytical and reporting skills, fluency in English (working knowledge of the French language will be an advantage).

CONTRACT DETAILS AND DURATION

It is estimated that the work will c cover a period of one year (dry and rainy seasons).

PAYMENT MODE

The Consultant shall be paid as per the following breakdown:

- 20% on submission of an acceptable Inception Report
- 50% on submission of draft Final Report
- 30% on submission of a Final Report