ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR UPGRADING OF THE EASTERN ENTRANCE TO DOUALA, PHASE 2

Boko-Tradex roundabout (Kp 9+925) to theDibamba viaduct (Kp 18+825)

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NON-TECHNICAL SUMMARY

See separate electronic file.

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ACRONYMS AND ABBREVIATIONS

Acronym / Abbreviation	Definition
ADC	Aéroports Du Cameroun
AFDB	African Development Bank
AoA	Area of Analysis
AOI	Area of Influence
AQI	Air Quality Index
APN	National Port Authority
ARC	Avoid, Reduce, Compensate
ASECNA	Agence pour la Sécurité de la Navigation Aérienne en Afrique et Madagascar
BUCREP	Central Bureau of Censuses and Population Studies
CCAA	Cameroon Civil Aviation Authority
CCO	Advisory Committees for the Orientation of Port Activity
CCTP	Cahier des Clauses Techniques Particulières (Special Technical Clauses)
CDCE	Départementale de Constat et d'Evaluation
CEMAC	Central African Economic and Monetary Sub-region
CESMP	Construction Environmental and Social Management Plan
CPEI	Infrastructure Environmental Protection Unit
CR	Critically Endangered
CSR	Corporate Social Responsibility
CUD	Communaute Urbaine de Douala
DAC	Directorate of Civil Aviation
DAET	Technical Studies Support Division
DAMV	Maritime Affairs and Navigable Ways Directorate
DEPR	Direction de l'Entretien du Patrimoine Routier
DFN	Domaine Forestier National
DFnP	Domaine Forestier non Permanent
DFP	Domaine Forestier Permanent
DIR	Directorate of Road Infrastructures
DUP	Declaration of Public Utility
EDSIII	Cameroon Demographic and Health Survey
EN	Endangered
EHS Guidelines	The World Bank Group Environmental, Health and Safety Guidelines

EPA	U.S. Environmental Protection Agency
EPFIs	Equator Principles Financial Institutions
ESIA	Environmental and Social Impact Assessment
FAO	Food and Agriculture Organisation
GDP	Gross Domestic Product
GHG	Greenhouse Gas
IFC	International Finance Corporation
ILO	International Labour Organisation
IRD	Institut de Recherche pour le Développement
IUCN	International Union for Conservation of Nature
Km	Kilometre
m	Metre
m^3	Cubic metres
m^2	Square metres
Magil	Magil Construction Corporation
MBR	Membrane Bioreactor
MINEPDED	Ministry of the Environment, Nature Protection and Sustainable Development
MINTP	Ministry of Public Works
mm	Millimetre
NGO	Non-Governmental Organisation
NO_2	Nitrogen Dioxide
NOx	Nitrogen Oxides
NR3	National Route 3
OPA	Autonomous Port Authorities
OTVP	Temporary Public Road Occupancy Permits
PAD	Port of Douala
PDU	Urban Planning Director Plan
PHP	Plantations du Haut-Penja
PIR	Plan d'Indemnisation et de Réinstallation (Compensation and Resettlement Plan)
PM	Particulate matter
POS	Land Occupancy Plan
PS	Performance Standard
RFP	Request for Proposal
ROW	Right of Way

SCB	Standard Chartered Bank
SDEE	Sub-Direction for Environmental Assessments
SEBAT	Syndicat des Entreprises du Bâtiment et des Travaux Publics du Cameroun
SEP	Stakeholder Engagement Plan
SLR	SLR Consulting (Africa) Pty Ltd
SMEs	Small and Medium-Sized Enterprises
SOCATUR	Société Camerounaise de Transport Urbain
SPNP	Société des Plantations Nouvelles de Penja
SO_2	Sulphur dioxide
TEU	Twenty-Foot Equivalent
TORs	Terms of Reference
UKEF	United Kingdom Export Finance
UNECA	United Nations Economic Commission for Africa
UNECE	United Nations Economic Commission for Europe
UNFCCC	The United Nations Framework Convention on Climate Change
UTLS	Unit of Tropical Livestock
VOCs	Volatile Organic Compounds
WHO	World Health Organisation

1 INTRODUCTION

This chapter provides a brief description of the project background and context and describes the purpose and the structure of this Environmental and Social Impact Assessment Report.

1.1 BACKGROUND

Douala is one of the two most populated cities in Cameroon and is a critical commercial hub, with more than half of Cameroon's economic activity and industrial production occurring here. The National Road 3 (NR3), running from the Autonomous Port of Douala through Douala to the interior of the country is a vitally important road within Cameroon as it links Cameroon and neighbouring countries with the Atlantic Ocean at the Autonomous Port of Douala. The upgrade of the NR3 has formed part of the Cameroonian Ministry of Public Works' planning for many decades, with the Right of Way (ROW) for the road having been declared by decree No. 84/048 in 1984. Various studies have informed the planning and design of the NR3 from the centre of Douala to the Dibamba River bridge resulting in the rehabilitation project titled the "*Eastern Entrance of Douala*". The first phase of this rehabilitation project, from the centre of Douala (PK0) up to the Boko-Tradex exchange (PK9 + 925), was completed and commissioned during 2016 and 2017.

The Ministry of Public Works (MINTP) appointed the Magil Construction Corporation (Magil) in December 2019 to undertake construction of the phase 2 of the *Eastern Entrance of Douala*, including from the Boko-Tradex exchange (PK9 + 925) up to the foot of the Dibamba River bridge (PK18 + 825). The scope of the project includes widening and reconfiguration of nine kilometres of the NR3 over, the development of five interchanges, nine hydraulic structures and related urban infrastructure. The scope of the works is fully described in Section 2 of this report.

1.2 CONTEXT TO THIS ESIA

The MINTP sponsored *Eastern Entrance of Douala* rehabilitation project was subject to an Environmental Impact Assessment in terms of Cameroonian requirements and a Certificate of Environmental Compliance was issued in 2012. Construction of phase 1 was undertaken in terms of this authorisation, which from a local regulatory context also covers phase 2 of the project.

Magil are seeking finance from Standard Chartered Bank (SCB) and United Kingdom Export Finance (UKEF) who required that the environmental and social risks be addressed in terms of the Equator Principles 4 and the International Finance Corporation's (IFC) Performance Standards (PS). Magil appointed APAVE Cameroon to undertake an Environmental and Social Impact Assessment of phase 2 of the *Eastern Entrance of Douala* and an ESIA report was produced in July 2020 (translated into English in September 2020). However, there was concern that this assessment was not fully aligned with the applicable lender standards. As such, Magil appointed SLR Consulting (Africa) (Pty) Limited (SLR) to review the project documentation and revise the Environmental and Social Impact Assessment (ESIA) Report to meet the IFC Performance Standards and associated World Bank Environmental and Social Guidelines, as required by the lenders. SLR competed a gap analysis of the APAVE ESIA document in November 2020 and advised Magil on a number of actions to close the identified gaps. This ESIA has been developed to provide consideration of the environmental and social risks of phase 2 of the *Eastern Entrance of Douala* rehabilitation project in terms of the IFC Performance Standards. As the project is previously authorised in terms of Cameroonian requirements, this ESIA report will not be disclosed as part of national

process for such reports. In compiling the revised ESIA, SLR has drawn extensively on the content of APAVE's July 2020 ESIA, with the consent of the authors.

The purpose of this Environmental and Social Impact Assessment Report is to present the proposed project, detail the current physical, biological and social conditions of the site, and to analyse the impacts that the activities associated with the implementation and operation of the project are likely to generate on the receiving environment. The document also proposes measures that, as part of a Construction Environmental and Social Management Plan (CESMP), will aim to avoid or mitigate negative impacts or improve beneficial impacts.

1.3 CONTENT OF THE ESIA

This ESIA Report has been prepared in compliance with Performance Standard 1 and is divided into various chapters and appendices, the contents of which are outlined in Table 1-1 below.

TABLE 1-1: STRUCTURE AND CONTENT OF THE ESIA REPORT

Section	Contents
Non-Technical Summary	Provides a plain language synopsis of the ESIA Report in language suitable for non-technical readers.
Chapter 1	*Introduction* Provides a brief description of the project background and context and describes the purpose and the structure of this report.
Chapter 2	*Project Description* Provides general project information and a detailed description of the proposed activities and associated project facilities and suppliers.
Chapter 3	*Alternatives* Describes the possible project alternatives and the rationale for inclusion or exclusion of these from further consideration
Chapter 4	*Project Standards* Presents the legal framework applicable to road projects and ESIA process in the Cameroonian and International Finance Institution.
Chapter 5	*ESIA Approach and Methodology* Presents the ESIA Project Team, assumptions and limitations, and outlines the approach and process to be followed during the ESIA.
Chapter 6	*Receiving Environment* Describes the existing physical, biological and socio-economic environment that could potentially be affected by the proposed activities.
Chapter 7	*Stakeholder Engagement* Presents and describes the stakeholder identification and consultation process undertaken during the history of the NR3 upgrade project and ESIA.
Chapter 8	*Impact Assessment* Describes and assesses the potential impacts related to construction and operations on the affected physical, biological and socio-economic environment.
Chapter 9	*Environmental and Social Management Plan*

	Presents the ESMP prepared for the proposed project, which sets out the implementation, management and control of the mitigation measures, as well as the monitoring and reporting requirements.
Chapter 10	*References* Provides a list of the references used in the compilation of this report.
Appendices	Appendix 1: Climate Change Risk Assessment (January 2021) Appendix 2: Minutes of Stakeholder Meetings Appendix 3: Stakeholder Engagement Plan (SEP) Appendix 4: Environmental and Social Management Plan (ESMP)

2 PROJECT DESCRIPTION

This chapter describes the project context, its objectives, location and schedule. The full scope of the project components and activities required to implement these are detailed.

2.1 BACKGROUND

Douala is one of the two most populated cities in Cameroon and is a critical commercial hub, with more than half of Cameroon's economic activity and industrial production occurring here. The National Road 3 (NR3), originally established between 1980 and 1985 to link Yaounde with Douala, is a critical transportation corridor for Douala, Cameroon, and the wider west African region (See Figure 2-1). Douala is a natural gateway for imports and exports. The landlocked nature of countries such as Chad and the Central African Republic imposes a compulsory transit through Cameroon with goods arriving, and departing, at the Autonomous Port of Douala.

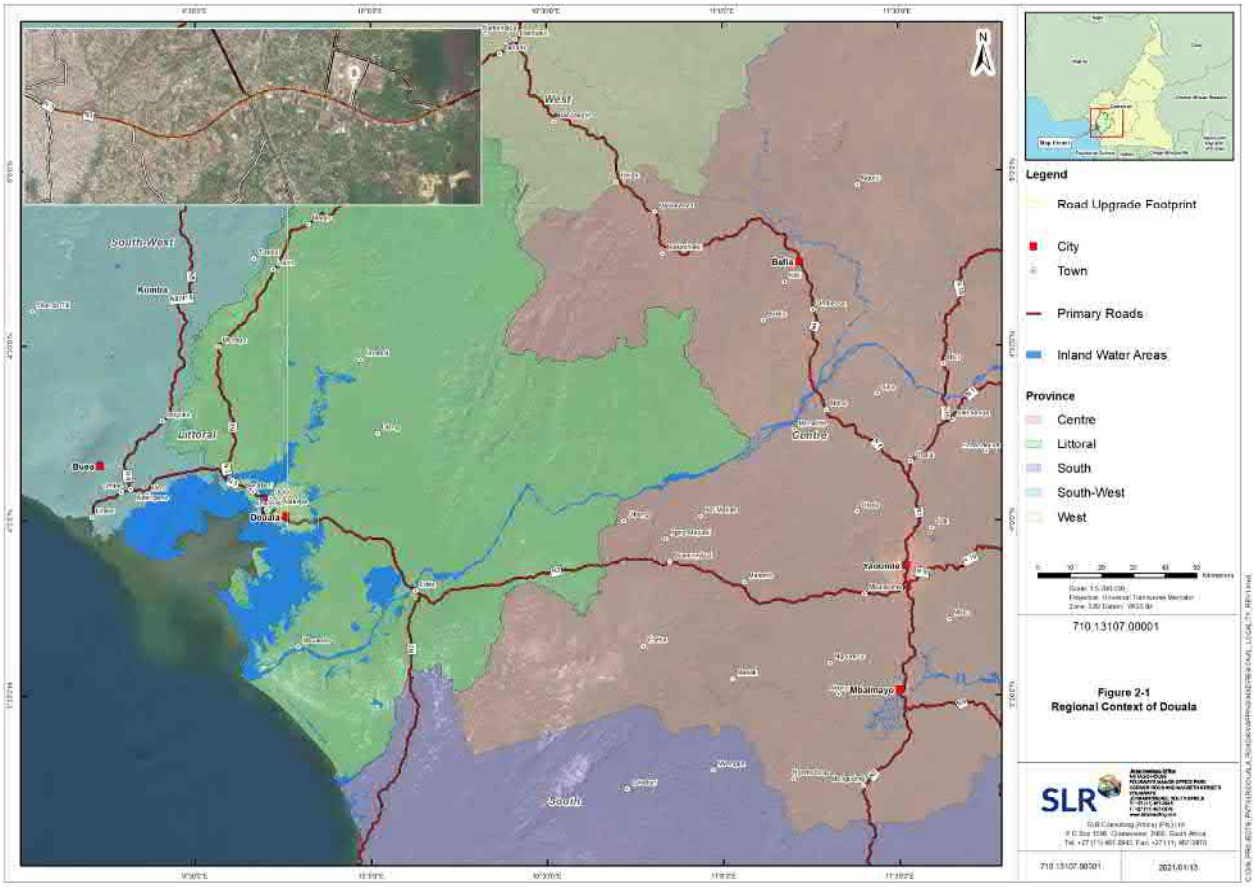


FIGURE 2-1: REGIONAL CONTEXT OF DOUALA

As economic activity and the extent of the city of Doula have expanded the NR3 has become an: important transit route between the port, local industrial areas, and the interior; an entrance to the city of Douala; and an urban boulevard. Over the past two decades the volume of traffic using and crossing the NR3 has grown significantly and there is substantial unregulated use and occupation of the roadsides. It is evident that current accesses through Douala are undersized, resulting in traffic congestion and inefficiencies. This has resulted in both regional transportation and intercity traffic being regularly disrupted. It is therefore important that the connection

between the Port Autonome and the exit of the Douala be optimized for through traffic, while making provision for the mobility requirements of local users. Widening of NR3 will facilitate development the of Yassa industrial area and improve access of inhabitants of the Douala 3rd district.

The redevelopment of the NR3 has formed part of the Cameroonian Ministry of Public Works' planning for many decades, with the Right-of-Way for the NR3 having been declared by decree No. 84/048 in 1984. Various studies were conducted and have informed the planning and design of the NR3 from the centre of Douala to the Dibamba River bridge. These have included:

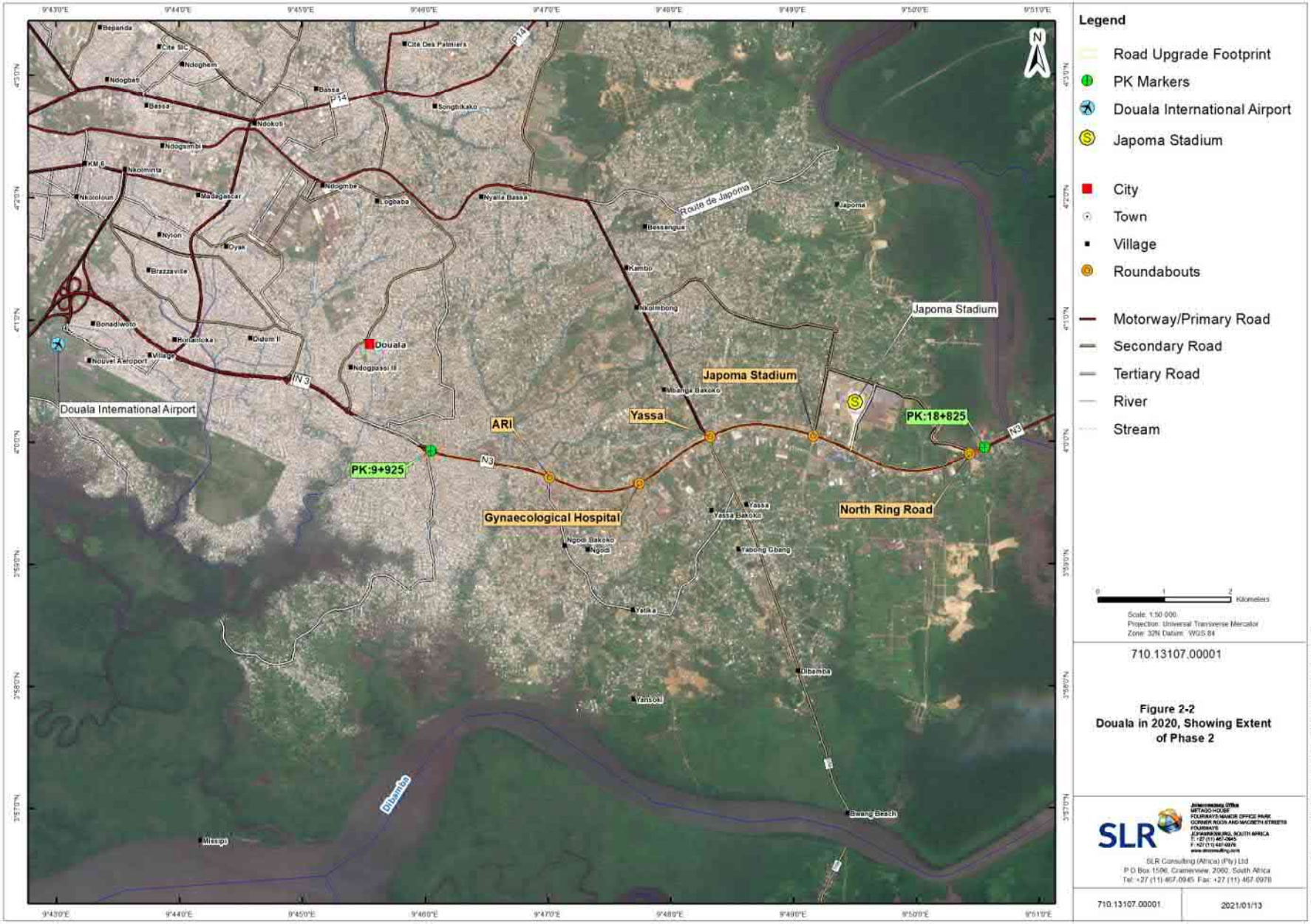
- 2008: Preliminary studies having retained the functional scenario;
- 2010: Summary Preliminary Project leading to the optimised scenario; and
- 2011: Detailed Preliminary Project, presenting the Douala East Entrance solution.

The aims of the project are to:

- decongest the NR3 road course, in order to allow the crossing of the city without traffic jams;
- to considerably improve the functioning of the hydraulic flows and the quality of sanitation in the area;
- facilitate trade between neighbourhoods intersecting the NR3;
- encourage the movement of persons and goods, promoting urban mobility, etc. in complete safety;
- improving access to markets, ports, Yassa industrial areas, 3rd district inhabitants and to public utilities such as hospitals and schools;
- enable the populations living along the road course and all the inhabitants of Douala to see their living and transport conditions change and thus improve their living environment;
- meet the needs of accessibility on days of sporting events at the Japoma stadium in Douala; and
- improve road safety by providing pedestrian crossing areas and adequate parking.

The MINTP divided the *Eastern Entrance of Douala* rehabilitation project into two phases. The first phase, from the centre of Douala (PK 0+00) up to the Boko-Tradex exchange (PK 9+925), was completed and commissioned during 2016 and 2017. As detailed in Section 2.2, during the lead up to phase 1 all residential and commercial infrastructure was cleared from the full roadway footprint (i.e. both phase 1 and phase 2) up to the foot of the Dibamba River bridge. The clearance was completed by December 2011.

The MINTP appointed the Magil in December 2019 to undertake construction of the phase 2 of the *Eastern Entrance of Douala*, including from the Boko-Tradex exchange (PK 9+925) up to the foot of the Dibamba River bridge (PK 18+825), refer to Figure 2-2. The scope of the project includes widening and reconfiguration of nine kilometres of the NR3, the development of five interchanges, nine hydraulic structures, and related urban infrastructure. The scope of the works is fully described in Section 2 of this report. EGIS has undertaken a subsequent investigation campaign to inform the pavement design, material specifications, geotechnical characteristics, and lighting requirements (May 2020). This ESIA is focussed on phase 2, which will be constructed by the Magil.


Legend
Road Upgrade Footprint
PK Markers
Douala International Airport
Japoma Stadium
City
Town
Village
Roundabouts
Motorway/Primary Road
Secondary Road
Tertiary Road
River
Stream
Douala International Airport
Douala
Japoma Stadium
Yassa
ARI
PK:9+925
PK:18+825
Gynaecological Hospital
North Ring Road
Dibamba
Bwang Beach
Missoke
N3
P14
Route de Japoma
Scale: 1:50 000
Projection: Universal Transverse Mercator
Zone: 32N Datum: WGS 84
710.13107.00001
Figure 2-2
Douala in 2020, Showing Extent of Phase 2
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Tel: +27 (11) 467-0945 Fax: +27 (11) 467-0978
710.13107.00001
2021/01/13

2.2 RIGHT OF WAY (ROW)

The ROW for the NR3 was declared by the Cameroonian MINTP by decree No. 84/048 in 1984. The Declaration of Public Utility provided for a 150 meters wide ROW (75 m on either side of the axis) in urban areas and 200 meters wide (on both sides of the axis) in open country. The ROW for the NR3 within Douala was the subject of a complete expropriation procedure which led to the payment in November 1985 of compensation for the destruction of property.

In 2011, a Compensation and Resettlement Plan (Plan d'Indemnisation et de Réinstallation (PIR)) was once again drawn up at the request of financiers, to serve as a reference framework for managing the expropriations required to redress the illegal settlements of the populations in the right-of-way and preventing the necessary works. The PIR process included the removal of all residential and commercial infrastructure from the central portion of the ROW as required for the 2011 project design (i.e. both phase 1 and phase 2). The measures undertaken in terms of the PIR process were completed in December 2011, prior to phase 1.

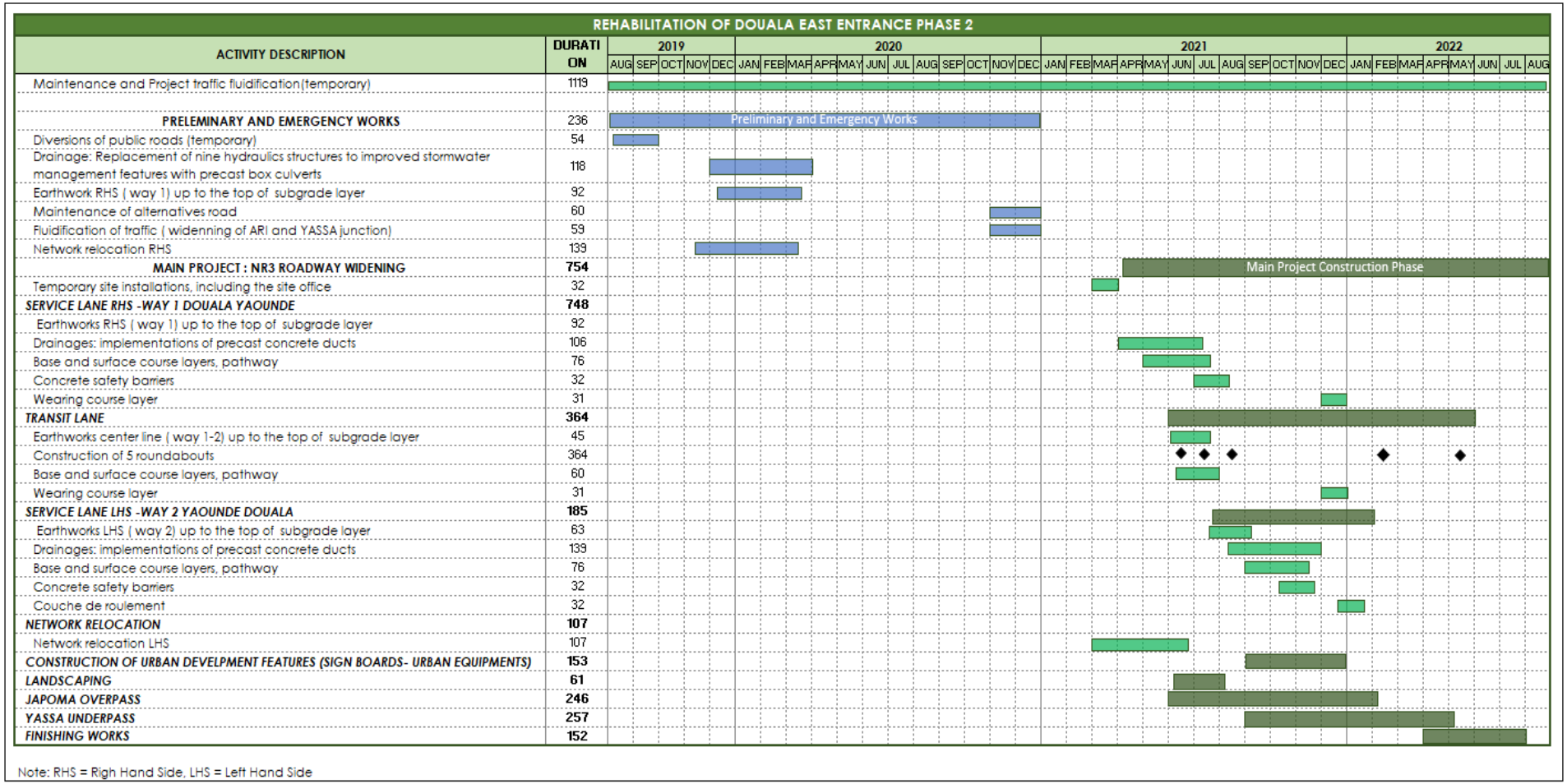
The scope of phase 1 also included some bulk earthworks within the phase 2 footprint up to the foot of the Dibamba River bridge. The result of these previous processes is that the phase 2 site (being the footprint required for the roadway) was free and clear of residential and commercial infrastructure before Magil took over the site.

It is noted that the footprint of the phase 2 roadway does not utilise all of the declared ROW, but is limited to land within the ROW made available through the previous clearance process.

2.3 SCHEDULE

The schedule in Table 2-1 lists the work and activities completed or to be completed according to the various phases of the project. Commencement of the project and the schedule of the construction start date (March 2021) is subject to financial close with the lenders.

TABLE 2-1: ESTIMATED PROJECT SCHEDULE



ACTIVITY DESCRIPTION	DURATION
Maintenance and Project traffic fluidification(temporary)	1119
PRELEMINARY AND EMERGENCY WORKS	236
Diversions of public roads (temporary)	54
Drainage: Replacement of nine hydraulics structures to improved stormwater management features with precast box culverts	118
Earthwork RHS (way 1) up to the top of subgrade layer	92
Maintenance of alternatives road	60
Fluidification of traffic (widenning of ARI and YASSA junction)	59
Network relocation RHS	139
MAIN PROJECT : NR3 ROADWAY WIDENING	**754**
Temporary site installations, including the site office	32
SERVICE LANE RHS -WAY 1 DOUALA YAOUNDE	**748**
Earthworks RHS (way 1) up to the top of subgrade layer	92
Drainages: implementations of precast concrete ducts	106
Base and surface course layers, pathway	76
Concrete safety barriers	32
Wearing course layer	31
TRANSIT LANE	**364**
Earthworks center line (way 1-2) up to the top of subgrade layer	45
Construction of 5 roundabouts	364
Base and surface course layers, pathway	60
Wearing course layer	31
SERVICE LANE LHS -WAY 2 YAOUNDE DOUALA	**185**
Earthworks LHS (way 2) up to the top of subgrade layer	63
Drainages: implementations of precast concrete ducts	139
Base and surface course layers, pathway	76
Concrete safety barriers	32
Couche de roulement	32
NETWORK RELOCATION	**107**
Network relocation LHS	107
CONSTRUCTION OF URBAN DEVELPMENT FEATURES (SIGN BOARDS- URBAN EQUIPMENTS)	**153**
LANDSCAPING	**61**
JAPOMA OVERPASS	**246**
YASSA UNDERPASS	**257**
FINISHING WORKS	**152**

Note: RHS = Righ Hand Side, LHS = Left Hand Side

2.4 PROJECT COMPONENTS

2.4.1 Component Summary

The IFC Performance Standards require that project proponents identify and manage environmental and social risks and impacts within their 'Area of Influence'(AOI). The appropriate level of assessment and management of risks and impacts is determined by the degree of control that the project is able to exercise over its facilities or activities and by the importance of the facilities or activities to the project's successful operation. The AOI of the project is delineated as a basis for defining the boundaries for baseline data gathering by taking into consideration the spatial extent of the activities and potential direct and indirect impacts of the project. The first step in defining the AOI is to classify the facilities and activities ('the project components') that make up the Project. The following project component categories are considered for this Project. Table 2-2 provides a full list of the project components considered in this assessment.

Core component. Facilities constructed and operated by the Project, and activities directly associated with their construction and operation. The Project is expected to have full control of these components in terms of management of risks and impacts.

Associated component. Third party facilities that have been constructed or expanded as part of the Project and that are essential to its successful operation. Activities associated with constructing and operating these facilities are also considered associated components. As the component is dependent on the Project, and vice versa, the Project is expected to have a high level of control. Note that these types of components are considered to meet the definition of an associated facility per Performance Standard 1.

Primary supply chain. Third parties supplying goods or materials that are essential to the successful operation of the Project, on an ongoing basis. The level of control the Project can exercise may be limited, especially for suppliers further along the supply chain.

Other supply chain. Facilities constructed or operated by third parties, and associated activities, which are not essential to the successful operation of the Project, for example use of the container port. These are not within the Project's AOI.

TABLE 2-2: KEY PROJECT COMPONENTS

Key Components	Classification
Roadway expansion (~9 km)	Core
Construction of five roundabouts	Core
Construction of one overpass and one underpass	Core
Construction of nine improved stormwater management features	Core
Construction of urban development features (e.g. pedestrian crossings, bus stops, parking areas)	Core
Roadway lighting	Core
Landscaping	Core
Temporary site installations, including the site office	Core

Relocation of public services (i.e. power, telecommunications and water)	Core
Diversions of public roads (temporary)	Core
Project traffic (temporary)	Core
Management of inert construction material spoil	Core
Use of existing quarries and borrow pits (see Project Activities)	Other supply chain
Use of existing waste disposal facilities (see Project Activities)	Other supply chain

2.4.2 Roadway Expansion

The primary component of the phase 2 project is the widening of the roadway from PK 9+925 to PK 18+825. The widening will extend the roadway from the current two lanes to include:

- 2 transit lanes;
- 4 side service lanes;
- 2 sidewalks;
- 2 Emergency Stop Strips (ESS) (replaced by pedestrian crossing points at the vicinity of roundabouts) of 2 metres each.

Refer to the figure below for the six-lane roadway concept. The width of the roadway sections vary between 41 m and 70 m and the widening will remain within a portion of the declared ROW. The specific configuration of the roadway will vary over the length of the road in relation to the adjacent conditions and available space (refer to the images in Figure 2-4.

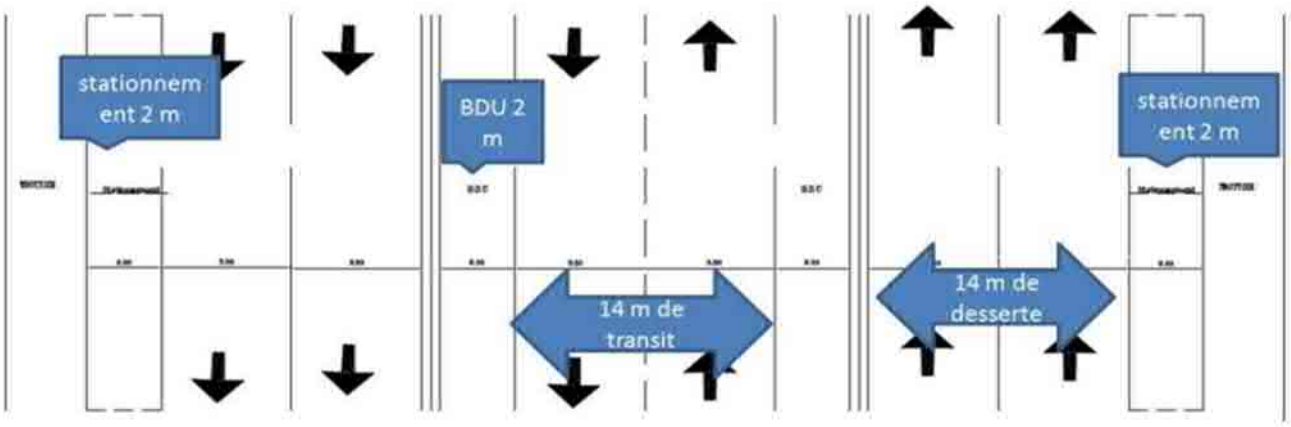
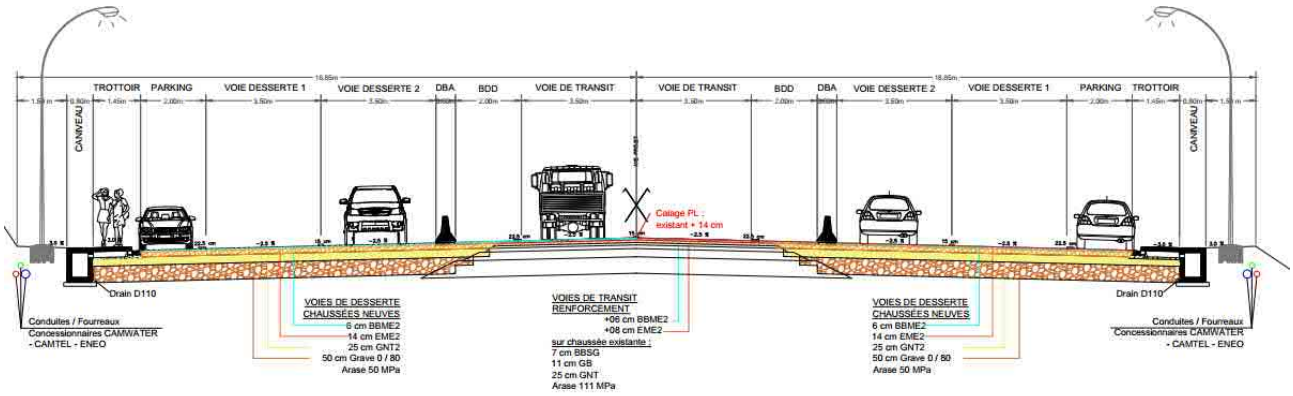
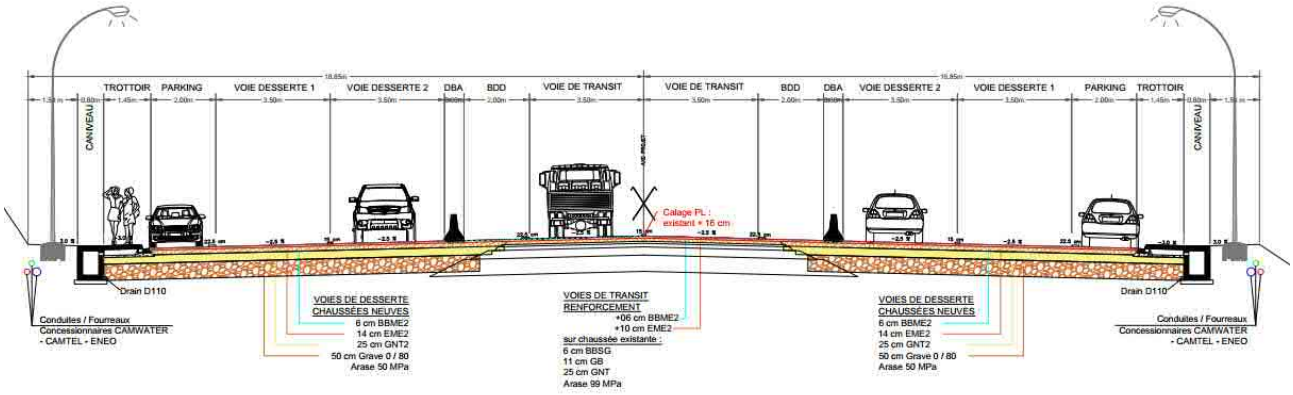


FIGURE 2-3: TRACK CONCEPT PLAN

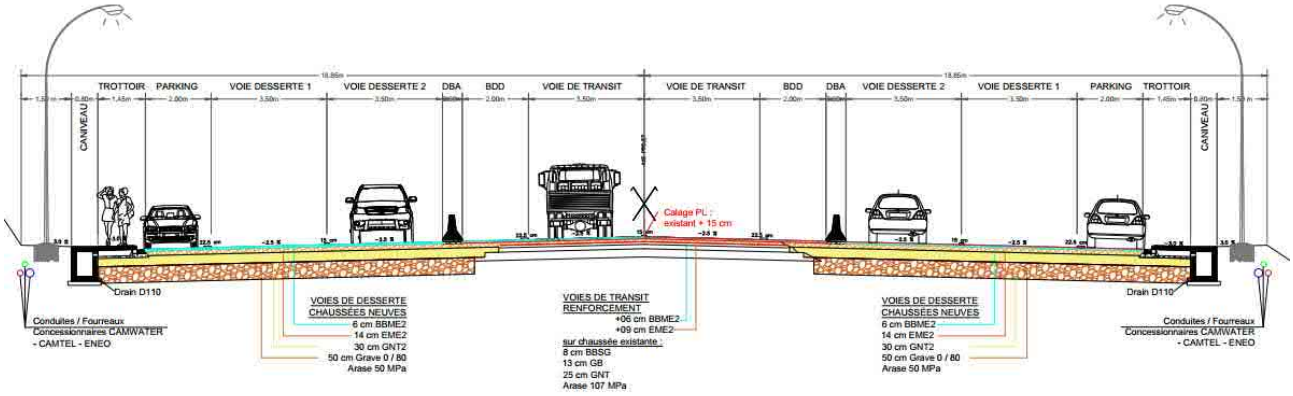
Tronçon n°1 du PK9+225 (Giratoire Boko)
au PK11+764 (Giratoire Ari)



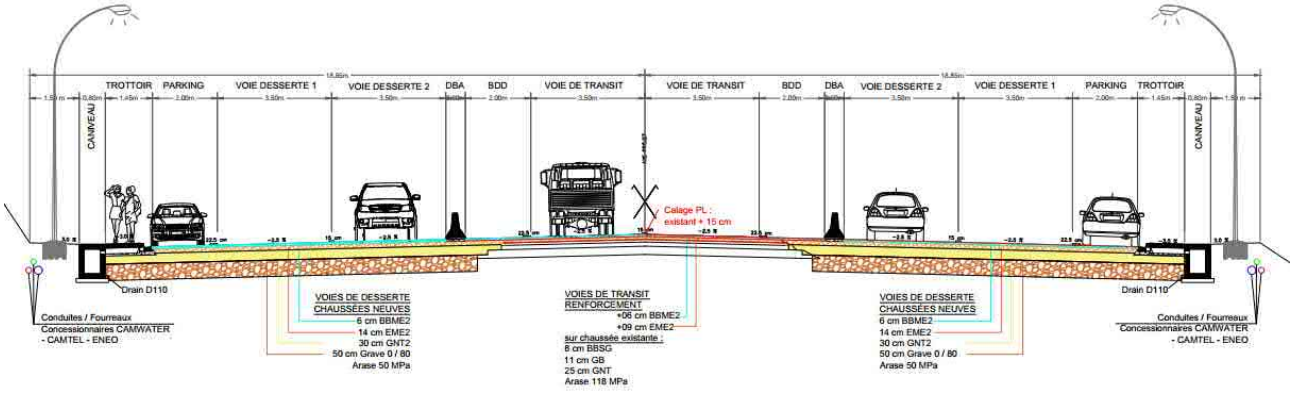
Tronçon n°2 du PK11+764 (Giratoire Ari)
au PK13+088 (Giratoire Hôpital)



Tronçon n°3 du PK13+088 (Giratoire Hôpital)
au PK14+453 (Giratoire Yassa)



Tronçon n°4 du PK14+453 (Giratoire Yassa)
au PK16+072 (Giratoire Japoma)



Tronçon n°5 du PK16+072 (Giratoire Japoma)
au PK18+875 (Giratoire Rocade Nord)

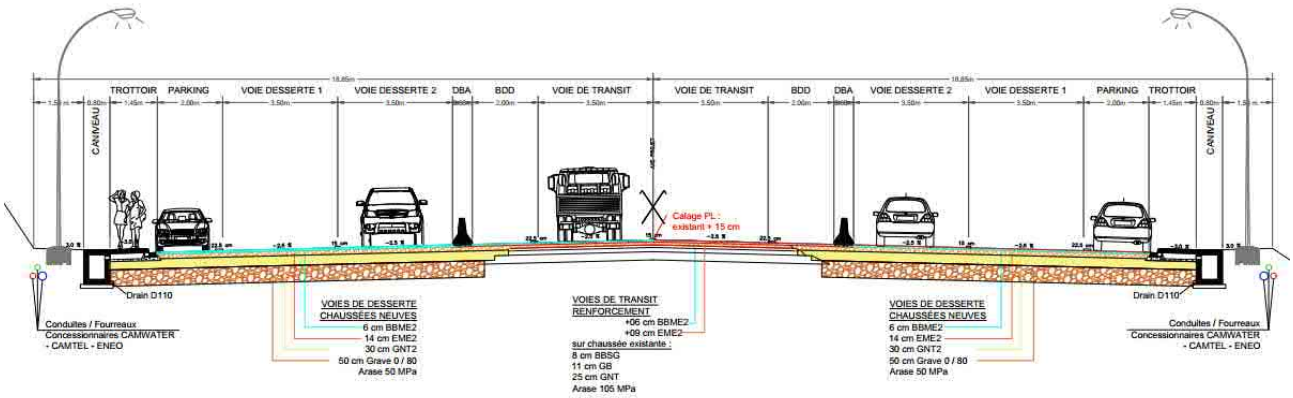


FIGURE 2-4: TYPICAL CROSS SECTIONS OF THE ROADWAY LAYOUT

The proposed pavement structure is based on the traffic properties (current and future) and technical characteristics provided by the EGIS design office through their design studies and investigation campaign. In May 2020, the EGIS design office defined the technical characteristics that Magil is required to respect in the project. Several structural assumptions have been incorporated into the final definition of the "Earthworks" component of the project:

- the backfill materials packed are not treated with hydraulic bonding agents and / or lime;
- the geometry of excavated earthworks is definitive;
- the bearing capacity of the upper part of the roadway substructure is 50 Mpa (AR2);
- the bearing capacity of the substructure layer is 80 MPa;
- the bearing capacity of the roadway platform is 120 MPa (PF3).

The typical layer works for the road, with adjustments for local conditions along the length of the roadway are illustrated in the images in Figure 2-4.

2.4.3 Roundabouts

The project involves the construction of five roundabouts between PK 9+925 to PK 18+825, with ROW widening. The layout of each of the roundabouts is illustrated in Figure 2-5 to Figure 2-9.

The distances between the roundabouts were determined based on intercity traffic requirements and the distances recommended by EGIS Routes in terms of visibility, legibility and location of road signs and traffic flow safety. The inter-distances between the roundabout are greater (> 1170 m) than the requirements of the standard (refer to Table 2-3).

TABLE 2-3: LOCATIONS OF THE ROUNDABOUTS

Roundabout	Location marker	Distance from previous (m)
Boko Tradex (existing)	PK 9+900	N/A
ARI	PK 11+750	1640
Gynaecological Hospital	PK 13+150	1170
YASSA	PK 14+450	1175
Japoma Stadium	PK 16+050	1620
North Ring Road	PK 18+840	2790

Three of the proposed intersections will be developed as ground-level roundabouts with the Yassa and Japoma roundabouts being uneven crossings, including an underpass and an overpass, respectively (see Section 2.4.4). These follow consecutively on the roadway meaning that that there is no interchange of the transit road with the city traffic (via the side roads) for more than five continuous kilometres (i.e. more than half of the length of the road redevelopment).

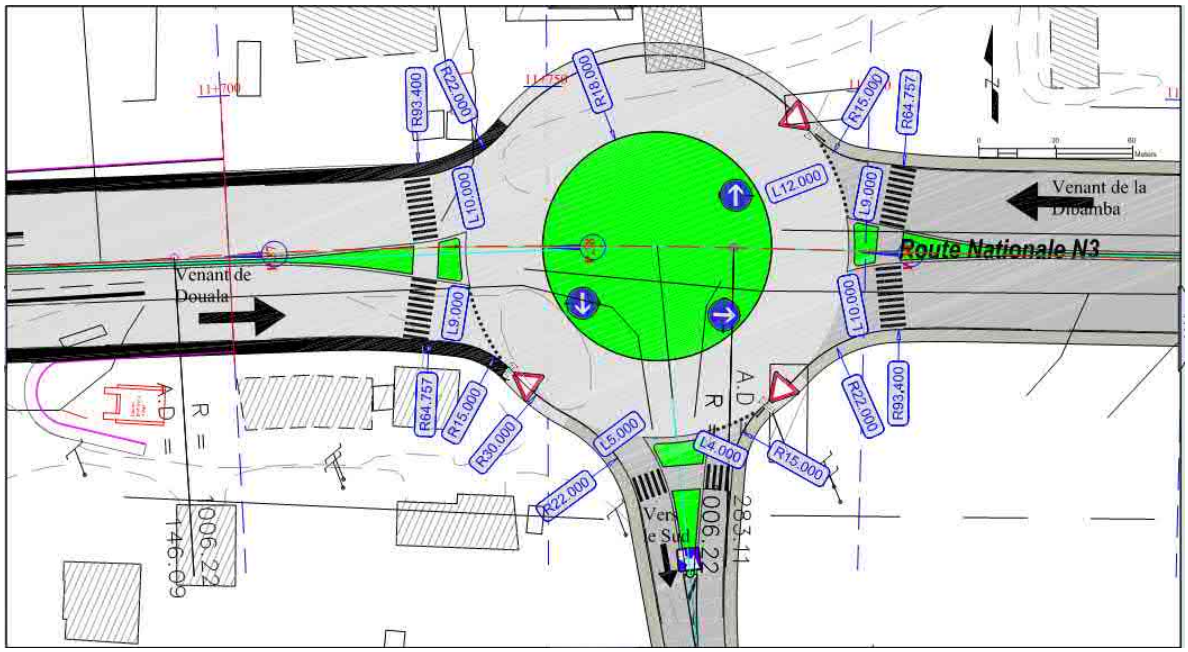


FIGURE 2-5: PK11 + 750: ARI ROUNDABOUT

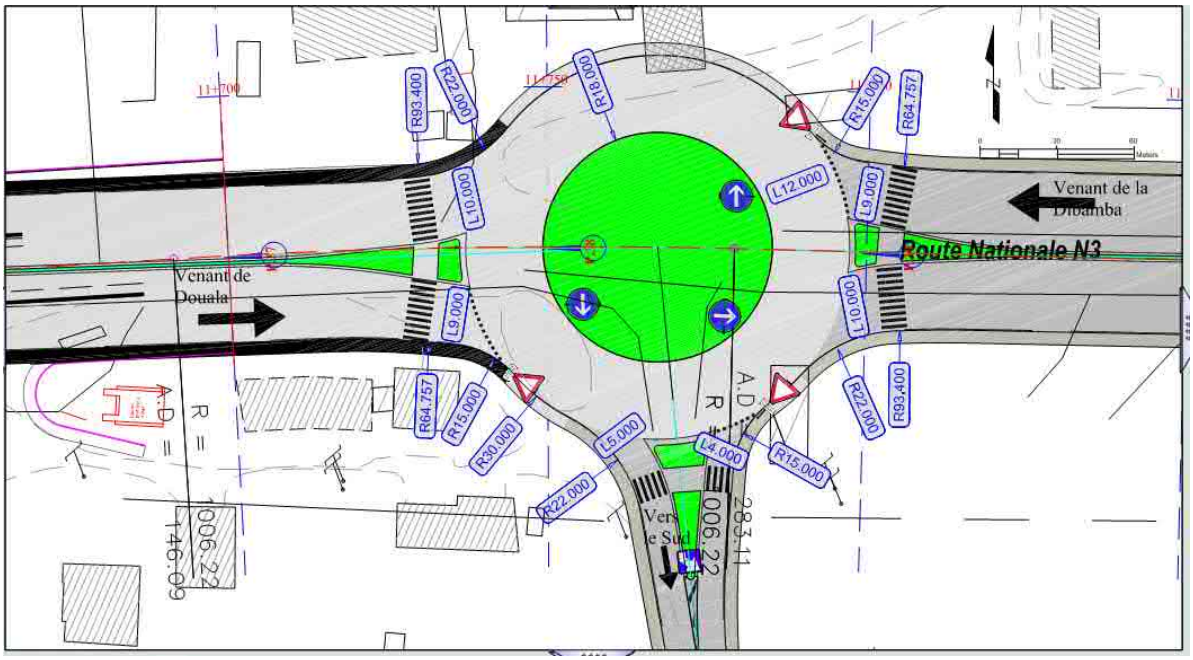


FIGURE 2-6: PK13 + 150: GYNAECOLOGICAL HOSPITAL ROUNDABOUT

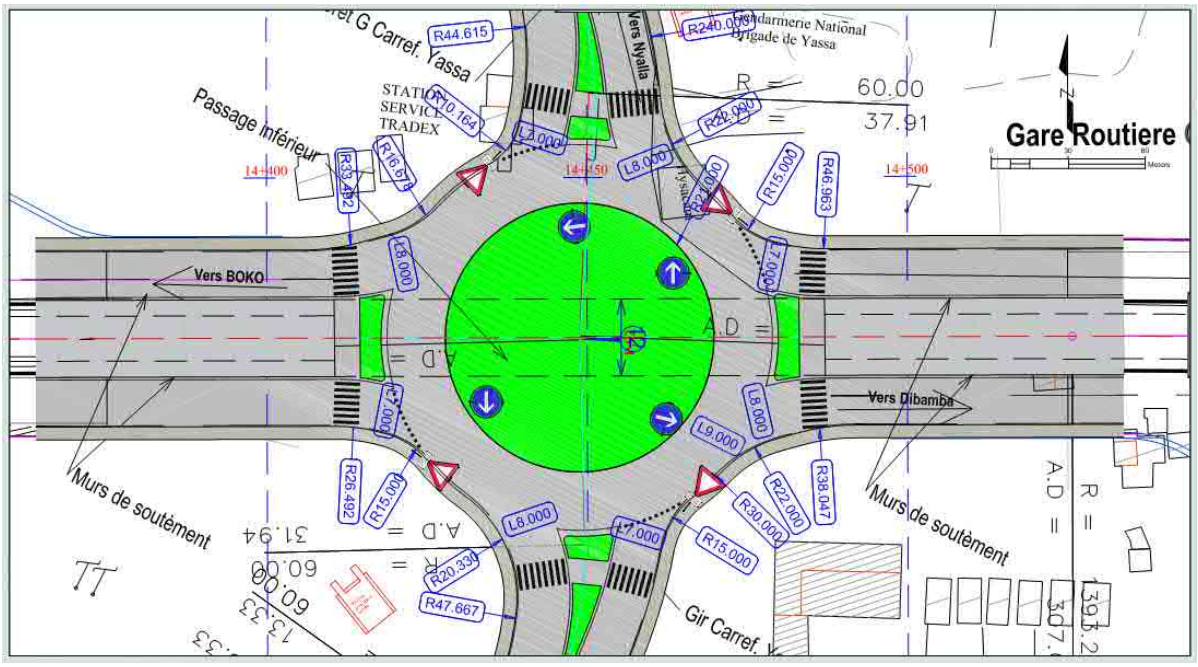


FIGURE 2-7: PK14 + 450: YASSA ROUNDABOUT

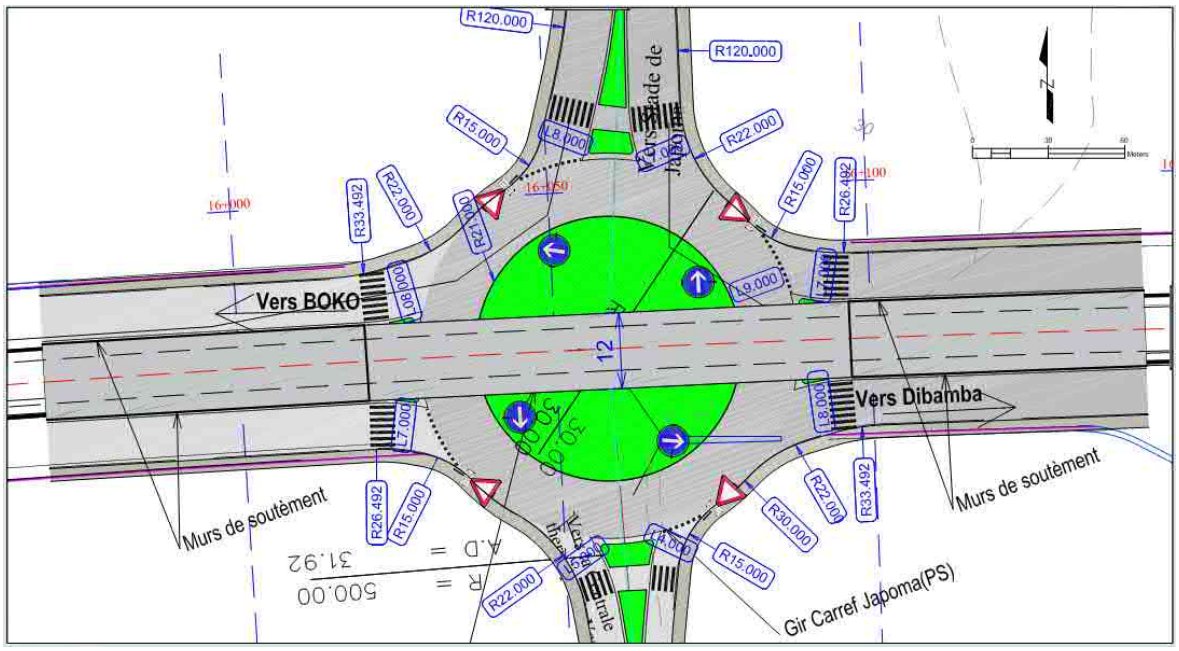


FIGURE 2-8: PK16 + 050: JAPOMA STADIUM ROUNDABOUT

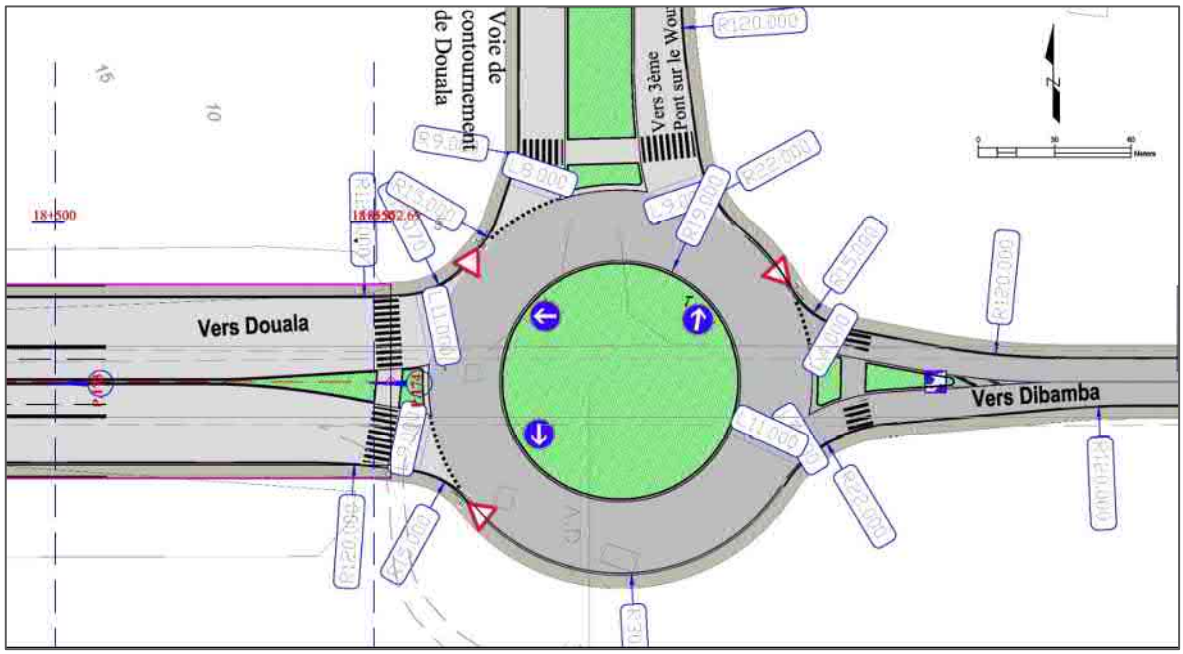


FIGURE 2-9: PK18 + 600: NORTH RINGWAY ROUNDABOUT

2.4.4 Underpass and Overpass

The project includes the construction of two engineered structures namely:

- **Yassa Roundabout Underpass** (at PK 14+450), being an open portico underpass type, to allow the passage of transit vehicles. Provision is made for service lanes adjacent to the traffic lanes. The underpass will consist of a reinforced concrete frame bridge (cast in place). Retaining walls of varying heights are provided over a total length of 83 m on each side of the structure. Dimensions: Height = 5m; Width = 9.60 m; Length = 66.20 m.
- **Japoma Roundabout Overpass** (at PK 16+050), being an overpass (upper passage in armed slab type), allowing the transit traffic to cross over the roundabout. The overpass includes one bridge with two abutments, two spans and intermediate piers, the middle three of which will be located in the roundabout. The traffic lane will be seven meters wide, with one-meter sidewalks. Dimensions: Height: 18 m; Width: 11 m; Length: 75.50 m.

The following figures illustrate the design features of these structures.

FIGURE 2-10: RENDERING OF UNDERPASS AND ROUNDABOUT

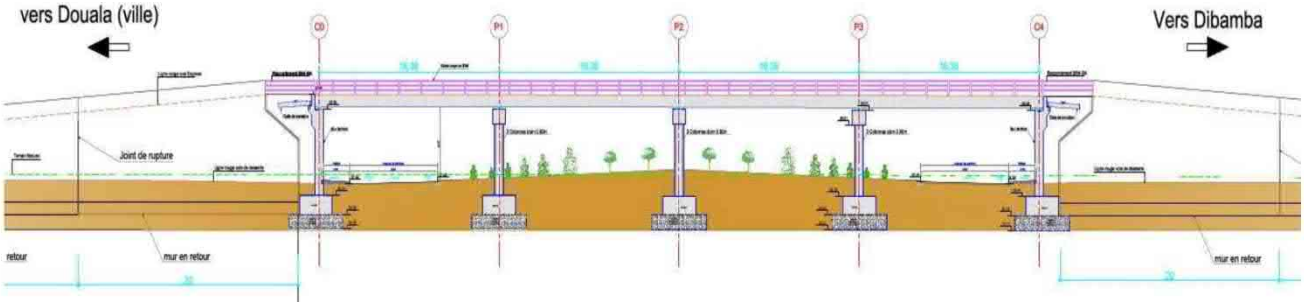


FIGURE 2-11: LONGITUDINAL SECTION OF THE REINFORCED CONCRETE DECK

FIGURE 2-12: OVERPASS RENDERING

2.4.5 Stormwater Management Infrastructure

During the roadway expansion works a number of improvements were proposed to be implemented to the stormwater management systems. The primary intervention was the construction of nine hydraulic structures, at the sites of existing drains/culverts, to replace undersized or defective structures with structures of an appropriate sizing and a longer service life. None of the structures are over defined watercourses, but rather provide for urban drainage. Each structure consists of a 1.5 m by 1.5 m reinforced concrete box culvert, with the sizing based on a 1:10 year flood return period, per guidance from MINTP.

The nine hydraulic structures, located at PK10+368, PK12+457, PK13+100, PK13+282, PK13+977, PK15+170, PK17+620, PK17+840 and PK18+137, have already been constructed (see Section 2.5.2), and as such limited mitigation options exist for managing any impacts that may have occurred as a result of their construction.

The project will also include a stormwater collection network to collect and drain stormwater from the roadway. This will include a: network for collecting water from the embankments; longitudinal channel network to collect runoff water generated by the road platform; and a transverse channel network at certain locations (i.e. roundabouts) to connect the branches of the longitudinal network to each other.

Additionally, a simple cleaning of the existing ditches upstream and downstream of the roadway will allow for improved flow of the run-off water.

2.4.6 Urban Development Features

As part of urban improvements, the project includes development of:

- nine bus stops with bus shelters;

- four taxi stop areas, located at crossroads, with stop zones positioned downstream of the roundabouts, so as not to penalise insertions. In order to ensure the safety of passengers and vehicles, it is proposed to make stops at the exit of the roundabout, offset laterally.
- five parking areas for motorcycles positioned at each junction on roads other than the NR3, as well as on ramps.
- two parking areas for vehicles (ARI and Yassa roundabouts). Each will provide a capacity of 30 parking places.
- ten pedestrian crossings positioned upstream of bus stops (in the direction of traffic flow) to prevent buses from concealing pedestrians from other users. Additional pedestrian access is planned in the works phase to ensure the smooth flow of traffic in complete safety;
- collection areas for domestic waste, located at bus or taxi stops;
- speed bumps along the road to slow the traffic; and
- road signage and safety equipment.

Examples of the layout and scale of the key infrastructures are shown in the following figures.

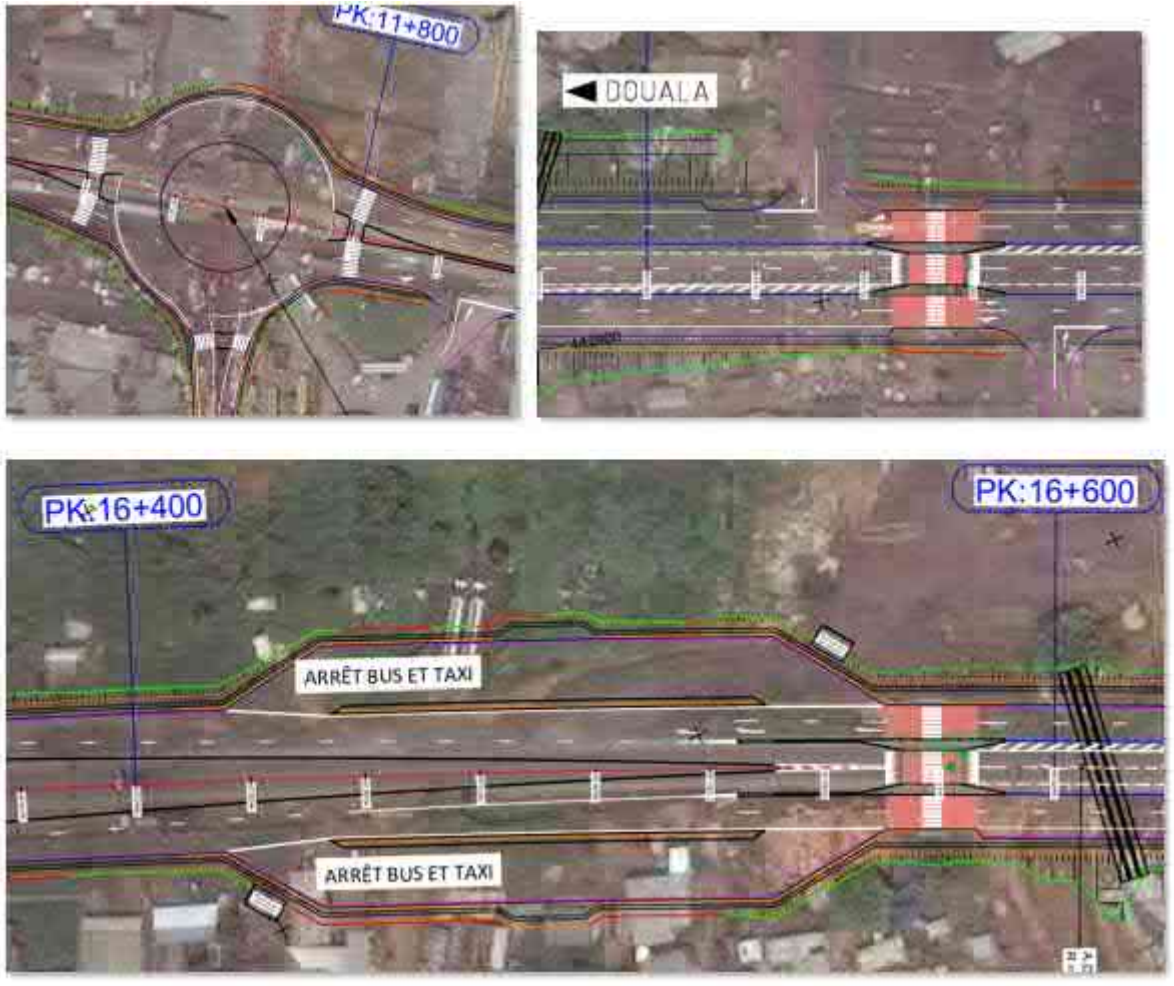


FIGURE 2-13: EXAMPLE OF A PEDESTRIAN CROSSING

FIGURE 2-14: EXAMPLE OF BUS STOP CONFIGURATION

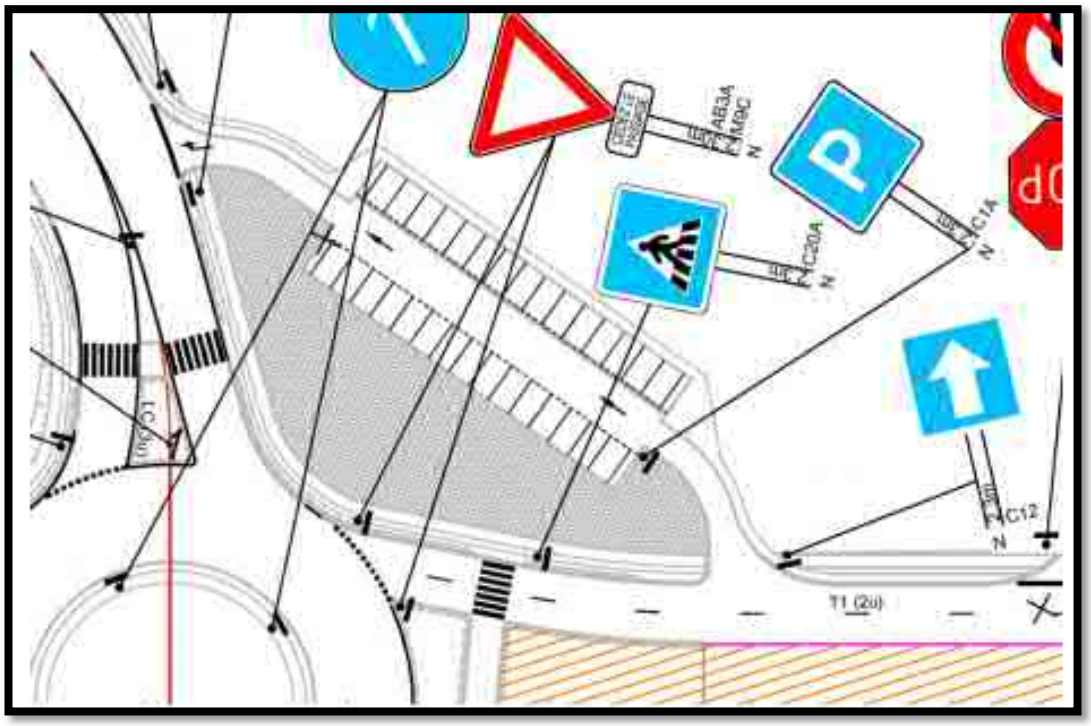


FIGURE 2-15: EXAMPLE OF PARKING AREA CONFIGURATION

2.4.7 Lighting

Public lighting is planned along the roadway, mainly near inhabited areas. The proposal includes for 550 single-beam and 55 double-beam lampposts per the EGIS luminescence study. The lighting is composed of mast/lighting fixture/lamp assemblies that are more or less architecturally designed according to the expected performance, in all cases adapted to the roads and spaces to be lit. Each light post will be protected by concrete structures on both sides. LED lighting will be provided to reduce power consumptions and increase durability.

These lampposts will be powered from the existing electrical network. At the current stage of the design studies, the overall power balance of the installation amounts to 189 kVA. It is proposed that all the light posts be distributed among six of the fifteen available transformer sub-stations (P2, P4, P6, P8, P11 and P15) in order to limit the power required per station and reduce the distances between source and load.

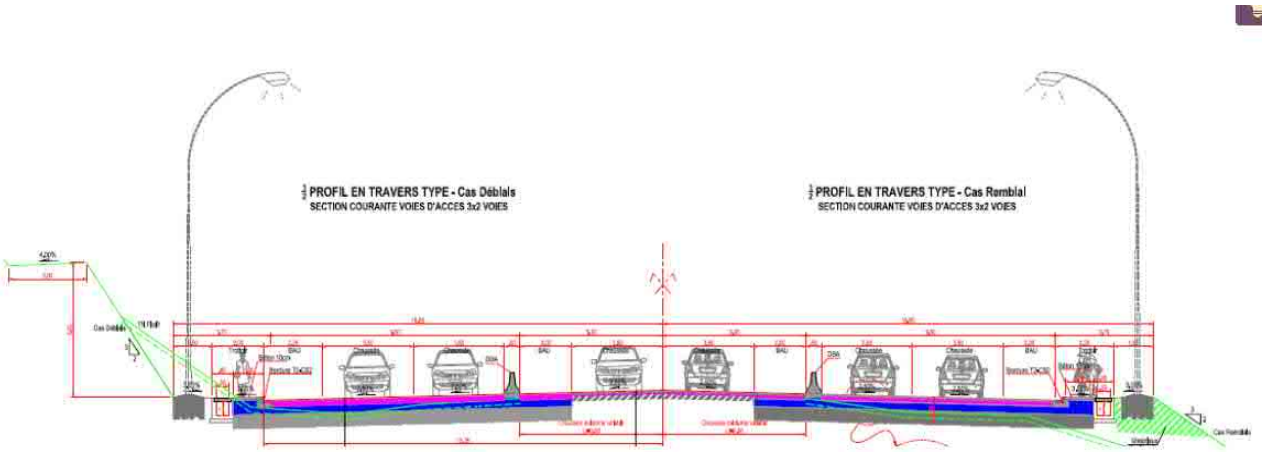


FIGURE 2-16: LIGHTING SCHEME

2.4.8 Landscaping

Landscaping is planned along the roadway with the aim of improving the urban environment. This will involve the planting of trees along the shoulders of the service roads and landscaping of the central islands of the roundabouts. Plantings will primarily consist of two species, derived from a dedicated project nursery. Other species adapted to local conditions are planned for motorcycle and car parking areas. The landscaping work would be carried out by a specialised company toward the end of the project schedule.

2.4.9 Site Installations

Various installations are required by Magil for the work. Some of the most important include:

- the site office for the construction works will be located immediately adjacent to the roadway at PK 16+320 in an area declared a public utility zone. It is located in a low urbanisation area, more than 50 m from dwellings as prescribed by MINTP environmental directives.
- aggregate material storage areas;
- parking areas for heavy machinery and vehicles;

- storage areas for materials other than aggregates and fuel tanks;
- operating areas for concrete mixing plants; and
- portable chemical toilets.

These facilities will all be located within the ROW and the majority will be located within the footprint of the roadway. With the exception of the site office, the location of these areas is likely to evolve as part of the iterative process of avoiding and reducing impacts on the surrounding environment.

The site office (see Figure 2-17) will consists of pre-manufactured modular elements formed by cold-formed profiles in galvanised steel. The site office will be equipped with a containerised membrane bioreactor (MBR) wastewater treatment plant. All toilet waste will be directed to the MBR for treatment and processing before being discharged to the public sewer. Along the roadway the project will make use of portable chemical toilets. These will be serviced daily by ALIGI SARL A DOUALA. The wastewater will be disposed the public sewer.

At completion of the project, all of the site installations will be removed, the footprint will be rehabilitated and returned to the site owner per agreed conditions.

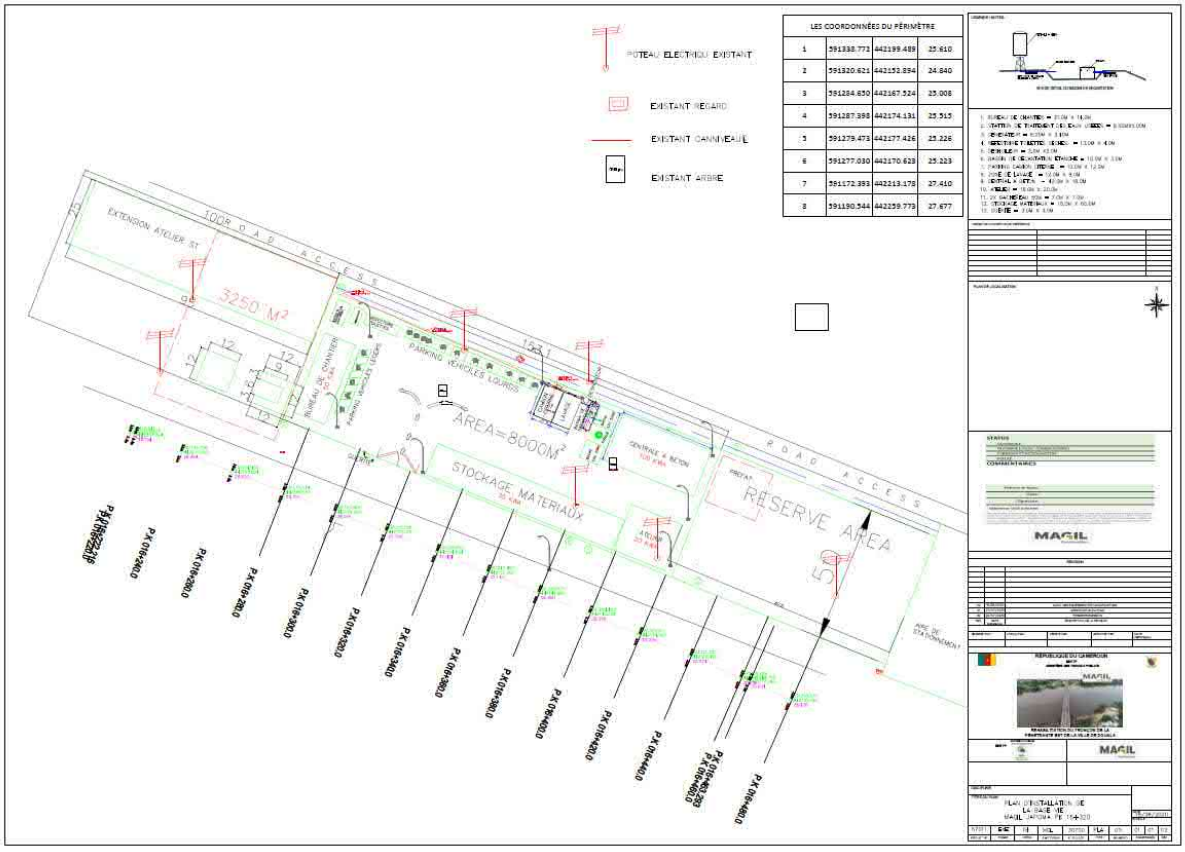


FIGURE 2-17: MAGIL SITE OFFICE

2.4.10 Relocation of Services

It is known that various services (i.e. electrical, telephone, water) exist within the footprint of the roadway. These will require relocation during the construction. Plans will be implemented, in conjunction with the network

operators, to ensure the safe and efficient relocation of the service infrastructure where this is required for the roadway construction.

In this regard the replacement infrastructure, outside of the roadway, will be installed prior to removal of the current infrastructure. The service would be disconnected and reconnected via the new infrastructure for the shortest feasible interruption. Only then would the conflicting infrastructure within the roadway be removed. Some of the service relocations were undertaken during the emergency works.

2.4.11 Traffic Deviations

In order to facilitate localised construction activities within the roadway it will be necessary to intermittently implement minor deviations from the roadway (Figure 2-18). In these cases, alternate routes with a suitable, temporary road surface will be prepared and implemented for the required period. The deviations will be open to all traffic and appropriately signed.

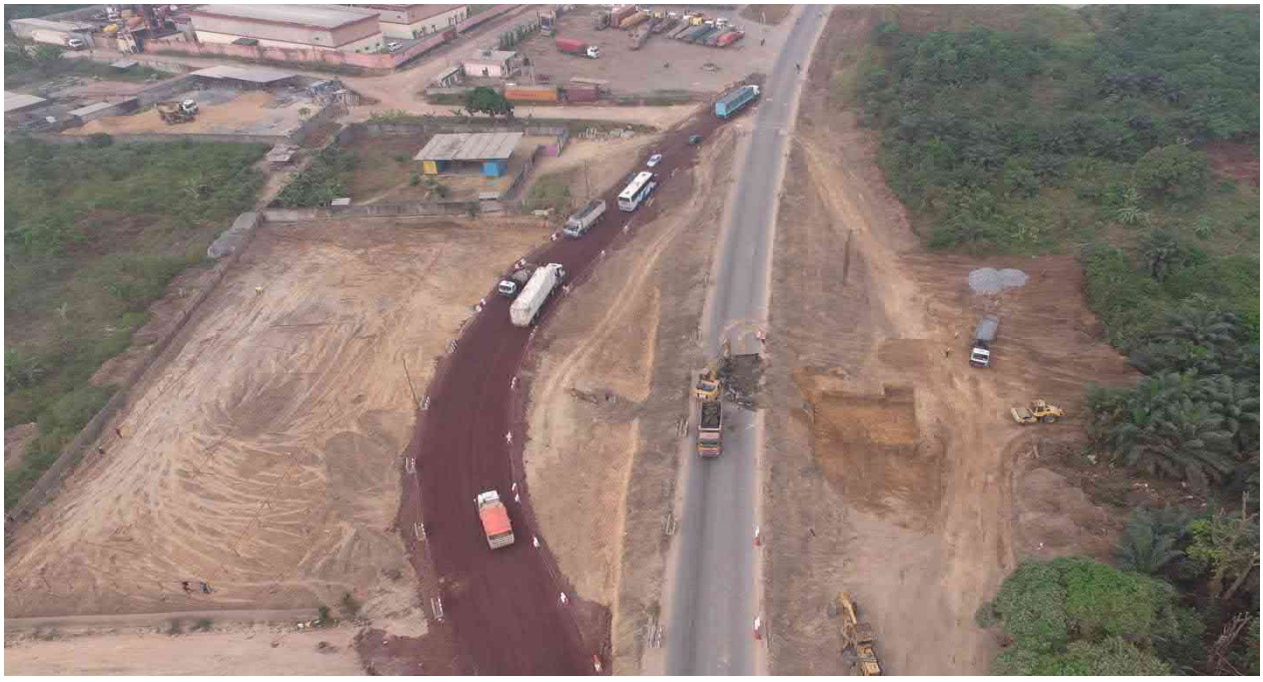


FIGURE 2-18: EXAMPLE OF LOCALISED ROAD DEVIATION

In other instances, construction of the roadway will require minimal traffic across a longer length of the roadway and/or result in very limited capacity for current traffic. To address these requirements a road deviation will be implemented to divert traffic onto alternate roads. The road deviations will be signed effectively on the NR3 and along the route of the deviation. Heavy motor vehicles will be accommodated along the roadway and will not be permitted to use the deviations. Five deviation routes (see Figure 2-19) were implemented during the emergency works and will be used further. During use of the deviation Magil will monitor and maintain the road surface.

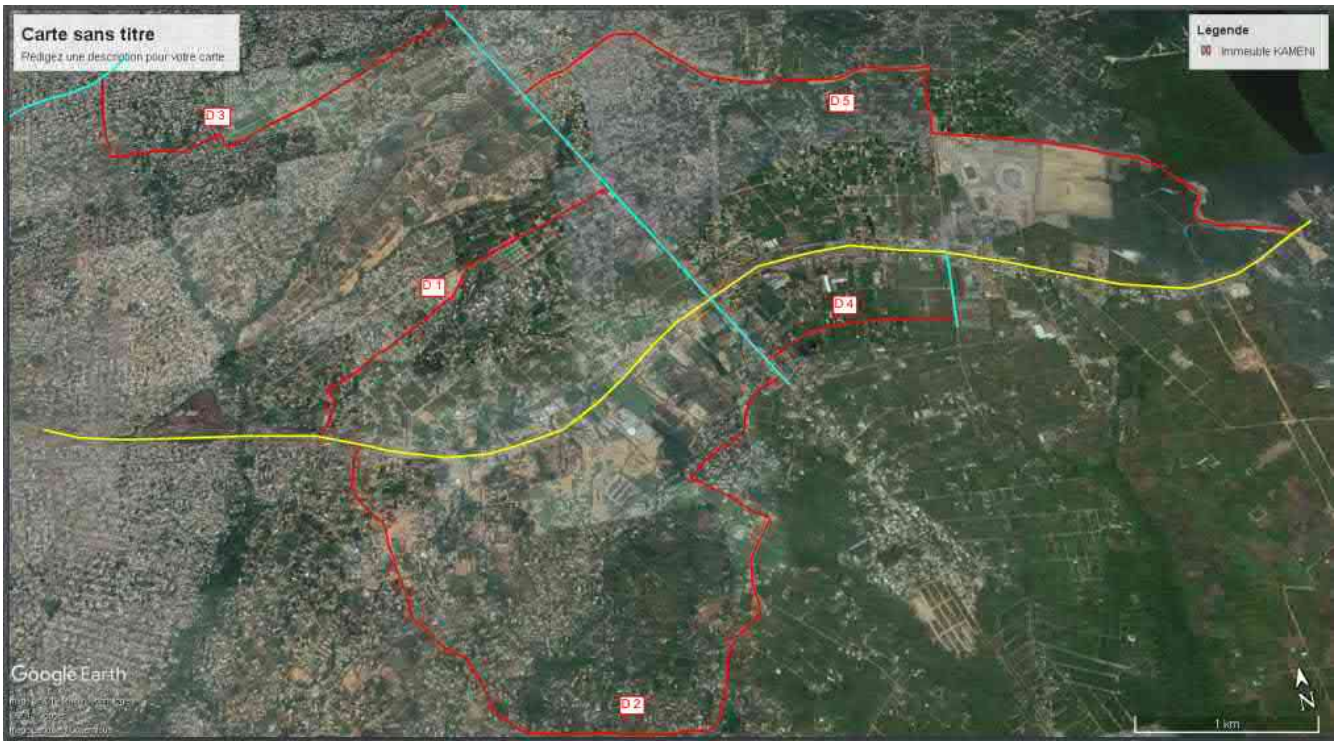


FIGURE 2-19: TRAFFIC DEVIATION PLAN

2.4.12 Management of Inert Construction Material Spoil

Cut material from the roadway that does not meet the technical specifications for use in preparation of the road base will be accumulated in three areas adjacent to the roadway and within the ROW. No general wastes will be deposited on these sites. Collectively these spoil sites can accommodate approximately 21 000 m^3 of material. This material is not considered a waste product. It will be available to the surrounding area for future developments. The location of these sites (PK14+800, PK16+200, PK18+700) are indicated in Figure 2-20.

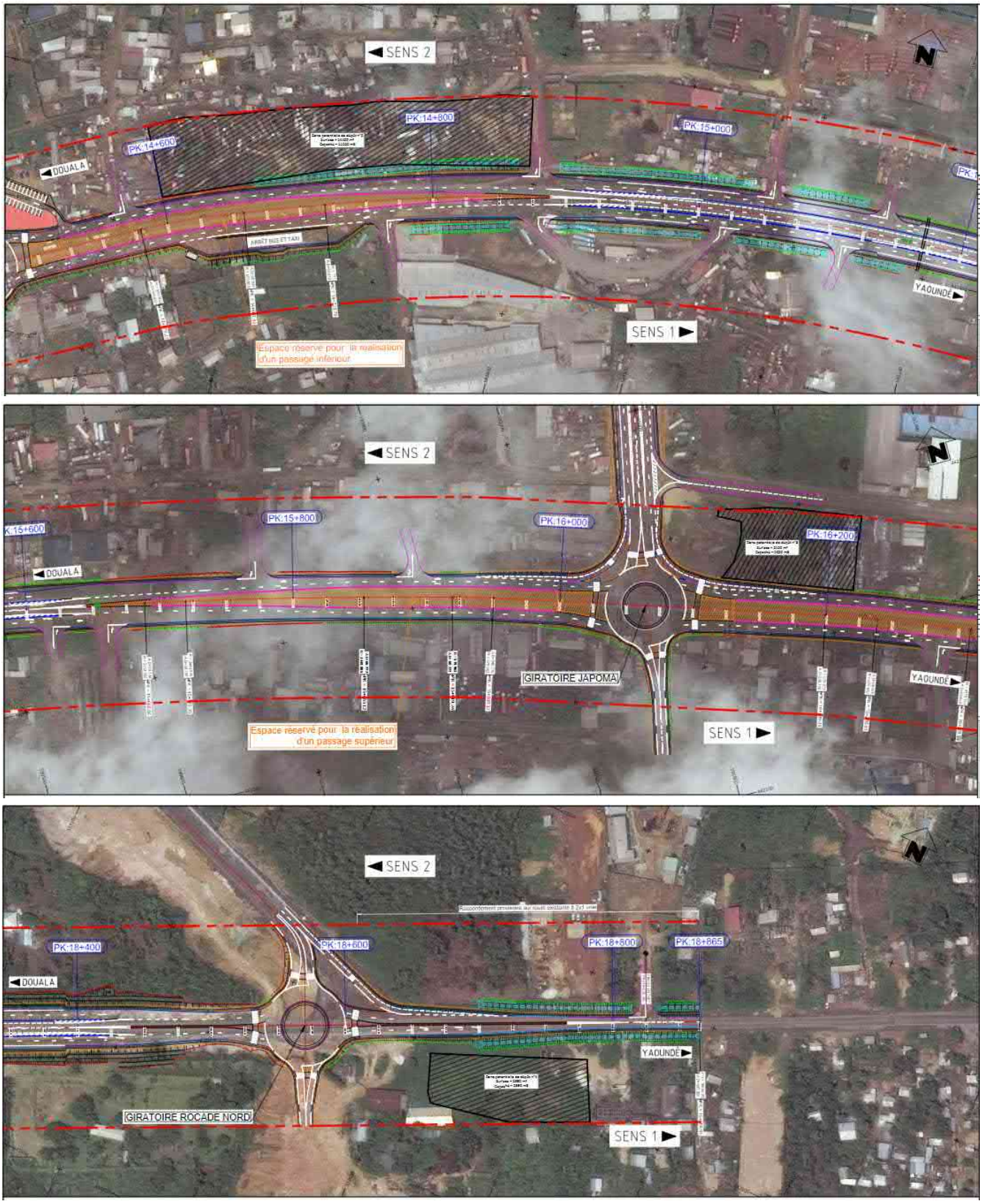


FIGURE 2-20: LOCATIONS OF MATERIAL SPOIL SITES

2.4.13 Material Sourcing

2.4.13.1 Sourcing of Hard Aggregate

The commercial Logbadjeck Quarry (Figure 2-21), owned and operated by is the company Razel Fayat Cameroun was selected for the supply of aggregates. The rock mined is basalt, a magmatic rock consisting of plagioclases, pyroxenes, olivine, and magnetite. Its proximity to the site (between 32 and 41 km) makes it the best supply point for aggregates. The commercial Logbadjeck quarry is operated in terms of the required mining approvals and a Certificate of Environmental Compliance.

Magil confirmed that the Logbadjeck Quarry has an adequate mineral resource and operational capacity to supply the project and their regular customer base.

2.4.13.2 Sourcing of Asphalt

Asphalt required for the project will most likely be generated and sourced from the asphalt plant at the Logbadjeck quarry. The sub-contractor designated for road sealing may provide is own asphalt plant.

FIGURE 2-21: LOGBADJECK QUARRY

Source: Razel Fayat Cameroun

2.4.13.3 Sourcing of Sand

The preferred source of sand is the Folepe Sand Mine, located approximately 5 km east from the project along the NR3 (Figure 2-22), which is operated in terms of the required mining approvals and a Certificate of Environmental Compliance. Many other sand quarries and local resellers are located in Doula; however, these were discounted due to either technical reasons (salinity) or unsustainable practices used in sourcing the material. See the Alternatives assessment in Section 3 for more details.

FIGURE 2-22: FOLEPE SAND MINE

2.4.13.4 Sourcing of Concrete

Bulk concrete will most likely be sourced from local, commercial ready-mix concrete suppliers. In the case of ready-mix supply, the concrete would arrive by truck on public roads terminating on the site. The sub-contractor designated for concrete works may provide their own batching-plants at a commercial location or as part of the site installations. For local concrete batching the supply would be by truck along the project area.

2.5 PROJECT ACTIVITIES (COMPLETED OR IN PROGRESS)

2.5.1 Emergency Works

Several 'emergency works' activities are required prior to the construction phase to support the phasing of the project. In some situations, these activities have been completed prior to this ESIA, whilst others are currently

underway or pending. Given the timing of these activities, the ESIA will not be able to propose mitigation measures to avoid or minimise impacts from these activities and the focus will instead be on understanding the significance of the unmitigated impact and if any retroactive measures can/should be taken as a result. These works are as follows:

- Relocation of six graves to create parking areas in Yassa; Status: Pending.
- Relocation of the D400 CAM Water pipe; Status: Pending.
- Relocation of ENEO transmission line poles: these are temporary trips to carry out the side benches in direction 2 of the project; Status: Underway with some complete and approximately approx80 more remaining.
- Recalibration of the shoulder direction 1; Status: Pending.
- Creation of access to the various service stations (temporary works); Status: Partially complete with works ongoing.
- Maintenance of alternative roads; Status: Complete.
- Relocation of china railways for disposal; Status: Pending.
- Creation of Yassa and ARI crossroads clearance zones in order to facilitate traffic flow in these two zones; Status: Pending.
- Creation of a third lane (facing the Japoma stage 700 ml, Start of project 680 ml, end of project 800ml); Status: Complete.
- Adjustment of the PST (top of earthworks) following the waiting period from March to November to favour the heavy and light vehicle parking during the competition; Status: Partially complete with works ongoing.
- Pothole filling and general asphalt mat on the transit lane (existing part); Status: Partially complete with works ongoing.
- OH1 embankment to allow the expansion planned at the start of the project. Status: Partially complete with works ongoing.

2.5.2 Hydraulic Structures

Installation of hydraulic structures within nine water flow pathways occurred during the earthworks completed for the emergency works in 2019. All nine structures have now been installed. In each case the existing roadway and existing hydraulic structures were excavated to expose a base marginally below the level of the water course. This required a local deviation of traffic (see Section 2.4.11). A reinforced concrete base was cast in-situ to a width marginally wider than the proposed structure. Pre-cast culvert blocks (1.5 m by 1.5 m) were installed on the base and the structure was sealed to be watertight. The roadway base was reinstated over the hydraulic structure. The adjacent embankment was shaped to ensure a stable surface that directs runoff to the drain. Refer to Figure 2-23 for an example of the activity. The photographs in Figure 2-24 depict some of the installed structures.

No work was undertaken within the unnamed watercourse at PK 11+080 as the existing culvert is adequately sized to accommodate the proposed roadway expansion.

FIGURE 2-23: INSTALLATION OF HYDRAULIC STRUCTURE AT PK 13+282

FIGURE 2-24: EXAMPLES OF INSTALLED HYDRAULIC STRUCTURES

2.6 PROJECT ACTIVITIES (PROPOSED)

2.6.1 Site Access

Access for road rehabilitation work will primarily be from the NR3 roadway itself. Rehabilitation and road widening zones are executed from the platform or from existing external accesses. For certain construction activities portions of the existing road will be closed. In these instances, there may be local traffic diversions or traffic deviations (refer to Section 2.4.11 for details).

2.6.2 Preparatory Earthworks

2.6.2.1 Initial Preparation

This operation consists of:

- clearing and grubbing operations to remove vegetation (if any) from the roadway footprint.
- the shaping of the natural land, prior to the execution of the general earthworks give a regular appearance without cavities or irregularities.
- the excavation of the rubbish found during the shaping operation.

2.6.2.2 Topsoil Stripping

Initial preparation in the roadway footprint requires stripping of topsoil (if any) to a thickness of about thirty centimetres. Stripping plans will be drawn up and submitted to the project owner for approval. These plans define homogeneous soil units that are located at specific depths in one or two independent layers. Stripped topsoil from different areas are not mixed together. Topsoil is not stripped from areas beyond the scope of the project. In areas where cut is required, a second soil layer will be stripped from under the topsoil layer. Both layers are stripped and stored separately.

Stripped topsoil will be utilised on the road embankments and in the green spaces provided in the centre of the roundabouts, and for landscaping.

2.6.3 Earthworks

Establishment of the base for the project roadway will require substantial cut and fill activity to create the required profile. In addition to the primary shaping the base of the roadway is required to achieve the technical characteristics defined by the EGIS design office (refer to Section 2.4.2). In this regard the earthworks will involve the placement, spreading, wetting and compaction of specified sub-layers. All of these 'earthworks' activities are undertaken by mechanical equipment such as dozers and excavators (See Section 2.6.8).

Cut material that does not meet the technical specifications for use in preparation of the road base will be spoiled in three areas adjacent to the roadway.

2.6.4 Drainage

All embankment surfaces along the roadway will be shaped to manage surface water flow and direct this away from the roadway. Where necessary, waterproof drainage channels (longitudinal and transverse) will be developed to direct runoff away from the roadway. All of the existing channels/ditches upstream and downstream of the roadway will be cleaned for improved flow of the run-off water.

2.6.5 Road Construction Layers and Seal Works

The road will be comprised of five layers, with the thickness and extent varying slightly along the route according to technical and design considerations. These five layers will be:

- Sub-grade Layer I and II, comprised of crushed gravel stone (25 cm thickness for each);
- Sub-base Course Layer, comprised of crushed gravel stone (25-30 cm thickness);
- Base Course-Binder Layer, comprised of HMA (High Modulus Asphalt) binder course bitumen content 5.5% (8-14 cm thickness);
- Top Layer: Asphalt Wearing Course, comprised of HMA wearing course bitumen content 5.6% (6 cm thick).

HMA will be implemented to limit environmental impacts:

- In reducing thickness of asphalt layers
- In reducing asphalt transportation because of less volume of HMA layers compare to classical mixes Binder Course and Wearing course
- In reducing extraction of natural resources from quarry (aggregates and gravel crushed stone)
- In reducing ashes production from asphalt plant with less production of asphalt

Road layers will be implemented from PK 18+600 to 9+925 according to the sequence and steps depicted in Figure 2-25 and Figure 2-26**.**

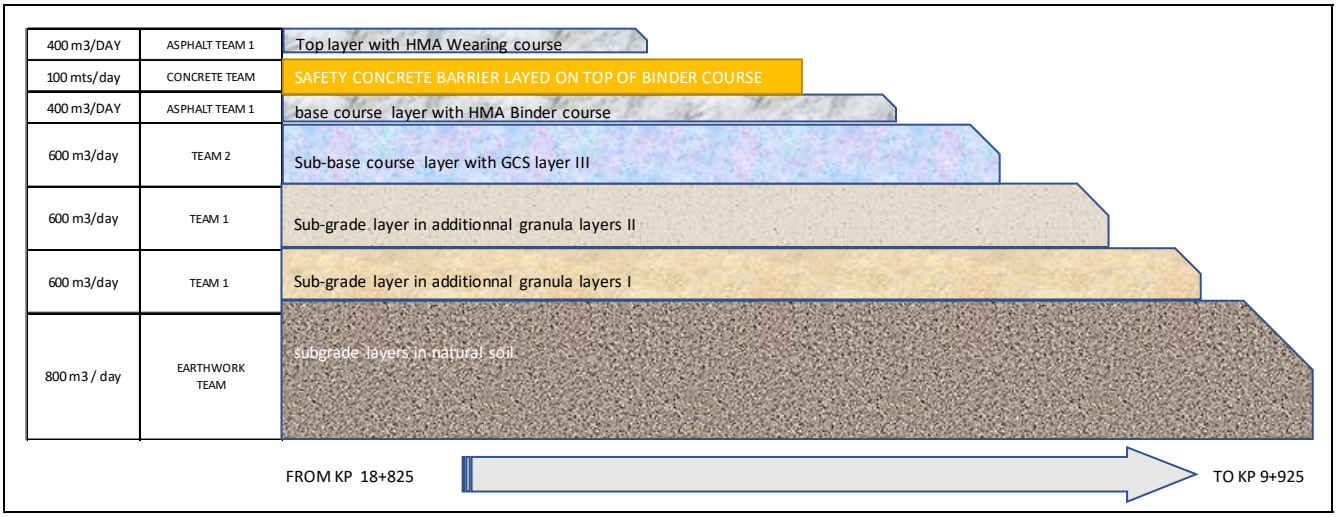


FIGURE 2-25: CROSS SECTION OF ROAD LAYERS

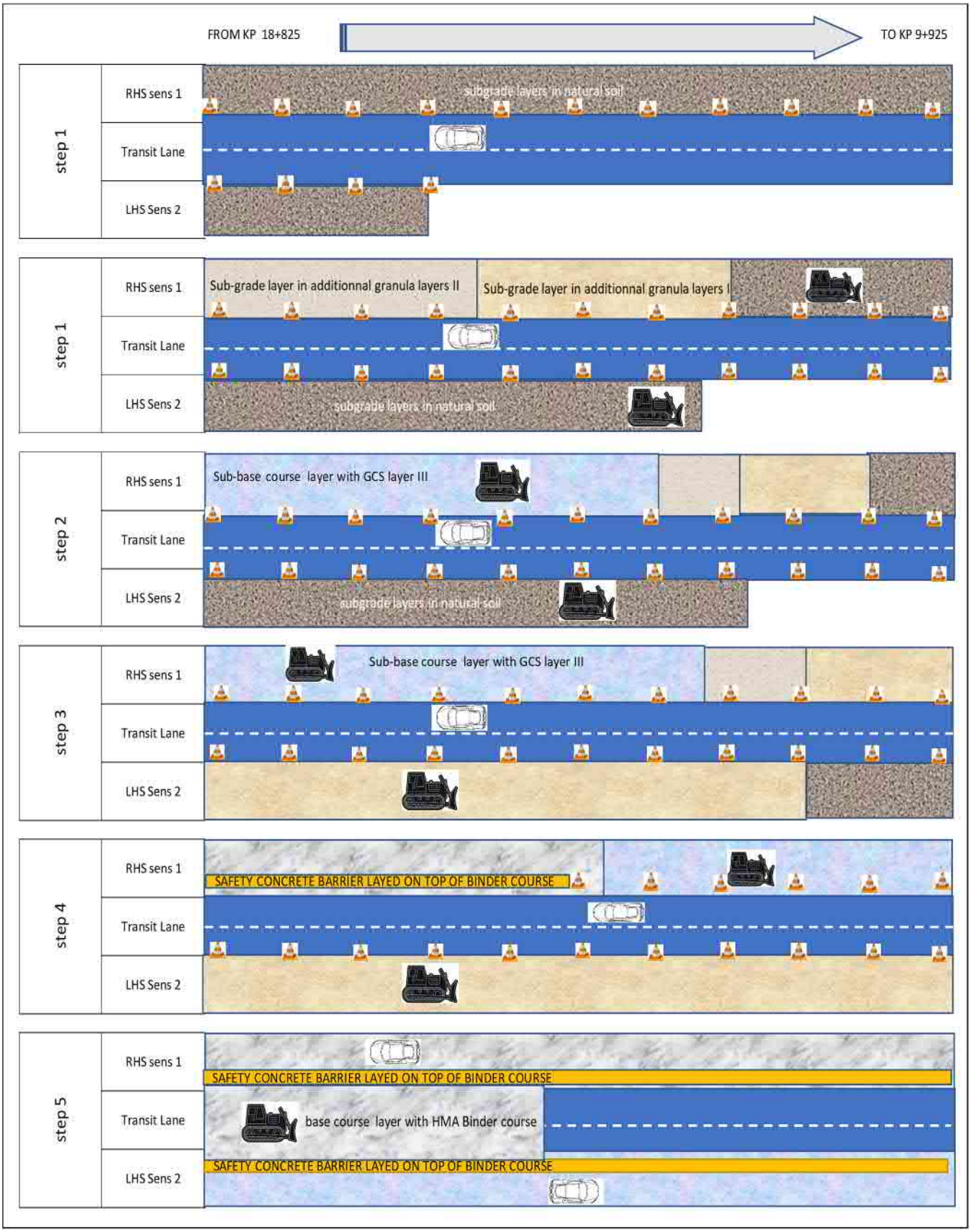


FIGURE 2-26: STEPS IN ROAD LAYER INSTALLATION

2.6.6 Underpass Construction

The underpass will consist of a reinforced concrete frame bridge (cast in place), a height under porticoes estimated at 4.5 meters high and several pedestrian crossings. The range of the underpass is 300 m (from PK 14 + 320 to PK14 + 600) with a width of 7.00 meters.

In preparation for the construction of the Yassa underpass, diversion of local traffic will be provided. Gynéco Hospital and Japoma Roundabouts will allow changes of direction. Diversion D1 and D4 will be used to divert traffic. Excavation will only commence upon completion of diversion roads. During the excavation to attain the formation level desired, a two-meter buffer zone shall be observed between the wall of the excavation and the retaining wall to be constructed to provide space for the installation of scaffolding and installation of formworks. Excavation wall shall be sloped at 60 degrees.

After the desired formation level is attained and passed the ground compaction test requirement, concrete casting for blinding (lean concrete) will follow.

Installation of rebar and shutter for the base slab and then concrete casting. In case of water accumulation on the excavation, water pump will be used to remove stagnant water and the water will be re-used for dust suppression. Once concrete curing requirement is done, fixing of starter rebar will commence and continue the top rebar fixing until the required height of the retaining wall is attained.

Installation of formworks will be done in preparation for the casting of concrete for the retaining wall. Expansion joints will be installed to prevent the structure from damage during movements due to vibration.

Backfilling and compaction on the buffer zone of the retaining wall. Then, rebar fixing works will start on the deck slab in preparation for the concrete pouring. Prior to the casting of concrete in the deck slab, a calculation design for scaffolding support below will be submitted to ensure the structure can support the load of the concrete and prevent collapse. The concrete deck bridge will be cast in place. Cuttings and embankments of unstable soil or with flood risk will be protected with stone pitching.

2.6.7 Overpass Construction

The overpass includes one bridge with two abutments, two spans and intermediate piers. The overpass will have a range of eighty (80) meters and 4.50 meters height under the bridge. The traffic lane will be seven meters wide with one-meter sidewalk. There will be no deep or wide excavation in this activity.

Prior to the commencement of the construction works, diversion roads will be provided to ensure continued traffic flows.

Overpass works include construction of retaining walls of 4.5 meters vertical height. After the retaining walls are attain the maximum curing requirement, construction of the bridge will follow. Both bridge approach (abutment) are backfilled and masonry rip-rap will be constructed for the protection of the embankment.

Steps in the overpass construction include:

- Site installation, implementation of diversion both side;

- Foundation works, footing casting;
- Erection of 2 abutments and columns:
- Implementation of bent beam;
- Implementation of longitudinal precast girders
- Concrete deck slab casting;
- Backfilling of 2 approach ramps including wing walls erection;
- Implementation of safety equipment and road layers.
- Cuttings and embankments of unstable soil or with flood risk will be protected with stone pitching.

2.6.8 Management of Mechanised Equipment

2.6.8.1 The Fleet

The fleet of mechanical equipment is likely to include:

- earth-moving machines with excavators and dozer;
- grader-type spreaders with or without scarifiers;
- pneumatic tyre, cylindrical roller, sheep-foot and vibrating compaction machines;
- front or backhoe loaders;
- dump trucks and water tank trucks;
- mobile crane;
- fuel tanker; and
- light service or liaison vehicles.

This heavy equipment is complemented by light equipment that can be used for manual tasks. The mechanised equipment is primarily diesel driven, but certain of the plant may be petrol or electric driven.

TABLE 2-4: ESTIMATE OF EQUIPMENT REQUIREMENTS

Description	Number	Type of Energy
Hydraulic Excavator	3	Thermal-Diesel
Bulldozer	2	Thermal-Diesel
Pneumatic Road Roller	4	Petrol-Diesel
Grader	6	Petrol-Diesel
Vibrating Road Roller	6	Thermal-Diesel
Road Paver	1	Thermal-Diesel
Asphalt Spreader	1	Thermal-Diesel
Dump Trucks	20	Thermal-Diesel
Mobile Crane	2	Thermal-Diesel
Wheel Loader	4	Thermal-Diesel
Tower Crane	1	Electric
Service Vehicles	15	Thermal-Diesel

Generator	6	Thermal-Diesel
Small Construction Tools (Drilling Machines)	15	Electric
Water sprayer	4	Thermal-Diesel

2.6.9 Hazardous Products

The operation of mechanised equipment requires the use of fuel (diesel and petrol) and lubricants (oils and greases). Oils and greases will be supplied by an oil distributor in drums and stored in a container located in the designated storage area. Refuelling of the mechanised equipment will be on-site via a 9 000 litre capacity tanker. The refuelling tanker will be refilled at a tank at the site office, which will be provided by the fuel supplier (likely Total- Tradex). The installation of this tank meets the supplier's criteria (retention tank - fire safety). Asphalt will be stored and mixed at the asphalt plant located at the Logbadjeck quarry. Fuel for the asphalt plant will be derived from the fire safe, holding tank at the Logbadjeck quarry. Consumption estimates are provided below but are subject to change based on site conditions.

TABLE 2-5: FUEL CONSUMPTION ESTIMATES

Equipment	**Total estimated consumption (m^3)**
Generators	2,360
Equipment	6,480
Trucks	5,088
Service vehicles	1,176
Asphalt plant	1,412
TOTAL	**16,518**

2.6.10 Materials Management

2.6.10.1 General

The project requires a wide range of materials, namely:

- backfill materials or homogeneous materials of good mechanical quality (laterite, etc.);
- crushed gravel;
- sands;
- cement;
- bitumen;
- reinforcing steel for reinforced concrete structures or
- flat irons for formwork or mechanical fabrication; and
- wood, sheet metal for construction, mechanical fabrication and formwork.

The quality of each material will be as per the EGIS specifications. The volume of material inputs/imports required for the work are shown in the table below. At this stage of design, the quantities are likely to change by a margin of 10 to 30%.

TABLE 2-6: VOLUMES OF MATERIALS REQUIRED

Materials	Quantity
Gravel	295,000 m^3
Sand	55,000 m^3
Cement	7,000 tons
Bitumen	6050 tons
Reinforced steel	2.350 tons

2.6.10.2 Earthwork Volume Assessment

Earthwork materials include:

- topsoil: this top layer of soil is generally stripped and stored on site to be put back in place at the end of the work, in order to carry out landscaping. Where the quantity required is less than the quantity available, the topsoil shall be removed from the site, possibly after provisional storage. The surplus is used for landscaping for other projects or for the development of land of poor quality;
- excavated materials: these are materials extracted from the site for the purposes of the project. Depending on their nature, they can be reused directly or via a specific treatment for the construction site. They can be disposed of, if their properties are not suitable for reuse;
- backfill materials: these materials are required to fill in or build-up particular areas of the project. They come either from site excavations or from external supplies (quarries).

The reuse of materials is favoured, but this will depend on the technical characteristics (e.g. mechanical strength, particle size, compactness, water content, etc.). The proportion of backfill material in the volume of fill required is estimated to be around 40%. At this stage of engineering studies, the re-use rate (including topsoil) is estimated to be about 35%. Project earthworks are anticipated to generate 170 700 m^3 from cut operation and utilise 30 000 m^3 for backfill.

Topsoil will only be used for landscaping, either on the embankments or in the centres of the roundabouts. Where possible, the cuttings that cannot be used as structural fill will used to create sound protection berms or landscape patterns. The project will generate material that cannot be utilised and this will require to be spoiled. Refer to Section 2.4.13 on Inert Material Spoiling.

2.6.10.3 Material Sourcing and Transport

Aggregate materials will be sourced and transported by truck from the Logbadjeck Quarry and Folepe sand quarry. The asphalt mix will also arrive by truck from the asphalt plant at the Logbadjeck Quarry or alternate sources. Concrete may be sourced from local ready-mix concrete suppliers or mixed at concrete batching-plants established as part of the site installations. In the case of ready-mix supply, the concrete would arrive by truck

on public roads terminating on the site. For local concrete batching the supply would be by truck along the project area.

Cement, concrete, bitumen, steel, wood, fuel and other materials will arrive to the site by truck from commercial suppliers on public roads.

2.6.10.4 Storage of Materials

Material acquisition for the project will be on a 'just-in-time' basis (i.e. the required materials and equipment are delivered in situ on a daily basis). This will limit the requirement for on-site material storage. The materials delivered daily are either processed directly or stored along the roadside. All storage areas will be located in the site's ROW and primarily on the road footprint. The storage sites are operated as follows:

- stripping and temporary storage of topsoil in accordance with the relevant technical requirements;
- backfilling in layers of thirty centimetres thick, at the locations specified in the installation and site road plans;
- careful compaction quality and construction of a peripheral ditch at the base of the stockpile, for temporary deposits of excavated material for later reuse; and
- 6% sloping adjustment to maintain rainwater drainage;

2.6.10.5 Topsoil Stockpiling

Areas for topsoil stockpiling will be proposed by the Contractor in the ROW of the worksite. They will be operated as follows:

- the topsoil from different areas, according to the stripping plan, is separated from each other during storage;
- the storage area is cleaned of all undesirable foreign elements: pebbles over 20 cm, branches, stumps, scrap metal, etc.
- the topsoil is stockpiled with an excavator. No equipment shall roll on the topsoil during and after storage. The soil should never be compacted.
- storage is made of 4 m high cords. The finished cord is smoothed with the shovel bucket, without compacting the material;
- the contractor maintains the topsoil stock plan with identification and particle size analysis.

2.6.11 Water Use and Supply

An estimated 27 177 m^3 of water will be required for the works, particularly during the fill operations period (e.g. backfill materials brought to the optimal water content, watering of road substrates and platforms to avoid dust), manufacture of concrete and to maintain the water content in fill materials and roadway substrates, supply to personnel, and site installations.

Several solutions for water supply are being evaluated. The first choice source of water will be the city water provider known as Cam-Water. Magil has also planned the installation of two boreholes; one at the base camp site and a second at Yassa. A third borehole has already been drilled on Razel's technical base and may be used

as a reserve. These boreholes will be used in the short term to supply the concrete plant as well as the base camp and in the long term they will be used to supply drinking water to the populations. Two 50 m^3 emergency water tanks will be filled in the event of Cam-Water disruption or drop in groundwater levels. Surface water from the Dibamba River will also be used for backfilling wetting, watering of road aggregates and platforms to avoid dust.

Analysis campaigns will be carried out to ensure the potability of the water and its suitability for the manufacture of concrete. Control monitoring of the level and quality of groundwater will be conducted at all locations where groundwater is abstracted.

2.6.12 Workforce Management

The project will be managed by Magil with a direct workforce comprising of approximately ten (10) expats and twenty-five (25) locals. All components of the project will be implemented through sub-contracting of local contractors. The key items to be subcontracted include: the emergency works, general earthworks, pavement and sidewalk construction, sanitation and drainage, lighting, and construction of the Japoma overpass and Yassa Underpass. The numbers of personnel employed for each of these items will vary per month, depending on the activities and the sub-contractor requirements. The local workforce will vary between 35 and 315 employees per month over the duration of the project.

2.6.13 Project Traffic

During the construction period, project traffic will include:

- delivery and removal of the mechanised fleet to the location;
- operation of the mechanised fleet within the roadway footprint; and
- material supply vehicles traversing from the material source to the point of use.

Material supply will consist of heavy motor vehicles (dump trucks, cement trucks, water tankers and flat beds). The primary material supply traffic will be between Logbadjeck Quarry and the site as all aggregates and asphalt will be derived from this source.

2.7 EMISSIONS, DISCHARGES AND WASTES

2.7.1 To Air

2.7.1.1 Air Quality

During construction, the primary emissions to air from the Project will include particulates arising from dust: as vehicles travel on unpaved surfaces; during material handling; and from wind across unsurfaced materials and stockpiles. The total suspended particulate component can result in nuisance dust, principally to immediately adjacent receptors. The finer particulate component (PM_{10} and $PM_{2.5}$) can result in health risks to receptors, including those some distance from the source. The project's use of vehicles will also generate other pollutants of concern to human health, principally NO_x, CO and SO_x, as well as PM_{10} and $PM_{2.5}$. Note that the project also

will utilise six emergency power generators during the construction phase; however, as these units will have a collective thermal input of 1.9 MW_{th}, they are assumed to be negligible sources of air pollutant emissions.

During the operational phase, the only direct emissions to air will be from maintenance vehicles and equipment. However, the Project will also indirectly contribute to increased emissions associated with increased traffic along the road over time. It is also important to note that by expanding the road, these emissions will now be closer to some sensitive receptors.

2.7.1.2 Greenhouse Gases

The most internationally accepted guidance for estimating GHG emissions for this purpose is 'The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard', published by the World Resources Institute. This is the guidance that has been followed in estimating GHG emissions for this ESIA. The GHG Protocol defines three emissions 'scopes' for GHG accounting and reporting purposes: Scope 1 (direct emissions), Scope 2 (indirect emissions from power consumption) and Scope 3 (other). According to the GHG Protocol requirements, organisations must separately account for and report Scope 1 and Scope 2 emissions at minimum. Scope 3 is an optional reporting category.

The Project's Scope 1 and 2 GHG emissions all occur during the construction phase. Because the total duration of construction is only 540 days, this inherently makes the total year-on-year impacts to global climate change negligible. However, for the sake of completeness, the Scope 1 and Scope 2 Project emissions have been estimated, as well as Scope 3 emissions associated with traffic. Table 2-8 summarises these emissions for the construction phase.

TABLE 2-7: GHG EMISSIONS DURING CONSTRUCTION

Units	Number	Emission factor1 (kg CO_{2e}/hr/unit)	Note	Estimated Maximum Days of Operation	Estimated emissions (tons CO_{2e})
Asphalt Spreader	1	8.82	1,2	63	8.33
Hydraulic Excavator	3	132.3	1,2	540	3214.89
Bulldozer	2	73.5	1,2	540	1190.70
Pneumatic Road Roller	4	52.92	1,2	63	200.04
Grader	6	102.9	1,2	292	2704.21
Vibrating Road Roller	6	52.92	1,2	63	300.06
Road Paver	1	64.68	1,2	63	61.12
Mobile Crane	2	132.3	1 (assume comparable to hydraulic excavator)	621	2464.75

Wheel Loader	4	102.9	1,2	540	3333.96
Emergency Generators (1.9 MW_{th} total)	6	81.87	3,4	540	6365.88
Service Vehicles	15	See Table 2-9	N/A	754	348.32
Dump Trucks	20	58.8	1,2	754	13300.56
Water sprayer	4	79.38	1,2	292	1390.74
				Total Construction Phase CO_{2e} Emissions	**34,884**

Notes

[1] Emission factors taken from Greenhouse Gas Emissions Mitigation in Road Construction and Rehabilitation: A Toolkit for Developing Countries, World Bank.

[2] Assume 15 hours of operation per day for all equipment, with the exception of the emergency generators.

[3] Emission factors for emergency generators taken from EEMS, Atmospheric Emissions Calculations, Oil and Gas UK, November 2008. Emission factors provided in units of mass of pollutant emitted/mass of fuel combusted. Emission factors are:
3.2 kg CO2/kg diesel burned, 0.00022 kg N2O/kg diesel burned, and 0.00018 kg CH4/kg diesel burned
Where:
The global warming potential for methane is 25 and 298 for N2O.
The energy content of diesel fuel is assumed to be 45.5 MJ/kg.

[4] Power will be provided from either the mains power or from the emergency power generators. The exact breakdown of hours from grid power versus that generated onsite is not known, as it will depend on a number of factors including reliability of the supply. On this basis, a conservative approach has been taken for emission purposes by assuming that all power demand will be met by the emergency generators.

During the operations phase, the only GHG emissions will be Scope 3 emissions related to project traffic. As summarised in Table 2-9, the Project will result in a reduction in GHG emissions of 1243 tons CO_{2e} per annum over the predicted baseline.

TABLE 2-8: GHG EMISSIONS FROM TRAFFIC

Type	**CO_2 Emission factor (mg/km)**	**CH_4 Emission factor (mg/km)**	**N_2O Emission factor (mg/km)**	**Distance travelled per journey**	**AADT**	**Estimated Maximum Days of Operation**	**Estimated emissions (tons CO2e)**	**Notes**
Construction								
Service vehicles, diesel	76000	4	3	50	120	540	249.46	Distance travelled based on distance to quarry and AADT estimated based on one trip per hour per vehicle.
Operations								

General traffic - light duty vehicles, petrol	212100	101	8	9.16	-1460	365	-1059.05	Distance travelled estimated based on length of Phase 2 route. AADT estimated based on the difference between the forecasted AADT with and without the project.
General traffic - heavy duty vehicles, diesel	76000	4	3	9.16	-711	365	-183.12	Distance travelled estimated based on length of Phase 2 route. AADT estimated based on the difference between the forecasted AADT with and without the project.

Source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Table 3.2.3

Notes:
For CO_2, the default emission factors in kg/TJ were converted to mg/km using the ratio of the corresponding emission factors for CH_4.
CO_{2e} emissions calculated using a global warming potential of 25 for methane and 298 for N_2O.
For additional detail on the existing and predicted changes to general traffic both with and without the Project, see Table 6-8.

On the basis of the preliminary GHG emissions provided here, this Project is considered to not have any significant impacts on global climate change and is below the IFC's threshold of 25,000 tons CO_{2e} per annum that would require specific measures be implemented related to climate change.

The Project has also carried out a Climate Change Risk Assessment to evaluate how the project may be affected by climate change risks. This assessment report is included in Appendix 1.

2.7.1.3 Noise

The project will generate noise emissions from a number of sources during construction, including: project traffic, operation of road construction equipment and operation of the generators. To abate noise impacts, all noisy road construction activities will occur during day-time hours and the generators will be of closed design. No noise modelling has been carried out to estimate the project's noise impacts.

2.7.2 To Water

The key risk to surface water quality is sedimentation from the materials exposed and worked during construction of the roadway. The project involves the handling of 100s of thousands of tons of soil, sand and

aggregate over an extended period. Rainfall across the stockpiles and disturbed surfaces will transport sediments into the watercourses. As the topography of the area is generally very gentle, water flow velocities are typically low with limited potential for sediment transport.

A further risk is the introduction of contaminants to surface water, this could include from in-situ materials exposed during earthworks, spillages of hydrocarbons from the mechanised fleet and runoff from areas where hazardous materials are stored and handled.

2.7.3 To Land

Topsoil stripping operations will likely generate topsoil in excess of the requirements for rehabilitation and landscaping. Some of the excess material may be used in the creation of sound berms while the balance will be stockpiled. Cut and fill operations will generate material in excess of the project requirement and/or of unsuitable geotechnical characteristics. This inert material will be spoiled to one of three spoil sites adjacent to the roadway and within the ROW (see Section 2.4.12).

Excess cut material, of satisfactory geotechnical quality, may be deposited at the Youpwè landfill site, in order to contribute to the rehabilitation of areas previously filled. This proposal would make it possible to combat scavengers and rodents, while limiting the infiltration of rainwater into the waste (improvement of the water balance of the site).

Additional inert material may be reused for other uses, treatment of secondary roads in the neighbourhood, filling in low flood zones to make public or private land accessible, according to the request but with the prior agreement of the project owner.

Where wastes arise (e.g. from the cleaning of the ROW or the cleaning of ditches) or materials of doubtful composition are generated these will be deposited on the city's formalised landfill site (HYSACAM military engineering or Makepè landfills, etc.).

Wastes generated at the site office, at material storage areas and during construction will be placed in appropriate receptacles for collection and disposal to the city's formalised landfill site (HYSACAM military engineering or Makepè landfills, etc.).

3 ALTERNATIVES

This chapter provides a qualitative evaluation of the relative environmental and social effects for the alternatives consider by the project. This includes a general consideration of the Project itself,

3.1 NO PROJECT ALTERNATIVE

The NR3 links Douala with Yaounde and is of paramount importance in the economic functioning of this region of Africa. The road is a critical transportation corridor for Douala, Cameroon, and the wider west African region. The landlocked nature of countries such as Chad and the Central African Republic imposes a compulsory transit through Cameroon, with goods arriving at and departing through the Autonomous Port of Douala. It is therefore important that the connection between the Port Autonome and the exits of Douala be optimal for through traffic. In addition to being an important transit, the NR3 is also an entrance to the city of Douala and an urban boulevard.

Over the past two decades the volume of traffic using and crossing the NR3 has grown significantly and there is substantial unregulated use and occupation of the roadsides. It is evident that current accesses through Douala are undersized, resulting in traffic congestion and inefficiencies. This has resulted in both regional transportation and intercity traffic being regularly disrupted.

Not developing phase 2 of the *Eastern Entrance of Douala* would result in the continuation of the status quo which includes:

- Congestion along the NR3 road course, including to intra-city traffic;
- Restrictions on the efficiency and safety of the movement of persons and goods;
- Limitations on access between markets, ports and industrial areas;
- Poor hydraulic flows and impacts on local stormwater quality;
- Challenges to the conduction of business in and between neighbourhoods intersecting the NR3;
- Decline in the living environment and transport conditions of the population living along the roadway;
- Likely constraints in access to the Japoma stadium on days of sporting events;
- Poor road safety, notably for pedestrians.

The long-term adverse regional socio-economic and traffic impacts in particular will be of such magnitude that not improving NR3 is not considered a viable alternative. Whilst the project will result in adverse impacts, these will all be localised and most will occur only during construction.

Other networks (river, rail or air) within Douala do not have sufficient technical characteristics or flexibility to meet the country's development and transport needs. Widening the road network is therefore considered to be the most feasible of the transportation alternatives. Additionally, as the NR3 is existing, with a pre-established ROW, the environmental and social impacts are anticipated to be intrinsically less than pursuing a greenfield transportation corridor to meet the region’s need for economic growth.

The no-go option is therefore not considered suitable and is not assessed further.

3.2 ROUTING, LAYOUT AND SITING ALTERNATIVES

As an upgrade to an existing road, routing the project is logically constrained by the current alignment of the NR3. Additionally, with connections to Phase 1 in the west and the Dibamba River bridge in the east, the start and end points are fixed. The bridge over the Dibamba River is a key piece of infrastructure, essential to the transit of goods from Douala to the country's interior. The nature of the road widening does not allow the implementation of geographical avoidance.

The phase 2 section of the road passes through an urban area of relatively high density, with numerous structures located along the length of the road and immediately adjacent to the proposed roadway footprint. Indeed, although all of the roadway footprint is free of commercial and residential infrastructure, this is only due to the expropriation and resettlement processes undertaken in 1985 and 2011 (refer to Section 1.1).

During planning of the layout of the roadway, consideration was given to the location of existing commercial and residential infrastructure and adjustments were made to the alignment and road configuration to prevent the need for any physical resettlement. This has been achieved. As a result of the above, it is determined that there are no reasonable routing alternatives for consideration.

In addition to the road itself, the project includes five roundabouts, and overpass and an underpass. The provision of roundabouts, rather than other intersections (stops or signalised), has been selected to maintain traffic flow. The differences in environmental and social impacts from a roundabout versus a stop or signalled intersection are also considered to be relatively minor.

Whilst the road route is largely fixed, the Project has had control in the selection of sites for other installations such as the site office, as well as the selection of where the key raw materials (i.e. stone, sand and water) will be sourced from.

As stated in Section 2, all site installations (e.g. the site office, spoil management areas, and other temporary installations) will be located within the ROW. The alternative to this would be to use sites further from the road in the surrounding communities. This alternative would result in added traffic and a larger AOI for the Project. As such, the approach that the Project has taken is the best option from an environmental and social perspective.

With regards to sourcing stone and sand, the preferred option to consider is the use of existing facilities or greenfield operations. Generally speaking, the use of existing facilities results in lower environmental and social disturbance because no change of use is occurring at the site. Using existing facilities also means that these sites are considered as 'other supply chain facilities', and not as 'associated facilities' under the definition of AOI in the IFC's PS 2. Because other supply chain facilities are not included within the definition of the AOI, no assessment of environmental and social impacts is required for these sites. Magil has determined to use exclusively existing sources of these materials.

The suburb of Edéa has several quarries which supply aggregates to all construction projects in the eastern part of the city of Douala. During the EIA conducted by APAVE a comparative assessment of the quarry options was undertaken and Logbadjeck Quarry was identified as the preferred source. A key determinant was the lower transport distance to the site. Magil confirmed that Logbadjeck Quarry had suitable material from a technical perspective and sufficient supply available to accommodate the project's demand and continued local use. The

selected Logbadjeck Quarry is therefore considered the best option from an environmental and social perspective.

There are multiple existing sand quarries and local resellers in Doula, some closer to the project than others. However, through a comparative assessment undertaken for the ESIA conducted by APAVE, a number of these were discounted due to either technical reasons (i.e. salinity) or unsustainable practices in sourcing material that has detrimental impacts on the local mangroves and coastal erosion. Magil confirmed that Folepe Sand Mine has suitable material from a technical perspective and sufficient supply available to accommodate the project's demand and continued local use. The Folepe Sand Mine was identified as the preferred source and is considered the best option from an environmental and social perspective.

Magil has confirmed that both the preferred stone quarry (i.e. Logbadjeck) and sand mine (i.e. Folepe) sites are operated in terms of the required mining approvals and have Certificates of Environmental Compliance.

With regards to water sourcing options, the project is still evaluating options. The available water sources include the municipal water supply, surface water (i.e. the Dibamba River), or groundwater. Due to technical reasons, the project cannot use the Dibamba River water for concrete mixing, as it is too alkaline. The Project's current plan is to source water for dust suppression from the Dibamba River, water for concrete mixing from existing groundwater boreholes or from the municipal water supply. Given the volume of the Dibamba River, the water demand for dust suppression should place no undue strain on this resource. Before finalising water use plans, the Project will conduct a study to evaluate 1) the ability of the potential boreholes identified to accommodate the water demand and 2) how this water usage could affect other groundwater users in the area, especially during the dry season. This study will also identify any associated monitoring required during construction.

3.3 TECHNOLOGY ALTERNATIVES

This Project will comply with Good International Industry Practice (GIIP) as defined by the applicable World Bank EHS Guidelines:

- *Environmental, Health, and Safety Guidelines for Toll Roads*, 2007; and
- *General Environmental, Health, and Safety Guidelines*, 2007.

By applying these guidelines, the Project will be able to demonstrate that the design has incorporated environmental and social considerations into the design and management of this Project. For full transparency, this ESIA has denoted those mitigation measures that directly align with the EHS Guidelines in the ESMP.

4 PROJECT STANDARDS

This chapter presents the legal framework applicable to the ESIA process for road projects in the Cameroonian and International Finance Institution context.

4.1 INTERNATIONAL LENDER STANDARDS

4.1.1 Equator Principles

The Equator Principles are intended to serve as a common baseline and framework for financial institutions to identify, assess and manage environmental and social risks when financing Projects. It is recognised that large infrastructure and industrial projects can have adverse impacts on people and on the environment. However, if environmental and social risks and impacts are identified, assessed and managed in a structured way sustainable performance can be achieved, leading to improved financial, environmental and social outcomes. Equator Principles Financial Institutions (EPFIs) have adopted the Equator Principles 4 in order to ensure that projects financed or advised on by EPFIs are developed in a manner that is socially responsible and reflects sound environmental management practices.

4.1.2 Performance Standards

IFC's Sustainability Framework articulates the Corporation's strategic commitment to sustainable development and is an integral part of IFC's approach to risk management. The Sustainability Framework comprises IFC's Policy and Performance Standards on Environmental and Social Sustainability, and IFC's Access to Information Policy. The Policy on Environmental and Social Sustainability describes IFC's commitments, roles, and responsibilities related to environmental and social sustainability. The Performance Standards are directed towards clients, providing guidance on how to identify risks and impacts, and are designed to help avoid, mitigate, and manage risks and impacts as a way of doing business in a sustainable way, including stakeholder engagement and disclosure obligations of the client in relation to project-level activities. In the case of its direct investments (including project and corporate finance provided through financial intermediaries), IFC requires its clients to apply the Performance Standards to manage environmental and social risks and impacts so that development opportunities are enhanced. IFC uses the Sustainability Framework along with other strategies, policies, and initiatives to direct the business activities of the Corporation in order to achieve its overall development objectives.

The likely applicability of each PS to the project is indicated in Table 4-1.

TABLE 4-1: IFC PERFORMANCE STANDARDS AND THEIR APPLICABILITY TO THE FC PROJECT

Performance Standards (PS)	Applicability to this project
PS1 Assessment and Management of Environmental and Social Risks and Impacts sets out the Borrower's responsibilities for assessing, managing, and monitoring environmental and social risks and impacts associated with each stage of a project supported by the Bank through Investment Project	Yes

Financing (IPF), in order to achieve environmental and social outcomes consistent with the environmental and social standards.	
PS2 Labour and Working Conditions recognises the importance of employment creation and income generation in the pursuit of poverty reduction and inclusive economic growth. Borrowers can promote sound worker-management relationships and enhance the development benefits of a project by treating workers in the project fairly and providing safe and healthy working conditions.	Yes (construction phase)
PS3 Resource Efficiency and Pollution Prevention recognises that economic activity and urbanisation often generate pollution to air, water, and land, and consume finite resources that may threaten people, ecosystem services and the environment at the local, regional, and global levels. This standard sets out the requirements to address resource efficiency and pollution prevention and management throughout the project lifecycle.	Yes (construction phase)
PS4: Community Health, Safety and Security addresses the health, safety, and security risks and impacts on project-affected communities and the corresponding responsibility of Borrowers to avoid or minimise such risks and impacts, with particular attention to people who, because of their particular circumstances, may be vulnerable.	Yes
ESS5: Land Acquisition and Involuntary Resettlement - involuntary resettlement should be avoided. Where involuntary resettlement is unavoidable, it will be minimised and appropriate measures to mitigate adverse impacts on displaced persons (and on host communities receiving displaced persons) will be carefully planned and implemented.	Yes (construction phase)
PS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources recognises that protecting and conserving biodiversity and sustainably managing living natural resources are fundamental to sustainable development and it recognises the importance of maintaining core ecological functions of habitats, including forests, and the biodiversity they support. PS6 also addresses sustainable management of primary production and harvesting of living natural resources and recognises the need to consider the livelihood of project-affected parties, including Indigenous Peoples, whose access to, or use of, biodiversity or living natural resources may be affected by a project.	Yes (construction phase)
PS7: Indigenous Peoples ensures that the development process fosters full respect for the human rights, dignity, aspirations, identity, culture, and natural resource-based livelihoods of Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities. PS7 is also meant to avoid adverse impacts of projects on Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities, or when avoidance is not possible, to minimise, mitigate and/or compensate for such impacts.	No
PS8: Cultural Heritage recognises that cultural heritage provides continuity in tangible and intangible forms between the past, present and future. PS8 sets out measures designed to protect cultural heritage throughout the project lifecycle.	Yes (construction phase)

In addition to meeting the requirements under the PS, EPFI clients must comply with applicable national law, including those laws implementing host country obligations under international law.

4.1.3 EHS Guidelines

The World Bank Group Environmental, Health and Safety Guidelines (EHS Guidelines) are technical reference documents with general and industry-specific examples of good international industry practice. IFC uses the EHS Guidelines as a technical source of information during project appraisal. The EHS Guidelines contain the performance levels and measures that are normally acceptable to IFC, and that are generally considered to be achievable in new facilities at reasonable costs by existing technology. For IFC-financed projects, application of the EHS Guidelines to existing facilities may involve the establishment of site-specific targets with an appropriate timetable for achieving them. The environmental assessment process may recommend alternative (higher or lower) levels or measures, which, if acceptable to IFC, become project- or site-specific requirements. The General EHS Guideline contains information on cross-cutting environmental, health, and safety issues potentially applicable to all industry sectors. It should be used together with the relevant industry sector guideline(s).

The EHS guidelines relevant to the project are:

- *General Environmental, Health, and Safety Guidelines*, 2007; and
- *Environmental, Health, and Safety Guidelines for Toll Roads*, 2007.

The General EHS Guidelines (as summarised in Table 4-2 below) are applicable to all projects. In addition to this, the sectoral EHS guidelines for Toll Roads will also apply. Note that whilst the title of this standard references tool roads, as stated in the guideline, it also applies to:

"to construction, operation and maintenance of large, sealed road projects including associated bridges and overpasses."

As such, this sectoral guidance will also be used for this project.

TABLE 4-2: GENERAL EHS GUIDELINES AND THEIR APPLICABILITY TO THE PROJECT

World Bank Environmental, Health, and Safety (EHS) Guidelines	Applicability to this project
Environment	
Air Emissions and Ambient Air Quality	Yes
Energy Conservation	Not applicable
Wastewater and Ambient Water Quality	Yes
Water Conservation	Yes
Hazardous Materials Management	Yes, but limited to where relevant to the use of hazardous materials during construction (e.g. fuel and bitumen).
Waste Management	Yes
Noise	Yes
Contaminated Land	Not applicable unless contamination is uncovered during development of the roadway.
Occupational Health and Safety	
General Facility Design and Operation	Yes
Communication and Training	Yes
Physical Hazards	Yes
Chemical Hazards	Yes
Biological Hazards	Not applicable
Radiological Hazards	Not applicable
Personal Protective Equipment (PPE)	Yes
Special Hazard Environments	Not applicable
Monitoring	Yes
Community Health and Safety	
Water Quality and Availability	Yes, in the case where the local water sources are utilised during construction
Structural Safety of Project Infrastructure	Yes
Life and Fire Safety (L&FS)	Not applicable
Traffic Safety	Yes
Transport of Hazardous Materials	Yes
Disease Prevention	Yes
Emergency Preparedness and Response	Yes
Construction and Decommissioning	
Environment	Yes
Occupational Health & Safety	Yes
Community Health & Safety	Yes

TABLE 4-3: SECTORAL EHS GUIDELINES AND THEIR APPLICABILITY TO THE PROJECT

World Bank Environmental, Health, and Safety (EHS) Guidelines	Applicability to this project
Environment	
Habitat Alteration and Fragmentation	Not applicable, as the affected habitat is not sensitive.
Stormwater	Yes
Waste	Yes
Noise	Yes
Air Emissions	Yes
Occupational Health and Safety	No, the General EHS Guidelines cover all relevant requirements
Community Health and Safety	
Traffic Safety	Yes
Contaminated Land	Yes

When host country regulations differ from the levels and measures presented in the EHS Guidelines, projects are expected to achieve whichever is more stringent.

4.2 CAMEROONIAN REGULATORY FRAMEWORK

4.2.1 International Conventions and Protocols

Cameroon has ratified several conventions, protocols and international agreements with which activities undertaken Cameroonian territory must comply. These include:

- The World Heritage Convention
- The Convention for the Protection of the Ozone Layer
- The Convention on Biological Diversity
- The United Nations Framework Convention on Greenhouse Gas (GHG) Emissions
- The United Nations Framework Convention on Climate Change (UNFCCC)
- Sendai Border
- The Montreal Protocol on Protection of the Ozone Layer
- The Kyoto Protocol

4.2.2 National Legal Framework

4.2.2.1 Regulatory Right of Way

In accordance with "Decree no. 84/048 of February 24, 1984 classifying the land required for the construction work on the Douala - Edéa - Yaoundé (NR3) heavy road course in the artificial public domain", the ROW of the NR3 is defined as follows:

- Urban area: 75 m on either side of the road axis;

- open country: 200 m on either side of the road axis.

4.2.2.2 Land Tenure

Ordinance No. 74-1 of July 6, 1974

Article 12 of the Act stipulates that, in order to achieve objectives of general interest, the State may resort to expropriation in the public interest. Article 13 of the Act requires the bodies benefiting from the expropriation to compensate the victims from their budgets. No compensation shall be due for the destruction of dilapidated buildings threatened with ruin or those built in breach of town planning regulations.

Decree No. 84 / 048 of February 24, 1984

This decree classified as artificial public domain the ROW of 150 metres (75 metres on either side of the axis) in urban areas and 200 metres (on either side of the axis) in open country.

On the ground, the regulatory provisions defined by this decree are frequently in contradiction with the Temporary Public Road Occupancy Permits (OTVP) that municipal authorities issue to occupants of urban road rights-of-way for commercial purposes. They often make it difficult to defeat procedures, particularly when using compensation.

4.2.2.3 ESIAs and Road Impacts

These international conventions and protocols generally aim at committing signatory countries to put in place and implement policies, laws, strategies or programs that would ensure the protection of the environment, the prevention of climate change, the preservation of protected animal and plant species and/or the preservation of soils and subsoils. Also, as we will see below, Cameroon has defined laws, decrees and orders that are in line with these conventions.

Act No. 96 / 97 of April 8, 1996

It relates to the protection of the national road heritage. It sets the provisions relating to the protection of the national road heritage by instituting controls within the road framework on the elements of vehicles with defects likely to degrade infrastructure and the environment, hence control of load capacities at the toll booths to ensure the protection of the road assets.

Act No. 96 / 12 of August 5, 1996

At the national level, the implementation of ESIA studies finds its legal basis in Law no. 96/12 of August 5, 1996 on the framework law on environmental management.

This Law, in its article 17, provides that " *The promoter or Client of any development, equipment or installation project which, because of its size, nature or the impact of the activities carried out therein on the natural environment, risks damaging the environment is required to carry out, according to the specifications, an impact*

study to assess the direct or indirect effects of the said project on the ecological balance of the site or any other region, the environment and quality of life of the populations and the impact on the environment in general."

This law also sets out the fundamental principles that should guide the rational management of the environment and natural resources in Cameroon.

Those are:

- The precautionary principle, according to which lack of certainty, taking into account current scientific and technical knowledge, should not delay the adoption of effective and proportionate measures to prevent a risk of serious and irreversible damage to the environment at an economically acceptable cost;
- The principle of preventive and corrective action, giving priority to action at the source of environmental damage, using the best available techniques at an economically acceptable cost;
- The polluter pays principle, according to which the costs resulting from measures to prevent, reduce and control pollution and to restore polluted sites should be borne by the polluter;
- The principle of responsibility, according to which any person who, by his action, creates conditions likely to harm human health and the environment, is obliged to ensure, or to cause to be ensured, the elimination of such conditions in such a way as to avoid such effects;
- The principle of participation according to which:
    - each citizen must have access to information on the environment, including information on hazardous substances and activities;
    - every citizen has a duty to ensure the protection of the environment and to contribute to the protection of the environment;
    - public and private persons must, in all their activities, comply with the same requirements;
    - Decisions on the environment must be taken after consultation with the sectors of activity or groups concerned or after public debate where they are of general scope.
- The principle of subsidiarity according to which, in the absence of a written rule of law, whether general or special, on environmental protection, the identified customary norm of a given terroir that is proven to be more effective in protecting the environment applies.

Law No. 98 / 005 of April 14, 1998

It provides for a water management and lays down, in accordance with the principles of environmental management and protection of public health.

It stipulates that any natural or legal person owning installations likely to cause water pollution must take all necessary measures to limit or eliminate the effects of such pollution.

This law is in fact supplemented by implementing decrees including:

- decree No 2001 / 165 / PM of May 08, 2001 laying down detailed rules for the protection of surface water and groundwater against pollution;
- decree No 2001 / 162 / PM of May 08, 2001 laying down the procedures for the appointment of sworn officers for the monitoring and control of water quality;

- decree No 2001 / 163 / PM of May 08, 2001 regulating protection perimeters around points for the collection, treatment and storage of drinking water;
- order in Council 2011-2585-PM of August 23, 2011 laying down the list of harmful or hazardous substances and the procedure for their release into continental waters.

Law No. 98 / 020 of December 24, 1998

This law regulating gas pressure and water vapour pressure appliances. It stipulates that any establishment with gas pressure and/or water vapour pressure equipment must build, use, maintain and control them according to a well-defined periodicity and under controlled conditions, by natural or legal persons with an appropriate approval. Magil will have pressure equipment on its site and must comply with this Act and ensure permanent and compliant control of its equipment.

Law No. 98 / 015 of July 14, 1998 on Establishment Classified as Dangerous, Unsanitary or Inconvenient

The Act governs, in accordance with the principles of environmental management and the protection of public health, establishments classified as dangerous, unsanitary or inconvenient. This is the case for quarries and installations at large construction site bases.

Are generally subject to the provisions of this law, artisanal or commercial industrial facilities operated or owned by any natural or legal person, public or private, and which present or may present either dangers to health, safety, public health, agriculture, nature and the environment in general, which are disadvantages for the convenience of the neighbourhood.

Decree No. 99 / 818 / PM of November 9, 1999

It lays down the terms and conditions for the establishment and operation of establishments classified as dangerous, unhealthy and inconvenient. It establishes the general legal framework for the safety of the premises and the level of reasonable danger of the proposed installations.

To this end, any establishment, and therefore by extension any development project that may cause inconveniences to air, ambient noise level, soil, water (surface or groundwater), vegetation, hygiene and human health, may only be erected, transformed, moved or operated under the terms of a permit.

Act No. 0001 of April 16, 2001

Title IV of this Act specifies the provisions relating to quarry substances which are, according to Article 2, construction materials or industrial minerals extracted by excavation or otherwise, for the purpose of providing materials for construction, trade, industry or manufacture.

This Act recommends that appropriate techniques and methods must be used to protect the environment and the safety of workers and local residents.

Decree No. 00004 / MINEP of July 2, 2007

It lays down the conditions for the approval of design offices to carry out impact studies and environmental audits.

Article 11 states that an ESIA or environmental audit report may be received at the Ministry of the Environment only if it has been carried out by an approved consultancy firm under the conditions laid down in the legislation in force in this area.

APAVE Cameroon is approved to carry out impact studies and environmental and social audits.

Decree No. 22013 / 0171 / PM of February 14, 2013

This framework law is supplemented by decrees and orders, including decree ***n°2013/0171/PM of February 14, 2013*** setting the terms and conditions for carrying out environmental and social impact studies.

Decree No. 00001 / MINEPDED of February 8, 2016

It sets out the different categories of operations whose implementation is subject to an environmental and social impact study. The project is covered by Article 2A specific to transport facilities.

4.2.2.4 Social Dimension

Cameroon has ratified all international instruments for the protection of general human rights (Universal Declaration of Human Rights of 1945, Charter of the United Nations, International Covenants on Civil and Political Rights, and Economic Rights, social and cultural, etc.) and of a specific nature (Convention on the Rights of the Child, Convention on the Elimination of All Forms of Discrimination against Women).

The ratification of the Convention on the Rights of Persons with Disabilities was signed on 01 10 2008, without ratification to date. The construction of dykes and roads has aspects related to people and their property, and to populations including people with disabilities. The national court concerning the disabled is as follows:

- act No 83 / 013 of July 21, 1983 on the protection of persons with disabilities;
- decree No 90 / 1516 of November 26, 1990 laying down the conditions for the application of Law No 83 / 013 of July 21, 1983 on the protection of persons with disabilities;
- decree No 96 / 379 / PM of June 14, 1996 on the establishment and functioning of the National Committee for the Rehabilitation and Socio-economic Reintegration of Persons with Disabilities.

Decree of February 14, 2013

Chaired by the Minister in charge of labour or his representative, the National Commission for Health and Safety at Work is composed of technicians and specialists with competence in occupational medicine, industrial hygiene and occupational safety, including, in equal numbers, representatives of employers and workers' representatives.

4.2.2.5 Resettlement and Compensation

Ordinance No. 74-3 of July 6, 1974

In its Article 2, it states that expropriation for public utility only affects private property as defined in Article 2 of the land cadastral ordinance.

Article 3 of this Ordinance requires any ministerial department wishing to undertake an operation in the public interest to submit an application file to the Ministry in charge of the lands, the documents of which are defined by the said article.

On the basis of Article 7, expropriation gives entitlement to pecuniary compensation, however, the authority benefiting from the expropriation may substitute pecuniary compensation for land with compensation in kind of the same value and, according to Article 8, such compensation must relate to the direct, immediate and certain material damage caused by the eviction.

Decree No. 78 / 263 of September 3, 1978

It refers to Decree No 78 / 263 of September 03, 1978 laying down rules for the settlement of disputes. This text is used to manage disputes that may arise during the development of the project and indicates the procedures to follow in the event of a conflict.

Act No. 85 / 009 of July 4, 1985

It lays down provisions on expropriations and terms of compensation. According to its article 1, expropriation in the public interest affects only private property as provided for by laws and regulations and entitles the owner to monetary compensation or compensation in kind under the conditions defined by this Act (article 2).

Article 7 ((1) refers to the provision of Article 8 of Order No. 74-3 dated July 6, 1974, which states that the compensation relates to direct, immediate and certain material damage caused by eviction. Its field of application covers bare land, crops, buildings and all other forms of development.

Decree No. 87 / 1872 of December 16, 1987

This decree fixes the compensation procedure. Its Article 2 defines the composition of the Commission Départementale de Constat et d'Evaluation (CDCE), which decides on the expropriation procedure initiated at the request of the public services.

This commission begins its work as soon as the prefect and the local authorities are notified by an order declaring the work to be of public utility, which the prefect publishes by posting notices. Populations shall be informed 30 days before the start of field investigations (Article 10).

Decree No. 2003 /418 / PM pf February 25, 2003

It sets the rates allocated to persons who are victims of the destruction of crops and trees planted in the public interest.

Law No. 80 / 22 of July 14, 1980

It punishes violations of land and state property; this law punishes illegitimate occupation of the State's private domain. It requires that the land that has been so occupied be vacated at the occupant's expense. In the event that the land is developed in the form of plantations, construction or works of any kind whatsoever, let the development be acquired by right by the owner, without any compensation for the occupant.

4.2.2.6 Public Health

Act No. 64-LF-23 of November 13, 1964

It focuses on the protection of public health, which already gives urban sanitation a prominent place in all development activities.

Decree No. 68 / 59 / COR of April 20, 1968

Relating to construction, it specifies technical devices relating to toilets in its articles 27, 28 and 29, this in order to avoid the propagation of odours and nuisances in the various rooms of a construction for residential use.

Circular No. 067 / NC / MSP / DMPHP / SHPA of June 19, 1973

From the Minister of Public Health addressed to the Provincial Delegates of Public Health and to the Municipal Administrators specifying the functions of the Sanitary Engineering Technicians and Technical Agents assigned in the Provinces or placed at the disposal of municipalities of great importance for the protection of health and the environment in urban and rural areas.

Act No. 96 / 12 of August 5, 1996

Providing a framework law relating to environmental management, it emphasises the need for environmental impact studies for any project to be carried out in urban and rural areas, the protection of receiving environments (air, soil, soil), inland waters and flood plains (surface water and groundwater), coastal and maritime waters, as well as human settlements.

This Law takes measures relating to installations classified as dangerous, unhealthy or inconvenient and with regards to polluting activities (waste, harmful and / or dangerous chemical substances, noise and odour nuisance, etc.), the management of natural resources and the conservation of biological diversity (protection of nature, preservation of animal species and their habitats, maintenance of biological balances and ecosystems, etc.), and in the management of risks and natural disasters.

Decree No. 99 / 820 / PM of November 9, 1999

Concerning the control of environmental pollution and laying down the conditions for the approval of natural or legal persons to operate laboratories for the control of the quality and quantity of solid, liquid or gaseous effluents discharged by establishments classified as dangerous, unhealthy or inconvenient.

Decree no. 2001/165/PM of May 8, 2001 specifies the modalities for the protection of surface and ground waters against pollution from various sources.

Law No. 2004 / 019 of July 22, 2004

It lays down the rules applicable to the regions in accordance with the provisions of the Act governing decentralisation and the Act.

Act No. 2004 / 017 of July 22, 2004

It lays down general rules for territorial decentralisation.

4.2.2.7 Labour and Working Conditions

As a member State of the International Labour Organisation (ILO), Cameroon has ratified conventions whose fundamental principles are included in the labour code to protect workers.

These particular texts are also of interest to the road project and its area of implantation, as converging fronts for populations seeking employment and areas for the integration of multisectoral activities.

The eight fundamental ILO conventions which apply by law to Cameroon are:

- Elimination of forced or compulsory labour (conventions 29 and 105): if necessary, be careful of the requisitions of village groups, or even labourers;
- Non-discrimination in employment (Convention 111): equal conditions of recruitment for women and equal pay (Convention 100: equal remuneration); no ethnic discrimination or discrimination against staff with HIV or AIDS;
- Abolition of child labour (Conventions 138 and 182): minimum age of 14 in Cameroon, 18 for hazardous work;
- Freedom of association and collective bargaining (Conventions 87 and 98): in particular, not to refuse to hire workers who belong to a trade union or to form one; allow meetings of staff representatives with employees (outside normal working hours);
- The Labour Code derives from Act 92 / 007 of August 14, 1992, the Labour Code. These include the following provisions:
    - On equal working conditions and professional skills, the wages shall be equal for workers, regardless of their age, gender, origin, status and religious denomination;
    - Children may not be employed in any business before the age of 14 years, except by order of the Minister of Labour;

  - Temporary workers must be reported to the Labour Inspectorate and registered with the NJC; they are entitled to a business card issued by the employer;
- Every contractor must organise a medical and health service for the benefit of its workers, with qualified paramedical personnel approved by the Minister of Labour;
- The hours of work may not exceed 40 hours per week, but orders specify the conditions of overtime. The weekly rest period is mandatory and at least 24 consecutive hours per week.

The Collective Agreement

The National Collective Agreement for Building, Public Works and Related Activities of August 25, 2004 is applicable to the winning company, even if it is not a member of the Syndicat des Entreprises du Bâtiment et des Travaux Publics du Cameroun (SEBAT).

The collective agreement provides guarantees to employee representatives (unions and employee representatives), compensation plans in the event of suspension of the employment contract for non-occupational illness or for technical unemployment, compensation for the family in the event of the death of the employee. worker, seniority bonuses, specifies the allowances for occasional assignments and transfers on a site. It improves paid leave on seniority.

Other benefit and bonus plans are provided for. A professional classification is defined, from which it follows that the monthly gross minimum wage is 35.706 CFA for 40 hours of work per week. A National Joint Wage Commission meets every 2 years and can review wage rates. The precise definition of occupational classification criteria is attached to the agreement.

Social Protection

Registration of all workers at the CNPS is mandatory, including for "temporary" workers (CDD, CDC, temporary, casual, seasonal). The CNPS covers occupational injury (AT), occupational disease (MP), retirement and family benefits. Contributions to the NHPB are as follows:

- employer's contribution: 1.75% on full salary for AT - MP, 7.2% on other benefits on the maximum salary of 300.000 CFA per month; and
- salary share: 2.8% on the salary capped at 300,000 F CFA.

4.2.2.8 Decentralisation

The beneficiaries or partners of the project are also the local authorities (municipalities) identified in the scope of the project (see also the texts of the institutional framework).

The texts on the decentralisation process are:

- Law No 2004 / 019 of July 22, 2004 laying down the rules applicable to the regions in accordance with the provisions of the Act for the guidance of decentralisation;

- Law No 2004 / 018 and 019 laying down the rules applicable to the Communities and Regions and their competences;
- Decree No 2012 / 0882 / PM of March 27, 2012 laying down detailed rules for the exercise of certain powers transferred by the State to municipalities in the field of the environment; and
- Legal and regulatory provisions relating to decentralised local and regional authorities.

Act No. 74 / 23 of December 5, 1974

According to the terms of the above Law, "the commune is a decentralised public authority and a legal person under public law, with legal personality and financial autonomy, which manages local affairs under the supervision of the State, with a view to the economic, social and cultural development of its populations" (art.1).

Law No. 2004 / 018 of July 22, 2004

This Act defines the municipality as a basic local and regional authority with a general mission of “local development and improvement of the environment and living conditions of its inhabitants” (s.16). This Act transfers the following powers in the field of water and sanitation to municipalities:

- drinking water supply, protection of groundwater and surface water resources;
- the promotion of agricultural, pastoral, artisanal and fish farming activities of general interest;
- the fight against improper sanitation, pollution and nuisances, etc.

In most of the district municipalities, the application of these legal provisions remains dependent on the precariousness of financial means and the immobility of the populations insufficiently sensitised and mobilised for convergent actions in the field of water and sanitation.

Decree No. 2012 / 0882 / PM of March 27, 2012

Fixing the modalities for the exercise of certain powers transferred by the State to the municipalities in environmental matters.

5 ESIA APPROACH AND METHODOLOGY

This chapter outlines the approach and methodology followed in the ESIA process.

5.1 ESIA TEAM

As noted in Chapter 1, SLR has been appointed as the Independent Environmental and Social Consultant to undertake the ESIA for phase 2 of the *Eastern Entrance of Douala*. SLR has no vested interest in the proposed project other than fair payment for consulting services rendered as part of the ESIA process. The details of the SLR project team are provided in Table 5-1.

TABLE 5-1: THE ESIA PROJECT TEAM

Company	Name	Qualifications	Experience (years)	Roles
SLR Consulting	Shana Westfall	Professional Engineer Certification (Environmental Engineering), USA B.Sc. Chemical Engineering (with Honours), Illinois Institute of Technology	19	Project Director and QA/QC
	Matthew Hemming	M.Sc (Cons. Biology) University of Cape Town & BSc. Agric. (Wildlife science), University of Natal	15	Project management and ESIA report compilation
	Greg Huggins	Master's in social science	30	Social assessment
	Nicola Faulks	M.Sc (Environmental Consultancy), University of Newcastle upon Tyne	15	Biodiversity inputs and assessment

It is recorded, with thanks, that SLR has drawn extensively on the content of APAVE's July 2020 ESIA, with the consent of the authors. APAVE and Magil's personnel in Cameroon also provided additional valuable support.

5.2 THE PROCESS

The ESIA is based on an analytical approach that allows the integration of environmental and social considerations, from the planning stage of the project and throughout its implementation, through a participatory approach of the different administrative authorities and population groups.

The first consisted in:

- ensure accurate reading and analysis of all documents provided by Magil and local stakeholders;
- to carry out the documentary research that made it possible to gather the documents, plans and maps relating to the project.

The second phase was that of data collection in the field.

- physical and economic sample surveys to verify the presence of official dwellings and businesses in the ROW;
- Direct observations were made on aspects as diverse as housing, sanitation, and people's activities. These observations were made by APAVE Cameroon, either on the basis of established frameworks or according to the situations encountered.

The third phase consisted of the analysis and processing of the data collected, and ultimately the drafting of the ESIA and the ESMP. The study was carried out using recognised methods to identify and assess the project's environmental impacts to the best of current knowledge.

5.3 METHODOLOGY

5.3.1 Introduction

The assessment of likely significant effects will proceed through an iterative process considering four questions:

- Prediction - What will happen to the environment as a consequence of this Project?
- Evaluation—Positive/negative? Does this impact matter? How important or significant is it?
- Develop Mitigation - If it is significant can anything be done about it?
- Residual Effect - Is it still significant?

This process is illustrated in Figure 5-1.

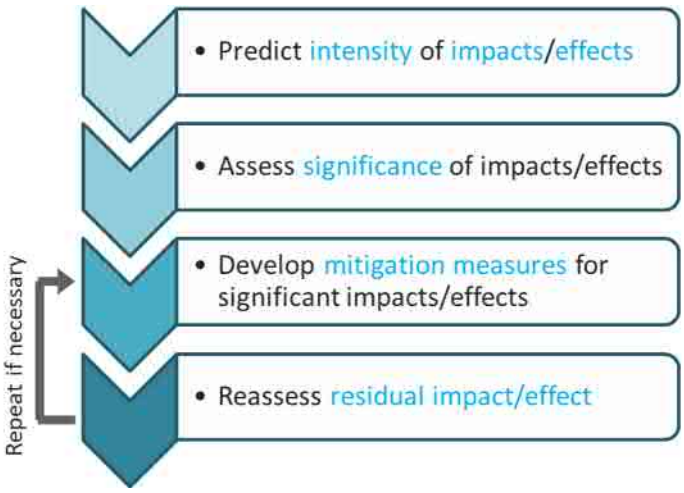


FIGURE 5-1: IMPACT ASSESSMENT PROCESS

Where significant residual effects remain, further options for mitigation may be considered and impacts re-assessed to establish whether they can be reduced in the context of technical feasibility and cost effectiveness.

The first step, Prediction, is informed by an analysis of the proposed project activities (see Section 2) and the baseline conditions of the surrounding environment (see Section 6).

The second step, Evaluation, estimates the significance of these potential impacts using the ESIA Impact Assessment Criteria (see below).

Where significance impacts are predicted, the next step is to develop mitigation measures that can help reduce the significance of the predicted impact. Note that when applying mitigation, a mitigation hierarchy has been used. This means that where feasible, preferred mitigation would be measures that would avoid the predicted impact from occurring. Where not possible, the second most preferred type of mitigation would be those measures that reduce the significance of a predicted impact. The final option, when no other mitigation is feasible, should be compensation or offsetting. Note that whilst mitigation is primarily only necessary for adverse impacts, this ESIA also evaluates positive impacts and includes recommended enhancement measures as well.

Once suitable mitigation has been considered, the significance of the potential impact is evaluated again using the impact assessment criteria to determine the residual significance of the impact.

5.3.2 Impact Assessment Criteria

5.3.2.1 Parameters Considered

In order to characterise the impacts on the environment, five parameters were selected: nature, intensity, duration and extent. The qualification of each parameter is described below.

Nature

An impact is qualified as negative when it is harmful to the environment and/or populations, and as positive when it is beneficial to the environment and/or populations.

Intensity of Impact

The intensity of the impact is a function of the magnitude of the changes to the affected component of the environment or the disturbances that will result. The methodology used applies a scale for intensity of low, medium, strong and high. These are selected based on project's proposed activities and SLR's best profession judgement on how the project activities will affect changes in the component of the environment, including resulting differences in use, characteristics or quality.

Duration of Impact

An impact can be characterised as temporary or permanent. A temporary impact may take a few days, weeks or months, but must be associated with the concept of reversibility. Temporary impacts are considered to be of short (weeks or less) or medium duration (months or the full duration of construction). However, a permanent impact is irreversible or is observed in the long term.

Extent of Impact

The extent of the impact corresponds to the spatial extent of the modification of the affected element. There are three levels of extent: regional, local and punctual. Extent is regional if an impact on a component is felt in a large area or affects a large portion of its population. The extent is local, if the impact is felt on a limited portion outside the project's footprint or affects a restricted group of its population. The extent is punctual if the impact is felt within the project's footprint only.

Receptor Sensitivity

Receptors are environmental components, people and cultural heritage assets that may be affected (adversely or beneficially) by the project. The sensitivity denotes the importance or, value or, vulnerability of a receptor to an impact. Whilst the methodology does not specifically utilise receptor sensitivity in the determination of impact significance, where a significant impact is predicted on a highly sensitive receptor, the ESIA will identify this and include additional mitigation to help reduce the predicted residual impact to as low as practicable.

5.3.2.2 Significance of the Foreseeable Impact

The potential impact of each activity on the main environmental and social components is assessed on the basis of the pre-defined criteria. This assessment involves determining the significance of the identified likely impacts. Although such an assessment may sometimes involve a value judgment, it still allows for the establishment of acceptability levels and the identification of the requirement for impact mitigation, compensation, monitoring and follow-up. Particular attention is paid to the assessment of impacts when sensitive elements/receptors of the environment are potentially affected.

In order to assess each of the identified impacts, the FECTEAU method was used, which uses a combination of three parameters (intensity, duration and extent) to determine the absolute significance of the impact in relation to which specific mitigation or enhancement measures are recommended.

As part of this method:

- each parameter used to determine significance has the same weight;
- if the values of two parameters have the same severity level, it shall be assigned the value corresponding to that level regardless of the severity level of the third criterion; and
- if the values of the three parameters are different, it is assigned the value of average importance.

TABLE 5-2: DETERMINATION OF IMPACT SIGNIFICANCE

Intensity	Extent	Duration	Significance
High	Regional	Long	Major
		Medium	Major
		Short	Major

	Local	Long	Major
		Medium	Major
		Short	Medium
	Punctual	Long	Major
		Medium	Medium
		Short	Medium
Strong	Regional	Long	Major
		Medium	Medium
		Short	Medium
	Local	Long	Medium
		Medium	Medium
		Short	Minor
	Punctual	Long	Medium
		Medium	Minor
		Short	Minor
Medium	Regional	Long	Medium
		Medium	Minor
		Short	Minor
	Local	Long	Minor
		Medium	Minor
		Short	Negligible
	Punctual	Long	Minor
		Medium	Negligible
		Short	Negligible
Low	Regional	Long	Minor
		Medium	Negligible
		Short	Negligible
	Local	Long	Negligible
		Medium	Negligible
		Short	Negligible
	Punctual	Long	Negligible
		Medium	Negligible
		Short	Negligible

6 BASELINE CONDITIONS

This chapter provides a description of the physical, biological and socio-economic environment likely to be affected by the proposed roadway redevelopment. An understanding of the environmental and social context and sensitivity within which the proposed project activities would be located is important to understanding the potential impacts.

6.1 PHYSICAL ENVIRONMENT

6.1.1 Climate

Douala's climate is of the humid equatorial coastal type and is strongly influenced by the proximity of Mount Cameroon.

6.1.1.1 Temperature

The average monthly temperature in Douala is 28 ° C. August is the coldest month with a monthly average temperature value of 25.5°C, while February is the warmest with a monthly average of 28.9°C (Figure 6-1).

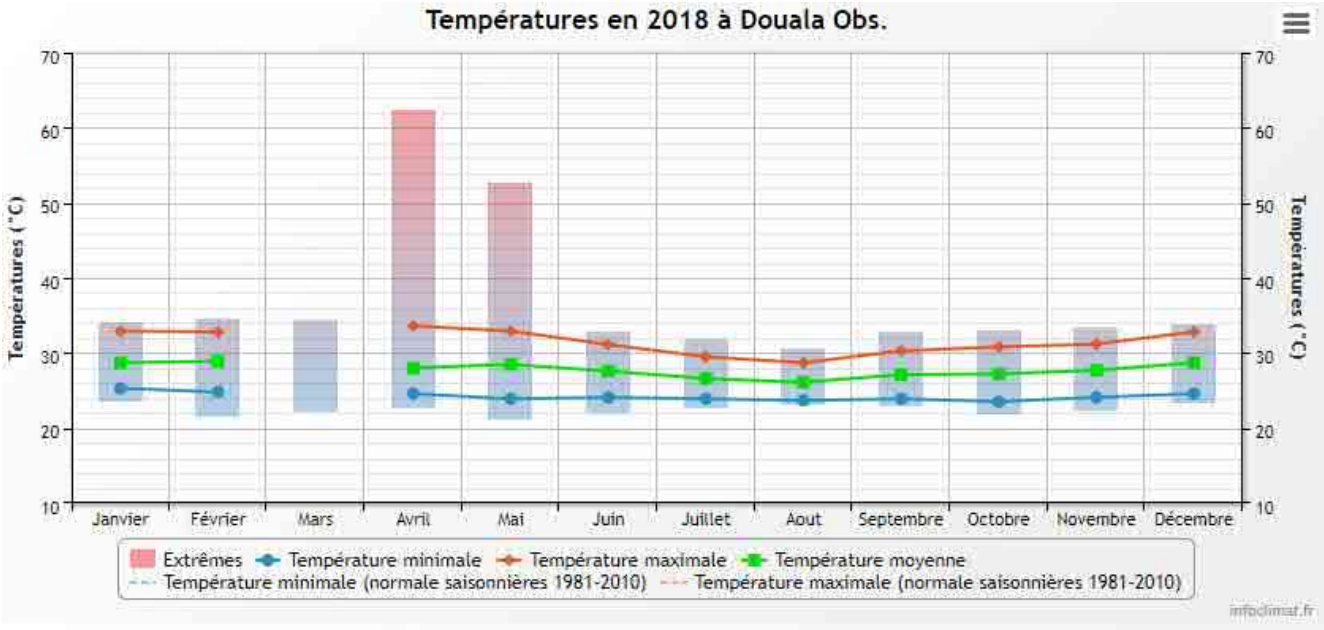


FIGURE 6-1: DOUALA 2018 TEMPERATURES

Source: APAVE EIA/infoclimat.fr

6.1.1.2 Sunshine

The city of Douala has about 1713 hours of sunshine (duration of sunshine per day). The least sunny month is August (53 hours on average) and the sunniest month is January (193 hours on average) (Figure 6-2).

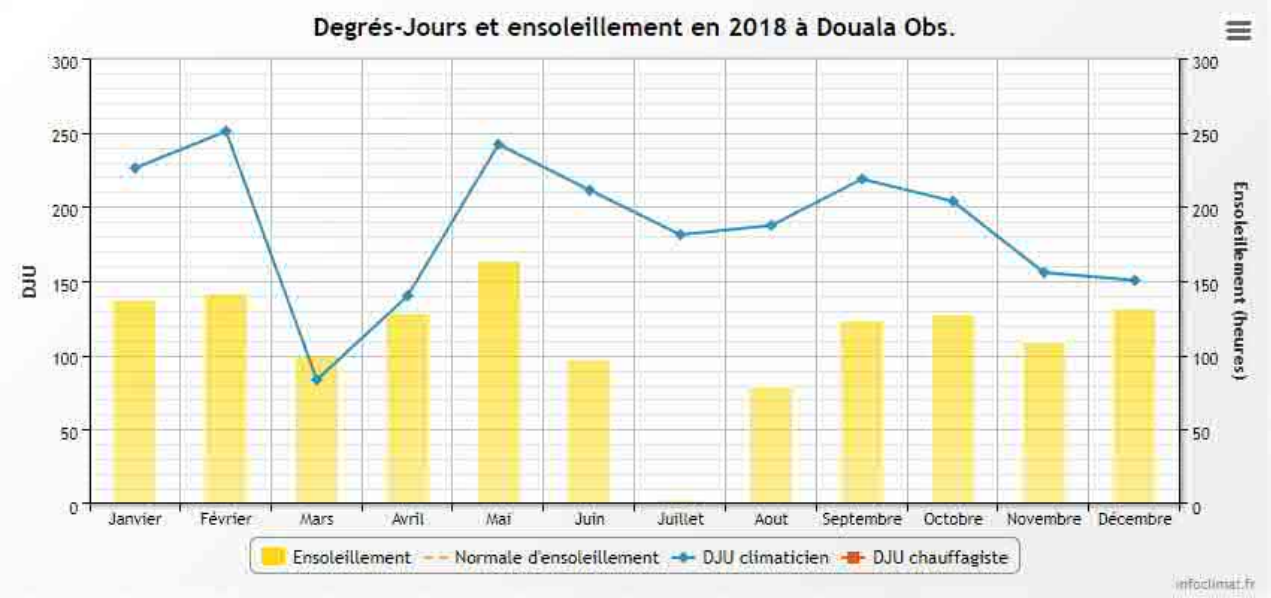


FIGURE 6-2: DOUALA 2018 SUNSHINE

Source: APAVE EIA/infoclimat.fr

6.1.1.3 Rainfall

Rainfall is abundant in the region, varying between 2.5 m and 4.5 m of annual rainfall with an average of 3591 mm per year in Douala. The monthly distribution of rainfall indicates that the maximum rainfall amounts are in July and August, although in 2018 the rainy season extended from June to October. Minimum rainfall is in December and January. In 2018 precipitation was recorded on >200 days of the year.

moyenne	3 591,5 mm
maximum	4 477,2 mm
médiane	3 614,9 mm
minimum	2 595,9 mm
écart type	506,7 mm
Coef. de variation	0,14
Coef. de variabilité max/min	1,72
Coef. de dispersion moy/med	0,99

TABLE 6-1: AVERAGE ANNUAL RAINFALL FOR THE DOUALA STATION

Source: APAVE ESIA

6.1.1.4 Evaporation

The average annual relative humidity over Douala is constantly high at around 80%, with maximum evaporation values in March (133 mm) and minimum values in August (72.4 mm). Calculated average evaporation values are significantly lower in the rainy season than the annual rainfall amounts. In the dry season, the opposite phenomenon is noted. Annual evaporation is substantially exceeded by annual rainfall, resulting in strong surface water flows and recharge to groundwater.

Month	J	F	M	A	M	J	J	A	S	O	N	D
Evaporation (mm)	108.0	123.8	133.0	131.5	125.8	107.2	82.1	72.4	93.2	107.9	103.8	98.0

TABLE 6-2: AVERAGE EVAPORATION IN DOUALA

Source APAVE EIA / Djeuda Tchapnga et al. 2006

6.1.1.5 Winds

Winds are rarely violent in Douala, with an average speed of less than 5 ms-1. Ocean winds, with average speeds between 2.5 and 3 ms-1, are predominant.

6.1.1.6 Climate Change

Global warming has the potential to change some of the baseline conditions described in this ESIA over time. The Climate Change Risk Assessment included in Appendix 1 provides a review of what these potential changes are likely to be within the Project's AOI and makes recommendations on design mitigation to minimise these risks.

6.1.2 Air Quality

Like other urban areas in Cameroon, the city of Douala is subject to ongoing air pollution, largely due to emissions from vehicle traffic and the large industries located there. There is little available data on air quality from measurements in the city of Douala and no air quality data was collected for this project.

The discussion presented here is based on the air quality indices of the World Air Map which generates an Air Quality Index (AQI) using modelled satellite data. The AQI takes into account the concentrations of several different pollutants and is calculated based on the pollutant with the greatest impact on health at the time. The higher the air pollution, the higher the AQI with the effect that an increasing proportion of the population is likely to feel the effect of pollution by developing symptoms in the short or long term. The AQI is compared to various categories which provide an indication, based on international standards established by the World Health Organisation (WHO) guidelines, of the suitability of the air for outdoor activities and health risks.

The average AQI for Douala in 2020 is 36 which indicates that air quality is generally 'average' (i.e. moderately polluted and greater than the maximum limit established for one year by WHO). The AQI indicates 'fresh air' for only 7 days of the year, 'average' air for 113 days, 'poor' air quality for 95 days of the year, 'very poor' for 106 day

and 'dire or worse' for 44 days of the year. The primary pollutants are marginally elevated O_3 levels, which are an indicator of Nitrogen Oxides (NO_x) and volatile organic compounds (VOCs) released by activities such as the combustion of fossil fuels. O_3 levels vary between 35 and 65 $\mu g / m^3$. The other contributor to reduced air quality is fine particulates ($PM_{2.5}$ and PM_{10}), with small contributions from NO_2. The bulk of the particulates are likely to arise from vehicle entrainment on roads with loose surfaces. What is evident is that the air quality has a close, inverse correlation with rainfall, which has the effect of knocking particulates out of the air.

FIGURE 6-3: AQI CATEGORIES AND MAIN POLLUTANTS IN DOUALA, 2020

Source: www.iqair.cn

As the only available baseline data for air quality is generalised for all of Douala, this is not representative of the localised conditions that will be experienced near the road (especially within 200 m). For this reason, the project will carry out kerb-side air quality monitoring at several locations along the route prior to construction. This will include an analysis of NO_x, SO_2, PM_{10}, and $PM_{2.5}$ and will be collected over a period of at least 3 months.

6.1.3 Noise and Vibration

As with most large cities, noise is omnipresent in Douala. No detailed noise surveys have been conducted within the project's AOI. Noise levels are expected to be more elevated during the day then at night, due to the higher activity levels, and are expected to be elevated nearest the road. Along the roadway the main sources of noise are likely to be:

- Use of road and roundabout, by motorbike, car and heavy motor vehicle traffic;
- market areas with street sales, convenience stores;
- commercial trade and goods handling; and
- populous areas with dense housing.

There are no significant noise point sources located along the road route, although significant events at the Japoma Stadium will result in elevated noise levels on those days. Given the high density of residential and commercial buildings, as well as people living and working, adjacent to the road there are numerous noise sensitive receptors within the project's AOI. The density of these receptors declines toward the east of the project extent. The density of built structures along and around the road will likely abate noise levels to receptors further from the road. Heavy motor vehicle traffic is also likely to contribute to elevated vibration levels in the air immediately adjacent to the roadway.

As no robust baseline noise data has been collected along the route, the project will carry out a noise survey at representative locations along the route to characterise baseline conditions. This survey will be conducted prior to commencement of construction activities. This survey will include both day-time and night-time intervals and will be carried out using international best practice with regards to the analytical method and equipment.

6.1.4 Topography

The city of Douala is located over an area of low altitude, with some points being below sea level at high tide. The topography across the city of Douala is relatively flat with few inclines of significance and a maximum altitudinal variation of less than 60 m. About 60% of the surface area of Douala is prone to flooding.

The ground elevation across the project site varies from 1 m above sea to a about 40m above sea level. The local terrain is undulating with gentle but irregular slopes. Magil has undertaken topographical surveys over the entire length of the project.

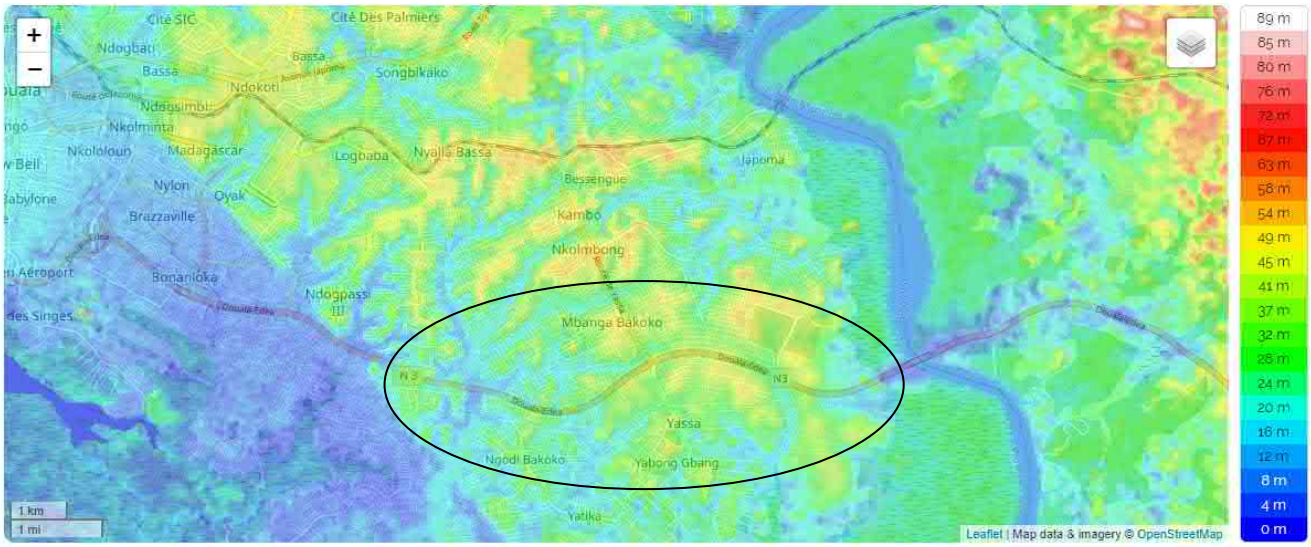


FIGURE 6-4: TOPOGRAPHY OF DOUALA AND SURROUNDINGS

Source: APAVE EIA / OpenStreet Map

6.1.5 Geology and Pedology

6.1.5.1 Geology

Douala is located over a large coastal sedimentary basin with an area of about 7000 km^2. The lithology of the "Douala Sedimentary Basin", Douala sedimentary basin is as follows:

- quaternary sediments of fluvio-deltaic type, mainly sands with a clay matrix;
- tertiary sediments consisting mainly of clay formations;
- secondary sediments consisting of sandstone and shale clays.

6.1.5.2 Pedology

The Douala agglomeration comprises sandy-clay and clayey-sandy formations, made up of more or less consolidated quaternary alluvium, which is not very permeable. Across the project site the soils vary between:

- hydromorphous or compressible soils across the swampy areas, consisting essentially of a soft greyish clay; and
- yellowish sandy-clayey soils, in the elevated portions, resting on a decomposed armour of variegated clay.

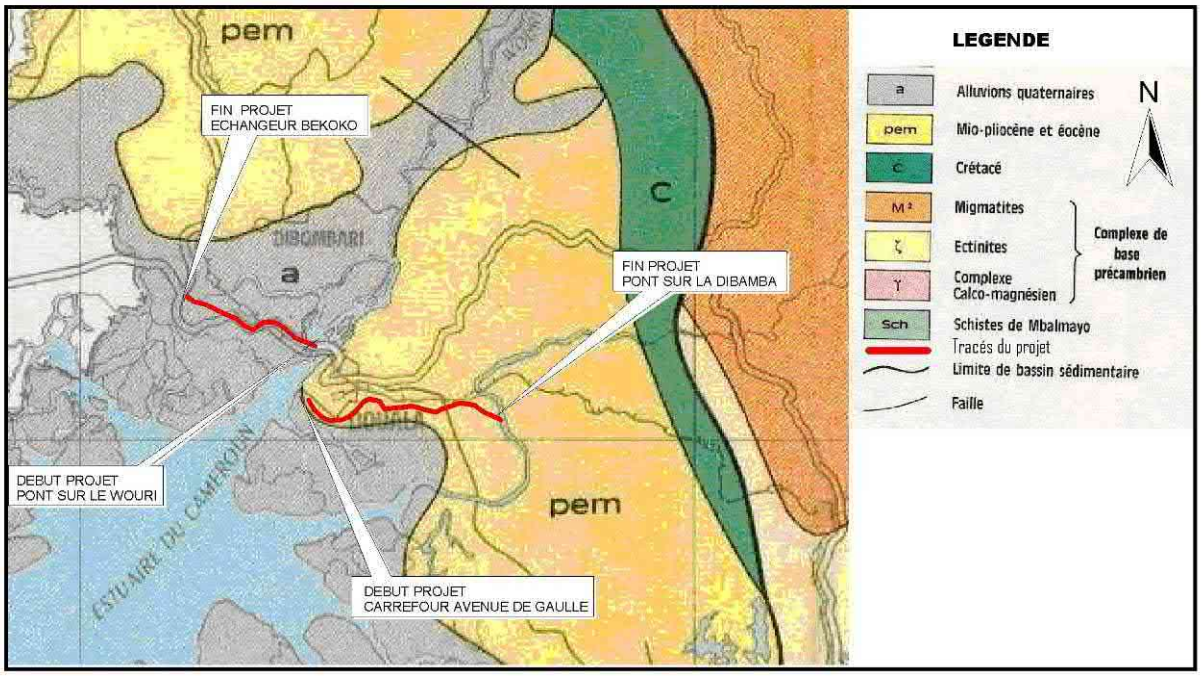


FIGURE 6-5: GEOLOGICAL MAP OF THE DOUALA REGION (IN ORSTOM REGIONAL ATLAS 1973)

Source: APAVE EIA / Orstom Regional Atlas 1973

6.1.5.3 Soil Pollution

The level of pollution of Douala's urban soils is poorly known. Nevertheless, it is likely that contaminated soils may be encountered along the road due to:

- the nature of the commercial activities, along the roadway;
- poor urban sanitation conditions;
- behaviour of the population, particularly with regards waste management;
- the omnipresence of water in Douala that can promote pollutant mobilisation.

6.1.6 Hydrology

6.1.6.1 Surface Water

The city of Douala is located inside the "Cameroon estuary" and developed on both banks of the Wouri River, at a point of constriction, which facilitated the natural dredging of a channel necessary for the establishment of a future port. The natural limits of the current site of the city are: to the east, the Dibamba; to the west, the Bomono and Moungo creeks; to the north, the Nsapé watershed; to the south, the Bay of Manoka, where the Dibamba joins the Wouri. The Wouri has a watershed area of over 12,000 km², which generates a maximum flood flow of 1,100m^3 /s. It is crossed by two bridges that connects the two parts of the city. Finally, the course of the drains and the mangrove areas along the coastline are bathed in the waters of the Wouri and are subject to the upwelling of salt water. The Dibamba has a watershed area of 3,000 km², which would generate, by

analogy with the Wouri, a maximum flow rate of $300_m^{3/s}$. The Dibamba river limits the city, and the project, to the East. At the point where the NR3 crosses the Dibamba River, the water is at sea level. Due to its coastal location, the hydrology of the study area is strongly influenced by tidal movements. Tides in the study area have locally variable but generally low amplitudes (0.3 to 3 m depending on location). The reflux of marine waters towards the mainland during high tide slows down the flow from the mainland to the sea, causing the water body to rise in rivers and creeks.

Within the city of Douala, and across the project route, the gentle slope of the local ground (see Section 6.1.4 on Topography) limits flow velocities and promotes the stagnation and infiltration of rainwater. Several areas in the lower part of the city are suffering from the rising water table/sinking ground, including the airport grounds and the New-Bell, Nylon and Madagascar neighbourhoods. Surface water outlets from Doula are to the Wouri and Dibamba rivers, the Doctor's Creek and the mangrove swamp.

Drainage from the project area is primarily to the Dibamba River .There is only a single, unnamed watercourse identified along the length of the roadway between PK 9+925 and 18+825, this is located at PK 11+080 (see Figure 2-2). The unnamed watercourse drains the area north of the NR3 to the Dibamba River estuary some 3.5 km to the south. Due to the flat topography the path of the watercourse is very winding as it approaches the Dibamba River. The NR3 crosses the watercourse with a multi-box culvert of approximately 20 m in width. The culverts will not be upgraded for this project.

Provision is made within the roadway for nine other hydraulic structures to cater for localised surface water flows during periods of rainfall (see Figure 2-3). Surface water is concentrated to these flow paths due to the urbanised nature of the surrounds and the increase in hardened surfaces. As a result, the volume and the intensity of this flow is increased during rainfall.

Surface water in these drains is likely to be of poor to average quality due to the same factors that influence soil quality. The quality of the runoff likely has an inverse relationship with the frequency and volume of rainfall due to the cleaning and dilution effects. There is little available data on surface water quality in the drains outside of watercourses from measurements in the city of Douala and no surface water quality data was collected for this project.

As no baseline ambient water quality data has been collected at surface water resources long the route, the project will carry out a water quality survey at representative locations along the route to characterise baseline conditions. This survey will be conducted prior to commencement of construction activities.

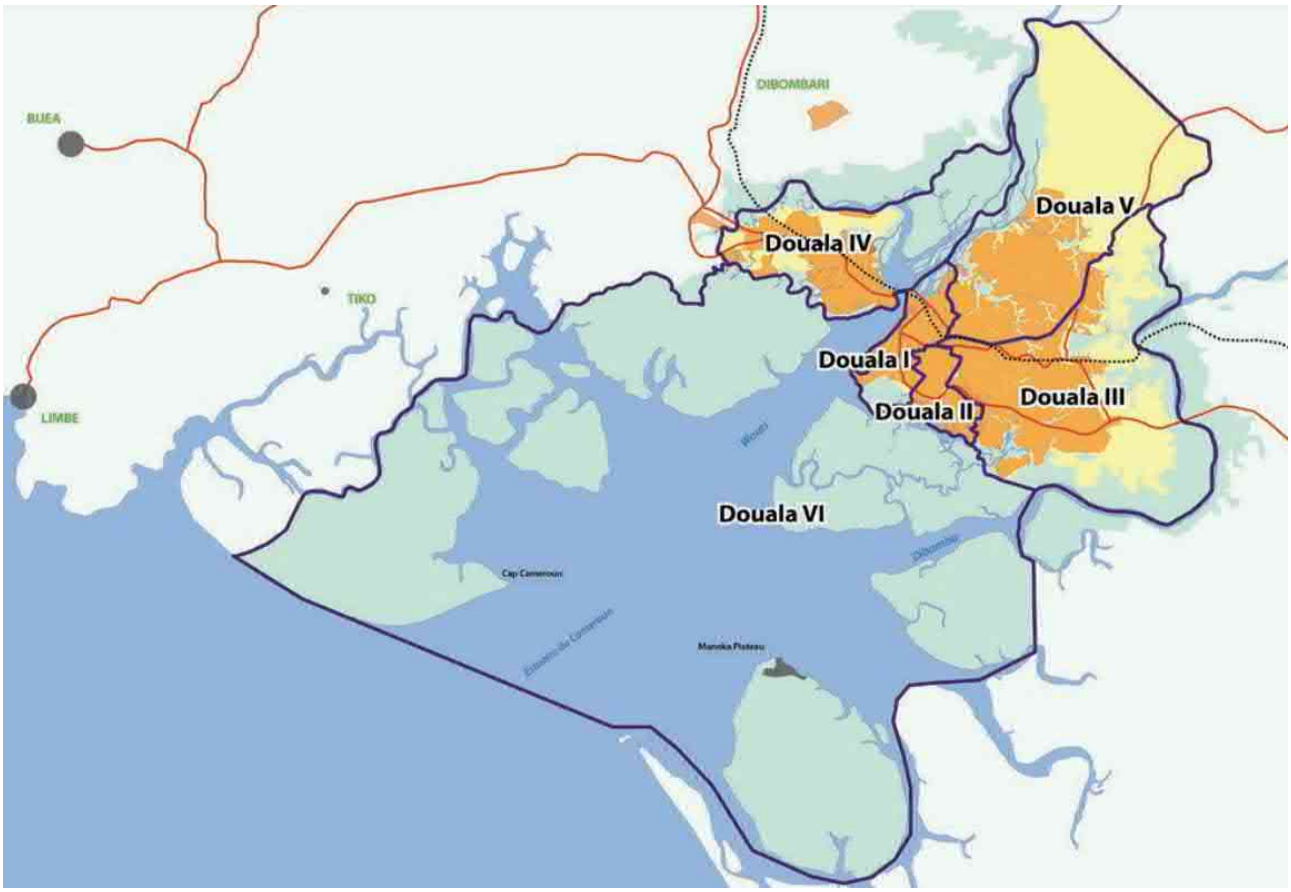


FIGURE 6-6: THE CAMEROON ESTUARY

Source: APAVE EIA

6.1.6.2 Groundwater

The Douala Sedimentary Basin contains several groundwater bodies, located at varying depths. Three systems make up the hydrogeological resource of the city's subsoil. The aquifers lie in the "mio-pliocene" formations and the Quaternary Alluvions. These formations have heterogeneous sequences characterised by alternating sandy passages with more or less frequent clay episodes. The communication of the sandy sequences with the brackish waters of the Wouri estuary can lead, in case of overexploitation, to salt water intrusion. (Martin 1979 cit. Sigha, 2006).

The Report " *bref sur SFD* produced by: GFA Consulting Group GmbH" in 2018 states that the average groundwater level in the unconfined aquifer fluctuates between 0.3 m and 1.60 m during the dry and wet seasons. The aquifer has water depths of about 1 to 20 m and is mainly exploited by hand-dug wells. The hydrodynamic parameters of the aquifers are generally poorly known, as wells are often incomplete and imperfect and long-term pumping tests are generally not carried out. Piezometric controls are rare, as there is no real functional piezometric network (Ketchemen- Tandia et al. In 2004).

High population density has added to the spontaneous development of drinking water wells. Approximately 60% of the inhabitants of Douala depend on groundwater wells for their drinking water supply (Feumba et al., 2011). The location and number of wells (and boreholes) within the project's AOI is unknown.

Studies have shown that much of the Douala area is unsuitable for traditional sanitation facilities due to the shallow groundwater levels. The reality is that there are on average two pit latrines around a well at a distance of less than 30 m (Bilogue, 2011; ENSP/L3E, 2014). The quality of construction of the sanitation facilities is often poor, increasing groundwater contamination risks. The study shows that 75 per cent of wells are highly vulnerable to this effect (Feumba, 2015). With the regular surface flooding across Douala basin is prone to flooding, often poorly maintained sanitation facilities, and pollutants on surface there is ongoing risk of groundwater pollution (Feumba and Ngounou Ngatcha, 2014).

There is little available data on the water quality of the unconfined aquifer in the project's AOI. As no baseline ambient groundwater quality data has been collected along the route, the project will carry out a groundwater quality survey of resources near to project sources (i.e. boreholes) to characterise baseline conditions. This survey will be conducted prior to commencement of construction activities.

6.2 BIOLOGICAL ENVIRONMENT

The baseline for the biological environment has been taken from available opensource websites as no detailed biodiversity surveys have been conducted within the project's AOI. The following websites were accessed in order to retrieve biodiversity data relevant to the Project.

- Integrated Biodiversity Assessment Tool: https://www.ibat-alliance.org/
- Bird Life International: http://www.birdlife.org
- Global Forest Watch: http://www.globalforestwatch.org/
- International Union for Conservation of Nature (IUCN): https://www.iucn.org/
- Zoological Society for London: https://www.zsl.org
- Fish Base: https://www.fishbase.de
- Protected Planet (Protected Areas Information): https://www.protectedplanet.net/country/CMR
- APAVE Cameroon (July 2020) Environmental and Social Impact Assessment of phase 2 of the *Eastern Entrance of Douala* (translated into English in September 2020).

6.2.1 Flora

Regionally the flora of Cameroon is described as having a high ecological value because the country includes such a rich diversity of ecosystems such as: montane forests, sub alpine grasslands, estuarine habitats, mangroves and a range of habitats in between. To date 8,260 plant species have been recorded, of which 156 are endemic.

A search of the IUCN database revealed that for flora, there are some species of conservation concern which have ranges that either overlap the Project area (roadway between PK 9+925 and 18+825) or lie within 5 km of the project's AOI. Species of conservation concern are those which are listed on the IUCN database as critically endangered (CR), endangered (EN) or vulnerable (VU). The data search found no CR species with the target area. Seven EN plant species and four VU plant species have been recorded within the search area. The data search

did not reveal the presence of any ecosystems, or habitats of conservation concern within 5km of the project's AOI.

Information on each species has been set out in Table 6-3 below. As stated previously in this document, there are no identified watercourses along the course of the roadway between PK 9+925 and 18+825. The Project, represented by a section of road also known as the phase 2, passes through an urban area of relatively high density, with numerous structures located along the length of the road and immediately adjacent to the proposed roadway footprint, refer to Section 1.1 of this document for more information. As a result, the habitats present in the project's AOI, are urban or at least semi-urban, and do not include habitats such as forest, shrub or mangrove. The likelihood of occurrence of the botanical species of conservation concern are therefore assessed against their habitat requirements (listed in the IUCN database) and the likelihood that suitable habitats would occur within the project 's AOI.

TABLE 6-3: PLANT SPECIES OF CONSERVATION CONCERN WITH RANGE OVERLAPPING THE PROJECT AREA

Species	IUCN Conservation Status	Habitat Description	Likelihood of Occurrence in the project Area of Influence
Ledermanniella thalloidea	EN	Small aquatic herb, annual, growing on rocks in waterfalls. The rivers in which it grows are generally not tributary to each other and their fertilisation process seems discrete and complicated.	No
Inversodicraea annithomae	EN	Annual aquatic herb, submerged, fixed on rocks in fast water of waterfalls and rapids.	No
Leiothylax quangensis	EN	Submerged freshwater plant, living attached to rocks' surface or any hard materials in rapids.	No
Ledermanniella linearifolia	EN	Small aquatic herb, submerged or not in waterfall's water, fixed with thallus on rocks.	No
Ledermanniella batangensis	EN	Small annual aquatic herb, submerged, fixed on rocks in the fast water of a waterfall.	No
Eriocaulon stipantepalum	EN	Probably perennial herb, growing at the margins of small pools and flooded depressions in grassland, on iron-rich ground; 1,250 m above sea level.	No
Macropodiella pellucida	EN	Flat aquatic herb, submerged, annual, oblate on rocks in flooded rivers.	No
Inversodicraea cristata	VU	Annual aquatic herb submerged or not in fast water of waterfalls, fixed by a thallus on rocks or any other hard object	No
Inversodicraea boumiensis	VU	Annual aquatic herb submerged or not in fast water of waterfalls, fixed by a thallus on rocks or any other hard object.	No
Asystasia lindauiana	VU	Shrub liking river's or waterfall's borders in forest area or deep shade in forest	No

Inversodicraea kamerunensis	VU	Annual aquatic herb submerged or not in fast water of waterfalls, fixed by a thallus on rocks or any other hard object.	No

In summary, due to the urbanised nature of the project's AOI and the lack of water courses within the Project area, no species of conservation concern are considered likely to be present.

6.2.2 Fauna

Cameroon is a country which is considered to support Africa's second highest concentration of biodiversity. The rich wildlife consists of 409 species of mammal of which 14 are endemic, 690 species of birds, 250 species of reptile and 200 species of amphibians. Cameroon is also an important breeding area for marine and freshwater species, such as crustaceans, molluscs, fish and birds.

The data search identified seven fish species of conservation concern that may occur within the project's AOI. No other species groups (e.g. mammals, birds or amphibians) of conservation concern were identified as having a range which overlaps the Project area. It is considered that this is likely to be due to the urban nature of the project area, with its proximity to the city of Douala.

As described in Section 6.2.1 above, there are no identified watercourses along the course of the roadway between PK 9+925 and 18+825. As all of the potential species of concern are fish, this means that the project's AOI does not include these receptors. A summary of this assessment is set out in Table 6-4.

TABLE 6-4: FAUNAL SPECIES OF CONSERVATION CONCERN WITH A RANGE OVERLAPPING THE PROJECT AREA

Species	IUCN Conservation Status	Habitat Requirement	Likelihood of Occurrence in the Project Area of Influence
Labeobarbus mungoensis	EN	This fish species has spawning migrations and is benthopelagic, living just above the bottom of the water column.	No
Fundulopanchax amieti	EN	This fish occurs in the swampy parts of brooks in the rainforest. It is usually found in shallows It is a benthopelagic, non-migratory species and a bottom spawner with a one-month incubation.	No
Aphyosemion franzwerneri	EN	This fish is a benthopelagic, non-migratory; species. It occurs in very small pools, shallows in swamps and shallow swampy parts of brooks in the rainforest. This species has a greatly reduced swim bladder, and the fish lives on the bottom habitats in shallow water.	No

Fundulopanchax fallax	EN	This fish is found in swamps and swampy parts of brooks in the humid coastal rainforest. It is a benthopelagic, non-migratory specie and a bottom spawner with a two-month incubation.	No
Amphilius korupi	EN	This type of catfish occurs in small streams, shallow water among leaf litter.	No
Chromidotilapia linkei	EN	A freshwater benthopelagic fish, feeding mainly on detritus.	No
Benitochromis nigrodorsalis	EN	This fish is a benthopelagic, non-migratory species. It is found in coastal rivers and creeks.	No

In summary, the only species of conservation concern listed on the IUCN database which have ranges that overlap the project area are aquatic species (fish). As there are no permanent watercourses within the project area (roadway between PK 9+925 and 18+825); it is assessed that fish species would not be present here. It is noted that some fish species can occur in ephemeral/storm run-runoff watercourses, but the species listed in Table 6-4, all require permanent water bodies. Due to the urban nature of the project area, no other species of conservation concern are likely to be present, due to lack of suitable habitat (forest/mangrove/gallery forest) for foraging and breeding.

6.2.3 Protected Areas

Cameroon has 49 protected areas, comprising national parks, zoos, forest reserves and sanctuaries. An online data search, designed to identify all types of recognised protected areas, both nationally and internationally, was used. The search included a radius of up to 50 km from the project location, not because this is considered to be the AOI of the project, but rather to provide a comprehensive search of the wider area.

The protected areas which were identified are described in Table 6-5. For all of the protected areas, no official citation could be found; therefore, the description of each site has been taken from the open source websites, listed at the start of Section 6.2.

TABLE 6-5: PROTECTED AREAS WITHIN 50 KM OF THE PROJECT LOCATION

Site Name	Conservation Category	Description	Distance (Km) and direction from the Project
Douala-Edéa	National Park	Officially classified in 2018, as being a Marine Protected Area, covering 2,715.12 km^2. The Douala-Edéa coastal ecosystem – includes mangroves, beaches, swamps, rainforests, rivers and freshwater lakes south of Cameroon's second largest city, Douala. The tangled mangroves and vast swamp forests have long protected this highly productive land and seascape, which sits within the Atlantic Equatorial Coastal Forest Ecoregion. Threatened	1.6 km south

		species such as forest elephants, chimpanzees, mandrills, African soft-shelled turtles, marine turtles, sharks, rays and West African manatees still find refuge in this unique mosaic of habitats. The wetlands are a haven for birdlife with over 70 water-bird species recorded, many overwintering after long migrations from Europe and Asia. They are also an important nursery area for a variety of fish and crustaceans, providing the basis for productive fisheries that local people depend upon for food security.	
Lac Ossa	Wildlife Reserve (Douala-Edéa National Park)	As of 2018 Lac Osssa Wildlife Reserve in now included in the Douala-Edéa National Park complex.	25 km south-east
Ebo	Wildlife Reserve and proposed National Park Includes the Yabassi key Biodiversity area	A terrestrial protected area which covers an area of 1,416.67km2, which was designated in 2006. The Ebo Forest is a natural tropical rainforest, home to a range of species including gorillas and chimpanzee.	50 km north-east
Mount Cameroon and Mokoko-Onge	National Park Includes a Key Biodiversity Area and Important Bird Area	Situated west of Douala, Mount Cameroon is a vast volcanic dome, 45 km long by 30 km wide, with its long axis aligned south-west–north-east. It lies on the Atlantic Ocean coast from which it is separated by the road skirting its base which links the town of Limbe in the south to Idenau in the west. The avifauna is very diverse, with some 370 species recorded, including most of the montane endemics, of which two are known only from Mount Cameroon: *Francolinus camerunensis* and *Speirops melanocephalus*.	50 km West
Guinean Forests of west Africa	Biodiversity Hot Spot – 2016	This is a large area, which covers the lowland forests of west Africa, as they are home to more than a quarter of Africa's mammals, including more than 20 species of primates.	Eastern end of Project lies within this site.
Cameroon and Gabon Lowlands	Birdlife Endemic Bird area 2014	This is a large area which covers a large section of the Cameroon lowlands and coastal area (280,000 Ha).	Project area lies within site.

The project's AOI is not located in or within 50 km of a site of Global Biodiversity Significance, or an Alliance for Zero Extinction Site.

6.2.4 Habitat Evaluation against IFC's PS 6 Categories

6.2.4.1 Background and Approach

Because the IFC's Performance Standard includes specific requirements for certain types of habitat (i.e. critical habitat, natural habitat and modified habitat), it is important to evaluate if any of these types of habitat are

present within the project's AOI. This evaluation is referred to as the Critical Habitat Assessment (CHA), although a consideration of potential natural and modified habitat is also included.

In this evaluation, the concept of the Area of Analysis (AoA) has been used. This is specific to the CHA and differs from the Area of Influence used generally across the impact assessment disciplines. The AOI represents the area that could potentially be influenced by the Project, so takes in to account the activities of the Project. The assessment of critical habitat does not take in to account the likely impacts of the Project, so is referred to as an AoA.

For the flora assessment, the AoA for the CHA is the same as the AOI for flora as it includes all areas where vegetation will be permanently lost (if present) and could also be temporarily lost/impacted/modified.

For the terrestrial fauna: there are no features to consider.

For the aquatic fauna: the AoA also varies, but in this case is dependent on the location of permanent watercourses.

6.2.4.2 Critical Habitat Determination

Critical habitat is a description of the most significant and highest priority areas of the planet for biodiversity conservation. It considers both global and national priority setting systems and builds on the conservation biology principles of 'vulnerability' (degree of threat) and 'irreplaceability' (rarity or uniqueness). Determination of critical habitat is based upon quantitative thresholds of biodiversity priority which are largely based on globally accepted precedents such as IUCN Red List (IUCN, 2012) criteria and Key Biodiversity Area (KBA) thresholds.

The identification of critical habitat is based on five criteria (IFC 2012) and is linked to quantitative thresholds for some of the criteria, as summarised below.

TABLE 6-6: TRIGGERS FOR CRITICAL HABITAT

Type of Critical Habitat	Thresholds
Habitat of significant importance to critically endangered and/or endangered species	Areas that support globally important concentrations of an IUCN Red-listed EN or CR species (≥ 0.5% of the global population AND ≥ 5 reproductive units of a CR or EN species). Areas that support globally important concentrations of an IUCN Red-listed Vulnerable (VU) species, the loss of which would result in the change of the IUCN Red List status to EN or CR and meet the thresholds in ('a' above). As appropriate, areas containing important concentrations of a nationally or regionally listed EN or CR species.
Habitat of significant importance to endemic and/or restricted-range	For terrestrial vertebrates and plants, restricted-range species are defined as those species that have an EOO less than 50,000 square kilometres (km^2).

species, where restricted range refers to a limited extent of occurrence (EOO).	For marine systems, restricted-range species are provisionally being considered those with an EOO of less than 100,000 km^2. For coastal, riverine, and other aquatic species in habitats that do not exceed 200 km width at any point (for example, rivers), restricted range is defined as having a global range of less than or equal to 500 km linear geographic span (i.e., the distance between occupied locations furthest apart).
Habitat of significant importance to concentrations of migratory and congregatory species.	Areas known to sustain, on a cyclical or otherwise regular basis, ≥ 1 percent of the global population of a migratory or congregatory species at any point of the species' lifecycle. Areas that predictably support ≥10 percent of the global population of a species during periods of environmental stress.
Highly-threatened and/or unique ecosystems.	Areas representing ≥5% of the global extent of an ecosystem type meeting the criteria for IUCN status of CR or EN. Other areas not yet assessed by IUCN but determined to be of high priority for conservation by regional or national systematic conservation planning.
Areas associated with key evolutionary processes.	There are not quantitative thresholds set for this criterion, however the advice note (IFC 2019) does provide a range of examples for areas that are associated with key evolutionary processes.

To determine if critical habitat is present, the following key steps were undertaken:

Step 1: Preliminary critical habitat determination – The desk study data search has been used to inform this step.

Step 2: Define the area of analysis – The AoA has been defined for each species or habitat type and is described in the text for each feature. It should be noted that the AoA may be influenced by the area of occurrence or range of a given species as shown on the IUCN website, species profiles; however, often these ranges are often quite general, based at a regional level and don't take in to account habitat availability at a more local level. Therefore, the AoA used here, for the assessment of each species takes in to account the availability of habitat at a local level.

Step 3: Confirming which features qualify as critical habitat – The results of this determination are provided in Table 6-7.

TABLE 6-7: ASSESSMENT OF CRITICAL HABITAT

Type of Critical Habitat	**Status**

Habitat of significant importance to critically endangered and/or endangered species	For the botanical analysis the AoA is assessed to include all habitats and species of plant occurring within 500 m of the Project location/area. None of the Endangered (EN) botanical species are assessed likely to be present within this area. For the faunal species, the AoA must include permanent watercourses with suitable habitat for each species. For ease of assessment the AoA has been set at 2 km for fish species. The nearest water course which may provide suitable habitat for some of the fish species would be the Dibamba River, which lies 80 metres east of the Project area at its closest point. The Dibamba River at this point is crossed by a large bridge, and the banks have been urbanised, creating suboptimal habitat for a range of fish species. For the fish species described as EN, they all have ranges (IUCN species data) which includes a number of rivers and tributaries in the region; therefore, significant concentrations of each species are not likely to occur within the AoA assessed here. For the botanical and fish species identified as EN and potentially occurring in the AoA, none are considered to trigger the threshold criteria set out under this criterion.
Habitat of significant importance to endemic and/or restricted-range species, where restricted range refers to a limited extent of occurrence (EOO).	No habitats of significant importance to endemic or restricted-range species was identified within the AoA for flora or fauna.
Habitat of significant importance to concentrations of migratory and congregatory species.	No habitats of significant importance to concentrations of migratory and congregatory species were identified within the AoA for fauna.
Highly-threatened and/or unique ecosystems.	Although the Douala-Edéa National Park boundary is located approximately 1.6 km south of the Project area, it cannot be assumed that the entire National Park is de facto critical habitat. The National Park boundary is large, covering an area of 2,715.12 km^2. The boundary includes some urban areas, roads, villages and farmed land. Within the AoA (a 2 km radius from the Project area); the Douala-Edéa National Park comprises recently developed urban areas and farmed land. For this reason, it is concluded that there are no habitats which trigger critical habitat under C4, within the AoA.
Areas associated with key evolutionary processes.	Due to the urban development within the AoA, the habitat present within the AoA does not meet this criterion.

Note that if the results of Step 3 had indicated any potential critical habitat, engaging in expert stakeholder consultation would also have been required; however, for this project expert stakeholder consultation has not been considered necessary.

6.2.4.3 Natural and Modified Habitats

In accordance with PS6 requirements, as well as the identification of critical habitats, natural and modified habitats must also be identified.

- Modified habitats are those habitats which are determined to contain a large proportion of plant and /or animal species of non-native origin, and/or where human activity has substantially modified an area's preliminary ecological function and species compositions. For this Project such habitats include areas managed for agriculture, forest plantations (e.g. cashew), reclaimed wetlands (e.g. paddy fields).
- 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.
- Critical habitats can be either modified or natural habitats.

The habitats located within the footprint of this project are all modified habitats; in fact, the habitats located within the Project area and up to 2 km out from this area all modified, as they comprise urban and semi-urban conurbation with associated kitchen gardens/ farmed land. The only exception to this is the gallery forest associated with the Dibamba River, this is likely to be natural habitat (though partially modified due to tree removal and firewood collection). These forested areas are located within 2 km of the Project area, approximately 150 metres from the working area (footprint) of the Project, at the eastern end, adjacent to the Dibamba River only.

6.3 SOCIAL ENVIRONMENT

6.3.1 Regional Overview

From a macro administrative context Cameroon is divided into regions. The project is located within the Coastal Region. With Douala as its capital, the Coastal Region has four departments:

- the Department of Wouri which contains the city of Douala which is also its principal city – and in which the project is located;
- the Department of Nkam whose principal city is Yabassi;
- the Moungo Department whose principal city is Nkongsamba;
- the Department of Sanaga-Maritime, whose principal city is Edéa.

Within the Department of Wouri is the Urban Community of Douala that was created on September, 24 1987 by Decree no. 87/1366. This succeeded the decree defining the Urban Community of Douala created in 1974, The municipality itself came into being in 1967.

The Urban Community of Douala covers the same area as the department of Wouri, i.e. 923 km2. Its current administrative headquarters is the town hall of Bonanjo. Five urban district municipalities and one rural municipality form the Urban Community of Douala:

- the district municipality of Douala I, whose headquarters is in Bonanjo;
- the district municipality of Douala II whose headquarters is in New Bell – part of the project site;
- the district municipality of Douala III, whose headquarters is in Logbaba – part of the project site;
- the district municipality of Douala IV, whose headquarters is in Bonassama;
- the district municipality of Douala V, whose headquarters is in Kotto; and
- the district municipality of Douala VI with its headquarters in Manoka.

With an estimated population of more than 3,000,000 inhabitants[1] in 2019, the city of Douala is home to 84% of the urban population of the Coastal Region. The third General Census of Population and Housing (3rd RGPH, 2005) put the population of Douala at around 1,931,977 inhabitants distributed heterogeneously throughout the city. The population is therefore estimated to have increased by about a million people between 2005 and 2020. This population is now unevenly distributed amongst the boroughs. The districts of Douala III and Douala V are the most populated. Douala overall is characterised by a growing population leading to an increase in land use and an expansion of the city limits. Demographic growth rates remain elevated in the outskirts.

The 2004 Cameroon Demographic and Health Survey (EDSIII) (INS, 2005) put the average household size at 4.3 persons compared to 4.8 persons at the national level.

6.3.2 Land Ownership and Planning

According to the Statistical Yearbook of Cameroon (2010) in 2007 in Douala it was estimated that 35.7% of respondents were landowners, 56.6% are tenants and 7.6% are housed free of charge/informally resident. Access to the land in working-class neighbourhoods is mainly informal and without guarantees. The majority of construction projects are carried out without first obtaining a building permit. However, it is possible to obtain a land title when the land is the subject of an administrative procedure undertaken with the Domains and Land Affairs Departments.

The littoral region to which Douala belongs also stands out by an extremely high urbanisation rate of 96.1%, well above the 2010 Cameroonian urbanisation rate estimated at 52.0%. This high rate of urbanisation is dependent on the definition of the concept of city, which is mostly based on the administrative criterion.

The procedures for drawing up and reviewing urban planning documents are set out in Decree no. 2008/0736/PM of 23 April 2008. The town planning of the city of Douala is governed by a Land Use Plan (POS).

[1] Pres comm - Arsène Gideon Nkama. Senior Lecturer of Economics.

The ROW crosses the Douala II and Douala III boroughs in zone A10 and C1 to the POS statutory mapping of the city of Douala. This area is the predominantly residential urban area. Commercial and artisanal activities are small. The work on the NR3 is not prohibited there.

In terms of land planning and envisaged/existing land use the proposed road section crosses:

- areas for the expansion of economic and industrial activities;
- expansion zones on untitled land;
- areas to be redeveloped;
- industrial activity zones.

The city of Douala has not had a comprehensive urban development plan to manage it expansion. Except for large, planned developments, which provides for models for development and housing, the occupation of the urban spaces is largely spontaneous and not part of planned and formal development. Only 50% of the dwellings in Douala can be considered accessible by a paved road and to garbage trucks (Toukap, 2012).

Due to the poorly enforced architectural and building standards, some constructions described as "hard" stand side by side with precarious dwellings (made of planks, plywood, corrugated sheets, etc.). This is particularly visible in the vicinity of the ROW.

The ROW for the NR3 was declared by the Cameroonian MINTP by decree No. 84/048 in 1984. The Declaration of Public Utility provided for a 150 meters wide ROW (75 m on either side of the axis) in urban areas and 200 meters wide (on both sides of the axis) in open country. The ROW for the NR3 within Douala was the subject of a complete expropriation procedure which led to the payment in November 1985 of compensation for the destruction of property. Refer to Section 2.2 for additional details.

6.3.3 Services

Approximately 60% of the inhabitants of Douala depend on groundwater wells for their drinking water supply (Feumba et al., 2011). In addition, according to ENSP/L3E (2014), 30% to 40% of the area is unsuitable for traditional sanitation facilities due to high groundwater levels (the water table is less than 2 m from the topographic ground). Accessibility to water is therefore very difficult for poor households since they live in urban areas on average 2.5 km from a water network connection point (6.6 km in rural areas). The AOI is very poorly covered with respect to access to formal water supply and the drinking water supply network is absent beyond PK 10+000.

Due to the high groundwater table, most on-site sanitation facilities are of a poor construction quality. The Municipality of Douala is the only entity authorised to issue permits for septic tanks or latrines to households or any third party, to ensure that there is no risk of groundwater contamination from on-site sanitation facilities. However, due to the rapid expansion of the slums, the application of these regulations is weak. Due to the soil conditions (mainly sandy, sandy loamy, silty loam, clayey or clayey), seepage from sanitary facilities increases the risk of groundwater pollution.

High population density has added to the spontaneous development of drinking water wells and has led to an additional risk to public health because there are on average two pit latrines around a well at a distance of less

than 30 m (Bilogue, 2011; ENSP/L3E, 2014). The study shows that 75 per cent of wells are highly vulnerable to this effect (Feumba, 2015).

Cameroon's household waste management policy is based on a public-private partnership that enables the largest cities in Cameroon to have a regular household waste collection and treatment service. There are two types of waste generated. Domestic and liquid waste is distinguished from industrial and common waste.

Domestic waste is the waste produced by the population. Domestic waste is collected and managed by the company HYSACAM which has a direct contract with the city authorities. Refuse bins are installed along the roadway, mainly in densely populated areas. Industrial waste is collected by an accredited specialised firm which has a contract with the companies producing the waste.

In 2018, Douala's waste production was estimated at 2,500 tons per day, compared to less than 2,000 tons per day the previous year. Currently, all household waste collected in Cameroon is sent to landfill sites.

The only existing recycling industry is for products such as iron and bottles, which are recovered by "garbage sorters" upstream of collection. Metals are sold to mainly Chinese and Indian industries. However, in the project's AOI it appears that littering and waste dumping from the local residents leads to large volume of waste, outside of the collection bins.

Electricity is accessible to 97.5% of non-poor households and 86.3% of poor households (source PDU Douala). It is less discriminatory than access to water but comparatively less well distributed than in Yaoundé.

Overhead and underground power grids exist on both sides of the road. These networks, especially those of the aerial type, are likely to need to be moved for the work.

6.3.4 Economic Characteristics

6.3.4.1 National Level

Cameroon has experienced sustained economic growth in recent years. The recovery in economic activity that began in the wake of the 2008/09 financial crisis largely continues. The current growth rate is estimated at 4.1% in 2019[2], thanks to a dynamic tertiary sector and growth in consumption and investment.

In terms of human development Cameroon places 151st in the world (21st in Africa) in the 2018 Human Development Index. The poverty rate has declined moderately from 39.9 per cent in 2007 to 37.5 per cent in 2014, but the current pace will not allow two of the objectives of the Growth and Jobs Strategy Paper to be achieved: a reduction in labour underuse from 76 per cent to 50 per cent and a poverty rate of 28.7 per cent in 2020.

[2] https://www.afdb.org

The inflation rate increased from 1.1% in 2018 to 2.4% in 2019 but remained below the Central African Economic and Monetary Sub-region (CEMAC) 3% set objective. The budgetary deficit is declining (3.8% of Gross Domestic Product (GDP) in 2017, 2.5% in 2018 and 2.3% in 2019) as a result of fiscal consolidation under the three-year programme (2017-2019). The current account deficit is estimated to be at the same level in 2019 as in 2018 (3,7% of GDP) and is expected to decrease to 2,6% in 2020 (its level in 2017). Cameroon however continues to present a high risk of over-indebtedness according to the IMF assessment in November 2018 (debt represented close to 39% of GDP in 2018 compared to 12% in 2007).

Formal activities, the driving force of the economy in Cameroon's urban areas, have been steadily caught up by the informal sector. This sector is essentially tertiary, mainly linked to markets, which today support a large part of the city's population, with 40% of the jobs generated.

In terms of Tourism Cameroon comprised of 579 hotel establishments in 2014. These consist of 353 one-star hotels, 132 two-star hotels, 47 three-star hotels, 7 four-star hotels and one five-star hotel and 39 unclassified hotels. As the main gateway to and from Cameroon, the city of Douala plays an important role for tourism in Cameroon. The arts and crafts market (Avenue de Gaulles) offers tourists opportunities to acquire local handcrafts. The tourist industry is a significant source of foreign currency inflow into the city.

Agriculture is a key sector of the Cameroonian economy which ensures its food and self-sufficiency and the influx of foreign currency. The Ministry states in 2013 that this sector contributes 22.9% to GDP and accounts for approximately 23% of the country's total exports. The agricultural sector is the largest employer with 62% of the working population.

Agriculture is one of the main economic activities in the Douala region and is practised in all the regions, particularly the Moungo region. The oil palm, which is by far the most important oil palm in the region, is cultivated in Sanaga-Maritime by SOCAPALM, in Dizangué by SAFACAM and in Edéa by the Swiss Farm.

Bananas for export are grown more in the Moungo region, specifically in Penja, by the Société des Plantations Nouvelles de Penja (SPNP) and the Plantations du Haut-Penja (PHP).

The rubber tree is produced by the CDC (Douala-Limbé road axis). Robusta coffee and cocoa are grown in the Moungo and Nkam regions. Food crops and domestic gardening are practiced in almost all the region, but particularly in the Moungo.

While urbanisation rates are increasing, urban agriculture has also intensified. Urban agriculture is not only a food and land security valve, but also a socio-cultural model that is an integral part of the city's planning amongst the city dwellers who practice it.

In terms of fishing Cameroon has 360 km of coastline in the western pocket of the Gulf of Guinea and an important hydrographic network, floodplains, marshes, natural lakes and water reservoirs, which allow for continental fishing. The following is noteworthy:

- Fisheries GDP in 2013 was 155 billion FCFA (236,3M €);
- The fishing sector employs 122,000 people (primary sector), to which 70,000 jobs in the secondary sector must be added;

- In 2012, fish production was 64 741 tons, consisting mainly of industrial fishing, artisanal fishing and continental fishing;
- Production of the industrial fishing fleet in 2012 amounted to 13 013 tons;
- Artisanal fishing is carried out in the 3 nautical mile zone and in estuaries from dugouts, its production in 2012 reached 48,645 tons;
- Continental fishing is practised by around 100,000 fishermen and in 2012 represented a production of 3,082 tons.

Industrial fishing is carried out by large companies based in Douala and Nkongsamba. Artisanal fishing is carried out in the inland rivers including the Wouri, Sanaga and Dibamba.

Compared to its neighbouring countries, Cameroon has a relatively diversified industrial fabric, both in terms of the variety of activities and the size of companies, with a large number of SMEs as well as a large number of informal enterprises (the 2009 RGE lists 12,150 companies in this sector, 32% of which are located in the city of Douala and 27% in Yaoundé). The industrial sector represented close to 53,000 jobs, or 7.6% of the labour force in RGE 2009.

6.3.4.2 **Douala**

Douala is the leading industrial centre of Cameroon and the CEMAC. Industrial activities first developed in the city, due to the transport advantages offered by the Autonomous Port of Douala, then to the establishment of land and rail networks and finally, due to the concentration of urban population which makes Douala the largest consumer of manufactured products in the country.

Several industrial enterprises are present in the AOI, as per below:

- Food industry – MACAFOP; BROLI;
- Cosmetic – CAMCOS.
- Automotive - ELERY automotive; SIDEM Oasis Motors.
- Wood processing – PLACAM.
- Plastic – DEEPLAST.
- Pulp paper - New Cardboard Industry.
- Public Works – MAG.

The service sector in Cameroon is becoming an increasingly important part of the country's economy. OSEED estimates that there were some 229 financial institutions in the city of Douala in 2006. They include, in addition to banks (32, including 11 branches and 21 agencies), micro-finance institutions (including 132 agencies) and 65 insurance companies (including agencies).

The banking sector employs more than 3,000 people in the city, to which must be added the micro-finance sector which has developed considerably over the last decade (Express Union, 56 employees in Douala), with nearly 2,000 people employed.

The city of Douala has 57 markets spread throughout the city. Based on an average of 1.3 assets per sales facility, it is estimated that the Douala markets alone would employ approximately 64,000 people. The concentration of

large markets in the two central boroughs, Douala 1 and 2, with peripheral boroughs comprising a higher number of markets but consisting mostly of medium-sized or very small local markets.

The various markets and commercial spaces set up at the eastern entrance to the city of Douala are part of the infrastructure that particularly affects the living environment and the movement of the population at various levels: road congestion, health and safety problems, lack of drainage of wastewater and rainwater, etc. The infrastructure of the city of Douala is also a major source of pollution.

In Douala, the informal sector employs nearly three out of every four workers and has grown rapidly. In 2007 informal jobs represented 73% of jobs, compared with only 57% in 2001. The number of jobs in this sector thus increased from 300,000 in 2001 to approximately 440,000 in 2007. This rapid development in Douala refers more to the need for survival than to the emergence of alternative productive activities.

Income from the informal sector is generally very low and well below the monetary poverty line. These jobs are often ancillary income within households. The informal sector plays a positive role in dampening shocks in times of crisis, but also translates into a precarious increase of jobs created. The share of street or home activities is growing at the expense of the local informal sector.

6.3.4.3 **ROW**

The main identified markets and commercial spaces in the project's AOI are Commercial space "Entrance Block 9" and Commercial space "Entrance Terminal 10". In addition to these markets, which correspond to structured spaces recognised by the Urban Community of Douala, there are also commercial spaces which have been created spontaneously, and which do not have any organisation and do not pay any market fees.

The informal sector has a notable presence along the NR3 with numerous informal traders and service providers operating immediately adjacent to the current road (and thus within the ROW). Within the project's AOI there are a wide variety of informal traders and service providers including drinking establishments, cigarette stands, call boxes, grocery stores, fish shops, hardware stores, board depots, cinder block factories, food vendors who display their goods on the floor or on shelves, etc.

The project's AOI is included in an area of urban sprawl where there is a fairly high demand for building materials, such as sand. The sale of sand at the roadside is part of the commercial activities carried out by a particularly young part of the roadside population. The sand sold is extracted from the surrounding rivers (Wouri, Dibamba) and transported by dugouts to the banks, where truckers buy and sell their goods.

On both sides of the proposed roadway, mechanical garages located on the ROW, sometimes open-air, provide services for heavy goods vehicles, private cars, taxis and motorcycle taxis. These garages are sources of pollution due to uncontrolled oil spills, vehicle recovery in unplanned areas and a lack of water and waste management.

The various petrol stations along the route offer launderette facilities for vehicles. Due to the high demand and the prices charged at these service stations, they are not able to satisfy all customers. In order to compensate for this deficiency, washing areas are scattered around the roadway in an anarchic manner. In the absence of formally developed spaces, these laundries do not manage their wash water and therefore contribute to water pollution.

APAVE Cameroon carried out a field survey on 9 and 10 July 2020 to ascertain the status of housing in the ROW of the construction site and to investigate informal trade in the area. No formal housing or permanent structures were recorded within the ROW. Seven areas were documented where informal traders and service providers concentrate in order to access consumers. The following is noteworthy:

- Item 1: BOCO TRADEX roundabout PK 9+925 to PK10+000: the rights-of-way are occupied by kiosks, trucks, gluing and wheel repair activities.
- Item 2: Welcome Entrance PK 10 + 400: the rights-of-way are occupied by kiosks, mechanical workshops, and retail stores.
- Item 3: Locality mini city PK 11 + 400: The rights of way are occupied by wood resellers.
- Item 4: ARI roundabout PK 11 + 750: The rights-of-way are occupied by daily truck rentals and motorised taxis waiting for customers.
- Item 5: ARI D3 PK 12 + 000: The rights of way are occupied by trucks, stands and temporary mechanical shops.
- Item 6: Yassa roundabout PK 14+450: the rights-of-way are occupied by kiosks, shop-in-shops, parking areas (motorcycle taxis and vehicles).
- Item 7: Bocom Yassa PK 15 + 150: The rights of way are occupied by parking areas.

Examples of the informal traders and service providers are shown in the images in Figure 6-7. Refer to Section 6.3.11 for additional details on the nature of the informal traders and service providers.

FIGURE 6-7: EXAMPLES OF INFORMAL TRADERS AND SERVICE PROVIDERS ALONG THE NR3

6.3.5 Built Environment and Heritage

The cultural heritage of the city of Douala is rich and varied given the cosmopolitan nature of its population. The annual celebrations of the Ngondo by the indigenous populations as well as the royal buildings of the chiefs of the different townships are visible signs of this. This heritage is present among the population of immigrant origin through cultural centres.

The Wouri region's thousand-year history makes it an area where archaeological sites are present. During the April 2008 earthworks of the Dibamba Project for the construction of the Yassa Thermal Power Plant, an important archaeological site was uncovered.

A Franco-Cameroonian team led by the Institut de Recherche pour le Développement (IRD), uncovered more than 20,000 pieces of pottery. They have helped to define five in ceramics sprawling traditions over 2,500 years in a region as yet unknown to archaeologists. The chronological framework, which the results make it possible to construct, opens up possibilities for new reflections on the history of cultural interactions in Central Atlantic Africa since the beginning of the ancient Iron Age. Furthermore, the spatial distribution of the archaeological structures suggests the possible appearance of the hamlets at the beginning of the chronological sequence.

It is also noteworthy that whilst undertaking emergency works, six burial sites were identified within the Yassa roundabout. The graves include the parents (Father and Mother) of the Traditional Chief of Yassa District, buried around 2015. The grave sites had to be relocated to preserve their cultural heritage value and enable construction. Although planned in the Magil project, this task was transferred to MINTP as part of the TUCHAN 2020 works (CHAN emergency works). The relocation was undertaken in agreement with the population and their customs and included a traditional ceremony.

In Douala the city's heritage is the subject of an inventory and protection laws. It includes buildings emblematic of the city and its history such as the German Hospital, the Chamber of Commerce or the Palace of the Bell Kings, but apart from a few recently rehabilitated buildings such as the Court House, most of them are in very poor condition and are not the subject of short-term rehabilitation projects. Only 29 buildings are considered "heritage assets" in the studies undertaken and driven by the Communaute Urbaine de Douala (CUD), moreover, these are buildings from the colonial period and, with two exceptions (the Villa Mandessi Bell and the funerary stele of King Bell), they were all commissioned by colonial authorities. The recorded heritage is limited to colonial architecture and public or official buildings erected by the colonial authorities (e.g. none of the commercial buildings built in the 1950s at Akwa is included). None of these buildings are on the roadway and none were built after independence (such as the Besseke railway station).

It is worth noting the presence of the Japoma stadium close to the project route. This stadium will be a venue for sports and cultural events.

6.3.6 Labour Market

In 2010, women were less active than men in Cameroon in the labour market. Out of 100 Cameroonian men, 74 were active while out of 100 Cameroonian women, only 64 were active. The level of activity is higher in rural areas than in urban areas (76% versus 60%) and the gap between men and women is smaller in urban and rural areas. They are also more affected by unemployment than men: for every 1,000 men, 31 are unemployed and for every 1,000 women, 45 are unemployed. Unemployment is a much more urban than a rural phenomenon (8.1% compared to 1.4%) and the gap between men and women is not significant in rural areas.

Women have a higher representation in the informal agricultural sector than men. The proportion of women working in the informal agricultural sector in 2005 and 2010 is around 60%; that of working men working in this sector is around 50%.

The companies surveyed in the RGE employ 386,263 permanent workers, 281,972 of whom are men (73%) and 104,291 women (27%). Depending on the sector of activity, the primary and secondary sectors each employ three times as many men as women; this ratio improves in the tertiary sector, where women represent 30.8% of the permanent workforce. The improved reporting in the last sector could be explained by the ease of access to activities in the tertiary sector.

The economic and industrial activities are representative of the economic fabric of the city of Douala: wholesale activities (in particular drinking establishments), retail trade, craft activities (e.g. fishing, livestock), current service activities (e.g. hotels, service stations, garages, laundries) and construction.

6.3.7 The Health System

The health system in Douala comprises six health districts and fifty-five health areas. Independently of this division, there are also 3 central level hospitals: the Laquintinie Hospital, the Gynaeco-Obstetric Hospital of Douala and the General Hospital. There are 269 health structures in Douala and about 42 pharmacies.

The HIV/AIDS prevalence rate reflects that of the city as a whole which at 6.9% for the 15-49 age group.

According to the data collected in the health facilities, the main pathologies are malaria, typhoid and other water-related diseases. Overcrowding, lack of hygiene, sanitation and poorly maintained sanitation structures allow disease vectors to develop.

As indicated a large proportion of the AOI population obtains its water from wells. This makes the groundwater resource a highly valued component. On the other hand, the recurrence of water-borne diseases in the city testifies to the dubious quality of these waters.

6.3.8 The Education System

Teaching in the city of Douala is divided into two categories: Public and Private. These two categories are divided into four types (or streams) which are: Kindergarten, Primary, Secondary and Superior. In private education denominational institutions (Protestants, Catholics, Islamic) exist.

Public education is essentially secular. Secondary education (public or private), apart from this religious distinction, is divided into options:

- general secondary education;
- technical secondary education;
- general & technical secondary education.

Public basic education in the city of Douala is characterised by the separation of boroughs, between public kindergarten schools on the one hand, and public primary schools on the other. However, in the private sector, kindergarten and primary school are located on the same borough.

There are currently 58 public kindergarten schools, most of which are located in the central districts of the city. The Douala I district has 13 public kindergarten schools, i.e. just under 22%, and the Douala II district has 16, i.e.

just under 28%. The public educational offer in primary schools seems to be geographically better distributed in the city than that of kindergarten schools.

The overall analysis of secondary education in Douala confirms the observation previously made with regard to basic education. The spatial distribution of secondary schools appears to depend on the demographic weight of each borough. The Douala III district, the most densely populated in the city, also has the largest number of secondary schools (47 of the 143 schools surveyed, or 33 per cent of the total number of pupils). In addition, the Douala V district, the second largest in terms of population density, has 37 secondary schools, or 26 per cent of the total. The Douala IV district has 26 of these establishments, i.e. 18% of the total. As a result, the 'peripheral boroughs' have 110 secondary schools out of the 143 spread throughout the city, i.e. just under 77 per cent of the total number of students.

6.3.9 Transportation Networks

The transport sector, as a factor for stability, plays an important role in:

- economic and social development;
- strengthening solidarity;
- the reduction of local disparities and regional openness.

The development of efficient, competitive and complementary transport services with dense networks of links (road, rail, air, sea and river) is a prerequisite for economic growth, harmonious regional planning, the development of ecotourism, the opening up of the country and its strengthening in the world economy.

The medium-term prospects announced by the Ministry in terms of transport infrastructure are among others:

- the implementation of a railway network from Douala to Kousséri, from Limbé to Kribi via Douala, from Kribi to Mbalam via Ebolowa, from Mini-martap to Ngaoundal, from Bélabo to the border of the Central African Republic, from Nkongsamba to Foumbot via Bafoussam;
- the construction and commissioning of a fluid motorway network linking the main economic poles (Douala, Yaoundé and Bafoussam);
- the construction and commissioning of the deep-sea ports of Kribi and Limbé, as well as the international standards of the Douala and Garoua river ports;
- the construction of international airports in the main economic poles (Kribi, Limbe, Bafoussam), as well as the upgrading of Douala, Yaoundé and Garoua airports to international standards;
- the construction and commissioning of functional aerodromes in all regional capitals and towns with more than 200,000 inhabitants;
- the construction and commissioning of more than 3,000 km of asphalted roads;
- the rehabilitation of 55% of the road network (asphalt and earth).

Thanks to its flexibility and accessibility, road transport is the main mode of movement of goods and people, and thus makes a substantial contribution to the fight against poverty. In view of the advanced state of deterioration of the existing roadway, the rehabilitation programme will make it possible to preserve the heavy investments already made.

The Government's medium and long-term strategic orientations are as follows:

- improving the supply of road infrastructure, with emphasis first on the rehabilitation and maintenance of the existing network, and then on its extension and development;
- improving road maintenance operations on both the priority and non-priority networks, as well as the rural road network. This should lead to a significant improvement in the level of service of the road network, ensuring that 100% of the network classified as priority is in good condition, as well as a significant proportion (30%) of the rest of the road network. Road assets protection measures must enable:
  - to ensure load control on 100% of the bitumen network (compared to 30% currently);
  - the respect of traffic conditions in rainy weather and the construction of rain barriers on the dirt road network.

The management of road maintenance in Cameroon is carried out by MINTP, through the Direction de l'Entretien du Patrimoine Routier (DEPR). The country has a road network maintenance strategy which, backed by the Decentralisation Law, should lead to the transfer of budgetary resources (10%) of the Road Fund resources for maintenance to the Decentralised Territorial Communities.

The Cameroonian vehicle fleet has reached one million vehicles according to the UN road safety report "Road Safety Performance Evaluation". According to a 2017 Ministry of Transport assessment, 92% of Cameroon's vehicle fleet is made up of second-hand vehicles.

In the 2020 Finance Law, the Cameroonian government decided to introduce a reduced customs tariff of 5% on imports of vehicles intended for transport by taxis and coaches to promote the improvement of the quality of the Cameroonian vehicle fleet.

The Urban Travel Plan of the City of Douala (December 2009), presents its objectives for:

- improving urban mobility and reducing travel times;
- provide the city with a complete network of structuring roads to cope with urban travel;
- contribute to the fight against poverty by improving access to public transport for people living in outlying areas and by improving local roads;
- to protect the quality of the environment by controlling the traffic and parking of heavy goods vehicles and other polluting modes;
- improve and secure pedestrian pathways;
- to improve the competitiveness of the city by facilitating accessibility to the port and to the industrial zones.

The major road network in Douala= is made up of two key roads:

- Douala – Yaoundé – Ngaoundéré;
- Douala - Bafoussam - Banyo - Ngaoundéré.

Long-distance freight and passenger traffic is approximately equally divided between the two roadways and represents approximately 1,500 heavy goods vehicles / day on each roadways. Passenger traffic on the road network to Yaounde is considered a determining factor for the competitiveness of Douala. Frequent trade between the economic capital and the administrative capital is necessary at all levels of business life. Most public

transport is now provided by coaches. Several lines connect the two capitals, some of which offer a superior service.

On average, the two cities are connected in about 4 to 5 hours and 6 to 7 hours in deteriorated conditions (delays, breakdowns). These times are quite excessive for professional transport compagnies on a journey of about 230 kilometres. The deterioration of the network and especially the traffic conditions in and between the two cities is an issue. The project carried by Magil partly meets this need.

One of the most widely used means of transport in Douala is the motorcycle taxi. Motorcycle taxis serve as a link between the main road and the outlying districts, which are not accessible to taxis due to the poor condition of the roadways. They typically park at the entrance of the neighbourhoods that have little or no connection to the main thoroughfares while waiting for customers. At peak times, they are the fastest means of transport to reach the urban centre from the outskirts. The motorcycle taxi, which offers only one place for the customer, takes two or even three passengers when the traffic is dense.

Taxis remain the most widespread mode of transport because of the practicability of the roadway in relation to the roadways that serve the neighbourhoods. Taxis provide transport mainly along the main roads and rarely enter the neighbourhoods.

Public transport by bus is provided by the Société Camerounaise de Transport Urbain (SOCATUR). There are currently three lines on the east entrance. SOCATUR's vehicle fleet is approximately 70 vehicles. Bus routes do not serve the entire length of the roads under study. The terminus is at Ndogpassi, which makes it difficult to move people living beyond these areas.

Transport by minibus better know as "cargos" plays a significant role in urban passenger transport, although it has remained unregulated for a very long time. Since 2006 minibus transport has been governed by Ministerial Order no. 0182/MINT of February 16, 2006 granting an S1 licence for urban transport by vehicles with more than 11 seats.

The WHO 2009 Global Status Report on Road Safety is the first global assessment of road safety and is based on a survey conducted in 2008 in 178 countries, including the Cameroon. It reaffirms an already known fact: road traffic injuries are a health and development problem everywhere in the world and particularly in low- and middle-income countries where more than 90% of deaths occur. Taking Cameroon as a reference country, the ratio of the number of fatalities to the number of vehicles is extremely high: a vehicle in Cameroon kills on average 123.8 times more than in developed countries. Determined to change these figures, the country volunteered for the evaluation of its performance in this area by the United Nations, through the United Nations Economic Commission for Europe (UNECE) and for Africa (UNECA).

6.3.10 Traffic

Given the nature of the project, understanding current traffic flows and how these might change in the future is critical to the design of the Project. Magil conducted a survey of existing traffic composition and flow across the route. This survey consisted of four monitoring sections, with traffic data collected for one week for each monitored section. MINTP forecasts were then used to estimate predicted traffic levels both with and without

the Project for 2040. Note that these traffic projections assume all phases of the project will be completed (i.e. not just Phase 2). Specifically, the MINTP's study takes into account the construction of the highway that will connect Yaounde to Limbe through Douala. This highway will have a lane that will be connected to the roundabout just before the bridge over the Dibamba River. Part of the traffic that initially used the bridge over the Dibamba would be redirected to the highway. This will reduce the traffic at the bridge, meaning that overall traffic along the route will decrease as a result of the Project.

TABLE 6-8: ESTIMATED TRAFFIC FLOW

Type of Traffic	Current Traffic[1] (AADT)	2040 Traffic Projection[2,3] (w/o Project)	2040 Traffic Projection[2,3] (w/ Project)
Light Duty Vehicles	1179	2794	1335
Heavy Duty Vehicles	575	1362	650
Total Traffic	1754	4156	1985

[1]From four daily monitoring locations: Pk 9+775 to Pk 13+150, Pk 13+150 to Pk 14+450, Pk 14+450 to Pk 16+050, and Pk 16+050 to Pk 18+867. Monitoring over each interval was carried out for 1 week.
[2]Ratio of Heavy Duty to Light Duty Vehicles assumed same as baseline distribution.
[3]MINTP

6.3.11 Affected Population Baseline Survey

In order to generate a more detailed baseline understanding of the potentially impacted population a survey of traders was undertaken. The survey did not include every trader and service provider, but a statistically acceptable sample thereof. The sample size was based on the estimated number of entities in each of the categories. Three typologies were interviewed. These are:

- Traders consisting of those who have a stall from which they operate as well as mobile vendors.
- Mechanics and those providing vehicle repair services.
- Those losing land used for laydown areas or assets that need to be removed (walls/fencing, etc).

The survey, undertaken by APAVE, took place from 4-5 December 2020 (a Friday and Saturday). A total of 185 people responded to the questionnaire. Among the 188 interviews, 3 were done with the landowners. From the start of the project to the entrance to the Gyneco-Obstetrics Hospital in Yassa there were 118 people who responded to the questionnaire. From the Gyneco-Obstetrics Hospital in Yassa to the Japoma roundabout, with a smaller population, 68 people responded to the questionnaire. From the Japoma roundabout to the end of the project (pk18-825) with a very a small population, 2 entities were sampled. Not all survey forms were completely filled in.

- The categories of traders interviewed included the following:
- Sellers of accessories (e.g. telephone, vehicles, weather protection)
- Hairdressers
- Retail goods sellers (e.g. candy, cigarette, cola, kaolin)
- Fresh food vendors

- Transport carriers (e.g. motorcycle taxi, tricycle, intercity transport)
- Hardware stores
- Call-boxers (e.g. transfer of voice credits, money, orange MTN services: sale of chips and renewal of number)
- Sellers of wood/plans
- Brickworks
- Carpenters and upholsterers
- Clothing sellers (e.g. thrift stores and toys, safety shoes)
- Street restaurants (e.g. fish, meat, braised chickens; hot drinks, takeaways, popcorn vendors)
- Maintenance services activities (e.g. cold and air conditioning, garage, sale of oils and greases, gluing and sale of tires)
- Pet food vendors
- Pharmaceutical sellers;
- Other small trades (e.g. facilitator, money exchanges, shoemakers)
- Service station.

The distribution of respondents between the genders was almost even (i.e. 50.5% were female, 49.5% male). Only five of the enterprises interviewed were reported as child owned.

Respondents were asked how many people depended on the stall or enterprise for direct employment. In all 178 responses were recorded. The range was a single person to nine people. Most are enterprises with just a single person (67%) while 23% had two people.

Respondents were asked about the number of years that they have been trading in the general location. Results are set out in the figure below. While almost 30% had been trading for a year or less there was a substantial number of respondents who claimed to be trading for multiple years.

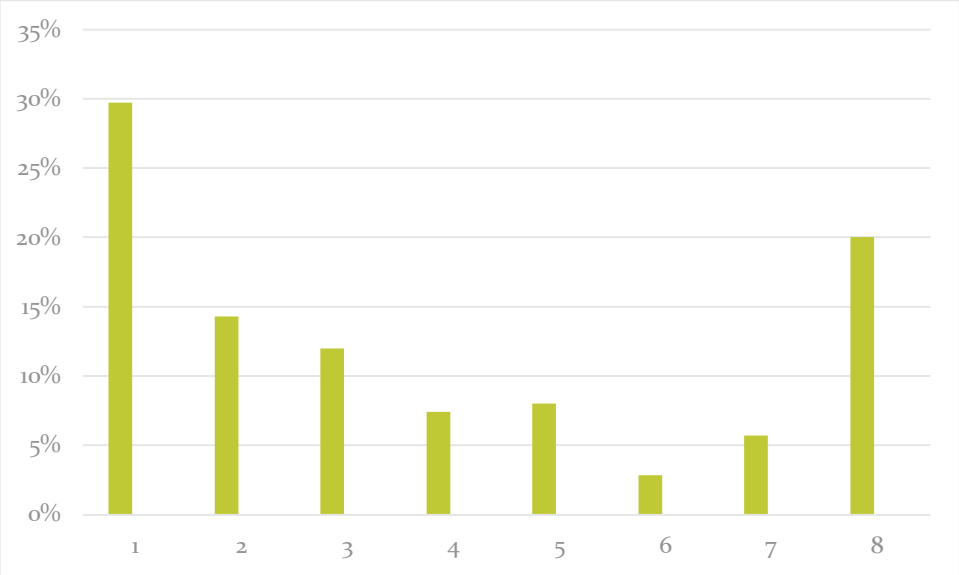


FIGURE 6-8: NUMBER OF YEARS TRADING IN AREA BY PERCENTAGE

Respondents were asked how frequently they were present in the area to trade. The responses are as per the Figure below. Most of the respondents (89%) indicated that they traded every day.

Respondents were also asked how they arrived at their place of trade. Almost half (49%) said that they arrived at their point of trade by using public transport, indicating that many of them are not resident locally. A smaller, albeit significant, percent (43%) said they walked to their place of trade either demonstrating that they are more locally resident or cannot afford the cost of public transport. A follow up question asked about length of time to arrive at their place of trade. Of those who said they walked 34% said the walk was less than 10 minutes, 46%s said it was 10 minutes to 30 minutes while the remaining 20% said it was more than half an hour. A much smaller percentage of those interviewed stated that they used private transport.

The interview asked respondents to indicate their main type of business activity or trade. The results are set out in Table 6.3 below. Sale of food was the most prominent activity (18.1%) followed by operation of a general goods kiosk, provision of mechanical sales (garage and air conditioning, refrigeration) and sale of souvenirs and trinkets.

FIGURE 6-9: FREQUENCY OF TRADE PRESENCE

TABLE 6-9: MAIN ECONOMIC ACTIVITY

Main Activity	%	Number
Accessories	7.1%	13
Boutique	2.7%	5
Brickyard	0.5%	1
Call box	6.6%	12
Hair and aesthetics	2.2%	4
Small General Kiosk	11.5%	21
Mechanic service and Maintenance	11.0%	20
Carpentry	0.5%	1
Handyman	1.6%	3
Restaurant and Food sales	18.1%	33
Tapestry	1.6%	3
Transport Provision	9.3%	17
Sale of animal grains	1.1%	2
Sale of wood planks	6.0%	11
Sale of medicine	1.6%	3
Sale of clothes and apparel	7.1%	13
Sale of souvenirs/crafts	11.0%	20
	100.0%	**182**

The degree to which the enterprise is a key source of household livelihood is a critical item to understand as this is linked to the significance of the impact of changes in ability to trade. Of 181 responds a total of 168 respondents

(92.8%) said that this enterprise was the only source of household income. Respondents were also asked how difficult it would be find a replacement site. As per the figure below the greater majority (86%) stated that they would find it very difficult to find an alternative site.

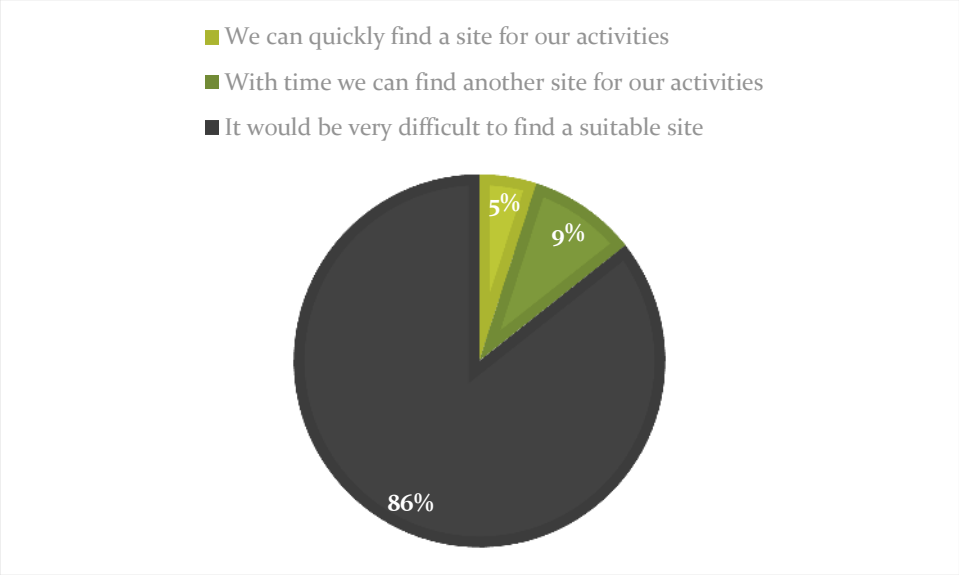


FIGURE 6-10: DIFFICULTY IN FINDING ALTERNATIVE SITE

The main reasons behind setting up the business was also asked of respondents. Popular response were: "It's the only type of business activity I know", "the start-up costs were low", "it's the only thing I can afford to do". Of interest was that most people who responded to the question as to what the main challenges in terms of starting the business were pointed to the lack of capital as the key issues, followed by competition for customers.

Most respondents said that they financed the start-up and operation of their business through their own savings (60.0%). Some said they took credit from their families (27.2%) or friends or lenders (9.8%) or savings clubs (12.6%). About 3.6% said they received family help.

The survey examined the type of structure that makes up the enterprises. Most are on tables with umbrellas as a roof. These can be moved to be more visible and have more customers. Some of the trading enterprises are in rickshaws and containers.

There was an attempt to ascertain the income and profit margin of enterprises, but this was not particularly successful. The majority of respondents had difficulty estimating the revenues and expenditures made over the past 30 days. This is because most keep no records and operate with credit. The use spare income to deal with cash and family demands as they arise. It is evident that most of the enterprises are extremely marginal and hence vulnerable entities.

Of the 146 companies that answered the question as to whether they have a trading or other license, only 3.4% indicated that they had any accreditation.

A series of additional general baseline questions were asked. These related largely to health and food security. In terms of health issues malaria was regarded as the most prevalent issue and 71.4% of respondents who

indicated that the household had been subject to a health issue in the last 12 months stated that this was a primary issue. Typhoid as well as respiratory problems were also mentioned as key health issues.

Respondents were asked if any member of the household went to bed without a meal on the previous night. Of those that responded 39.3% said that at least one member of the household had bene to bed hungry the previous evening. More generally 79.1% of the respondents said that their household had suffered a food shortage in the previous year. Among those that had suffered a shortage the month of May was most likely to be the time in which this occurred (73.3%) followed by June (67.9%) and then April (64.9%). It is likely that these months coincide with the agricultural season where access to harvest is limited and food prices increase.

7 STAKEHOLDER ENGAGEMENT

Presents and describes the stakeholder identification and consultation process undertaken during the history of the NR3 upgrade project and ESIA.

7.1 OVERVIEW

Stakeholders are persons or groups who are directly or indirectly affected by a project, as well as those who may have interests in a project and/or the ability to influence its outcome, either positively or negatively. Stakeholders may include locally affected communities or individuals and their formal and informal representatives, national or local government authorities, politicians, religious leaders, civil society organizations and groups with special interests, the academic community, or other businesses.

Stakeholder engagement for the *Eastern Entrance to Douala* has been an ongoing process which was either undertaken for the extent of the NR3 or portions thereof. A summary of these engagements included:

TABLE 7-1: SUMMARY OF STAKEHOLDER ENGAGEMENTS PROCESSES

Year	Process
1984	Ministry of Public Works formal declaration of the NR3-right of-way from Douala – Edea – Yaounde. The Declaration defined the ROW as being a 150 m.
2011	Development of the Plan d'Indemnisation et de Réinstallation (PIR) (Compensation and Resettlement Plan). This was drawn up at the request of financiers by MINTP, to serve as a reference framework for managing the expropriations necessary to acquire the rights-of-way requested as a result of settlement of the populations within the right-of-way of the necessary works
2011	Compensation payment made over to those identified in the PIR
2011-2013	EIA undertaken for the NR3 alignment (Certificat de Conformite Environnementale # 00077)
2019 - 2020	ESIA undertaken by APAVE for Phase 2 of the Eastern Entrance to Douala
2020 - 21 (current)	ESIA undertaken by SLR for Phase 2 of the Eastern Entrance to Douala – see below
2021 (Scheduled for Q1)	Revised ESIA (SLR) Disclosure The final stage of engagement will support the public release of the ESIA report for public review and comment. The engagement will be supported by a Background Information Document that provides detail on the Project and key provisions of the ESIA report. The document will be made available to the public and an executive summary in the local language will be developed. The grievance process will be made known.
Project Implementation	Continual engagement between the Project / Responsible Relations and stakeholders, directly related to operational aspects Ongoing information dissemination and consultation with Project stakeholders during ESMP implementation and management of the Grievance Process.

7.2 DETAILS OF THE CURRENT STAKEHOLDER ENGAGEMENT PROCESS

In addition to previous engagements with stakeholders by APAVE in 2019, the Contractor hosted two (No.2) meetings/ workshops with the upper local governmental administration and traditional authority leaders. Those in attendance are detailed in Table 7-2 and notes of the meetings included in Appendix 2.

TABLE 7-2: ATTENDEES AT STAKEHOLDER ENGAGEMENT MEETINGS

Meeting on 21 August 2020	Meeting on 9 December 2020
Deputy Prefect of Douala 3rd	Sub-prefect of Doula 3rd representative
Delegate of MINEPDED	Mayor of Douala Second Deputy
Delegate of MINTP	Chief of the Civil Protection Unit CAD3
MAGIL representatives	3rd degree Yassa Chief
Head of the 3rd degree of Ngodi Bakoko	3rd degree Bwang Bakoko Chief
Head of the 3rd degree of Yassa	MAGIL Director of Works and 3 other MAGIL delegates
Head of the 3rd degree of Japoma	Public Work Ministry delegate
Head of the 3rd degree of Bwang Bakoko	APAVE consultant
Head of the 3rd degree of Missole 1	

The processes undertaken by APAVE and SLR identified several concerns including (See Table 7-3):

TABLE 7-3: OUTCOME OF THE VARIOUS STAKEHOLDER CONSULTATIONS

Concerns	Response
Is there to be any form of compensation for residents relocated from their current dwelling and businesses adversely affected by construction.	The project does not require construction outside of the Right of Way declared in Decree no. 84/048 of 24 February 1984. As such there is no land take of privately owned property for Upgrading of the Eastern Entrance to Douala. Furthermore, the design of the road layout was completed with due consideration for infrastructure on adjacent property, such that no infrastructure will be compromised. The conversion of currently open land adjacent to the road into roadway will eliminate areas used by informal traders and service providers. This may affect their livelihoods. Refer to the impact assessment in Section 8.7.1
Road safety during construction and the provision of emergency services in the event of an accident involving a road user.	Aspects associated with road safety are discussed in Sections 8.7.10 and 8.6.2.3
Will the introduction of road deviations have any adverse social or environmental impacts?	The deviation of the road alignment has been included as a project component with the intention of alleviating traffic congestion and maintaining through flow during construction (See Section 2.4.11). The deviations are a mitigation to the traffic disruption/congestion resulting from the construction (see Section 8.6.1.2). The deviation of light motor vehicle traffic from the NR3 onto local roads will increase traffic on those routes and could result in noise, dust and economic effects for the duration of the deviation – refer to sections 8.5.1.1, 8.6.1.1 and 8.7.1.2.
Details of the construction scheduling (start and duration)	The project schedule is provided in Section 2.3
Management of waste, particularly historical waste and sludge recovered during excavation and earthworks.	Section 8.7 assesses the environmental and social risks associated with wastes generated by the project.
Labour recruitment and the procurement of goods and services	Employment and the procurements of skills and supplies are evaluated in Sections 8.6.1.6, 8.6.1.8 and 8.6.2.4.

should target local employees (including youth) and suppliers.	
The management of stormwater and increase in flood risks (particularly relating to the Dibamba River).	The increase in road pavement will increase the volume and rate at which stormwater is discharged from the construction site to receiving environment. These risks are assessed in Section 8.3.1.1 and 8.3.2.1.
Upskilling of locals so that they can participate in the project development	The project targets the use of local labour via several subcontractors who will be responsible for the construction works. Section 8.6.1.6 recommends the establishment and operation of a labour desk which would be responsible for the procurement of local labour. Where a skills shortage is identified, the subcontractor will evaluate the potential for upskilling local suppliers.
Displaced traders should be provided with alternative facilities once the project advances to the operational phase	Impacts on traders displaced because of the proposed project are discussed and assessed in Section 8.6.1.1.
Contamination resulting from construction chemical spillages	The environmental and social risks associated with the spillage of construction chemicals are assessed in Section 8.3.1.3.
The access to lawful water supply during construction.	Details of the proposed water sources to be used during construction is provided in Section 2.6.11.
Where possible, the project is requested to provide corporate social investment/ social beneficiation into the surrounding communities, ideally through the provision of schools and health care facilities or medical supplies to existing clinics.	Whilst Magil has no formal plans around corporate social investment, some budget has been set aside to respond to any ad hoc requests received from the community during construction activities. The types of requests that Magil anticipates supporting would be related to construction materials and activities (e.g. provision of materials or additional paving to surrounding homes and businesses).
Transmission of Sexually Transmitted Diseases/ Infections (STD/STI) and communicable diseases and an increase in sex workers, particularly among the youth.	The risks associated with the transmission of STD/STI, communicable diseases (most notably COVID-19), along with the increase in sex trade, are considered and assessed in Section 8.6.1.5.
A means to communicate with the Department and the Contractor should be established so that concerns and recommendations can be recorded and addressed.	Members of the society will be afforded several means of engaging with the Department including a Grievance Mechanism, the scope of which is set out in the Stakeholder Engagement Plan (See Appendix 3)
The supply of additional utilities such as electricity, water and health centres.	Details of how the project will help ensure continuity of services is provided in Section 8.6.1.3.
Communication of project details and progress during construction.	The Stakeholder Engagement Plan (Appendix 3) outlines the mechanisms to be adopted during construction to facilitate the dissemination of information.

7.3 STAKEHOLDERS IDENTIFIED FOR FUTURE ENGAGEMENT

The stakeholders that will be considered and engaged during the implementation of the project are detailed in Table 7-4. The primary responsibility for engagement will be with the designated officer with Magil.

TABLE 7-4: STAKEHOLDERSTO BE ENGAGED

Stakeholder/group	Objective of engagement	Engagement Methods/ Communication Channels
The Ministry of the Environment, Nature Protection and Sustainable Development (MINEPDED), Douala	Seek to create assurance that the Project will comply with and exceed contractual and legal compliance standards, following Cameroon legal and International best practice Obtain and maintain formal licence to operate Maintain a positive and ongoing relationship	• Face to face meetings • Focus groups with environmental and social specialists and regulatory institutions around specific issues • Project specific Information Sessions
Ministry of Public Works (MINTP)	Receive updates on the construction and provisions of the ESMP	• Face to face meetings • Telephonic meetings
Power Distribution Services-Douala	Consultation prior to any power disruption activity	• Face to face meeting • Formal letter / written notification
Douala Water Services	Consultation prior to any water diversion activity	• Face to face meeting • Formal letter / written notification
Hysacam (hygiene and sanitation company)	Consultation prior to any activity that may have a service delivery impact	• Face to face meeting
Douala Town Planning	Maintain a positive and ongoing relationship	• Face to face meeting • Formal letter / written notification
Public Services, including Hospital, Schools and Sports Stadium	Maintain a positive and ongoing relationship	• Face to face meeting • Formal letter / written notification
Douala Road Traffic Authorities	Consultation prior to any road disruption or diversion activity	• Face to face meeting • Formal letter / written notification
Office of the Mayor – Douala Municipality Sub prefecture - Douala *[Additional stakeholders to be added as required]*	Obtain and maintain formal licence to operate Maintain a positive and ongoing relationship Important communication channel and 'voice piece' for disseminating information about the Project (progress, schedule, activities, health and safety) to the wider community	• Focus group meetings • Media releases and media liaison activities • Participatory workshops

Bwang Bakoko Traditional Council and Administration; Yassa Traditional Council and Administration; Ngodi Bakoko Traditional Council and Administration; Japoma Traditional Council and Administration;	Build a trustful relationship, manage expectations and seek to ensure a sound understanding of various project processes Important communication channel and 'voice piece' for disseminating information about the Project (progress, schedule, activities, health and safety) to the wider community	• Face to face meetings • Focus groups • Notices • Communication boards • Grievance procedures • Pamphlets with project information • Special workshops or events with the community such as sport events • Project site visits for members/leaders of communities
Civil Society - CAM-ECO (Cameroon Ecology A.D.E.C (Association of Children of Charity); Civil Society- ACEH (Association for Cooperation and Assistance between Men "Action for the Development of Families"); Civil Society- ACTION FOR ALL (Action for All in Cameroon); Civil Society- A.D.E.C (Association of Children of Charity; Civil Society -ACEH (Association for Cooperation and Mutual Aid between Men "Action for the Development of Poor Families"):	Obtain and maintain social licence to operate and build and maintain trustful relationships	• Focus group meetings • Media releases and media liaison activities • Participatory workshops
International NGOs – The World Natural Union (IUCN); The Global Witness; The International Centre for the Promotion of Creation (CPIC); The African Institute for Economic and Social Development	Obtain and maintain social licence to operate and build and maintain trustful relationships	• Focus group meetings • Media releases and media liaison activities • Participatory workshops
Mobile Network Companies	Ensure a sound understanding various project activities that have the potential to impact on mobile network infrastructure	• Telephonic engagements • Email correspondence
Formal business interests in project area of influence	Obtain and maintain social licence to operate and build and maintain trustful relationships	• Focus group meetings • Media releases and media liaison activities • Participatory workshops
Local Traders	Obtain and maintain social licence to operate and build and maintain trustful relationships	• Focus group meetings • Media releases and media liaison activities • Participatory workshops

Newspapers	Seek to obtain and maintain social licence to operate Build and maintain a trustful relationship Seek to ensure that the public develops a sound understanding of the various processes relevant to the Project (engagement activities, construction, etc) Broadcast key messages about project activities	Media releases and media liaison activities (e.g. press events, photo opportunities)
Radio		
Television		
Persons temporarily or permanently displaced (economically and/or physically)	Ensure a sound understanding of resettlement and/or compensation processes Create awareness around formal processes through which stakeholders can contact Magil to prevent individuals from controlling or influencing the engagement process at the local level	• Face to face meetings • Focus groups • Notices • Communication boards • Grievance procedures • Pamphlets with project information • Special workshops or events with the community such as sport events • Project site visits for members/leaders of communities
Local businesses.	Ensure a sound understanding of various project processes (engagement activities, construction activities) Create awareness around formal processes through which stakeholders can contact the Project to prevent individuals from controlling or influencing the engagement process at the local level	• Face to face meetings • Focus groups • Notices • Communication boards • Grievance procedures • Pamphlets with project information
Roadside Artisans		
Road users - pedestrians		
Road users - drivers		
Employees	Understand needs around capacity building and where Magil may be able to assist. Build a trustful relationship and manage expectations in relation to training, employment opportunities, social and economic benefits etc	• Face to face meetings • Grievance procedures
Labour/Workers' union		
Contractors		

8 IMPACT ASSESSMENT

The chapter details the identification and evaluation of environmental and social risks and impacts of the project.

8.1 SCOPE OF ASSESSMENT

8.1.1 Scoping Exercise

After reviewing baseline conditions and the proposed project activities, the ESIA Team conducted a scoping exercise to determine the environmental and social impacts that could be considered potentially significant and thus required detailed assessment as part of the impact assessment.

To help visualise this, an activity and aspects matrix was used to summarise the potentially significant impacts on receptors during the construction and operations phase. This matrix is presented in Table 8-1A-B. This scoping exercise identified both positive and negative impacts.

8.1.2 Technical Scope

Based on the scoping exercise, this impact assessment will assess the impacts within the following technical disciplines:

- soil, surface, and groundwater quality (construction and operations)
- Air quality (construction only)
- Noise and vibrations (construction and operations)
- Social (construction and operations)
- Waste (construction and operations)

The technical scope of the ESIA is limited to those areas where the project has the potential to significant affect the receiving environment. This does not include any assessment of how changes to the environment may affect the project (i.e. from climate change). A separate Climate Change Risk Assessment was conducted to evaluate these potential effects. This report is included in Appendix 1. Mitigation recommended by the Climate Change Risk Assessment in incorporated into the ESMP.

TABLE 8-1A: ACTIVITY AND ASPECT MATRIX (CONSTRUCTION)

Phase	Activity	Physical						Biological					Social											Priority ecosystem Services				Any expected cumulative effects with other projects?
		Soil Quality (contamination)	Groundwater Quality	Surface Water quality	Noise and vibration	Air Quality	Climate	Flora	Fauna	Terrestrial habitat	Aquatic biodiversity	Protected Sites	Local communities	Greater Douala	Water availability	Natural resource availability (excluding water)	Workforce	Waste Infrastructure	Transportation Infrastructure	Other municipal services (e.g. power, telecoms.)	Livelihoods	Tangible Cultural Heritage	Intangible Cultural Heritage	Provisioning	Regulating	Supporting	Cultural	
Construction	Physical presence												■								■							No
	Land take												■								■	■						No
	Road construction (including construction of overpasses and underpasses)			■	■	■							■						■	■	■							No
	Relocation of municipal services (i.e. water, power, telecoms)														■					■								No
	Water consumption														■													No
	Use of existing quarries and borrow pits																											No
	On-site concrete batching (if used)				■	■																						No
	Project traffic				■	■							■															No
	Presence/employment of workforce												■				■				■							No
	Onsite power generation				■	■																						No
	Waste generated	■	■	■									■					■										No
	Traffic diversion				■								■															No
	Spills/leaks of hazardous materials	■	■	■											■													No
	Discovery of in-situ contaminated land	■	■	■		■																						No
	Traffic accidents												■															No

Note: For physical receptors where secondary biological and or social receptors are present, the impact will be assessed in the physical topic area only.

Key:
- = Scoped out
- = Scoped in, adverse impact
- =Scoped in, positive impact

text in italics is from unplanned activities

TABLE 8-1B: ACTIVITY AND ASPECT MATRIX (OPERATIONS)

		Physical						Biological					Social											Priority ecosystem Services				
Phase	Activity	Soil Quality (contamination)	Groundwater Quality	Surface Water quality	Noise and vibration	Air Quality	Climate	Flora	Fauna	Terrestrial habitat	Aquatic biodiversity	Protected Sites	Local communities	Greater Douala	Water availability	Natural resource availability (excluding water)	Workforce	Waste Infrastructure	Infrastructure	Other municipal services (e.g. power, telecoms.)	Livelihoods	Tangible Cultural Heritage	Intangible Cultural Heritage	Provisioning	Regulating	Supporting	Cultural	Any expected cumulative effects with other projects?
Operations	Physical presence																											No
	Project traffic (road maintenance)																											No
	Waste generated (road maintenance)																											No
	Presence/employment of workforce (road maintenance)																											No
	Spills/leaks of hazardous materials (road maintenance)																											No
	Traffic accidents (road maintenance)																											No

Note: For physical receptors where secondary biological and or social receptors are present, the impact will be assessed in the physical topic area only.

Key:
= Scoped out
= Scoped in, adverse impact
=Scoped in, positive impact

text in italics is from unplanned activities

8.1.3 Temporal Scope

This assessment considers potential impacts during construction (which also includes the emergency works activities already completed or underway) and the operational phase of the road.

The scale and intensity of the project's adverse impacts are highest during construction, with only limited significant impacts predicted to occur during the operations phase.

Potential impacts from any future decommissioning or upgrades of the road have not been considered as details of any such activities are not known at this time and would therefore require a separate impact assessment at that time.

The project schedule is provided in Section 2.3.

8.1.4 Physical Scope / Area of Influence (AOI)

The project's AOI includes all of the core components indicated in Section 2.4, which are located within the roadway footprint from PK 9+925 to PK 18+825.

The width of the roadway footprint varies between 35 and 71 m (refer to Section 2.4.2). Additional components, located primarily within or immediately adjacent to the ROW, include the site office (PK 16+320), material storage areas, parking areas for machinery and vehicles, fuel tanks, areas for concrete mixing plants, and waste disposal areas. These add to the extent of the project's AOI. A further addition to the project's AOI is the extent of the city roads to be used for traffic deviations during construction. These are detailed in Section 2.4.11.

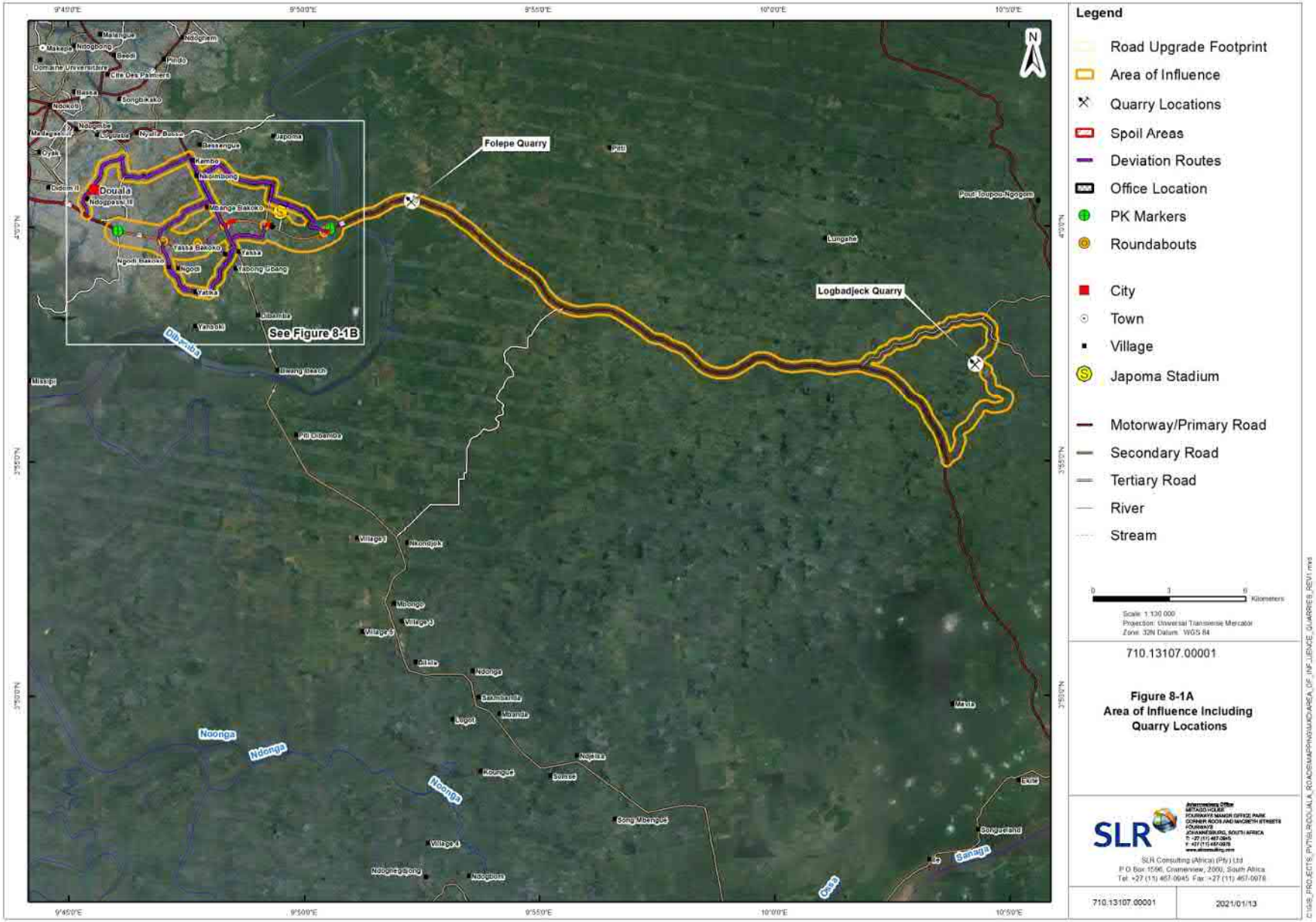
Receptors along the traffic diversions used will also be exposed to changes in traffic and emissions, so are also included in the project's AOI.

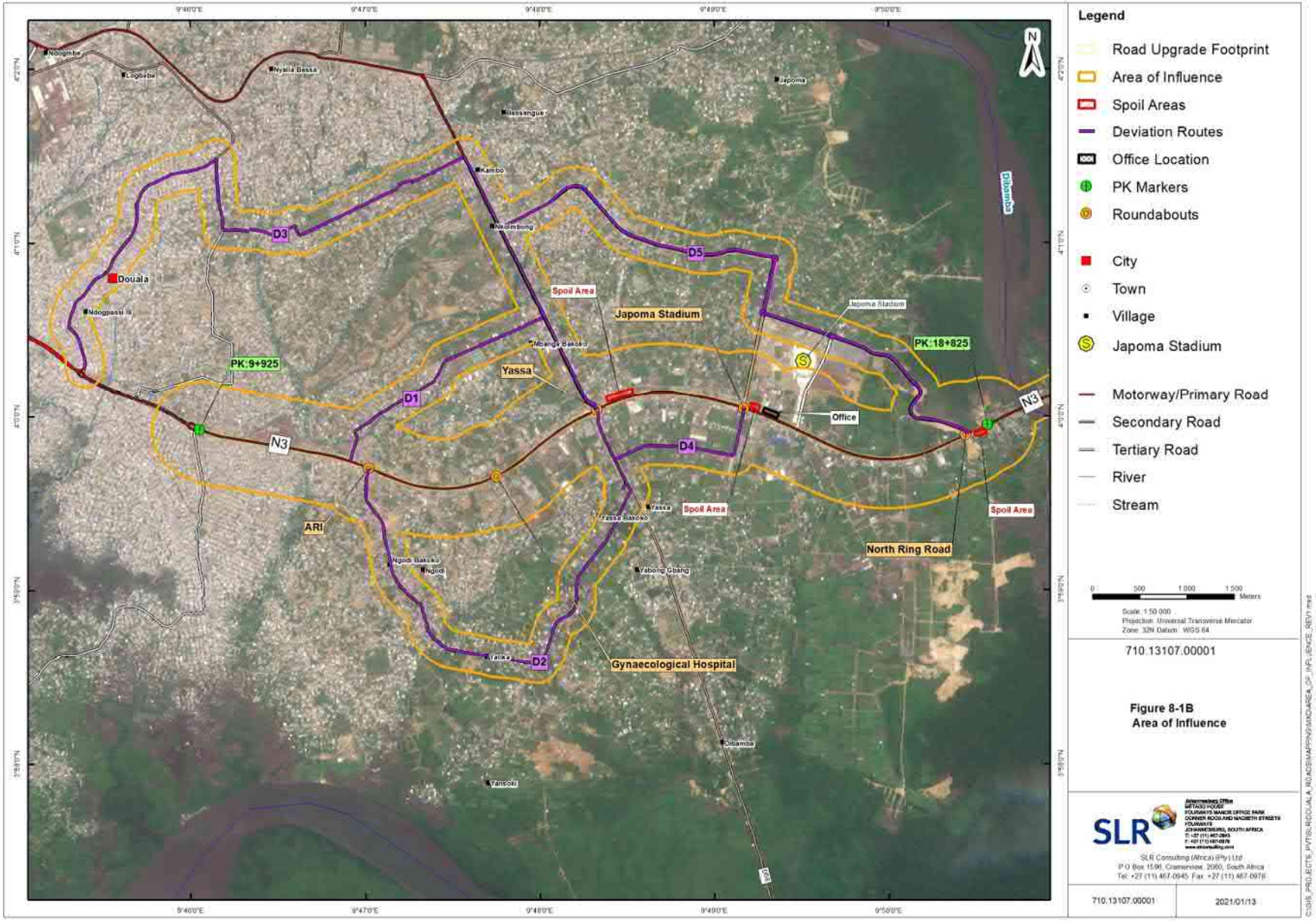
The transport of project materials on public roads from the sand and aggregate quarries has the potential to impact receptors along the route. The roads comprising the primary transport route are thus also included in the project's AOI.

Additional consideration in the definition of the project's AOI is the potential for project emissions which may affect receptors at a distance from the roadway footprint. Different types of emissions can be anticipated to travel different distances before reducing to levels where they are no longer likely to have an effect on receptors. In this regard specific distances of potential effect have been considered for a variety of potential emissions: noise (500 m), dust (350 m), other air pollutants (200 m), and surface water (500 m). The project's AOI is depicted in Figure 8-1A and 8-1B.

Whilst many social impacts will be quite localised to the immediate vicinity of the road, community receptors are considered holistically and therefore the AOI for social impacts includes all of Douala and the wider region.

The project does not include any components that could be considered as "associated components" nor is there a "primary supply chain" as the project' operations do not require goods or material inputs from third parties on an ongoing basis.


Legend
Road Upgrade Footprint
Area of Influence
Quarry Locations
Spoil Areas
Deviation Routes
Office Location
PK Markers
Roundabouts
City
Town
Village
Japoma Stadium
Motorway/Primary Road
Secondary Road
Tertiary Road
River
Stream
Folepe Quarry
Logbadjeck Quarry
See Figure 8-1B
Douala
Japoma
Yassa
Noonga
Ndonga
Dibamba
Sanaga
710.13107.00001
Figure 8-1A
Area of Influence Including
Quarry Locations
SLR
2021/01/13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Road Upgrade Footprint
Area of Influence
Spoil Areas
Deviation Routes
Office Location
PK Markers
Roundabouts
City
Town
Village
Japoma Stadium
Motorway/Primary Road
Secondary Road
Tertiary Road
River
Stream
Douala
Japoma Stadium
Spoil Area
PK:9+925
PK:18+825
Yassa
Office
North Ring Road
Gynaecological Hospital
ARI
D1
D2
D3
D4
D5
N3
710.13107.00001
Figure 8-1B
Area of Influence
SLR
2021/01/13

8.2 EMERGENCY WORKS

As detailed in Section 2.5, a number of activities have already been undertaken or are in progress to support the project. Although the activities form part of the overall "Upgrading of the Eastern Entrance to Douala" project, they were implemented in terms of an 'emergency works' sub-contract. The activities were undertaken in terms of an Environmental Management Plan developed by Magil.

There is limited information available to SLR on environmental performance during implementation of the emergency works, as there is no documented baseline prior to the works and no record of monitoring of environmental aspects during or after implementation. Thus, SLR is not able to directly confirm application of mitigation or to assess if significant impacts occurred.

For the purposes of this ESIA, the significance of impacts during emergency works have been estimated by assuming the pre-mitigation significance ratings in the construction sections related to similar construction activities.

Should significant impacts have occurred during the emergency works' sub-contract the impact significance is likely to be as per the unmitigated scenario described in Construction section of each of the assessed impacts that follows in the next sections. A summary of the likely impacts and their potential significance, in the case where environmental performance was less than adequate, is presented in Table 8-2.

As these activities have already been completed or are underway, the construction phase mitigation measures provided in this ESIA cannot be applied retroactively to these activities. However, emergency works have been carried out under Magil's existing Environmental Management Plan, MAGIL – HSE – PLN – 003, Version 00. Table 8-3 lists the mitigation measures in this plan that would help mitigate the predicted impacts during emergency works and the expected residual significance if these measures were effectively implemented.

TABLE 8-2: LIKELY ADVERSE IMPACTS DURING EMERGENCY WORKS

Topic	Summarised Impact Description	Intensity	Duration	Extent	Significance (Pre-Mitigation)
Soil, Surface Water, and Groundwater Quality	**Erosion and sedimentation from road construction activities** As the emergency works included earthwork activities with unconsolidated soil and other fine materials (e.g. sand), these would have been vulnerable to erosion. Douala experiences frequent and high volume rainfall, including periods of high intensity rainfall, which contribute to the risk of erosion. The resultant transport of material in run-off water results in downstream sedimentation. The primary receptor in this regard is aquatic biodiversity, which is not highly sensitive. See Section 8.3.1.1.	**Medium**	**Medium**	**Local**	**Minor**
	Spills or leaks resulting in contamination of soil, groundwater, or surface water (unplanned) Whilst emergency works activities does not include the storage of any large amounts of hazardous chemicals, there is the potential for small scale spills or leaks associated with the use of heavy equipment and machinery. Because the chemical usage and storage is of a smaller scale than during the rest of construction, the intensity has been downgraded. See Section 8.3.1.3.	**Low**	**Medium**	**Local**	**Negligible**
	Mobilisation of pollutants from contaminated land encountered during earthworks (unplanned) Through site inspections undertaken by Magil and APAVE and during emergency works, waste materials have been encountered in-situ within the road construction footprint. These materials have included municipal solid wastes, sewage, and oils and greases. These improperly	**Strong**	**Medium**	**Local**	**Medium**

	disposed materials may be hazardous or contain hazardous elements which pose a risk to soil, surface, and groundwater. See Section 8.3.1.4.				
Air Quality	**Impacts associated with dust emissions** Earthworks during emergency works produces dust. Dust emissions can generate a nuisance to people in the immediate vicinity of these dust sources, but they can also result in human health impacts. See Section 8.4.1.1.	**High**	**Short**	**Local**	**Medium**
	Impacts associated with combustion emissions Project traffic and the operation of diesel and petrol-fired equipment contribute to the poor air quality in the area. The intensity of this impact during emergency works has been downgraded when compared to construction due to the smaller fleet size and reduced equipment usage. See Section 8.4.1.2.	**Low**	**Short**	**Local**	**Negligible**
	Mobilisation of VOCs from soil contamination Through site inspections undertaken by Magil and APAVE and during emergency works, waste materials have been encountered in-situ within the road construction footprint. Some of these wastes may include organic compounds that can be volatilised and pose a risk to human health from inhalation. See Section 8.4.1.3.	**Low**	**Short**	**Punctual**	**Negligible**
Noise and Vibration	**Human health impacts associated with increased noise levels from construction activities** Construction will result in noise and vibration impacts for local residents and businesses adjacent to the ROW. Elevated noise levels, particularly in times of expected comparative quiet such as night-time and weekends can be a source of stress and irritation, as well as adversely affecting human health. See Section 8.5.1.1.	**Strong (day-time)** **High (night-time)**	**Medium**	**Local**	**Medium**

Social	**Temporary disruptions to travel times and economic efficiency and increased travel safety risk** Some emergency work activities have the potential to have negative effects on economic activities related to the extension of travel time, due to traffic congestion, the implementation of temporary diversions, the closure of particular access points, and increase in construction traffic. The intensity of this impact during emergency works has been downgraded when compared to construction due o the relative scale of activity. See Section 8.6.1.2.	**Strong**	**Medium**	**Local**	**Medium**
	Temporary disruptions to municipal services Earthworks activities can potentially disrupt municipal services including waste collection, electricity, telecommunications and water supply. See Section 8.6.1.3.	**Strong**	**Short**	**Local**	**Minor**
	Work force presence and project related health impacts on immediate community The arrival of employees from diverse backgrounds in the project area is likely to increase the prevalence rate of sexually transmitted infections (STIs) and HIV/AIDS. The reduced size of the workforce during emergency works means that the intensity is downgraded compared to general construction. See Section 8.6.1.5.	**Strong**	**Medium**	**Local**	**Medium**
	Infringement on workers' human rights (unplanned) Safe working conditions and fair labour conditions are considered basic human rights. If a project does not put in place suitable measures to protect these rights for all of their workforce, including subcontractors, it is possible that these rights may be infringed upon. See Section 8.6.1.7.	**High**	**Medium**	**Punctual**	**Medium**
	Risk of project vehicle traffic accident (unplanned)	**Strong**	**Medium**	**Local**	**Medium**

	The operation of project vehicles, especially slow-moving equipment or vehicles, results in an inherent risk of traffic accidents. Such accidents can cause damage or loss of the vehicle and goods, damages to public and private property, traffic congestion and travel delays, as well as loss of life in the worst case. Because the number of project vehicles is less in emergency works than in construction, the intensity has been downgraded for emergency works. See Section 8.6.1.10.				
	Destruction of chance finds tangible cultural heritage (unplanned) Buried cultural heritage was encountered during emergency works. If not correctly identified, managed, and relocated such interactions could result in damage and/or destruction of significant tangible cultural heritage. See Section 8.6.1.12.	**Medium**	**Long**	**Regional**	**Medium**
Waste	**Project generated waste affecting local environment or community receptors** During road construction the activities, mechanised fleet and personnel will generate a variety of wastes. These wastes have the potential to contribute to adverse environmental and social effects if not correctly managed. Because less waste is generated during the emergency works that from general construction, the intensity has been downgraded. See Section 8.7.1.1.	**Medium**	**Medium**	**Local**	**Minor**

TABLE 8-3: EMERGENCY WORKS MITIGATION AND RESIDUAL IMPACT

Topic	Summarised Impact Description	Significance (Pre-Mitigation)	Significance (Post-Mitigation)	Mitigation from Existing Environmental Management Plan
Soil, Surface Water, and Groundwater Quality	Erosion and sedimentation from road construction activities	**Minor**	**Minor**	N/A
	Spills or leaks resulting in contamination of soil, groundwater, or surface water (unplanned)	**Negligible**	**Negligible**	Hold training to all employees to ensure awareness of the importance of soil quality in the area and how uncontrolled refuelling and maintenance can affect it Adhere to procedures on mitigation measures for fuel and oil storage and handling and spill prevention control measures. Hazardous materials including fuel must be stored away from waterways Spill kit for emergency must be supplied where all hazardous materials are stored Hazardous materials storage procedure stated in this plan must be followed Option to use less hazardous materials shall be considered prior to ordering such materials Spill response plan must be communicated to concern personnel and training to respond emergency must be conducted A secondary containment is required to all machineries and equipment that has the potential to spill.
	Mobilisation of pollutants from contaminated land encountered during	**Medium**	**Medium**	N/A

	earthworks (unplanned)			
Air Quality	Impacts associated with dust emissions	**Medium**	**Medium**	During transporting fry earth materials, cover the truck loads to avoid/reduce emissions of dust during transport For stockpiles, there should be a cover during dry season especially when there's high wind If during excavation, the materials are creating thick dust, spraying the area with water is mandatory, enough to dampen the materials and control dust emission Implement speed limit for driving in an unpaved road particularly diversions or local roads in the projects
	Impacts associated with combustion emissions	**Negligible**	**Negligible**	Reduce equipment usage where possible Policy on switching of vehicle and equipment when not in use must be implemented Ensure vehicle and equipment are properly serviced and maintained Where possible, use electric driven machineries and equipment over petrol or diesel Reduce traffic routes of trucks where possible
	Mobilisation of VOCs from soil contamination	**Negligible**	**Negligible**	
Noise and Vibration	Human health impacts associated with increased noise levels from construction activities	**Medium**	**Minor**	Keep equipment on the construction lot as far away from sensitive receptors Construct walled enclosures around especially for noisy activities or noisy machineries such as generators Avoid night time activities. Sensitivities to noise increases during night time particularly in residential areas

				use mufflers to bring down noise level to acceptable level to noisy equipment and machineries conduct regular inspections and maintenance of construction vehicles and equipment to maintain smooth running engines. Installation of noise barrier when used near residential areas, schools or business areas. Equipment lay-out location should be far from any sensitive receptors such as residential areas, schools or businesses.
Social	Temporary disruptions to travel times and economic efficiency and increased travel safety risk	**Medium**	**Medium**	N/A
	Temporary disruptions to municipal services	**Minor**	**Minor**	N/A
	Work force presence and project related health impacts on immediate community	**Medium**	**Medium**	N/A
	Infringement on workers' human rights (unplanned)	**Medium**	**Medium**	N/A
	Risk of project vehicle traffic accident (unplanned)	**Medium**	**Medium**	N/A
	Destruction of chance finds	**Medium**	**Medium**	N/A

	tangible cultural heritage (unplanned)			
Waste	Project generated waste affecting local environment or community receptors	**Minor**	**Negligible**	Store construction site materials in a safe manner to preserve the quality and in turn minimize waste Magil Construction, through the HSE department, will establish a system of segregation for the recycling of construction waste and other waste on site. Ensure only authorized and licensed waste collection company are allowed to collect and dispose hazardous and non-hazardous waste on site as per regulation set by the Republic of Cameroon Implementation of waste management on site including the following: • fire prevention systems and pollution control equipment will be provided for storage facilities provided for storage facilities where necessary to prevent fires or releases of hazardous materials to the environment. • provision of containers intended for storage of hazardous waste for disposal only. • different types of hazardous waste will be stored separately to avoid adverse chemical reactions and facilitate eventual treatment • used oil or fuel filters will be drained of the residual liquids by placing them on a mesh rack in a drum. • unused liquid paint cannot be disposed with the general waste. • Only completely dried up paints residue can be disposed together with the general waste • used batteries must be stored in a concrete surface, metal or plastic tray. This is due to acid content. • waste generated from the offices, canteens and welfare facilities shall be removed from the site on daily basis. • No waste shall be burnt on site

8.3 SOIL, SURFACE, AND GROUNDWATER QUALITY

8.3.1 Construction Phase

8.3.1.1 Erosion and sedimentation from road construction activities

Impact Description

Road construction requires the disturbance of ground within the road footprint; the importation of large quantities of aggregate; and the storage, handling and placement of these materials along the full extent of the construction footprint. As indicated in Table 2-1, these earthworks will occur for the majority of the construction phase, although these activities will be phased along the extent of the road. Thus, the construction results in unconsolidated soil and other fine materials (sand, cement etc) materials being present for a long duration and over a wide extent. Most of the unconsolidated materials would be vulnerable to erosion during rainfall. As Douala experiences frequent and high volume rainfall, including periods of high intensity rainfall, this will also contribute to the risk of erosion, and the resultant transport of sediments in run-off water and downstream sedimentation.

The erosion of large volumes of material can result in structural, safety and landscaping concerns, particularly on the crests of slopes and steep slopes. The combination of exposed, unconsolidated materials and rainfall could result in erosion of materials from the source location, the transport of these materials via surface flow to watercourses and the deposition of the material at a downstream location. The presence of fine particulates can reduce water quality through impacts on total suspended solids and total dissolved solids. The reduced water quality from this sedimentation could then affect flora, fauna, and local communities dependent on these water resources.

Receptor Sensitivity

All of the areas and materials exposed to erosion risk would be within the road footprint, with the higher risk areas being the steeper sloped embankments established by either cut or fill. These areas do not have particular sensitivity in terms of environmental or social aspects. The topography of the project's AOI is flat to gently undulating with the result that there are no steep areas and only a single defined watercourse. Surface water flow is typically slow and largely dispersed, resulting in low flow velocities and higher infiltration. There are nine identified water flow pathways that cross the roadway (via hydraulic structures), all of which are ephemeral. Due to the surrounding urbanisation the water flow pathways are highly modified and not subject to any known use. The downstream receptors of surface water flows are the mangrove swamps and estuarine environments of the Dibamba and Wouri Rivers. As the primary community water supply is from the municipal water supply (CAM Water), supplemented by some local groundwater wells, the primary receptor of concern for this impact is the aquatic biodiversity. The unnamed watercourse connects to the Dibamba River estuary, some 3km downstream, via a wetland area with convoluted channels and very slow flow. This aquatic environment is not considered sensitive to soil and aggregate based sediments.

Impact Significance (Pre-Mitigation)

Using the methodology presented in Section 5, the unmitigated impact has been assessed. The nature of the impact is negative. The impact is of **MEDIUM** intensity, potentially **LOCAL** extent, and **MEDIUM** duration and as such is of **MINOR** significance.

Mitigation

Primary mitigation is to ensure the project controls are correctly implemented for all activities, in all locations and over the full duration of the project. The Table below details recommended mitigation.

Project Phase	Measure	Source of Measure
Construction	When construction activities are located within 500 m of surface water bodies, implement measures to reduce erosion and off-site sediment transport, such as: • prioritize scheduling of construction activities near surface water bodies to avoid heavy rainfall periods; • contour and minimise the length and steepness of slopes; • implement stabilisation of slopes where required; • if steep channels and slopes are present, or cannot be avoid through design, line these with materials such as jute matting; • spread mulch to stabilise exposed areas prior to re-vegetation; • re-vegetate areas within 6 months of the completion of construction activities; • using settlement ponds, silt fences and/or water treatment; • modifying or suspending earth moving activities during extreme rainfall and high winds to the extent practical; • segregate or divert any clean water runoff to prevent it mixing with water containing a high solids content to minimize the volume of water to be treated prior to release; and • providing effective short-term measures for slope stabilization, sediment control and subsidence control until long-term measures for the operational phase can be implemented.	Section 4.1, page 89-91, General EHS Guidelines
Construction	Where discharging water into the environment, the Total Suspended Solids (TSS) should not exceed 50mg/l.	Derived from various sector specific EHS guidelines

Project Phase	Measure	Source of Measure
Construction	Use stormwater management practices that slow peak runoff flow, reduce sediment load, and increase infiltration. Such measures may include: including vegetated swales (planted with salt-resistant vegetation), filter strips, terracing, check dams, detention ponds or basins, infiltration trenches, infiltration basins and constructed wetlands.	Section 1.1, EHS Guideline for Toll Roads, 2007
Construction	Paving activities should be conducted during dry weather to prevent runoff of asphalt or cement materials.	Section 1.1, EHS Guideline for Toll Roads, 2007
Construction	Utilise sweeping practices rather than washing where practicable to reduce water runoff from dust suppression. Collect and returning swept material to aggregate base or disposing as solid waste	Section 1.1, EHS Guideline for Toll Roads, 2007
Construction	Develop and implement a **stockpile management plan** to ensure responsible management of all bulk materials during construction.	Bespoke

After each rainfall event of greater than 30 mm, inspect all disturbed areas and material stockpiles for erosion and the first 100 m of the downstream water flow pathways for sedimentation. If damages are evident these should be repaired, and measures implemented to divert sources of incoming surface water flow where practicable. Sediments may need to be recovered from deposition areas.

Monitoring of downstream water quality in surface water within 500m (Section 4.1, page 89-91, General EHS Guidelines) should be undertaken to detect if the change in Total Suspended Solids (TSS), when compared to baseline monitoring levels, is no greater than 50 mg/L. Refer to the water quality monitoring programme.

Residual Impact

Post-mitigation the impact will be of **MEDUM** intensity, **LOCAL** in extent**, SHORT** duration and as such will be of **NEGLIGIBLE** significance**.**

Project Phase:	Construction
Type of Impact	**Direct and Indirect**
Nature of Impact	**Negative**
Highly Sensitive Receptor(s)?	**No**

	Pre-Mitigation Impact	Residual Impact
Intensity	Medium	Medium
Extent	Local	Local
Duration	Medium	Short
Significance	**Minor**	**Negligible**

8.3.1.2 Construction materials resulting in contamination of soil, surface, or groundwater

Impact Description

Road construction requires the introduction of a range of materials, primarily in the layer works, which may have the potential to contaminate the in-situ soils. The primary materials of concern include bitumen (asphalt) and cement. Cement may be present in storage areas, be used as a stabiliser in layer works or in concrete for site applications and in concrete batching. Cement can be mobilised during the washing of equipment. Bitumen is used for sealing of the road surface. In their unprocessed form both bitumen (asphalt) and cement can be mobilised in water and disperse to surface or ground water. However, once set both become inert or very nearly so. The volume of bitumen, cement and concrete to be used in the project is substantial. Significant volumes of other aggregates (sand, gravel, rock) will be utilised in the layer works and concrete however, most of these are inert and pose no risk to the soil, surface or groundwater.

Bitumen will be prepared off-site (at the Logbadjeck Quarry or other sub-contractor site) and delivered to the site on a 'just-in-time' delivery approach. Thus, other than the point of use within the road footprint, there no other at-risk locations within the project. Cement, in dry form, will be used within the layerworks, which extend across the entire project footprint. Bagged cement will be delivered and stored on pallets, which are typically wrapped/covered to ensure the quality of the material. Where small quantities of concrete are required this may be batched locally at sites within the road footprint. The preferred option for procurement of all substantial concrete volumes (i.e. for formwork in over- and underpass) will be from commercial sources as 'ready-mix'. Thus, other than the point of use within the road footprint, there no other at risk locations. If the sub-contractor elects to establish their own concrete batching plant within the project site, the cement and wash water could pose risks to soil, surface or groundwater.

Bitumen and cement have the potential to contaminate the soil, and then subsequently surface or groundwater, depending on the volumes that are mobilised. The potential for contamination depends on the volume of the material present, the form in which the material exists and the location relative to sensitive environmental features. The location of the risks will primarily be within the construction footprint, material storage areas and at the site office. Risks could occur at any time within the project duration, but use of the materials is highest during earthworks, over- and underpass construction and road sealing.

Whilst detailed surface water quality monitoring data was not available specific to the project's AOI, based on the urbanisation of the area and observations during site inspections, it is assumed that water in the flow paths is typically of degraded quality (due to sediments and contaminants). This will be confirmed through the additional baseline data collection planned prior to construction. On this basis, any contaminants from the project will further exacerbate the poor surface water quality conditions in the area.

Receptor Sensitivity

Receptors directly exposed to bitumen and cement risks would be soil within the road footprint. These working areas do not have particular sensitivity in terms of environmental or social aspects. Surface water runoff from these areas could distribute the contaminants much more widely, potentially reaching water flow pathways and the wider hydrological network. The topography of the project's AOI is flat to gently undulating, with the result that there are no steep areas and only a single defined watercourse. Surface water flow is typically slow and largely dispersed, resulting in low flow velocities. Thus, dispersion of contaminants from the working areas would not be rapid. There is one unnamed watercourse and nine ephemeral water flow pathways that cross the roadway (via hydraulic structures). Due to the surrounding urbanisation the water flow pathways are highly modified and water quality in these flow pathways is anticipated to be poor. The surface water is not subject to any known use. The downstream receptors of surface water flows are the mangrove swamps and estuarine environments of the Dibamba and Wouri Rivers. Except at the extreme east of the project site, these receptors are some distance (> 3km) from the project. As the primary community water supply is from the municipal water supply (CAM Water), supplemented by some local groundwater wells, the primary receptor of concern for this impact is the aquatic biodiversity. Given the single permanent watercourse and already reduced water quality within the project area, the aquatic environment is not considered highly sensitive**.**

Impact Significance (Pre-Mitigation)

The nature of the impact is negative. The impact is of **STRONG** intensity, **LOCAL** extent, and **MEDIUM** duration and as such is of **MEDIUM** significance.

Mitigation

The Table below details recommended mitigation.

Project Phase	Measure	Source of Measure
Construction	Surface runoff from process areas or potential sources of contamination should be prevented, or where not practical, runoff from process and storage areas should be segregated from potentially less contaminated runoff.	Section 1.3, page 28, General EHS Guidelines
Construction	All storage and handling facilities and activities where hazardous materials are involved must be located at least 100 m away from surface water resources.	Bespoke

Construction	Where discharging water into the environment, water should meet the following levels: • pH 6-9 • TSS 50mg/l • Oil and grease 10mg/l	Bespoke (aligned with EHS Guidelines)
Construction	Paving activities should be conducted during dry weather to prevent runoff of asphalt or cement materials.	Section 1.1, EHS Guideline for Toll Roads, 2007
Construction	Avoid the generation of contaminated runoff from cleaning of asphalt equipment by implementing the following measures: only clean asphalt off equipment in dedicated washing facilities located away from surface water features or drainage structures, substituting diesel with vegetable oil as a release and cleaning agent, scraping before cleaning and containing cleaning products and contaminated asphalt residues. Dispose of contaminated residues as hazardous wastes.	Section 1.1, EHS Guideline for Toll Roads, 2007
Construction	Avoid the generation of contaminated runoff from cleaning of concrete equipment by implementing the following measures: only clean concrete off equipment in dedicated washing facilities located away from surface water features or drainage structures, scraping before cleaning, and containing contaminated cement residues. Dispose of contaminated residues as hazardous wastes.	Bespoke
Construction	In the event of an environmental incident, initiate a response in terms of the environmental response procedure	Bespoke

Daily visual inspections shall be undertaken of the material stockyards, hazardous material storage sites, and road footprint for signs of the spillage or dispersion of bitumen, cement, or concrete. Monitoring of downstream water quality in surface water within 500 m (Section 4.1, page 89-91, General EHS Guidelines) should be undertaken to detect changes in pH and Total Dissolved Solids (TDS) when compared to baseline monitoring levels. Refer to the water quality monitoring programme.

Residual Impact

Post-mitigation the impact will be of **MEDUM** intensity, **LOCAL** in extent**, SHORT** duration and as such will be of **NEGLIGIBLE** significance**.**

Project Phase:	**Construction**
Type of Impact	**Direct and Indirect**

Nature of Impact	**Negative**	
Highly Sensitive Receptor(s)?	**No**	
	Pre-Mitigation Impact	**Residual Impact**
Intensity	Strong	Medium
Extent	Local	Local
Duration	Medium	Short
Significance	**Medium**	**Negligible**

8.3.1.3 Spills or leaks resulting in contamination of soil, groundwater, or surface water (unplanned)

Impact Description

The operation of the mechanised fleet, including refuelling and maintenance thereof, has the potential to result in spills of fuels or hydraulic fluids, either through poor control or as the result of equipment failure. All hydrocarbons are potentially hazardous to soils, water and the organisms living there. The volume of hydrocarbons in each of the fleet is relatively small, however there are many individual pieces of equipment, which will collectively operate for many thousands of hours over the duration of construction. In the case of poor fleet management and maintenance many smaller spillages could result. The biggest single point source of hydrocarbons is the fuel tank located at the site office. Refilling of, and refuelling from, this tank has risks of potentially spilling substantial volumes of hydrocarbons.

Hydrocarbon related impacts are possible on two scales: potentially frequent, but low volume spillages from equipment failure and/or poor practices during refuelling and maintenance and likely infrequent, but potentially high volume spillages at the bulk fuel tank. The spillage of hydrocarbons (or other hazardous materials) has the potential to contaminate the soil, and then subsequently surface or groundwater, depending on the volumes spilt. Each spill has the potential to contaminate soil and be transported in runoff to the aquatic environment. The risk increases with the volume spilt. The location of the risks will primarily be within the construction footprint and at the site office. Risks could occur at any time within the project duration, but fleet activity is highest during earthworks and road sealing.

Other potentially hazardous materials that will be stored and handled within the construction footprint include paints, solvents, concrete, bitumen, and other chemicals. These hazardous materials may be present in storage areas, be used and applied for site applications and arise during washing of equipment. Each of these materials are potentially hazardous to the organisms living and using the soils and water. Spillages during usage and poor controls during equipment washing are the most likely pathways for impacts to soil and subsequently surface or groundwater quality. The risk increases with the volume spilt. The location of the risks will primarily be within

the construction footprint and at the material storage areas. Risks could occur at any time within the project duration. The intensity of risk increases with decreasing distance from a watercourse due to the increased rate of contaminant dispersion in water.

The construction workforce, which will number 350 at its maximum, will generate sewage and grey water on a daily basis for the duration of the project. The release of untreated sewage would comprise surface water quality and increase health risks to any downstream users. Health risks could occur through consumptive and non-consumptive use.

Detailed surface and groundwater quality monitoring data was not available specific to the project's AOI. Based on the level of urbanisation of the area and observations during site inspections, it is assumed that water in the flow paths is typically of degraded quality (due to sediments and contaminants). This will be confirmed through the additional baseline data collection planned prior to construction. On this basis, any contaminants from the project would further exacerbate the poor surface water quality conditions in the area.

Receptor Sensitivity

Receptors directly exposed to spillage risks would be soil within the road footprint. These working areas do not have particular sensitivity in terms of environmental or social aspects. Surface water runoff from these areas could distribute the contaminants much more widely, potentially reaching water flow pathways and the wider hydrological network. Surface water flow is typically slow and largely dispersed, resulting in low flow velocities. Thus, dispersion of contaminants from the working areas would likely not be rapid. There is one watercourse and nine ephemeral water flow pathways that cross the roadway (via hydraulic structures). Due to the surrounding urbanisation the water flow pathways are highly modified and not subject to any known use. The downstream receptors of surface water flows are the mangrove swamps and estuarine environments of the Dibamba and Wouri Rivers. Except at the extreme east of the project site, these receptors are typically some distance from the project. Given the limited presence of permanent watercourses within the project area and their transformed status, the aquatic environment is not considered highly sensitive. Groundwater is typically quite near to surface and thus potentially susceptible to contamination. The use of groundwater from localities close to the project footprint are not known.

As the primary community water supply is from the municipal water supply (CAM Water), supplemented by some local groundwater wells, the primary receptor of concern for this impact is the aquatic biodiversity. At a regional level the sensitivity of the Douala community to groundwater quality is low. However, at the individual household level receptor sensitivity to groundwater quality in supply wells may be very high.

Impact Significance (Pre-Mitigation)

The nature of the impact is negative. The impact is of **STRONG** intensity (although varying widely depending on the nature of the spilled contaminant), potentially **LOCAL** extent and **MEDIUM** duration and as such is of **MEDIUM** significance.

Mitigation

The Table below details recommended mitigation.

Project Phase	Measure	Source of Measure
Construction	Prior to taking water from a borehole or well: • identify all other boreholes and wells within 100 m of the source. • Measure the quality of water in these wells. Thereafter measure quality of water on a monthly basis, continuing until two months after abstraction ceases. If monitoring indicates a material reduction in water quality, then abstraction should cease. If the reduction is substantial enough to affect the usability of supply to the users, then Magil will need to provide and fund an alternate supply.	Bespoke
Construction	Stormwater should be separated from process and sanitary wastewater streams in order to reduce the volume of wastewater to be treated prior to discharge.	Section 1.3, page 28, General EHS Guidelines
Construction	Surface runoff from process areas or potential sources of contamination should be prevented, or where not practical, runoff from process and storage areas should be segregated from potentially less contaminated runoff.	Section 1.3, page 28, General EHS Guidelines
Construction	Oil water separators and grease traps should be installed and maintained as appropriate at refuelling facilities, workshops, washbays, fuel storage and containment areas.	Section 1.3, page 28, General EHS Guidelines
Construction	Where discharging surface water runoff into the environment, water should meet the following levels: • pH 6-9 • TSS 50mg/l • Oil and grease 10mg/l	Section 1.3, page 28, General EHS Guidelines
Construction	Maintain the mechanised fleet to accepted industry standards as documented in a Fleet Maintenance Plan. Maintenance or repair of mechanised fleet to primarily take place off-site at designated workshop facilities with bunded, impervious floor and oil traps.	Bespoke

	Where it is not possible or practical to conduct maintenance and repair offsite, such maintenance and repair on-site must be undertaken at a designated maintenance area, fitted with bunded, impervious floor and oil traps. The maintenance area floor will not discharge to stormwater, sewer, sewage holding tanks, soak-away trenches or to any other external connection. Stormwater runoff, rainwater and other drainage sources from areas outside of the maintenance area will be prevented from entering the area. Where it is not practicable to move damaged equipment to the designated maintenance area, secondary containment such as catch pans, drip trays, and ground protective sheets must be used during emergency works to prevent contamination of soil or water.	
Construction	Develop and implement an Emergency Response Plan. This plan should be communicated to local stakeholders.	Performance Standard 1
Construction	Store and handle all hazardous materials to accepted industry standards as documented in a Hazardous Materials Management Plan. Hazardous materials, including chemicals and fuels, shall only be stored at a designated site. Such sites shall be located away from high risk areas including significant pedestrian or vehicle traffic, residential areas and water flow paths (> 50 m). Storage methods shall be in terms of the MSDS and manufacturers' instructions, typically in facilities with bunded, impervious floor and with provision to exclude rainfall and runoff. The bund for hydrocarbons should have 110% of the maximum storage capacity of the facility. Hazardous material storage sites shall have adequate signage in place identifying hazardous the materials and the nature of hazard. incompatible materials shall not be placed in common containment and different class of chemicals will be stored separately. Leaking containers will be removed immediately and be appropriately disposed. Maintain an inventory at the site office for all chemicals and their types and quantity stored on the project site. Material Safety Data Sheets for all chemicals must be kept at the site office and in every vehicle used to transport such chemicals. Personnel involved in handling hazardous materials, particularly those specifically assigned to storage areas, must be trained on how to respond in case of spill. Spill containment and clean-up kits, appropriate to the volume and type of materials stored, will be kept on-site.	Bespoke

Construction	Refuelling of vehicle fleet to primarily take place off-site at commercial fuel stations. Refuelling of mechanised fleet to primarily take place in designated refuelling area at site office. Refuelling sites shall be located away from water flow paths (> 50 m) and any well. Fuel will only be stored in an industry approved and certified tank, with integrated bunding. The refuelling area will be equipped with a bunded, impervious floor. The refuelling area will not discharge to stormwater, sewer, sewage holding tanks, soak-away trenches or to any other external connection. Stormwater runoff, rainwater and other drainage sources from areas outside of the refuelling area will be prevented from entering the area. Personnel involved in handling refuelling, particularly those specifically assigned to refuelling areas/equipment, must be trained on how to respond in case of spill.	Bespoke
Construction	Where refuelling in the designated area is not possible due to the mobility of machinery, implement secondary containment such as catch pans or drip trays during refuelling. Refuelling vehicles / mobile delivery tanker will have the following: i. metal drip tray/s of sufficient capacity; ii. ground protective sheet/s; iii. a labelled, sealable container for storing spilled fuel; iv. any equipment required for transferring fuel captured in drip trays into the storage drum; v. a suitable spill clean-up kit vi. a shovel for use in spill clean-up	Bespoke
Construction	Develop and implement a stockpile management plan to ensure sustainable management of stockpiled material in a manner that protects surface water resources.	Bespoke
Construction	In the event of an environmental incident, initiate a response in terms of the emergency response plan.	Bespoke
Construction	If a project related leak or spillage has the potential to impact on groundwater usability/acceptability to a local user then Magil must investigate and provide an alternate, equivalent water supply for the duration of the period that an effect occurs.	Bespoke

Construction	Daily visual inspections shall be undertaken of the site office, material stockyards, hazardous material storage sites, fleet parking areas and stockpile areas for signs of hazardous material spillages. Daily visual inspections of the mechanised fleet shall be undertaken to observe leaks of hydrocarbons. Monitoring of downstream water quality in surface water within 500 m (Section 4.1, page 89-91, General EHS Guidelines) should be undertaken to detect changes in pH, Total Dissolved Solids (TDS) and Oil and Grease concentrations, when compared to baseline monitoring levels. Refer to the water quality monitoring programme.	Bespoke

Residual Impact

Post-mitigation the impact will be of **MEDUM** intensity, **LOCAL** in extent**, SHORT** duration and as such will be of **NEGLIGIBLE** significance**.**

Project Phase:	**Construction**	
Type of Impact	**Direct and Indirect**	
Nature of Impact	**Negative**	
Highly Sensitive Receptor(s)?	**No**	
	Pre-Mitigation Impact	**Residual Impact**
Intensity	Strong	Medium
Extent	Local	Local
Duration	Medium	Short
Significance	**Medium**	**Negligible**

8.3.1.4 Mobilisation of pollutants from contaminated land encountered during earthworks (unplanned)

Impact Description

Through site inspections undertaken by Magil and APAVE and during the undertaking of earth moving for the emergency works (refer to Section 2.5) a number of waste materials have been encountered in-situ within the road construction footprint. These materials have included municipal solid wastes, sewage, and oils and greases.

The origin of the materials may not be discernible but is generally as a result of poor compliance with acceptable waste management practices by public and private parties along the ROW. The improperly disposed materials may be dispersed across the surface or be concentrated in excavations, drains and other localities throughout the ROW.

These improperly disposed materials may be hazardous or contain hazardous elements which may pose a risk to soil, surface, and groundwater. In some situations, the exposure and handling of the improperly disposed materials during construction activities may exacerbate pollution risks and could also result in nuisance conditions (e.g. odours or vermin). The locality of such materials is not known, and they may be encountered at nearly any location within the ROW. The risk is most likely to present during initial earthworks.

Receptor Sensitivity

The NR3 has many residential and commercial receptors located immediately adjacent to the ROW. Additionally, there are concentrations of informal traders and service providers at various localities along the route. These receptors are the most likely source of the improperly disposed materials, and frequently tolerate the nuisance and risks associated with the improperly disposed materials (as evidenced in their ongoing activities in the presence of these materials. At a regional level, the sensitivity of the Douala community to the improperly disposed materials is low. However, at the individual household/business level receptor sensitivity to the improperly disposed materials may be very high.

Impact Significance (Pre-Mitigation)

The nature of the impact is negative. The impact is of **STRONG** intensity (although varying widely depending on the nature of the improperly disposed materials), potentially **LOCAL** extent and **MEDIUM** duration and as such is of **MINOR** significance.

Mitigation

Mitigation will depend on the level and location of contamination, the type and risks of any improperly disposed materials that is encountered. Where such materials are encountered, the objective should be to:

- Manage contaminated media with the objective of protecting the safety and health of occupants of the site, the surrounding community, and the environment post construction or post decommissioning.
- Understand the historical use of the land with regard to the potential presence of hazardous materials or oil prior to initiation of further construction activities.

The Table below details recommended mitigation.

Project Phase	Measure	Source of Measure
Construction	Preparing plans and procedures to respond to the discovery of contaminated media to minimize or reduce the risk to health, safety, and the environment consistent with the approach for	Section 4.1, page 89-91, General EHS Guidelines

	Contaminated Land in Section 1.6 of the EHS Guidelines. This should include consideration of what level of Personal Protective Equipment is appropriate for employees working in the immediate vicinity of the contaminated land (e.g. face masks).	
Construction	The waste management plan should make provision for the handling and disposal of obsolete, abandoned, hazardous materials or oil consistent with the approach to hazardous waste management described in Section 1.6 of the EHS Guidelines. Successful implementation of any management strategy may require identification and cooperation with whoever is responsible and liable for the contamination.	Section 4.1, page 89-91, General EHS Guidelines
Construction	The waste management plan should make provision for the handling and disposal of improperly disposed materials encountered during earthworks	Bespoke

Residual Impact

Post-mitigation the impact will be of **LOW** intensity, **PUNCTUAL** extent**, SHORT** duration and as such will be of **NEGLIGIBLE** significance**.**

Project Phase:	**Planning/Construction/Operations**	
Type of Impact	**Direct /Indirect**	
Nature of Impact	**Negative**	
Highly Sensitive Receptor(s)?	**Potentially**	
	Pre-Mitigation Impact	**Residual Impact**
Intensity	Strong	Low
Extent	Local	Punctual
Duration	Medium	Short
Significance	**Medium**	**Negligible**

8.3.2 Operations Phase

8.3.2.1 Increase in impermeable surfaces reducing infiltration and resulting in increased surface water runoff

Impact Description

Expansion of the surface of the NR3 from PK9 + 925 up to PK18 + 825, by the addition of lanes and supporting road infrastructure (e.g. parking, bus stops, drains) will increase the extent of the road's impermeable surfaces by two-thirds (e.g. up to 71 m in width). Although many of the areas within the road construction footprint were already compacted due to intensive use and thus already contributing to runoff. Rainfall on these impermeable surfaces will not be able to infiltrate into the soil and will therefore collect on the surface and runoff to down-gradient locations and ultimately water flow pathways. The installation of kerbing and drains will concentrate water flow to an extent. The increased volume of water collecting in downstream flow paths could result in water inundating larger areas, or the water flowing at higher velocities. Given the flat to gently undulating topography it is likely that water would extend over marginally greater areas during high rainfall events.

The risks are linked in time to rainfall events and will increase incrementally as construction advances and results in the installation of hard surfaces and will persist during operations. Overall, the increase in hard surfaces due to the project will be a tiny fraction of the total catchment area. However, the cumulative risk is increasing as urbanisation increases the impermeable surfaces in the catchment and amplifies the runoff intensity.

Receptor Sensitivity

Receptors directly exposed to increased surface water flow risks would be buildings and other infrastructure immediately downstream of the road footprint and particularly those adjacent to the unnamed watercourse and nine water flow pathways. These water flow pathways are all existing and convey run-off water during rainfall events. As a high rainfall location, which regular experiences intense rainfall events, and which has clayey soils with low infiltration, the presence of standing water and surface water flows is common. Historically, low lying areas and water flow paths were typically avoided during the development of buildings and other infrastructure, which provided space for surface water flow, infiltration and evaporation following rainfall events. With rapid urbanisation in Douala, there are an increasing number of buildings and other infrastructure in very close to water flow paths and a concomitant increase in impermeable surfaces in the catchment. The result is that water flow paths are increasingly constrained and runoff water volumes are increasing. The net effect is that adjacent buildings and other infrastructure are at risk of flooding during high intensity rainfall events. In relation to the nine water flow pathways, there is infrastructure at a few locations that could be considered sensitive to this risk, notably at PK 10+362 and PK18+138.

Impact Significance (Pre-Mitigation)

The nature of the impact is negative. The impact is of **MEDIUM** intensity, potentially **LOCAL** extent and **MEDIUM** duration and as such is of **MINOR** significance.

Mitigation

The Table below details recommended mitigation.

Project Phase	Measure	Source of Measure
Operations	Conduct regular inspection and maintenance of permanent erosion and runoff control features.	Section 1.1, EHS Guideline for Toll Roads, 2007
Operations	Quarterly maintenance and cleaning of the hydraulic structures to ensure that the flow of water is not obstructed by objects, waste, sediments or vegetation.	Bespoke

Residual Impact

Post-mitigation the impact will be of **MEDUM** intensity, **LOCAL** in extent**, SHORT** duration and as such will be of **NEGLIGIBLE** significance**.**

Project Phase:	**Planning/Construction/Operations**	
Type of Impact	**Direct /Indirect**	
Nature of Impact	**Negative**	
Highly Sensitive Receptor(s)?	**No**	
	Pre-Mitigation Impact	**Residual Impact**
Intensity	Medium	Medium
Extent	Local	Local
Duration	Medium	Short
Significance	**Minor**	**Negligible**

8.4 AIR QUALITY

8.4.1 Construction Phase

8.4.1.1 Impacts associated with dust emissions

Impact Description

The key sources of dust emissions from the project include:

- earthworks;
- storage and handling of particulates (e.g. soil);
- on-site concrete batching (if this option is used);
- project vehicles/equipment use over paved and unpaved surfaces; and
- increased traffic along paved and unpaved roads used for traffic diversions.

Dust emissions can generate a nuisance to people in the immediate vicinity of these dust sources, but they can also result in human health impacts. Fine particulate matter, i.e. $PM_{2.5}$ and PM_{10}, have been demonstrated to adversely affect human health from both acute and long-term exposure. As the human health impacts are more serious than the nuisance issue dust presents, and as any mitigation will manage both potential effects simultaneously, this assessment has focussed on the human health impacts.

The World Bank EHS Guidelines require that projects with significant sources of emissions do not result in pollutant concentrations that reach or exceed relevant ambient quality guidelines and that emissions do not contribute a significant portion to the attainment of relevant ambient air quality guidelines (25% is used as a general rule).

The applicable WHO Ambient Air Quality Guidelines for $PM_{2.5}$ and PM_{10} are summarised below. Note that Cameroon has adopted the WHO Ambient Air Quality Guidelines as air quality standards.

TABLE 8-4: WHO AMBIENT AIR QUALITY GUIDELINES

Pollutant	Averaging period	Guideline Value
$PM_{2.5}$	24 hour	25
	Annual	10
PM_{10}	24 hour	50
	Annual	20

Whilst detailed air quality monitoring data was not available specific to the project's AOI, based on the development of the area and the air quality index information presented in Section 6.1.2, it is assumed that the airshed within the Project's vicinity is degraded for both $PM_{2.5}$ and PM_{10} and baseline concentrations will exceed the guideline values stated above. This will be confirmed through the additional baseline data collection planned prior to construction. On this basis, any dust emissions from the project will further exacerbate unsafe air quality conditions in the area.

Receptor Sensitivity

The receptors of concern for air quality impacts will be people present in the AOI. This includes residents and businesses near the road (NR3 and deviation routes), as well as more transient populations (e.g. road users, informal traders), as human health impacts from particulate matter can occur from both short-term and long-term exposure to elevated levels of particulate matter. There are some highly sensitive receptors to air quality (i.e. hospitals and schools) within the immediate vicinity of the ROW that should be considered as high sensitivity.

Impact Significance (Pre-Mitigation)

Based on the assessment methodology presented in Section 5, unmitigated dust emissions would be result in a negative environmental and social risk, the intensity of which is considered **HIGH**, potentially **LOCAL** in extent and would occur for a **SHORT** duration. The significance is therefore assessed to be **MEDIUM**.

Mitigation

Primary mitigation is to ensure the project controls are correctly implemented for all activities, in all locations and over the full duration of the project. The Table below details recommended mitigation.

Project Phase	Measure	Source of Measure
Construction	Prepare and implement a Dust Management Plan (or equivalent). The dust management measures should include measures such as those set out below. This should include both management measures and monitoring measures to control and verify dust levels, as well as detail who will be responsible for implementing	Section 4.1, page 89-91, General EHS Guidelines

	these controls. The suitability of these measures shall be verified on an on-going basis considering monitoring results and any dust-related community grievances received.
	
	• Preparing and Maintaining the Site
	  ◦ Put measures in place to avoid site runoff of water or mud.
	  ◦ Remove materials that have a potential to produce significant dust from the site as soon as possible (e.g. <48 hrs), unless being re-used on site. Where this is not possible, these materials will be covered.
	  ◦ Cover or fence any stockpiles of dusty materials.
	  ◦ Use enclosed chutes and conveyors and covered skips.
	  ◦ Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
	  ◦ Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction e.g. suitable local exhaust ventilation systems.
	  ◦ After all site works are completed, all remaining exposed land should be verified as stable with regards to dust.
	  ◦ Suitable water-carts in good working condition and of not less than 10,000 liters capacity per 7.5 hectares of disturbed site, or other suitable alternatives, shall be available to commence watering on the site within 2 hours of being required to do so per the Dust Management Plan.
	• Vehicle Trackout
	  ◦ Vehicles will be kept clean and free of residual dirt and mud
	  ◦ Access gates to be located at least 10 m from receptors where possible.
	• Monitoring
	  ◦ Monitoring may include monitoring of dust deposition, dust flux, and visual inspections.
	  ◦ Ensure that adequate quality assurance/quality controls (e.g. equipment calibration) are in place for all monitoring.	

Construction	The project will carry out kerb-side air quality monitoring at several locations along the route prior to construction. This will include an analysis of PM10 and PM2.5 and will be collected over a period of at least 3 months. This monitoring will include upwind and downwind locations and associated meteorological monitoring (i.e. wind direction and strength). If ongoing dust complaints are received as part of the project's stakeholder grievance mechanism, this monitoring will be extended to occur throughout the duration of construction and the results of which	Bespoke

	will be used to inform the effectiveness of the dust suppression measures identified in the Dust Management Plan.	
Construction	The project will implement a community grievance mechanism to manage any complaints from surrounding community members, including those related to dust. In responding to any such complaints, the project will consider dust abatement measures (e.g. dust suppression, suspension of activities during dry and windy periods, screens) to help manage these types of impacts.	Performance Standard 1

Residual Impact

Post-mitigation the impact will be of **MEDIUM** intensity, **LOCAL** in extent**, SHORT** duration and as such will be of **NEGLIGIBLE** significance**.**

Project Phase:	**Construction**	
Type of Impact	**Direct**	
Nature of Impact	**Negative**	
Highly Sensitive Receptor(s)?	**Yes**	
	Pre-Mitigation Impact	**Residual Impact**
Intensity	High	Medium
Extent	Local	Local
Duration	Short	Short
Significance	**Medium**	**Negligible**

8.4.1.2 Human health impacts associated with combustion emissions

Impact Description

The key sources of combustion-related emissions from the project include:

- operation of diesel and petrol-fired project traffic and equipment; and
- operation of six emergency power generators (combined thermal input of ~1.9 MW_{th}).

For these types of combustion activities, the key pollutants of concern are NO_2, SO_2, PM_{10}, and $PM_{2.5}$. These pollutants have been demonstrated to adversely affect human health from both acute and long-term exposure.

The World Bank EHS Guidelines require that projects with significant sources of emissions do not result in pollutant concentrations that reach or exceed relevant ambient quality guidelines and that emissions do not contribute a significant portion to the attainment of relevant ambient air quality guidelines (25% is used as a general rule).

The applicable WHO Ambient Air Quality Guidelines for the key pollutants are summarised below. Note that Cameroon has adopted the WHO Ambient Air Quality Guidelines as air quality standards.

TABLE 8-5: WHO AMBIENT AIR QUALITY GUIDELINES

Pollutant	Averaging period	Guideline Value
NO_2	1 hour	200
	Annual	40
SO_2	10 minute	500
	24 hour	20
$PM_{2.5}$	24 hour	25
	Annual	10
PM_{10}	24 hour	50
	Annual	20

Whilst detailed air quality monitoring data was not available specific to the project's AOI, based on the development of the area and the air quality index information presented in Section 6.1.2, it is assumed that the airshed within the Project's vicinity is degraded for NO_2, $PM_{2.5}$ and PM_{10} and that baseline concentrations will exceed the guideline values stated above. This will be confirmed through the additional baseline data collection planned prior to construction. Whilst no data is available for SO_2, as this is a key pollutant from diesel exhaust, it is also possible that conditions around the existing road exceed the air quality standards as well. On this basis, any combustion emissions from the project will further exacerbate unsafe air quality conditions in the area.

Receptor Sensitivity

The receptors of concern for air quality impacts will be people present in the AOI. This includes residents near the road, as well as more transient populations, as human health impacts from key pollutants can occur from both short-term and long-term exposure to elevated levels of pollutants. There are no highly sensitive receptors to air quality (e.g. elder care homes, hospitals) within 200 m of the road or within 500 m of the site office, where concentrations of combustion-related project emissions are expected to be highest.

Impact Significance (Pre-Mitigation)

Considering the sporadic nature of project traffic to and from the road and site office area, as well as the small size of the emergency power generators, the intensity of the project's contribution to poor air quality from

combustion emission is considered to be **MEDIUM**. This would occur over a **LOCAL** extent and would occur for a **SHORT** duration. The significance is therefore assessed to be **NEGLIGIBLE**.

Mitigation

Whilst the unmitigated impact is considered to be Negligible, there are a number of good practice measures from the World Bank EHS Guidelines that would apply.

The Table below details recommended mitigation.

Project Phase	**Measure**	**Source of Measure**
Construction	Regardless of the size or type of vehicle, fleet owners / operators should implement the manufacturer recommended engine maintenance programs.	Section 4.1, page 89-91, General EHS Guidelines
Construction	Drivers should be instructed on the benefits of driving practices that reduce fuel consumption, including measured acceleration and driving within safe speed limits.	Section 4.1, page 89-91, General EHS Guidelines
Construction	Open burning of solid materials will be prohibited on-site.	Section 4.1, page 89-91, General EHS Guidelines
Construction	Open burning of improperly disposed materials will be prohibited on-site.	Section 4.1, page 89-91, General EHS Guidelines

Residual Impact

Post-mitigation the impact will be of **MEDIUM** intensity, **LOCAL** in extent**, SHORT** duration and as such will be of **NEGLIGIBLE** significance**.**

Project Phase:	**Construction**	
Type of Impact	**Direct**	
Nature of Impact	**Negative**	
Highly Sensitive Receptor(s)?	**No**	
	Pre-Mitigation Impact	**Residual Impact**
Intensity	Medium	Medium

Extent	Local	Local
Duration	Short	Short
Significance	**Negligible**	**Negligible**

Human Health Impacts Associated with Mobilisation of Volatile Organic Compound Pollutants from Contaminated Land Encountered during Earthworks (unplanned)

8.4.1.3 Mobilisation of VOCs from contaminated land encountered during earthworks (unplanned)

Impact Description

Whilst not a planned activity, it is possible that land contaminated with volatile organic compounds (VOCs) may be encountered during earthworks. As many VOCs can be harmful to human health, the fumes from any such contaminated land could present a health risk to employees. As there is no upward velocity for any such mobilised pollutants, it is anticipated that potentially unsafe concentrations would be confined to the immediate area around the contaminated land only.

Receptor Sensitivity

As the receptor in this case are the employees working in the area of the contaminated land, and the extent of the impact would be extremely localised, there are not expected to be any highly sensitive receptors within the AOI.

Impact Significance (Pre-Mitigation)

The intensity of this impact is considered to be **LOW**. This would occur over a **PUNCTUAL** extent and would occur for a **SHORT** duration. The significance is therefore assessed to be **NEGLIGIBLE**.

Mitigation

Whilst the unmitigated impact is considered to be Negligible, there are a number of good practice measures from the World Bank EHS Guidelines that would apply.

The Table below details recommended mitigation.

Project Phase	Measure	Source of Measure
Construction	Prepare plans and procedures to respond to the discovery of contaminated media to minimise or reduce the risk to health, safety, and the environment consistent with the approach for	Section 4.1, page 89-91, General EHS Guidelines

	Contaminated Land in Section 1.6 of the EHS Guidelines. This should include consideration of what level of Personal Protective Equipment is appropriate for employees working in the immediate vicinity of the contaminated land (e.g. face masks).	
Construction	Preparation of a management plan to manage obsolete, abandoned, hazardous materials or oil consistent with the approach to hazardous waste management described in Section 1.6 of the EHS Guidelines. Successful implementation of any management strategy may require identification and cooperation with whoever is responsible and liable for the contamination.	Section 4.1, page 89-91, General EHS Guidelines
Construction	The waste management plan should make provision for the handling and disposal of improperly disposed materials encountered during earthworks	Bespoke

Residual Impact

Post-mitigation the impact will be of **LOW** intensity, **PUNCTUAL** in extent**, SHORT** duration and as such will be of **NEGLIGIBLE** significance**.**

Project Phase:	**Construction**	
Type of Impact	**Direct**	
Nature of Impact	**Negative**	
Highly Sensitive Receptor(s)?	**No**	
	Pre-Mitigation Impact	**Residual Impact**
Intensity	Low	Low
Extent	Punctual	Punctual
Duration	Short	Short
Significance	**Negligible**	**Negligible**

8.5 NOISE AND VIBRATIONS

8.5.1 Construction Phase

8.5.1.1 Human health impacts associated with increased noise levels from construction activities

Impact Description

Construction will result in noise and vibration impacts for local residents and businesses adjacent to the ROW. Noise generating sources during construction include:

- the movement and operation of the construction site machinery and vehicles within the ROW;
- vibrations from the road rollers;
- operation of the emergency generators;
- project traffic along public roads;
- on-site concrete batching (if this option is used); and
- increased traffic along roads used for traffic diversions.

Elevated noise levels, particularly in times of expected comparative quiet such as night-time and weekends can be a source of stress and irritation, as well as adversely affecting human health.

The World Bank EHS Guidelines require that projects not exceed the noise levels presented in Table 8-4 at the site boundaries, and not result in a maximum increase in background levels of 3 dB at the nearest off-site noise sensitive receptor.

TABLE 8-6: WHO NOISE LEVEL GUIDELINES

Receptor Type	One Hour LAeq (dBA)	
	Day-time (07:00-22:00)	Night-time (22:00 – 07:00)
Residential, institutional or educational	55	45
Industrial or commercial	70	70

Whilst no suitable noise monitoring has been conducted yet near the ROW to determine baseline noise levels, based on the presence of the existing road and the density of urban development in the surrounding area, the baseline noise levels are expected to be relatively high given the high traffic volumes and use by heavy motor vehicles.

In the case of ground-borne vibration, the likelihood of perceptible vibration being caused is particularly dependent upon the smoothness of the road surface. Following the United Kingdom's Design Manual for Roads and Bridges (DMRB), guidance indicates that vibration levels caused by heavy goods vehicles travelling at 110kph over a 25mm hump could cause perceptible vibration at up to 40m from the road and that it is unlikely that significant levels of vibration would be generated at distances greater than this. Additionally, the DMRB guidance indicates that for a given level of traffic noise exposure the percentage of people significantly bothered by airborne vibration is 10% lower than the corresponding amount for noise nuisance. As such, it is expected that vibrational impacts will be much lower than the corresponding noise impacts.

Receptor Sensitivity

The most affected noise sensitive receptors in this case will be residents in close proximity to the AOI (e.g. within 500 m). As sounds levels halve with the doubling of distance, the intensity of impact is expected to drop off dramatically the further a receptor is from the RO. Furthermore, because urban structures around the ROW will act to block soundwaves from the road and construction activities in the ROW, noise effects will decline dramatically away from the ROW.

The general population along the NR3 is not considered to be highly sensitive to noise during the day; however, during night-time (i.e. 22:00 - 07:00) residents will be highly sensitive to noise.

Impact Significance (Pre-Mitigation)

The intensity of the impacts associated with the project's noise emissions (excluding project traffic along public roads) is considered to be **STRONG** during the day-time and **HIGH** during the night-time. This would occur over a **LOCAL** extent and would occur for a **MEDIUM** duration. The significance is therefore assessed to be **MEDIUM** during the day-time and **MAJOR** during the night-time.

Impacts along the public roads used by project vehicles (e.g. between the quarries and ROW) is estimated to be of **LOW** intensity for day-time and night-time because the project traffic is not expected to represent a significant proportion of the overall traffic on the roadway and these activities will be sporadic in nature. This would occur over a **LOCAL** extent and would occur for a **SHORT** duration. The significance is therefore assessed to be **NEGLIGIBLE** for receptors along public roadways outside of the ROW.

The project design does not include any hard-standing noise abatement measures around the road (e.g. noise attenuating walls); however, the emergency generators selected will include a closed design to help minimise noise levels from the generators.

Mitigation

The Table below details recommended mitigation.

Project Phase	Measure	Source of Measure

Construction	Develop and implement a Traffic Management Plan (or equivalent) that evaluates potential routes for the main project related vehicle movements for goods (e.g. deliveries of aggregates, bitumen and concrete), worker transport, and waste removal vehicles. This plan should prioritize routes that, where possible, avoid noise sensitive areas included but not limited to schools and residential areas. If avoidance is not possible, the plan will consider alternative minimization measures such as timing of vehicle movements, speed restrictions, staff training etc.	Section 4.1, page 89-91, General EHS Guidelines
Construction	Schedule any highly noisy construction activities during periods of the day that will result in least disturbance to the surround community	Section 4.1, page 89-91, General EHS Guidelines
Construction	Prohibit any routine night-time operation of noise generating equipment.	Section 4.1, page 89-91, General EHS Guidelines
Construction	Local residents must be informed (i.e. through notice boards and/or direct community consultation) of any periods of night work that may be necessary.	Bespoke
Construction	The description and timing of any particularly noisy activities (e.g. installation of guardrails, sandblasting of existing road signs, demolition of structures) must be communicated to the surrounding communities beforehand (i.e. through notice boards and/or direct community consultation).	Section 4.1, page 89-91, General EHS Guidelines
Construction	Prior to construction, the Project will conduct a noise baseline survey in accordance with *ISO 1996-1: 2016: Acoustics – Description, Measurement and Assessment of Environmental Noise - Part 1 Basic Quantities and Assessment Procedures*. This survey should include representative noise sensitive receptors adjacent to the ROW along the extent of Phase 2. Particular consideration should be made of receptors adjacent to the site office and material storage areas and the Yassa and Japoma Roundabouts.	Bespoke
Construction	The project will implement a community grievance mechanism to manage any complaints from surrounding community members, including those related to noise. In responding to any such complaints, the project will	Performance Standard 1

	consider noise abatement measures (e.g. provision of earplugs, temporary noise barriers, rescheduling of noisy activities) to help manage these types of impacts. Additionally, if significant noise complaints are received, the project may need to implement ongoing noise monitoring at affected receptors, following the methodology set out in in accordance with *ISO 1996-1: 2016: Acoustics – Description, Measurement and Assessment of Environmental Noise - Part 1 Basic Quantities and Assessment Procedures.*	

Residual Impact

Post-mitigation the impact near the ROW will be of **MEDIUM** intensity, **LOCAL** in extent**, MEDIUM** duration and as such will be of **MINOR** significance**.** The post-mitigation significance for receptors along public roadways outside of the ROW remains **NEGLIGIBLE.** The table below summarises the impact ratings for the worst-case receptors near the ROW.

Project Phase:	**Construction**	
Type of Impact	**Direct**	
Nature of Impact	**Negative**	
Highly Sensitive Receptor(s)?	**Yes**	
	Pre-Mitigation Impact	**Residual Impact**
Intensity	Strong (day-time) High (night-time)	Medium (day and night-time)
Extent	Local	Local
Duration	Medium	Medium
Significance	**Medium (day-time)** **Major (night-time)**	**Minor**

8.5.2 Operations Phase

8.5.2.1 Human health impacts associated with increased noise levels from traffic

Impact Description

Whilst the overall traffic volumes following construction of the project are expected to decrease when compared to the predicted future baseline without the project, by expanding the width of the road, some noise sensitive receptors adjacent to the ROW will be closer to road traffic sources and may experience higher noise and vibration levels.

As stated in the preceding section, elevated noise levels, particularly in times of expected comparative quiet such as night-time and weekends can be a source of stress and irritation, as well as adversely affecting human health. The World Bank EHS Guidelines require that projects not exceed the levels presented in Table 8-6, and not result in a maximum increase in background levels of 3 dB at the nearest off-site noise sensitive receptor.

It is expected that any vibrational impacts would be localised to within 40 m of the road following the United Kingdom's DMRB guidance for vibrational effects.

Receptor Sensitivity

The most affected noise sensitive receptors in this case will be residents in close proximity to the ROW (e.g. within 500 m). As sounds levels halve with the doubling of distance, the intensity of impact is expected to drop off dramatically the further a receptor is from the RO. Furthermore, because urban structures around the ROW will act to block soundwaves from the road and construction activities in the ROW, noise effects will decline dramatically away from the ROW.

The general population is not considered to be highly sensitive to noise during the day; however, during night-time (i.e. 22:00 - 07:00) residents will be highly sensitive to noise.

Impact Significance (Pre-Mitigation)

The intensity of the impacts associated with the expansion of the road is impossible to accurately predict without conducting detailed noise modelling; however, this assessment has conservatively estimated that the intensity would be **MEDIUM**, considering that the traffic volume is expected to decrease. This would occur over a **LOCAL** extent and would occur for a **LONG** duration. The significance is therefore assessed to be **MINOR**.

The World Bank's EHS Guideline for Toll Roads does include the following design recommendations to reduce noise impacts from roads projects:

- Construction of the road below the level of the surrounding land;
- Noise barriers along the border of the right-of way (e.g. earthen mounds, walls, and vegetation);
- Insulation of nearby building structures (typically consisting of window replacements); and
- Use of road surfaces that generate less pavement / tire noise such as stone-matrix asphalt.

However, as the traffic on the road is actually expected to decrease over time when compared to the future traffic baseline, these additional design measures are likely not required.

Mitigation

The Table below details recommended mitigation.

Project Phase	Measure	Source of Measure
Operation	The project will implement a community grievance mechanism to manage any complaints from surrounding community members, including those related to noise. In responding to any such complaints, the project will consider noise abatement measures, including the construction of noise barriers, to help manage these types of impacts.	Performance Standard 1
Operation	Additional noise monitoring may be required to inform selection of appropriate noise abatement measures such that no receptor experiences sustained noise levels above those presented in Table 8-6 of this ESIA. If additional noise monitoring is required, it should be in accordance with *ISO 1996-1: 2016: Acoustics – Description, Measurement and Assessment of Environmental Noise - Part 1 Basic Quantities and Assessment Procedures*.	Bespoke

Residual Impact

Post-mitigation, this assessment has estimated that the intensity would be **LOW**. This would occur over a **LOCAL** extent and would occur for a **LONG** duration. The significance is therefore assessed to be **NEGLIGIBLE**.

Project Phase:	**Construction**	
Type of Impact	**Direct**	
Nature of Impact	**Negative**	
Highly Sensitive Receptor(s)?	**Yes**	
	Pre-Mitigation Impact	**Residual Impact**

Intensity	Medium (day and night-time)	Low (day and night-time)
Extent	Local	Local
Duration	Long	Long
Significance	**Minor**	**Negligible**

8.6 SOCIAL

8.6.1 Construction Phase

8.6.1.1 Loss of livelihood associated with clearance of the ROW

Impact Description

Clearance of the footprint of the roadway within the ROW would result in the displacement of existing economic activities, resulting in a loss of source of income for the people concerned. Although there are no fixed commercial activities or infrastructure with the footprint of the roadway, informal and semi-formal street traders and service providers set up activities near the current road to attract passing custom and trade. See Section 6.3.11 for details on the trader composition and Section 6.3.4 for details on the localities frequented by the traders. These informal street traders and service providers use the ground immediately adjacent to the current roadway and some set-up rudimentary shelters to protect themselves and their goods from the weather. The proposed expansion of the roadway would displace these informal street traders and service providers during construction and prevent trade with customers. The expanded footprint of the roadway would reduce available space between road and other fixed infrastructure, thereby eliminating or severely constraining the space available to street traders.

Disruption of livelihoods could lead to loss of income for the informal street traders and service providers. If this income cannot be replicated or replaced, then the impact would manifest itself as increases in poverty levels among potential vulnerable households.

In addition to the potential impact on informal street traders/service providers, the project will also temporarily restrict access to some properties adjacent to the ROW. This restricted access also has the potential to adversely affect livelihoods.

Receptor Sensitivity

The baseline study conducted (See Section 6.3.11) demonstrates that many of the informal street traders and service providers rely on the income stream for the sole source of household sustenance. The baseline points to these traders as being vulnerable and among the poorer sectors of the Douala urban community. On this basis, this particular receptor sensitivity is considered to be high.

Impact Significance (Pre-Mitigation)

The nature of the impact is negative. The impact is of **HIGH** intensity, **LOCAL** extent and **MEDIUM** duration and as such is of **MAJOR** significance.

Mitigation

The Table below details recommended mitigation.

Project Phase	Measure	Source of Measure
Construction	The project will offer street traders equivalent replacement sites (in all seven sites are planned) that will be developed at points on the road for the purposes of their trading. The replacement location needs to be monitored against baseline expectations to ensure that they perform the function for which they are intended. Key aspects are that the sites are used by the traders displaced by the project and are functionally able to act as trading venues that attract an income that replicates that which is lost. A survey of traders that make use of the site must be initiated once they become operational.	Bespoke
Construction	Where the construction may affect access to adjacent property (e.g. to fuel stations) ensure that planning includes provision for temporary access and the reinstatement of the permanent access. Notify and consult with the property owner(s) and occupier(s) prior to undertaking the construction.	Bespoke
Construction and Operations	A grievance mechanism will be put in place to allow for the issues potentially associated with the loss of trade to be tracked and managed.	Bespoke

Residual Impact

Post mitigation the impact will **STRONG** intensity, **LOCAL** extent**, MEDIUM** duration and as such will be of **MEDIUM** significance**.**

Project Phase:	Construction
Type of Impact	**Direct**

Nature of Impact	**Negative**	
Highly Sensitive Receptor(s)?	**Yes**	
	Pre-Mitigation Impact	**Residual Impact**
Intensity	High	Strong
Extent	Local	Local
Duration	Medium	Medium
Significance	**Major**	**Medium**

8.6.1.2 Temporary disruptions to travel times and economic efficiency and increased travel safety risk

Impact Description

During the construction phase, works related to road development and the implementation of road rehabilitation are likely to have negative effects on economic activities related to the extension of travel time, due to traffic congestion, the implementation of temporary diversions, the closure of particular access points, and increase in construction traffic. Delays to other road users can also occur from the project bringing construction equipment and materials to and from site. This would be most prevalent for bulk material deliveries along public roads over an extended period (i.e. aggregate from Logbadjeck Quarry and sand from Folepe Quarry).

The temporary effects of construction of the project on road accessibility (to the NR3 and intersecting roads) can lead to greater travel distance (via alternate routes), traffic congestion, and increased travel times. This has a temporary negative impact on general users of the roads, as well as economic activities dependent on passing trade from and transportation along these routes. Businesses and informal traders in areas rendered inaccessible or bypassed as a result of road deviations would be negatively affected for the duration of construction in that area, while certain traders at areas of project derived traffic congestion may benefit from increased trade.

The additional traffic directed along deviation routes may result in concentrated road user volumes, traffic congestion, and increased travel times to regular users of the deviation roads. Certain businesses and informal traders along the deviation route may benefit from the increased traffic (new passing trade), while others may experience declines in business as consumers avoid the project derived congestion. The project would thus cause impacts to persons with no direct interaction with the project components or activities. Each of the five proposed deviation routes would only be utilised for short periods of time while key construction activities were completed on the section of the road bypassed by that deviation.

Indirect safety issues (e.g. public traffic accidents) may also occur as a result of the traffic congestion and user uncertainty due to changing road configuration on the NR3. Such uncertainty is likely to be greater at night when signage is less distinct. Increased delays to commuter traffic may result in an increased use of motorcycle taxis and speeding in uncongested areas of the roads. These have a reputation as being unsafe. The additional traffic volumes on the deviation routes could also increase user safety risks as the roads are (typically) narrower, the road surface is of lower quality, signage is less visible and road users will be concentrated.

Receptor Sensitivity

The affected community are those adjacent to, and commuters who use, the road network. This primarily includes those residents and businesses adjacent to the NR3, most notably at the sites of the five roundabouts, which are currently busy intersections. Receptor sensitivity is variable, but will likely include some users that should be considered as high sensitivity, e.g. patients needing to access the Gynaecological Hospital, businesses reliant on daily trade or economically vulnerable people dependent on the route for access to places of employment. In the worst case full closure of the NR3 could bring transport to a halt in the east of Douala with potential economic affects across Douala and the region. Receptor sensitivity is likely to be increased at night, particularly with regards user safety. Additional receptors include the residents and businesses adjacent to the proposed road deviations, and regular commuters on those roads.

Impact Significance (Pre-Mitigation)

The nature of the impact is negative. The impact is of **HIGH** intensity, **LOCAL** in extent and of **MEDIUM** duration and as such is of **MAJOR** significance. Note that an embedded measure of the project's design includes keeping all of the active construction areas and facilities within the ROW. This will limit project traffic of equipment on public roads. The project also intends to keep the NR3 open and accessible, and to implement road diversions to facilitate the flow of traffic when construction activities constrain traffic.

Mitigation

Construction activities will be planned and sequenced to enable continued public use of NR3, wherever it remains safe, practicable and efficient to do so. The diversion of light vehicle traffic onto road deviations (see Section 2.4.10) would enable traffic to flow, rather than being stopped due to road closure, but would increase volumes on these roads and likely reduce user efficiency. Provision will be made for heavy motor vehicles to utilise the NR3 throughout the project duration. The Table below details recommended mitigation.

Project Phase	Measure	Source of Measure
Construction	Develop and implement a Traffic Management Plan (or equivalent) that evaluates potential routes for the main project related vehicle movements for construction machinery, goods (e.g. deliveries of aggregates, bitumen and concrete), worker transport, and waste removal vehicles. This plan should prioritise routes that, where	Section 4.1, page 89-91, General EHS Guidelines

	possible, avoid noise sensitive areas included but not limited to schools and residential areas. If avoidance is not possible, the plan will consider alternative minimisation measures such as timing of vehicle movements, speed restrictions, staff training etc.	
Construction	Work should be planned and scheduled to enable ongoing public use of the NR3 when and wherever it remains safe, practicable and efficient to do so.	Bespoke
Construction	Road closures (and related route diversions) should be limited to the shortest period necessary to implement the required works. Roads closures should be reversed prior to nightfall whenever this is reasonably possible.	Bespoke
Construction	Road closures (and related route diversions) may not be left in place over construction holidays or any other period of construction inactivity unless it is essential to do so.	Bespoke
Construction	Traffic diversions should be planned and implemented to ensure that public traffic can reasonably access all areas affected by construction and in a manner that minimises traffic congestion.	Bespoke
Construction	Inspect the condition of road surfaces, intersection function and signage on traffic diversions routes prior to their use and ensure that conditions are suitable for the volume of traffic anticipated.	Bespoke
Construction	Maintain the road surfaces and signage on traffic diversions routes for the duration of their usage.	Bespoke
Construction	On termination of the use of a diversion, remove all unnecessary signage and ensure that the condition of road surface has not been unduly affected by the diversion traffic.	Bespoke
Construction	Flag bearers and traffic controls must be deployed at critical points / intersections along road diversions to maintain traffic safety and facilitate traffic flow.	Bespoke
Construction	Provide illumination of key junctions at night when construction works are present.	Bespoke

Construction	Signage warning of deviations mut be put in place to inform the population, so that they may pursue alternative routes. This must include advance warning of any planned deviations, as well as effective signage along deviation routes to inform the users.	Bespoke
Construction	Provision must be made for ongoing conveyance of heavy motor vehicles along the NR3 with the least disruption. Heavy motor vehicles should not be permitted to access road diversions unless the road is of a class suitable for such use.	Bespoke
Construction	Develop and implement a community grievance mechanism to provide a means for raising concerns. The process should be understandable and transparent, and provide timely feedback to those concerned, without retribution. Use of the mechanism shall be communicated to local communities through the Project's stakeholder engagement process.	Performance Standard 1

Residual Impact

Post mitigation the impact will be **MEDIUM** intensity, **LOCAL** extent and **SHORT** duration and as such will be of **MINOR** significance**.**

Project Phase:	**Construction**	
Type of Impact	**Direct and Indirect**	
Nature of Impact	**Negative**	
Highly Sensitive Receptor(s)?	**Variable, Including some highly sensitive**	
	Pre-Mitigation Impact	**Residual Impact**
Intensity	High	Medium
Extent	Local	Local
Duration	Medium	Medium

Significance	Major	Minor

8.6.1.3 Temporary disruptions to municipal services

Impact Description

Activities such as earthworks, construction of engineering structures and the construction of the roundabouts during the construction phase can potentially disrupt municipal services including waste collection, electricity, telecommunications and water supply.

The collection of household waste is performed by the company Hygiène et Salubrité du Cameroun (HYSACAM) through the provision of garbage bins at intervals on the roadside. Waste management is already a concern of the populations living along the road. The bins are often overloaded and overflowing, but there are also many situations where people put the garbage on the ground and not in the bins intended for this purpose.

The lack of access to waste bins or servicing of these bins during construction may result in uncontrolled deposition of litter by local populations in project area. This can contribute to a visually degraded urban landscape, an increase of unsanitary conditions and various forms of pollution.

In the footprint of the roadway within the ROW required for the work, electrical, telephone cables, and water pipelines are present. If damaged, these could result in member of the local community losing service. Disruption of these services could also lead to decreased economic efficiency and increased stress levels among those dependent on these services.

Receptor Sensitivity

The community affected are primarily permanent local residents and businesses. The community's sensitivity to waste collection disruptions is not considered to be high, but their sensitivity to loss of other services could be considered high, given the potential indirect economic effects from such a loss of service.

Impact Significance (Pre-Mitigation)

The nature of the impact is negative. The impact is of **STRONG** intensity, **LOCAL** in extent and of **SHORT** duration and as such is of **MINOR** significance.

Mitigation

The Table below details recommended mitigation.

Project Phase	Measure	Source of Measure
Construction	Planned collaboration with HYSACAM to anticipate and plan for disruptions to waste collection.	Bespoke

Construction	Raising awareness among the local population by posting signs on health issues associated with uncontrolled deposition of domestic waste in the construction area.	Bespoke
Pre-construction	The Project will coordinate with local service providers (i.e. power, water, and telecommunications) to identify locations of all known infrastructure within the ROW. These will be mapped and either relocated prior to construction, or where these can remain in situ, they must be visibly marked (if buried). Where practical the developer should ensure that an installation of install new service networks before removing existing ones occurs, so as to limit the length of the inconvenience.	Bespoke
Construction	The Project must maintain a prohibition of unauthorised work (earthworks, site machinery) within a defined perimeter around cables or electrical poles.	Bespoke
Construction	The Project should work with local service providers to map any planned service interruptions and estimate the anticipated dates and times of interruption. The Project must inform the population by means of posters before each planned service disruption event through the local media and posters in the neighbourhoods concerned.	Bespoke
Construction	Develop and implement a community grievance mechanism to provide a means for raising concerns. The process should be understandable and transparent, and provide timely feedback to those concerned, without retribution. Use of the mechanism shall be communicated to local communities through the Project's stakeholder engagement process.	Performance Standard 1

Residual Impact

Post mitigation the impact will be **LOW** intensity, **LOCAL** in extent**,** of **SHORT** duration and as such will be of **NEGLIGIBLE** significance**.**

Project Phase:	**Construction**
Type of Impact	**Direct and Indirect**
Nature of Impact	**Negative**

Highly Sensitive Receptor(s)?	**Yes (where economic effects exist)**	
	Pre-Mitigation Impact	**Residual Impact**
Intensity	Strong	Low
Extent	Local	Local
Duration	Short	Short
Significance	**Minor**	**Negligible**

8.6.1.4 Unauthorised community access

Impact Description

Road construction requires the presence and operation of significant heavy and technical machinery, hazardous and bulk material handling, deep excavations, and technical works. Each of these have elements that can result in community safety concerns if access is not restricted to all active work sites. The safety concerns are exacerbated when the activities are undertaken in an urban environment and even more so when the construction site is embedded within ongoing public activities. The public are not familiar with, or appreciative of, the dangers of such activities.

The construction activities and changing environment near the many public users of the ROW could result in public health and safety risks, including injuries and fatalities. The risk will be present throughout the duration of construction and could occur over the full extent of the construction footprint.

Community safety impacts related to traffic are addressed separately in Section 8.7.1.10.

Receptor Sensitivity

Local community members and informal traders are considered to receptors most likely to be present as part of pedestrian traffic. Receptor sensitivity is considered high.

Impact Significance (Pre-Mitigation)

The nature of the impact is negative. The impact is of **HIGH** intensity, **LOCAL** in extent and of **MEDIUM** duration and as such is of **MAJOR** significance.

Mitigation

Primary mitigation is to ensure the project controls are correctly implemented for all activities, in all locations and over the full duration of the project. The Table below details recommended mitigation.

Project Phase	Measure	Source of Measure
Construction	Measures will be put in place to restrict access to the Project site. These measures will include fencing and warning signs.	Section 4.3, page 94-95, General EHS Guidelines
Construction	As part of local community stakeholder engagement activities, the health and safety risks of unauthorised access will be communicated.	Section 4.3, page 94-95, General EHS Guidelines
Construction	Develop and implement a community grievance mechanism to provide a means for raising concerns. The process should be understandable and transparent, and provide timely feedback to those concerned, without retribution. Use of the mechanism shall be communicated to local communities through the Project's stakeholder engagement process.	Performance Standard 1

Residual Impact

Post-mitigation the impact will be of **MEDUM** intensity, **LOCAL** in extent**, MEDIUM** duration and as such will be of **MINOR** significance**.**

Project Phase:	**Construction**	
Type of Impact	**Direct and Indirect**	
Nature of Impact	**Negative**	
Highly Sensitive Receptor(s)?	**Yes**	
	Pre-Mitigation Impact	**Residual Impact**
Intensity	High	Medium
Extent	Local	Local

Duration	Medium	Medium
Significance	**Major**	**Minor**

8.6.1.5 Work force presence and project related health impacts on immediate community

Impact Description

The arrival of employees from diverse backgrounds in the project area is likely to increase the prevalence rate of sexually transmitted infections (STIs) and HIV/AIDS. The number of people working on civil engineering sites also leads to proximity between employees, which is the major cause of the spread of COVID.

The abundant rainfall and the almost flat topography of Douala are conducive to the formation of stagnant water bodies, the main breeding grounds for mosquitoes, vectors of malaria. The risk of flooding and/or the formation of pools of water directly related to construction activities can lead to an increase in malaria and as such may be an indirect consequence of poorly drained standing water.

People living near the work areas may also be exposed to various risks, associated with ROW clearing and demolition operations, operation of borrow pits and quarries, earthmoving, transportation of materials, movement of construction machinery and vehicles, etc.

Increases in health and safety risk can have a devastating impact on marginal communities. This is particularly so in countries such as Cameroon where health facilities are not always well resourced or appropriate health care easily available.

Receptor Sensitivity

The community affected are primarily permanent residents in the immediate vicinity. Given constraints on health resources, particularly within the context of potential COVID outbreaks, the receptor sensitivity is considered high. Pedestrians are

Impact Significance (Pre-Mitigation)

The nature of the impact is negative. The impact is of **HIGH** intensity, **LOCAL** in extent and of **MEDIUM** duration and as such is of **MAJOR** significance.

Mitigation

The Table below details recommended mitigation.

Project Phase	Measure	Source of Measure
Construction	In order to mitigate a potential increase in STI/HIV/AIDS increase in the areas, the following measures will be undertaken: • Sensitisation of the local population and site personnel on the prevention of STI/HIV/AIDS. (Note that international and national structures such as UNAIDS, African Synergies, the Provincial Technical Group (PWG), the National AIDS Control Committee (NACC) and the Local AIDS Control Committees (LACC) are already operational on this subject.) • Distribution of condoms to employees. • Encouraging voluntary testing.	Bespoke
Construction	In order to mitigate the resurgence of the COVID pandemic, the following measures will be undertaken: • Development of detailed COVID management plan for all contractors and sub-contractors. • Equipping workers with FFP2 masks or washable masks; • Closely follow recognised health organisation recommendation (such as the WHO) for preventative steps. • Enforce the recommended social distancing parameters. • Raising employee awareness of hygiene with the provision of soap for washing hands.	Bespoke
Construction	To mitigate the resurgence of malaria, the following measures will be undertaken: • Rehabilitate temporary construction sites at the end of their use, and drain them, considering the gradient so as to avoid the formation of mosquito-breeding areas. • Avoid depositing excavated material near natural water flow routes as provided for in the MINTP environmental guidelines. • Maintain adequate water pumps on site for rapid interventions in the event of flooding due to the work.	Bespoke
Construction	In order to mitigate general health and safety risks, the following measures will be undertaken: • Train and raise the awareness of site personnel on safety at work (in particular take note of the number of accident-free working days) and potential threats to community members.	Bespoke

	• Make community health and safety a key component of "Tool Box Talks". • Provide staff with appropriate personal protective equipment relevant to their work. • Provide for, penalties, for employees refusing to wear equipment for their protection or disregarding community safety to comply with safety requirements. • Put in place notice boards that are publicly visible that describe hazards and preventative measures. • Ensure that the construction site is bounded and cordoned and that these cordons are maintained on a very regular basis.	
Construction	Develop and implement a community grievance mechanism to provide a means for raising concerns. The process should be understandable and transparent, and provide timely feedback to those concerned, without retribution. Use of the mechanism shall be communicated to local communities through the Project's stakeholder engagement process.	Performance Standard 1

Residual Impact

Post mitigation the impact will be of **MEDIUM** intensity, **LOCAL** in extent**, MEDIUM** duration and as such will be of **MEDIUM** significance**.**

Project Phase:	**Construction**	
Type of Impact	**Direct**	
Nature of Impact	**Negative**	
Highly Sensitive Receptor(s)?	**Yes**	
	Pre-Mitigation Impact	**Residual Impact**
Intensity	High	Medium
Extent	Local	Local
Duration	Medium	Medium
Significance	**Major**	**Minor**

8.6.1.6 Employment

Impact Description

The effects of project construction on employment are:

- direct jobs required for construction – it is estimated that 206 construction period jobs will be created;
- indirect jobs involved in upstream industries for the manufacture of construction site supplies.

About 80% of the jobs created are subcontracted to Cameroon based contractors, with 5% local jobs and 15% expatriate jobs. Mobilising local businesses to carry out the work planned on the NR3 is an important issue in supporting local employment and growth.

The provision of jobs is a direct investment in the economy and as such stimulated an triggers economic growth. At a local level, short term employment can result in a windfall to those who succeed in obtaining positions. Income earned and savings made during construction could enable those employed to set up micro projects to avoid returning to unemployment at the end of their contracts. The experience gained by previously unqualified personnel will potentially enable them to apply and be eligible in other companies for similar work.

Receptor Sensitivity

The community affected are contractors and staff resident in Cameroon and immediate residents. The receptors are not considered to be highly sensitive.

Impact Significance (Pre-Mitigation)

The nature of the impact is positive. The impact is of **MEDIUM** intensity, **LOCAL** extent and of **MEDIUM** duration and as such is of **MINOR** significance.

Mitigation

Because this is a positive impact, no additional mitigation measures are required to manage this impact; however, there are several enhancement measures that the Project could implement to increase the positive effects in the local community. These are detailed below.

Project Phase	Enhancement Measure	Source of Measure
Construction	Set up a local labour desk and the staff recruitment policy is transparent.	Bespoke
Construction	Give employment priority to nationals, specifically to the inhabitants of Douala and the inhabitants located along the project's axes during recruitment.	Bespoke

Construction	Issue end-of-contract work certificates or attestations to employees to enable them to be more competitive in the event that they are offered another opportunity for similar jobs.	Bespoke
Construction	As far as possible, subcontract certain work to local SMEs using the Employment intensive investments programme (EIIP).	Bespoke

Residual Impact

Post mitigation the impact will be of **STRONG** intensity, **LOCAL** in extent**, MEDIUM** duration and as such will be of **MEDIUM** significance**.**

Project Phase:	**Construction**	
Type of Impact	**Direct**	
Nature of Impact	**Positive**	
Highly Sensitive Receptor(s)?	**No**	
	Pre-Mitigation Impact	**Residual Impact**
Intensity	Medium	Strong
Extent	Local	Local
Duration	Medium	Medium
Significance	**Minor Positive**	**Medium Positive**

8.6.1.7 Infringement on workers' human rights (unplanned)

Impact Description

Under the UN's Universal Declaration of Human Rights,

*"Everyone has the right to work, to free choice of employment, to **just and favourable conditions of work** and to protection against unemployment."*

As such, safe working conditions and fair labour conditions are considered basic human rights. If a project does not put in place suitable measures to protect these rights for all of their workforce, including subcontractors, it is possible that these rights may be infringed upon.

During construction, when the project's workforce will be highest, the risk of this impact occurring will be highest. For the purposes of this project the definition of the workplace should be designated as hazardous and as such measures to ensure appropriate worker safety must be adopted.

Receptor Sensitivity

The receptor for this impact will be all employees of the project, including subcontractors.

Impact Significance (Pre-Mitigation)

The nature of the impact is negative. The impact is of **HIGH** intensity, **PUNCTUAL** extent and of **MEDIUM** duration and as such is of **MEDIUM** significance.

Mitigation

The required measures to mitigate this potential impact are set out below.

Project Phase	Enhancement Measure	Source of Measure
Construction	Ensure application of Labour Law specifically Parts IV (Wages), V (Conditions of employment) and VI (Workplace Safety and Hygiene)	Cameroon Labour code 92/007
Construction	Develop an Occupational Health Management Plan (or equivalent) for construction. This should identify measures related to risks from: • Over exertion • Slips and Falls • Working at height • Object strikes All employees should be trained on the Occupational Health Management Plan, with particular focus on those risks specific to their roles.	Section 4.2, page 92-94, General EHS Guidelines
Construction	Develop a Human Resources Management Plan (or equivalent). This Plan will specify clear contracting procedures and worker rights in accordance with national law and IFC PS2. The Human Resources Management Plan will incorporate human rights and non-discrimination principles. Priority will be given to local workers provided they are suitably qualified to undertake the work. Implement training for all workers, including contract workers, on the principles of the Human Resources	Performance Standard 2

	Management Plan including worker rights, non-discrimination and human rights.	
Construction	All contracts for workers, including contract workers, will be in accordance with applicable national labour law and IFC PS2 requirements. Worker contracts must clearly detail workers' rights.	Performance Standard 2
Construction	Develop and implement a grievance mechanism for all workers (including direct employees and contractors) to provide a means for raising workplace concerns. The process should be understandable and transparent, and provide timely feedback to those concerned, without retribution. The mechanism shall be communicated to all workers, including subcontractors via accessible means (e.g., notice boards) and in employment contracts.	Performance Standard 2
Construction	Ensure the project, including subcontractors will utilise no child or forced labour (as defined by Performance Standard 2).	Performance Standard 2, ILO Conventions 138 and 182

Residual Impact

Post mitigation the impact will be of **LOW** intensity, **PUNCTUAL** in extent**, MEDIUM** duration and as such will be of **NEGLIGIBLE** significance**.**

Project Phase:	**Construction**	
Type of Impact	**Direct**	
Nature of Impact	**Negative**	
Highly Sensitive Receptor(s)?	**No**	
	Pre-Mitigation Impact	**Residual Impact**
Intensity	High	Low
Extent	Punctual	Punctual
Duration	Medium	Medium
Significance	**Medium**	**Negligible**

8.6.1.8 Local content and procurement

Impact Description

The effects of project will be such that the presence of a workforce and contracting entities will simulate direct local procurement. This could be procurement of meals for workers during breaks, increased demand for transport to and from site, ad hoc purchase of locally supplied goods and services.

The provision of increased opportunities for local procurement will stimulate local trading and service provider sales and be a direct investment into the immediate economy. Increase in local sales increases profitability and as such income levels.

Receptor Sensitivity

The community affected are immediate traders and residents. The receptor sensitivity is high given the direct dependence on trade from the immediately local community.

Impact Significance (Pre-Mitigation)

The nature of the impact is positive. The impact is of **MEDIUM** intensity, **LOCAL** extent and **MEDIUM** duration and as such is of **MINOR** significance.

Mitigation

Because this is a positive impact, no additional mitigation measures are required to manage this impact; however, there are several enhancement measures that the Project could implement to increase the positive effects in the local community. These are detailed below.

Project Phase	Enhancement Measure	Source of Measure
Construction	Encouraging contractors to prioritise local supply points will enhance the benefit.	Bespoke
Construction	Making meal breaks available and allowing for trade from local vendors to directly supply the work force will be of particular benefit.	Bespoke

Residual Impact

Post mitigation the impact will be of **STRONG** intensity, **LOCAL** in extent**, MEDIUM** duration and as such will be of **MEDIUM** significance**.**

Project Phase:	Construction

Type of Impact	**Direct**	
Nature of Impact	**Positive**	
Highly Sensitive Receptor(s)?	**Yes**	
	Pre-Mitigation Impact	**Residual Impact**
Intensity	Medium	Strong
Extent	Local	Local
Duration	Medium	Medium
Significance	**Minor Positive**	**Medium Positive**

8.6.1.9 Reduced availability of water to community users

Impact Description

Construction of the road requires substantial volumes of water in order to wet/saturate the layer works in order to achieve the correct grades and compactions. Water is also required for the mixing of concrete, the washing of equipment and mechanised fleet and for dust suppression. Potable water is also required for the workforce and various other uses. Certain of the project' uses are sensitive to water quality and thus the source of the water is important and limited (i.e. saline water cannot be used).

Where substantial volumes are taken, this use may affect other users of the same source. Where the current users are dependent on the source for supply, and such supply is limited, the project induced effects may be of concern. The impacts could occur throughout construction, but will be most closely linked to the activities that consume water.

Receptor Sensitivity

The local community obtains water from Cam-Water and from groundwater, typically via shallow wells. In the western areas, where residential areas have been established for a longer period, Cam-Water service levels are reasonable, and most residents have access to water from Cam-Water. However, water provision service levels decline significantly to the east in the more recently established urban areas. The communities in these areas are frequently dependent on wells for water. At a regional level the sensitivity of the Douala community to the availability of groundwater is low. However, at the individual household level receptor sensitivity to groundwater supply from wells may be very high.

Impact Significance (Pre-Mitigation)

The nature of the impact is negative. The impact is of **STRONG** intensity, **LOCAL** extent and **MEDIUM** duration and as such is of **MEDIUM** significance.

Mitigation

Primary mitigation is to obtain water from sources with adequate supply such that there is no competitive use or effect on other users. Water should be used efficiently, and water conservation should be promoted and practiced. The Table below details recommended mitigation.

Project Phase	Measure	Source of Measure
Construction	Before finalising water use plans, the Project will conduct a study to evaluate 1) the ability of the potential boreholes identified to accommodate the water demand and 2) how this water usage could affect other groundwater users in the area, especially during the dry season. This study will also identify any associated monitoring required during construction.	Bespoke
Construction	Prior to taking water from a borehole or well: • identify all other boreholes and wells within 100 m of the source. • Measure the level and quality of water in these wells. Thereafter measure the level and quality of water on a monthly basis, continuing until two months after abstraction ceases. If monitoring indicates a material reduction in water level or water quality then abstraction should cease. If the reduction is substantial enough to affect the availability or usability of supply to the users, then Magil will need to provide and fund an alternate, equivalent supply for the duration of the period that an effect occurs.	Bespoke
Construction	Obtain permits necessary to abstract groundwater.	Bespoke
Construction	Record volume of water abstracted on a monthly basis.	Bespoke
Construction	Develop and implement a community grievance mechanism to provide a means for raising concerns. The process should	Performance Standard 1

	be understandable and transparent, and provide timely feedback to those concerned, without retribution. Use of the mechanism shall be communicated to local communities through the Project's stakeholder engagement process.	

Residual Impact

Post mitigation the impact will be of **LOW** intensity, **LOCAL** extent**, MEDIUM** duration and as such will be of **NEGLIGIBLE** significance**.**

Project Phase:	**Construction**	
Type of Impact	**Direct**	
Nature of Impact	**Negative**	
Highly Sensitive Receptor(s)?	**Potentially**	
	Pre-Mitigation Impact	**Residual Impact**
Intensity	Strong	Low
Extent	Local	Local
Duration	Medium	Medium
Significance	**Medium**	**Negligible**

8.6.1.10 Risk of project vehicle traffic accident (unplanned)

Impact Description

In order to construct the proposed roadway within the road footprint, vehicles transporting employees, equipment and materials have to utilise public roads to access the site. Some of the public road use will be daily (i.e. employee arrival and departure), some will be infrequent and incidental (i.e. delivery and subsequent removal of plant), while others will be very frequent during specific periods (i.e. bulk aggregate, bitumen and ready-mix concrete deliveries). The extent and routing of the public road use will vary with the activity and location of the source and destination of the goods. The most intensively used routes will be those between the bulk material sources and the site.

Project traffic would be additional to current users of the public roads. There is only preliminary information as to which public roads would be used by project traffic and baseline data on traffic volumes has not been collated for all routes that may be followed by suppliers. The project vehicles frequently comprise loaded, heavy motor vehicles. These are large, slow to accelerate and break, have limited manoeuvrability and the operator often has restricted views of the adjacent environment. Additionally, public users are often impatient around these vehicles due to the congestion and time delays they can cause. As a result, the operation of these construction vehicles on public roads results in an inherent risk of traffic accidents. Such accidents can cause damage or loss of the vehicle and goods, damages to public and private property, traffic congestion and travel delays, as well as loss of life in the worst case.

Receptor Sensitivity

All users of public roads are potential receptors, as well as people and property immediately adjacent to the road, where their use coincides with that of project traffic. Receptor sensitivity is considered high.

Impact Significance (Pre-Mitigation)

The nature of the impact is negative. The impact is of **HIGH** intensity, **LOCAL** in extent and of **MEDIUM** duration and as such is of **MAJOR** significance.

Mitigation

The Table below details recommended mitigation.

Project Phase	Measure	Source of Measure
Construction	Train industrial vehicle operators in the safe operation of specialized vehicles, including safe loading/unloading practices and load limits. Ensure drivers undergo medical surveillance Ensure moving equipment with restricted rear visibility is outfitted with audible back-up alarms	Section 2.3, page 64-69, General EHS Guidelines
Construction	Develop and implement a Traffic Management Plan (or equivalent) that evaluates potential routes for the main project related vehicle movements for construction machinery, goods (e.g. deliveries of aggregates, bitumen and concrete), worker transport, and waste removal vehicles. This plan should prioritise routes that, where possible, avoid noise sensitive areas included but not limited to schools and residential areas. If avoidance is not possible, the plan will consider alternative minimisation measures such as timing of vehicle movements, speed restrictions, staff training etc.	Section 2.3, page 64-69, General EHS Guidelines

Construction	Develop and implement a community grievance mechanism to provide a means for raising concerns. The process should be understandable and transparent, and provide timely feedback to those concerned, without retribution. Use of the mechanism shall be communicated to local communities through the Project's stakeholder engagement process.	Performance Standard 1

Residual Impact

Post mitigation the impact will be of **STRONG** intensity, **LOCAL** in extent**, MEDIUM** duration and as such will be of **MEDIUM** significance**.**

Project Phase:	**Construction**	
Type of Impact	**Direct**	
Nature of Impact	**Negative**	
Highly Sensitive Receptor(s)?	**Yes**	
	Pre-Mitigation Impact	**Residual Impact**
Intensity	High	Strong
Extent	Local	Local
Duration	Medium	Medium
Significance	**Major**	**Medium**

8.6.1.11 Destruction of fixed property in the ROW (planned and unplanned)

Impact Description

In order to construct the proposed roadway within the road footprint there will be a need to demolish or partially demolish fixed structures that are within the ROW. Those that have been constructed after the publication of the Plan d'Indemnisation et de Réinstallation (PIR) (Compensation and Resettlement Plan) and its compensation implementation programme so are technically not liable for consideration for compensation. However, given the time lapse between the PIR, owners of the properties may not realise this destruction will occur and could still

pose a risk to the project's social license to operate. As such, the project should revisit the outcomes of the PIR with respect to these fixed structures to manage the risk.

Given the proximity of structures, there is also a possibility that construction activities within the ROW could result in unplanned property damage, especially when conducting planned demolition of other structures within the ROW.

Receptor Sensitivity

The owners of structures that potentially need to be demolished or partially demolished are the receptors. These receptors are not considered to be high sensitivity.

Impact Significance (Pre-Mitigation)

The nature of the impact is negative. The impact is of **MEDIUM** intensity, **LOCAL** in extent and of **MEDIUM** duration and as such is of **MINOR** significance.

Mitigation

The Table below details recommended mitigation.

Project Phase	Measure	Source of Measure
Construction	Compare current fixed structures with what was compensated as per the PIR. Interview those with fixed structures and those who have been previously compensated are excluded from further consideration. Those who were not compensated and can prove that structures exited prior to the PIR are liable for compensation.	Bespoke Performance Standard 5 consistent
Construction	Allow those not compensated to lodge a grievance and mange as per the community grievance mechanism.	Performance Standard 1/5
Construction	Magil will coordinate with all owners of structures within the ROW that must be demolished well in advance of any activities to ensure that they are aware of the plans and have sufficient time to take necessary steps to vacate the structures. Additionally, Magil will notify immediately surrounding properties when any demolition activities are planned.	Bespoke
Construction	Magil will verify that all structures are empty prior to demolition.	Bespoke

Construction	Any accidental damage to be repaired by Magil	Bespoke

Residual Impact

Post mitigation the impact will be of **Low** intensity, **LOCAL** in extent**, MEDIUM** duration and as such will be of **NEGLIGIBLE** significance**.**

Project Phase:	**Construction**	
Type of Impact	**Direct**	
Nature of Impact	**Negative**	
Highly Sensitive Receptor(s)?	**No**	
	Pre-Mitigation Impact	**Residual Impact**
Intensity	Medium	Low
Extent	Local	Local
Duration	Medium	Medium
Significance	**Minor**	**Negligible**

8.6.1.12 Destruction of chance finds tangible cultural heritage (unplanned)

Impact Description

It is possible that buried cultural heritage may be encountered during the project activities, especially earthworks. Given that the population density is high in the area surrounding the proposed activities, and the fact that human graves were encountered during the emergency works, the likelihood of this occurring is high. Depending on the nature of any chance finds encountered, it is possible that such material would be of cultural significance to the wider region.

If not correctly identified, managed, and relocated such interactions could result in damage and/or destruction of significant tangible cultural heritage.

Receptor Sensitivity

Subsequent to the relocation of graves from the Yassa Roundabout, there are no known heritage resources within the roadway footprint. The receptor for this impact would be any tangible cultural heritage encountered. Given the unplanned nature of this impact, it is not possible to definitively state the sensitivity of any such material encountered; however, given the archaeological works in proximity to the AOI, highly sensitive cultural heritage may be present.

Impact Significance (Pre-Mitigation)

The nature of the impact is negative. The impact is of **MEDIUM** intensity, **REGIONAL** in extent and of **LONG** duration and as such is of **MEDIUM** significance.

Mitigation

The Table below details required mitigation.

Project Phase	Measure	Source of Measure
Construction	The Project will implement a Chance Find Procedure in-line with national requirements and Performance Standard 8.	Performance Standard 8

Residual Impact

Post mitigation the impact will be of **LOW** intensity, **LOCAL** in extent**, LONG** duration and as such will be of **NEGLIGIBLE** significance**.**

Project Phase:	**Construction**	
Type of Impact	**Direct**	
Nature of Impact	**Negative**	
Highly Sensitive Receptor(s)?	**Yes (Potentially)**	
	Pre-Mitigation Impact	**Residual Impact**
Intensity	Medium	Low
Extent	Regional	Regional

Duration	Long	Long
Significance	**Medium**	**Negligible**

8.6.2 Operations Phase

8.6.2.1 Changes in traffic pattern (neighbourhood level)

Impact Description

The operational phase of the road project will result in a changed and more streamlined local traffic flow. The better designed and widened road, with roundabouts at key intersections, accompanied by the removal of the encroaching traders and associated economic enterprises will result in less travel time and better access between the immediate neighbourhoods and to the greater Douala region.

The better flow of traffic will enable local communities to be able to commute/travel more efficiently. Of particular benefit will be better access to the hospital and schools complex. This will ensure greater economic and travel efficiency for the residents as well as potential increases in the desirability of the immediate area and property prices.

Receptor Sensitivity

The receptors affected are the residents and traders in the immediate vicinity of the road.

Impact Significance (Pre-Mitigation)

The nature of the impact is positive. The impact is of **LOW** intensity, **LOCAL** extent and **LONG** duration and as such is of **NEGLIGIBLE** significance.

Mitigation

Because this is a positive impact, no additional mitigation measures are required to manage this impact; however, there are a number of enhancement measures that the Project could implement to increase the positive effects in the local community. These are detailed below.

Project Phase	Enhancement Measure	Source of Measure
Operations	Maintenance of the road to prevent mechanical failure of vehicles due to road conditions and users' ability to follow the designed traffic speeds.	Section 1.1, EHS Guideline for Toll Roads, 2007

Operations	Maintenance of all signs, signals, markings, and other devices used to regulate traffic.	Section 1.1, EHS Guideline for Toll Roads, 2007

Residual Impact

Post mitigation the impact will be of **MEDUM** intensity, **LOCAL in** extent**, MEDIUM** duration and as such will be of **MINOR** significance**.**

Project Phase:	**Construction**	
Type of Impact	**Direct**	
Nature of Impact	**Positive**	
Highly Sensitive Receptor(s)?	**No**	
	Pre-Mitigation Impact	**Residual Impact**
Intensity	Low	Medium
Extent	Local	Local
Duration	Long	Long
Significance	**Negligible**	**Minor Positive**

8.6.2.2 Changes in traffic pattern (Douala and regional level)

Impact Description

The eastern part of the city of Douala constitutes an economic transit route between the port, the industrial zones, the airport zone, the rest of the country and even the whole sub-region (Chad, Central African Republic and Congo) and Nigeria. These axes also serve urban neighbourhoods, shopping centres and urban extension routes (bypasses).

Due to its strategic position on the coast and its dense industrial fabric, the city of Douala has a variety of tourist attractions that are for the constrained with regard to access, especially along the main entrances to the capita. The operational phase of the road project will result in a changed and more streamlined city wide and regional traffic flow. The better designed and widened road accompanied by the removal of the encroaching traders and

associated economic enterprises will result in less travel time and better access within the greater Douala. This is the reason for the road project and as such is the critical objective.

The better flow of traffic will facilitate commuting and travel more efficiently. This will ensure greater economic and travel efficiency for the city and its adjacent regions and as a critical infrastructure development project it will increase economic returns and as such be of key long-term benefit to the fiscus.

Receptor Sensitivity

The community affected are the greater citizens of Douala and environs and in the ultimate analysis the nation of Cameroon.

Impact Significance (Pre-Mitigation)

The nature of the impact is positive. The impact is of **STRONG** intensity, **REGIONAL in** extent and **LONG** duration and as such is of **MAJOR** significance.

Mitigation

Because this is a positive impact, no additional mitigation measures are required to manage this impact; however, there are a number of enhancement measures that the Project could implement to increase the positive effects in the wider community. These are detailed below.

Project Phase	Enhancement Measure	Source of Measure
Operations	Maintenance of the road to reduce mechanical failure of vehicles due to road conditions and users' ability to follow the designed traffic speeds.	Section 1.1, EHS Guideline for Toll Roads, 2007
Operations	Maintenance of all signs, signals, markings, and other devices used to regulate traffic.	Section 1.1, EHS Guideline for Toll Roads, 2007

Residual Impact

Post mitigation the impact will be of **HIGH** intensity, **REGIONAL in** extent**, LONG** duration and as such will be of **MINOR** significance**.**

Project Phase:	Construction
Type of Impact	Direct
Nature of Impact	Positive

Highly Sensitive Receptor(s)?	**No**	
	Pre-Mitigation Impact	**Residual Impact**
Intensity	Strong	High
Extent	Regional	Regional
Duration	Long	Long
Significance	**Major Positive**	**Major Positive**

8.6.2.3 Risk of traffic accident (unplanned)

Impact Description

Traffic accidents are unfortunately a common risk for any roadway. Types of accidents include: vehicle to vehicle, vehicle and pedestrian, vehicle and external obstruction (e.g. infrastructure, debris or animal). Whilst these impacts are already present on the existing road and the road improvements are not expected to significantly adversely change these impacts, this impact has been included for limited assessment to capture required measures from the EHS Guidelines.

Receptor Sensitivity

All users of public roads are potential receptors, as well as people and property immediately adjacent to the road.

Impact Significance (Pre-Mitigation)

Whilst traffic accidents are generally an adverse impact, some of the provisions being designed by the project should actually reduce the risk of traffic accidents when compared to the baseline conditions. As such this is considered to be a positive impact. The impact is of **LOW** intensity, **REGIONAL** in extent and of **LONG** duration and as such is of **MINOR** significance.

Note that this rating assumes the presence of the following embedded measures:

- Installation of regular pedestrian safety crossing points, especially where large volumes of pedestrian traffic is expected.
- Installation of signs, signals, markings, and other devices used to regulate traffic, including those related to pedestrian facilities.
- Design of the roadway to accommodate anticipated traffic volume and flow.

Mitigation

The Table below details recommended mitigation.

Project Phase	Enhancement Measure	Source of Measure
Operation	The following measures related to pedestrian safety should implemented: • Installation and maintenance of speed control and traffic calming devices at pedestrian crossing areas. • Maintenance of all signs, signals, markings, and other devices used to regulate traffic, specifically those related to pedestrian facilities.	Section 1.1, EHS Guideline for Toll Roads, 2007
Operation	The following general safety measures should be implemented to minimize the risk of accidents along the road: • Maintenance of all signs, signals, markings, and other devices used to regulate traffic; • Setting and enforcement of speed limits appropriate to the road and traffic conditions; • Maintenance of the road to prevent mechanical failure of vehicles due to road conditions; • Installation of measures to reduce collisions between animals and vehicles (e.g. use of signs to alert drivers on road segments where animals frequently cross; construction of animal crossing structures; installation of fencing along the roadway to direct animals toward crossing structures; and use of reflectors along the roadside to deter animal crossings at night when vehicles are approaching).	Section 1.1, EHS Guideline for Toll Roads, 2007
Operation	Implementing a real-time warning system with signage to warn drivers of congestion, accidents, adverse weather or road conditions, and other potential hazards ahead.	Section 1.1, EHS Guideline for Toll Roads, 2007

Residual Impact

The implementation of the measures listed above have the potential to change this from a negative impact to a positive impact when compared to baseline conditions.

Project Phase:	Construction
Type of Impact	Direct
Nature of Impact	Positive

Highly Sensitive Receptor(s)?	**No**	
	Pre-Mitigation Impact	**Residual Impact**
Intensity	Low	Strong
Extent	Regional	Regional
Duration	Long	Long
Significance	**Minor Positive**	**Medium Positive**

8.6.2.4 Infringement on workers' human rights (unplanned)

Impact Description

Under the UN's Universal Declaration of Human Rights,

"Everyone has the right to work, to free choice of employment, to just and favourable conditions of work and to protection against unemployment."

As such, safe working conditions and fair labour conditions are considered basic human rights. If a project does not put in place suitable measures to protect these rights for all of their workforce, including subcontractors, it is possible that these rights may be infringed upon.

Whilst the operational workforce will be much smaller than during construction (i.e. those associated with road maintenance), these potential impacts must be managed during this phase of the project as well.

Receptor Sensitivity

The receptor for this impact will be all employees of the project, including subcontractors.

Impact Significance (Pre-Mitigation)

The nature of the impact is negative. The impact is of **STRONG** intensity, **PUNCTUAL** extent and of **LONG** duration and as such is of **MEDIUM** significance.

Mitigation

The required measures to mitigate this potential impact are set out below.

Project Phase	Enhancement Measure	Source of Measure
Operations	Develop an Occupational Health Management Plan (or equivalent) for road maintenance activities. This should identify measures related to risks from: • Over exertion • Slips and Falls • Object strikes All employees should be trained on the Occupational Health Management Plan, with particular focus on those risks specific to their roles.	Section 4.2, page 92-94, General EHS Guidelines
Operations	Develop a Human Resources Management Plan (or equivalent). This Plan will specify clear contracting procedures and worker rights in accordance with national law and IFC PS2. The Human Resources Management Plan will incorporate human rights and non-discrimination principles. Priority will be given to local workers provided they are suitably qualified to undertake the work. Implement training for all workers, including contract workers, on the principles of the Human Resources Management Plan including worker rights, non-discrimination and human rights.	Performance Standard 2
Operations	All contracts for workers, including contract workers, will be in accordance with applicable national labour law and IFC Performance Standard 2 requirements. Worker contracts must clearly detail workers' rights.	Performance Standard 2
Operations	Develop and implement a grievance mechanism for all workers (including direct employees and contractors) to provide a means for raising workplace concerns. The process should be understandable and transparent, and provide timely feedback to those concerned, without retribution. The mechanism shall be communicated to all workers, including subcontractors via accessible means (e.g. notice boards) and in employment contracts.	Performance Standard 2
Operations	Ensure the project, including subcontractors will utilise no child or forced labour (as defined by Performance Standard 2).	Performance Standard 2, ILO Conventions 138 and 182

Residual Impact

Post mitigation the impact will be of **LOW** intensity, **PUNCTUAL** in extent**, LONG** duration and as such will be of **NEGLIGIBLE** significance**.**

Project Phase:	**Construction**	
Type of Impact	**Direct**	
Nature of Impact	**Negative**	
Highly Sensitive Receptor(s)?	**No**	
	Pre-Mitigation Impact	**Residual Impact**
Intensity	Strong	Low
Extent	Punctual	Punctual
Duration	Long	Long
Significance	**Medium**	**Negligible**

8.7 WASTE

8.7.1 Construction

8.7.1.1 Project generated waste affecting local environment or community receptors

Impact Description

During road construction the activities, mechanised fleet and personnel will generate a variety of wastes. The wastes will primarily (by volume) consist of inert construction material (soil, aggregates, concrete, wood), some bitumen, packaging, but will also include food, sewage and limited volumes of hazardous materials (e.g. hydrocarbons, paints, solvent, and containers). Poor management of these wastes could result in inefficient resource use, the contamination of soil, surface and groundwater, impacts to aquatic biodiversity, a reduction to the local sense of place, nuisance concerns to nearby receptors, and potentially health impacts. Hazardous wastes have the greatest potential to result in risk, which would vary depending on the nature, volume, and locality of the waste.

The impacts could occur within the ROW or at any location where wastes are improperly managed or disposed. The primary pathways for the risks could be direct contact, air (nuisance and health) and water.

Receptor Sensitivity

The local community near the waste sites will be the community receptor. Indirect impacts may affect additional environmental receptors such as soil, surface water and aquatic biodiversity, with these being dependent on location and the nature of any contamination.

The local community live and conduct business in close proximity to the road footprint and could potentially have exposure to waste where the management measures are inadequate or inappropriate. The site office, where most hazardous materials will be stored and handled, and where most sewage will be generated does not have any residential receptors. It has been noted that waste management standards at many localities along the roadway are poor, with the result that waste currently impacts on the sense of place, surface water quality, nuisance levels etc. At the regional level, the sensitivity of the Douala community to poor waste management is low. However, at the individual household/business level receptor sensitivity to poor waste may be high.

Impact Significance (Pre-Mitigation)

The nature of the impact is negative. The impact is of **STRONG** intensity, **LOCAL** extent and **MEDIUM** duration and as such is of **MEDIUM** significance.

The project has planned to reuse as much of the material arising from cuttings as possible in the fill operations. The rate of reuse is limited by the suitability of the material properties. Excess cut materials will arise and the project has identified three localities, within the ROW, for the spoiling of this inert material. Disposal of the cut material to the spoil sites will enhance the development potential of the sites. Disposal of excess inert material to existing landfill sites is anticipated to be beneficial as it will provide cover material for management of the landfill.

Mitigation

All waste materials arising from construction should be responsibly stored, reuse or recycled where practicable, and disposed in terms of a waste management plan. Disposal should only be to facilities permitted and with capacity to accept the specific types of waste. Improperly disposed materials encountered during earthworks (refer to Section 8.4.1.4) should also be handled and disposed of in terms of a waste management plan. The Table below details recommended mitigation.

Project Phase	Measure	Source of Measure
Construction	Develop and implement a waste management plan to ensure responsible management of all waste arising from construction. The waste management plan should cover the following aspects: • Purpose/Objectives – of the Plan	"Section 4.1, page 89-91, General EHS Guidelines Section1.6, page 46-51, General EHS Guidelines"

Project Phase	Measure	Source of Measure
	• Context – legal requirements and general principles • Roles and Responsibilities – of different staff and contractors • Waste Arising (Types and quantities of key waste streams and Waste classification – local/international) • Waste Minimisation • Waste Storage and On-site Handling (including segregation of different waste types) • Reuse and Recycling • Waste Collection and Transfer • Treatment and Disposal • Waste Tracking, Data Management and Reporting • Communications/Community Liaison	Performance Standard 3
Construction	The waste management plan shall be disseminated to all staff responsible for managing the construction sites and accommodation camp and to all sub-contractors working on the Project. Personnel at an appropriate level of seniority will be nominated to be responsible for good site practices and arrangements for collection and effective disposal of all wastes generated by the Project. All personnel will be trained in proper waste management procedures as appropriate to their level of responsibility and duties. This will include training in concepts of site cleanliness and on appropriate waste management procedures, including waste reduction, reuse and recycling.	"Section 4.1, page 89-91, General EHS Guidelines Section1.6, page 46-51, General EHS Guidelines"
Construction	Wastes which cannot be recycled, will be transported to the closest suitable treatment or disposal site. This will depend on the individual type of waste. The WMP will detail the preferred treatment options for all of the expected types of waste and will also include a procedure for determining how any other wastes, not expected at this stage but which arise during the Project, will be treated. Waste disposal will only be undertaken at permitted facilities specifically designed to receive, handle and dispose of the waste. Potential waste management facilities will be assessed by the Project prior to being used for managing the Project's waste to confirm that they do have the necessary licenses for the particular waste(s) and to check that their environmental, health and safety performance is in line with good international industry practice (GIIP) as indicated in IFC guidelines . This assessment will extend to third-party waste management contractors use of waste facilities. The WMP will define procedures for onsite waste storage, biological, chemical, or physical treatment (including treatment of hazardous	Section 4.1, page 89-91, General EHS Guidelines Section1.6, page 46-51, General EHS Guidelines

Project Phase	Measure	Source of Measure
	waste materials to render them non-hazardous prior to disposal) and final disposal.	
Construction	The waste management plan should make provision for the handling and disposal of improperly disposed materials encountered during earthworks.	Bespoke
Construction	Maximise the re-use of soils and aggregates arising from cuttings as far as practicable in terms of material properties. Spoil inert soils and aggregates to identified properties up to the maximum volume receivable. The balance of soils and aggregates to be disposed to appropriate landfill sites in terms of the waste management plan.	Bespoke
Construction	• Provide sanitary facilities with capacity to meet sanitation requirements of personnel at all construction locations. All personnel must have access to toilet facilities within 500 m of their place of work. Personnel must use the provided facilities, which shall be serviced daily to ensure hygienic conditions. • No facilities containing sewage may be located within 100 m of a surface water resource. Raw sewage must be contained and subject to treatment and disposal by a registered service provider at an appropriately permitted facility. Records of safe treatment and disposal of sewage must be maintained.	Bespoke
Construction	The project will implement a community grievance mechanism to manage any complaints from surrounding community members, including those related to waste management.	Performance Standard 1

Residual Impact

Post mitigation the impact will be of **LOW** intensity, **LOCAL** extent**, MEDIUM** duration and as such will be of **NEGLIGIBLE** significance**.**

Project Phase:	Construction
Type of Impact	**Direct and indirect**
Nature of Impact	**Negative**

Highly Sensitive Receptor(s)?	**Potentially**	
	Pre-Mitigation Impact	**Residual Impact**
Intensity	Strong	Low
Extent	Local	Local
Duration	Medium	Medium
Significance	**Medium**	**Negligible**

8.7.2 Operation

8.7.2.1 Project generated waste affecting local environment or community receptors

Impact Description

Whilst significantly less waste will be generated during the operations phase, some wastes associated with road maintenance activities will be generated. This will may include inert road materials, bitumen, packaging, as well as limited volumes of hazardous materials (e.g. hydrocarbons, paints, solvent, and containers). Poor management of these wastes could result in the contamination of soil, surface and groundwater, impacts to aquatic biodiversity, a reduction to the local sense of place, nuisance concerns to nearby receptors, and potentially health impacts. Hazardous wastes have the greatest potential to result in risk, which would vary depending on the nature, volume, and locality of the waste.

The impacts could occur within the ROW or at any location where wastes are improperly managed or disposed. The primary pathways for the risks could be direct contact, air (nuisance and health) and water.

Receptor Sensitivity

The receptors will be the same as for construction.

Impact Significance (Pre-Mitigation)

The nature of the impact is negative. The impact is of **MEDIUM** intensity, **LOCAL** extent and **LONG** duration and as such is of **MINOR** significance.

Mitigation

All waste materials arising from construction should be responsibly stored, reuse or recycled where practicable, and disposed in terms of a waste management plan. Disposal should only be to facilities permitted and with

capacity to accept the specific types of waste. Improperly disposed materials encountered during earthworks (refer to Section 8.4.1.4) should also be handled and disposed of in terms of a waste management plan. The Table below details recommended mitigation.

Project Phase	**Measure**	**Source of Measure**
Operations	Develop and implement a waste management plan (or equivalent) to ensure responsible management of all waste arising from activities. The waste management plan should cover the following aspects: • Purpose/Objectives – of the Plan • Context – legal requirements and general principles • Roles and Responsibilities – of different staff and contractors • Waste Arising (Types and quantities of key waste streams and Waste classification – local/international) • Waste Minimisation • Waste Storage and On-site Handling (including segregation of different waste types) • Reuse and Recycling • Waste Collection and Transfer • Treatment and Disposal • Waste Tracking, Data Management and Reporting • Communications/Community Liaison	"Section 4.1, page 89-91, General EHS Guidelines Section1.6, page 46-51, General EHS Guidelines" Performance Standard 3
Operations	Wastes which cannot be recycled, will be transported to the closest suitable treatment or disposal site. This will depend on the individual type of waste. The WMP will detail the preferred treatment options for all of the expected types of waste and will also include a procedure for determining how any other wastes, not expected at this stage but which arise during the Project, will be treated. Waste disposal will only be undertaken at permitted facilities specifically designed to receive, handle and dispose of the waste. Potential waste management facilities will be assessed by the Project prior to being used for managing the Project's waste to confirm that they do have the necessary licenses for the particular waste(s) and to check that their environmental, health and safety performance is in line with good international industry practice (GIIP) as indicated in IFC guidelines . This assessment will extend to third-party waste management contractors use of waste facilities. The WMP will define procedures for onsite waste storage, biological, chemical, or physical treatment (including treatment of	Section 4.1, page 89-91, General EHS Guidelines Section1.6, page 46-51, General EHS Guidelines

	hazardous waste materials to render them non-hazardous prior to disposal) and final disposal.	
Operations	Incorporate the principles of recycling into cut and fill and repaving activities. This means maximising the rate of recycling of road resurfacing waste either in the aggregate (e.g. reclaimed asphalt pavement or reclaimed concrete material) or as a base and incorporating recyclable materials (e.g. glass, scrap tires, certain types of slag and ashes) to reduce the volume and cost of new asphalt and concrete mixes.	Section 1.1, EHS Guideline for Toll Roads, 2007
Operations	The project will implement a community grievance mechanism (or equivalent) to manage any complaints from surrounding community members, including those related to waste management.	Performance Standard 1

Residual Impact

Post mitigation the impact will be of **LOW** intensity, **LOCAL** extent**, LONG** duration and as such will be of **NEGLIGIBLE** significance**.**

Project Phase:	**Construction**	
Type of Impact	**Direct and indirect**	
Nature of Impact	**Negative**	
Highly Sensitive Receptor(s)?	**Yes (Potentially)**	
	Pre-Mitigation Impact	**Residual Impact**
Intensity	Medium	Low
Extent	Local	Local
Duration	Long	Long
Significance	**Minor**	**Negligible**

9 ENVIRONMENTAL AND SOCIAL MANAGEMENT

9.1 INTRODUCTION

This section provides an overview of how the Project will manage environmental and social impacts and risks. The measures identified through the impact assessment process are set out in the Environmental and Social Management Plan (ESMP), included in Appendix D.

The ESMP (like the ESIA) covers construction and operations. Decommissioning of the project is not covered included, as the details of this phase are not known at this stage. Broadly, the concepts of demobilisation follow the mitigation and commitments of the construction phase of the project; and at the time of demobilisation, a further review of environmental and social impacts would be required to inform the environmental and social management and mitigation measures.

Through implementing the commitments in this ESMP, the Project will fulfil the requirements presented in the IFC Performance Standards(1) This ESMP is set out in general accordance with these standards.

9.2 PURPOSE OF THE ESMP

The purpose of the ESMP is to summarise the mitigation and monitoring commitments from the ESIA, together with an initial environmental and social management overview for the Project. This is intended to provide the Project with the information required to develop into an Environmental and Social Management System (ESMS).

The ESMP can therefore assist the project's ESMS to comply with relevant authorisations, legal requirements, and the IFC Standards in a systematic and structured way.

The objectives of the ESMP are:

- Summarise the environmental and social aspects for management and mitigation applicable to the project under an ESMS;
- Outline the need to develop any policies, procedures and management plans for the identified environmental and social impacts/risks; and
- Provide guidance on the content of the project's ESMS to evaluate the effectiveness, suitability and adequacy of the implementation of the ESMP.

The ESMP is indicative, especially for Operations, and it will be the responsibility of Magil and MINTP to transpose these requirements into their management systems.

(1) IFC Performance Standard 1 (Assessment and Management of E&S Impacts), IFC General Environmental, Health, and Safety Guidelines and other relevant IFC Performance Standards and associated guidance notes.

9.3 DEVELOPMENT OF THE PROJECT ESMS

MINTP will need to develop an ESMS for the project. This ESMS will transpose the operational phase measures that have been set out in the indicative ESMP. The various elements of the ESMS will include provision of performance indicators and relevant mechanisms for reporting performance.

9.4 ROLES AND RESPONSIBILITIES

The effective implementation of the ESMP is dependent on established and clear roles, responsibilities and reporting lines within MINTP, and its contractors. The key organisational roles and responsibilities for the project are as follows:

- Magil Construction Corporation – EPC Contractor (responsible for project design, implementation of construction activities)
- MINTP – Project Owner (responsible for contracting EPC Contractor and implementation of the operational phase activities, either directly or through the management of other contractors)
- Other regulatory stakeholders, especially Department Commissions for the Recording and Evaluation of Assets (CDCE)

9.4.1 Magil Construction Corporation

9.4.1.1 Summary of Environmental and Social Management Responsibilities

Magil will mobilise the resources sufficient to deliver their activities for the Project in accordance with the Project environmental and social commitments laid out in this ESMP. They will identify and define environmental and social roles, responsibility and authorities, and ensure that human, technical and financial resources are provided where essential to the implementation and control of the environmental and social management.

During construction phases, day-to-day management of work activities will be led by Magil, who will have responsibility for environmental and social aspects, and MINTP will adopt a stewardship role, and maintain oversight in that regard.

During the operations phases, day-to-day management of work activities will be led by MINTP, or they will delegate this responsibility to contractor. If MINTP elect to delegate this responsibility, then they will adopt a stewardship role, and maintain oversight in that regard.

9.4.1.2 Key Roles

Magil Construction will be fully responsible for implementing this ESMP and for ensuring that any Subcontractors are (where applicable) actively following the implementation of this ESMP. Specific roles and responsibilities within the Contractor's team are the following:

Construction Director

Construction Director will be responsible directly, or by overseeing his project team, for compliance with the EMP. They shall require all Subcontractors to adhere to these requirements and provide necessary resources, facilities and personnel. He will be responsible to:

- Ensure resources are provided to prepare and implement the EMP
- Approve the EMP and any amendments to the EMP
- Facilitate and provide necessary support for communication related to environmental protection raised by different parties
- Approve monthly reports or other reports about environmental issues and non-conformances and communicate to the top management, the client (MINTP) and other stakeholders where necessary.

Environmental Manager

The Health and Safety Manager, who also function as Environmental Manager will be responsible to:

- Prepare, review and update the ESMP
- Prepare weekly and monthly environmental reports to Construction Director
- Ensure any changes to the EMP are made known to all staff and subcontractors
- Prepare information for environmental site training (toolbox talks)
- Deliver or prepare information for environmental inductions
- Ensure materials being used on the site are environmentally friendly and safe
- Close-out all environmental non-conformances raised by MINTP
- Conduct audits and inspections as required by the EMP at work sites
- Review Subcontractors' environmental protection/mitigating measures – to verify compliance with the ESMP
- Maintain the environmental training register
- Maintain the incidents and complaints register

Environmental Inspector/Officer

Responsibilities include:

- Control and monitor actions required by the ESMP
- Monitor subcontractor performance and commitment
- Report all environmental issues to the HSE Manager and Construction Director
- Maintain systems and records for waste management, fuels and chemicals, and training
- Ensure documented procedures are followed, and records kept on site
- Ensure any complaints are passed onto the HSE Manager or Construction Director immediately upon receiving the complaint

All Magil Construction Workers

All workers will be responsible to:

- Follow the requirements of the ESMP and those of the Site Foreman
- Follow requirements as directed by the Site Foreman
- Report any potential environmental or social issues to the Site Foreman
- Carry out work in accordance with the requirements of the ESMP
- Exercise due care, skill and judgment when carrying out tasks
- Implement corrective actions which have been approved by the appointed site supervisor.

Sub-Contractors

Any company hired directly or indirectly by Magil Construction to carry out the construction works is designated as a Subcontractor. Magil Construction is solely responsible for the environmental and social performance of Subcontractors, suppliers and visitors the Subcontractor's environmental performance will reflect directly on Magil. Before starting work Magil Construction shall require all suppliers and Subcontractors to submit a written ESMP or method statement (as required) specific to the site and their scope of work.

9.4.2 Ministère des Travaux Publics (MINTP)

9.4.2.1 Summary of Environmental and Social Management Responsibilities

As the Project Owner, MINTP is accountable for the hiring of contractors to deliver the commitments under this ESMP. Using a team of technical and environmental and social professionals, they will tender and appoint companies to deliver all phases of the Project. Selection and tender processes will include review of environmental, social, health and safety aspects.

The project commitments (including compliance obligations, IFC expectations and the ESIA commitments) are shared and reviewed by relevant parties in the course of submitting tenders / Requests for Proposals (RFPs). The Project Owner maintains a stewardship role over the activities undertaken by its contractors and therefore the commitments cascade into contractor documentation and management systems, plans and procedures.

9.4.2.2 Key Roles

The following key roles will be required of both MINTP and any contractor (if any) that they elect to delegate day-to-day environmental and social management responsibilities to.

Project Manager

There will be one senior representative accountable for the Project. This role will be the ultimate authority on all matters including environmental and social management. The role will be responsible for providing the human and financial resources necessary for ensuring compliance to the ESMP, be knowledgeable of the conditions of the regulatory approvals for the Project and ensure that the requirements for environmental and social management are communicated and adhered to by the construction team, all subcontractors and suppliers.

EHS Manager

One management role will be responsible for the day-to-day environmental and social management. The EHS Manager will be responsible for implementing the Project ESMS in accordance with this ESMP. The overall EHS Manager will have experience and the resources (people and equipment) to conduct competent EHS management of on-site activities.

These roles may be supported by other staff members as needed.

9.4.3 Department Commissions for the Recording and Evaluation of Assets (CDCE)

The environmental and social monitoring of the worksite is carried out by the Directorate of Road Infrastructures (DIR) through the ADB-WB Unit and the Infrastructure Environmental Protection Unit (CPEI) of the Technical Studies Support Division (DAET).

The framework law N ° 96/12 of August 5, 1996 relating to the management of the environment underlines the need to involve the institutions and other actors intervening in the field of the environment, in all the plans and sectoral programs. in relation to the environment, with a view to enabling them to ensure the application of Cameroon's international commitments and to redefine the terms of their integration into national legislation and policy in this area.

The Ministry of the Environment, Nature Protection and Sustainable Development (MINEPDED), through its entities listed below, may also carry out external monitoring. Namely:

- the Sub-Direction for Environmental Assessments (SDEE);
- the departmental committees for monitoring Environmental and Social Management Plans.

In order to ensure that the environmental measures recommended by the ESIA are effectively and concretely taken into account, the national Administration will have to carry out the following tasks:

- participate in the public hearing procedure, if required and approved by the Minister in charge of the Environment (MINEPDED), by presenting the project, its impacts and environmental management measures and by answering questions from the public;
- ensure in collaboration with the technicians and the award of contracts that all environmental provisions are provided for in the RFQs and included in the contracts before they are signed. These provisions include:
- the environmental practices to be followed by the contractors;
- the environmental work to be carried out by the contractors;
- accompanying measures to be carried out by specialised subcontractors paid by the contract.

The 2011 Compensation and Resettlement Plan has been completed, costed and implemented.

9.5 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLANS INCLUDED IN THE ESMP

The ESIA has identified certain specific environmental and social aspects that are core to the delivery of the mitigation and management outlined in this ESMP. Specific plans / procedures (or equivalent) are recommended in order to support the ESMP and guide management of the project activities. The plans / procedures that have been identified are set out in Table 9-1.

TABLE 9-1: SUGGESTED MANAGEMENT PLANS AND PROCEDURE

Plan	**Construction (Magil)**	**Operations (MINTP)**
Stakeholder Engagement Plan	✓	✓
Community Grievance Mechanism	✓	✓
Worker Grievance Mechanism	✓	✓
Human Resources Management Plan and Policy	✓	✓
Contractor and Supplier Management Protocols	✓	✓
Worker Health and Safety Awareness Programme and Training	✓	✓
Occupational Health Management Plan	✓	✓
COVID-19 Management Plan	✓	
Hazardous Materials Management Plan	✓	
Dust Management Plan	✓	
Waste Management Plan	✓	✓
Fleet Maintenance Plan	✓	
Chance Finds Procedure	✓	
Traffic Management Plan	✓	✓
Monitoring Programme (water, noise and air)	✓	
Emergency Response Plan and Emergency Management Plan	✓	✓

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APPENDIX 1: CLIMATE CHANGE RISK ASSESSMENT

APPENDIX 2: NOTES FROM STAKEHOLDER MEETINGS

APPENDIX 3: STAKEHOLDER ENGAGEMENT PLAN

APPENDIX 4: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

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