ENVIRONMENTAL AND SOCIAL SUPPLEMENTARY LENDER INFORMATION PACKAGE

ROVUMA LNG PROJECT

MZLN-EL-RBENV-00-0001

Information contained within is current as of the publication date and EMML takes no responsibility to update and it is provided on a non reliance basis / for information only.

REVISION MODIFICATION LOG

Revision	Section	Description
15 May 2019		Rev 1
01 June 2019		Rev 2

TABLE OF CONTENTS

1. INTRODUCTION 6

1.1. The Concession 6
1.2. The Project 8
1.3. Direito do Uso e Aproveitamento da Terra (DUAT) 8
1.4. Project Components 8
1.5. The EIA (2014) 11

2. PROJECT OVERVIEW 12

2.1. Upstream 12
2.2. Midstream 12
2.3. Summary of Key Changes to the Project Design from those Described in the EIA (2014) 14
2.4. Joint Venture Structure 16
2.5. Area 4 EPCC 16
2.6. Legal and Regulatory Framework 20
2.7. Lender Due Diligence 22
2.8. Project Timeline 23

3. ALIGNMENT AND COLLABORATION 25

3.1. Baseline Integration 25
3.2. Cumulative Effects Modelling 26
3.3. Biodiversity 29
3.4. Common Waste Management Facility 30
3.5. Community Health 32
3.6. Infectious Disease and Vector Control Management 32
3.7. Emergency Response 33
3.8. Medevac 34
3.9. Incident Notification 34
3.10. Communications 34
3.11. Incident Investigation 35

4. ENVIRONMENTAL BASELINE 36

4.1. Introduction 36
4.2. Onshore 38
4.3. Nearshore 43
4.4. Offshore 51

5. SOCIO-ECONOMIC BASELINE AND ADDITIONAL STUDIES 56

6. RESETTLEMENT 58

6.1. Updates to the Resettlement Action Plan Since 2014 58
6.2. The Resettlement Planning Phase (2014–2016) 58
6.3. The Resettlement Implementation Phase (since 2016) 59

6.4. Updates to the Livelihood Restoration Plans Since 2014 60
6.5. Planning and Development of Detailed Livelihood Restoration Plans (2014–2016) 60
6.6. Implementation Phase (since 2016) 61
7. ALTERNATIVES ASSESSED 63
7.1. Upstream 63
7.2. Midstream 64
8. ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT 66
8.1. Updates to Environmental Impact Assessments 66
8.2. Upstream-Specific Updates 74
8.3. Updates to Socio-Economic Impact Assessments 75
9. ENVIRONMENTAL AND SOCIAL MANAGEMENT 78
9.1. Upstream Environmental and Social Management System 78
9.2. Midstream Environmental and Social Management System 82
10. FUTURE WORK 87
10.1. Development of the Project Biodiversity Strategy 87
10.2. Pre-Construction Survey 87
11. DISCLOSURE 88
Appendices 89
Appendix A Acronyms and Terms 90

LIST OF FIGURES

Figure 1-1: Area 4 Block Location and Discovery Areas 7
Figure 1-2: Straddling Discovery Areas 7
Figure 1-3: Rovuma LNG Layout 9
Figure 1-4: Afungi LNG Park Layout 10
Figure 2-1: Area 4 Rendering of Onshore LNG Plant 13
Figure 2-2: Area 4 Concessionaire 17
Figure 2-3: Area 4 Operatorship Structure 19
Figure 2-4: Master Schedule 23
Figure 3-1: Modelled Groundwater Abstraction Locations and Sensitive Receptors 27
Figure 3-2: Ecosystems and Sites in the Vicinity of the Project with Potential to Contain Critical Habitat Qualifying Features 30
Figure 3-3: Global Response Resources 34
Figure 4-1: Onshore, Nearshore, and Offshore Project Areas 37
Figure 4-2: Terrestrial Biodiversity Surveys and Monitoring Timeline 38
Figure 4-3: Borehole Monitoring Locations in the Project Site 41
Figure 4-4: Groundwater Chemistry for the Shallower Aquifer 42
Figure 4-5: Summary of Air Quality Baseline 43
Figure 4-6: Timeline of Nearshore Environmental Surveys 44
Figure 4-7: Seawater Profiling and Quality Sample Locations 46
Figure 4-8: New Survey Data Gathered on Habitat Type in Tungue Bay Post 2015 47
Figure 4-9: Nearshore Particle Size Distribution in the Dry Season 48
Figure 4-10: Nearshore Particle Size Distribution in the Wet Season 49
Figure 4-11: Dry Season Sediment Metal Concentrations in Tungue Bay 50
Figure 4-12: Wet Season Sediment Metal Concentrations in Tungue Bay 50
Figure 4-13: Monthly Sound Detections at a Monitoring Location in 2017 51
Figure 4-14: Timeline of Offshore Environmental Surveys 52
Figure 4-15: Offshore Particle Size Analysis Results across the Study Area 53
Figure 4-16: Summary of Offshore Sediment Metal Concentrations 54
Figure 4-17: Summary of Offshore Sediment Hydrocarbon and Polyaromatic Hydrocarbon Concentrations 54
Figure 4-18: Marine Mammal Sightings 55
Figure 9-1: Environmental and Social Management System Framework 82

LIST OF TABLES

Table 3-1. Operational Phase Air Quality Impacts 28
Table 4-1: Integrated Environmental Baseline Topic Areas 36
Table 8-1: Summary of Key Changes arising from Design Optimization since the 2017 EMPs 67

1. INTRODUCTION

This Supplementary Lender Information Pack (SLIP) provides an overview of the environmental and social work that has been conducted by Mozambique Rovuma Venture S.p.A. (MRV) since the EIA Environmental Impact Assessment Report for the Liquefied Natural Gas Project in Cabo Delgado (2014) was approved by the Government of Mozambique in 2014, herein after referred to as EIA (2014). The SLIP provides:

- A summary of the Rovuma LNG project (upstream and midstream, jointly utilized facilities and associated facilities)
- A summary of the project operating context
- A summary of how the Rovuma LNG project is meeting both Mozambican, corporate and E&S international lending requirements
- A summary of additional baseline data that has been collected since the completion of the EIA (2014) and additional planned data collection
- A summary of additional impact assessments that have been undertaken since the completion of the EIA (2014)
- An overview of how the outputs of these impacts assessments have been utilized to inform the development of management system strategies and plans
- An overview of the management systems in place and responsibilities for delivery of all requirements
- An overview of the current state of development of future work scopes

1.1. The Concession

The Area 4 Exploration and Production Concession, operated by Mozambique Rovuma Venture S.p.A. ("MRV" or the "Area 4 Operator"), and the Area 1 Exploration and Production Concession, operated by Anadarko Moçambique Área 1 Limitada ("AMA1", or the "Area 1 Operator") are located in the Rovuma Basin of Northern Mozambique and comprise multiple hydrocarbon reservoirs, some of which straddle the boundary between the two Areas (the "Straddling Reservoirs"). The Rovuma Basin straddles Mozambique's northern border with Tanzania and is part of the Tanzania-Mozambique coastal basin, which has a total extension of approximately 80,000 km^2 and a maximum thickness of about 10 km.

Area 4 is located in Mozambique's Exclusive Economic Zone, situated approximately 250 km north east of Pemba and 50 km from the coastline. Measured from the western limit of the concession area, the Area 4 Block is about 70 km wide by 200 km long. To the west side a straight border line divides Area 4, operated by MRV, from Area 1, operated by AMA1.

Pursuant to Article 7 of the Decree Law, the Straddling Resources will be initially exploited through two independent and coordinated developments: one developed by Area 4 and one by Area 1, with a combined production of 24 TCF. This Rovuma LNG Project includes the plan to develop the Area 4 Initial Development Quantity only, to be developed together with other Non-Straddling Resources located in Area 4.

Subsequent developments, for the full exploitation of Straddling Reservoirs, will be executed and operated by Area 1 and Area 4 pursuant to the UUOA and dedicated plans of development. Further developments of Area 4 non-straddling resources will be developed through dedicated plans of development prepared exclusively by Area 4.

Figure 1-1: Area 4 Block Location and Discovery Areas

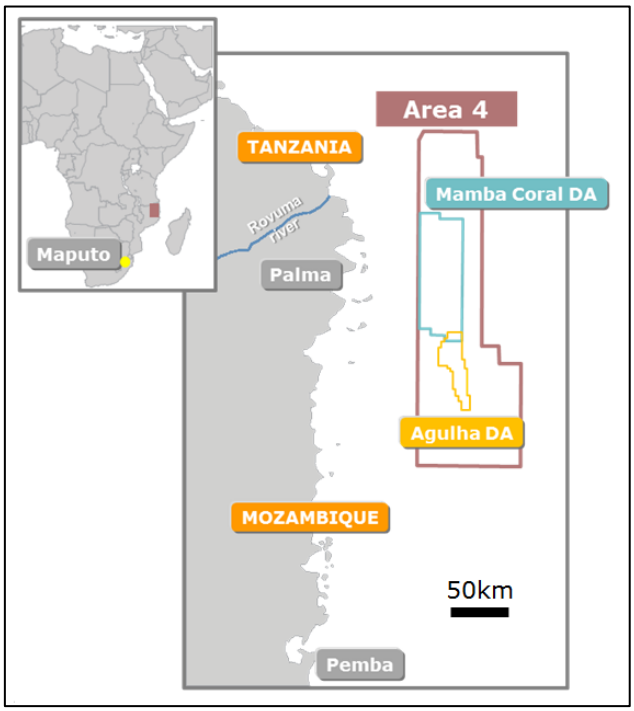
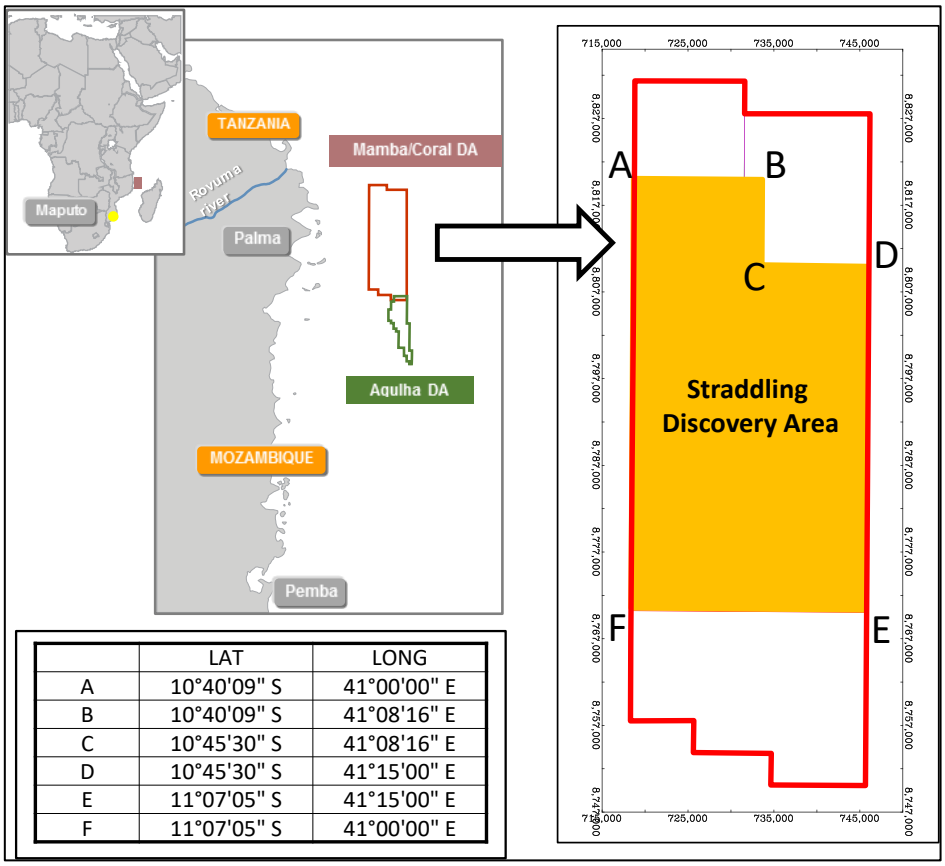


Figure 1-2: Straddling Discovery Areas



	LAT	LONG
A	10°40'09" S	41°00'00" E
B	10°40'09" S	41°08'16" E
C	10°45'30" S	41°08'16" E
D	10°45'30" S	41°15'00" E
E	11°07'05" S	41°15'00" E
F	11°07'05" S	41°00'00" E

1.2. The Project

The Rovuma LNG Project (RLNG) is designed to gather, process and export (in liquefied form) natural gas. This process begins offshore in Area 4, where natural gas will be extracted from below the seafloor via subsea wells. The gas will be collected and transported to the onshore LNG Facility by subsea pipelines. Once onshore, the gas will be processed, converted to liquid (through cooling the gas) and stored in storage tanks. The liquefied gas will then be transported through insulated pipelines to an export jetty, where it will be loaded into specialized LNG ships to be transported to international markets. These specially designed ships maintain the LNG in a cold liquid state for sea voyages of several thousand kilometers. Further detail is provided in Section 2.

1.3. Direito do Uso e Aproveitamento da Terra (DUAT)

An area of around 6,475 ha, located in the Afungi peninsula, located in the Palma District of the Cabo Delgado province, has been allocated by the Government through a specific act for the Right of Use and Benefit of Land (*Direito do Uso e Aproveitamento da Terra or* DUAT) for the development of the onshore components of the multiple LNG projects of Area 1 and Area 4 (the "Afungi LNG Park"). This industrial area is sufficient to develop both the Initial Developments of Area 1 and Area 4 in segregated zones as well as future additional LNG trains to be built during the subsequent development phases, in a common expansion area.

Rovuma Basin LNG Land, Lda. ('RBLL'), an entity owned equally by Anadarko Moçambique Area 1 Limitada (AMA1), MRV and Empresa Nacional de Hidrocarbonetos, E.P (ENH), holds the DUAT ref 004/2017 where the Afungi LNG Park will be built, which was granted, pursuant to Decree 66/98 of December 8, 1998, by the National Land Authority (*Direçao Nacional de Terras*) for a period of 50 years, on September 28, 2017.

The main onshore components of the Project to be built in or adjacent the Afungi DUAT area are:

- The Onshore Facilities and supporting infrastructure, such as temporary and permanent worker accommodation facilities, temporary construction areas and access roads designed for project activities.
- The Nearshore Facilities, which consist of the marine infrastructure within Palma Bay necessary for construction, operation and maintenance of the Project. This includes logistic facilities, as the Pioneer Dock, the Materials Offloading Facilities ("MOF"), and the Export Terminal for LNG and Condensate (the "LNG Marine Terminal").

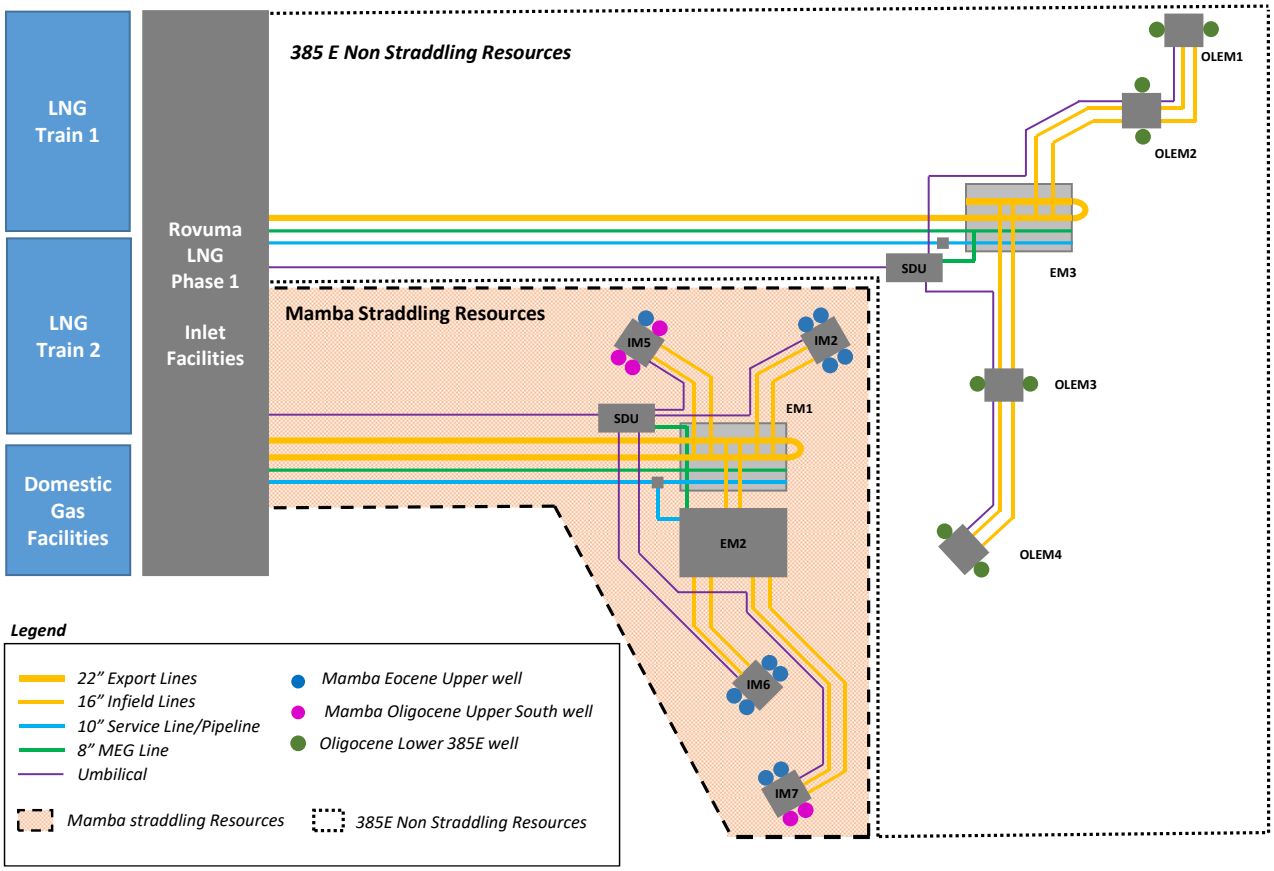
Design, construction and commissioning of Shared Facilities (MOF, LNG Marine Terminal, common roads, security fences, shared airstrip, and offshore fiber optic cabling system), further defined on page 16, located within the agreed common areas will be coordinated between the Area 4 Operator and Area 1 Operator with the objective that the construction of such shared facilities and relevant joint concessions will follow agreed standards, methods and procedures.

1.4. Project Components

The Rovuma LNG Project includes an independent initial development of 12 TCF of gas (plus domestic gas and condensate) from the Straddling Reservoirs by the Area 4 Concessionaire (the "Area 4 Initial Development"), involving coordination with Area 1 – as required under the Decree Law.

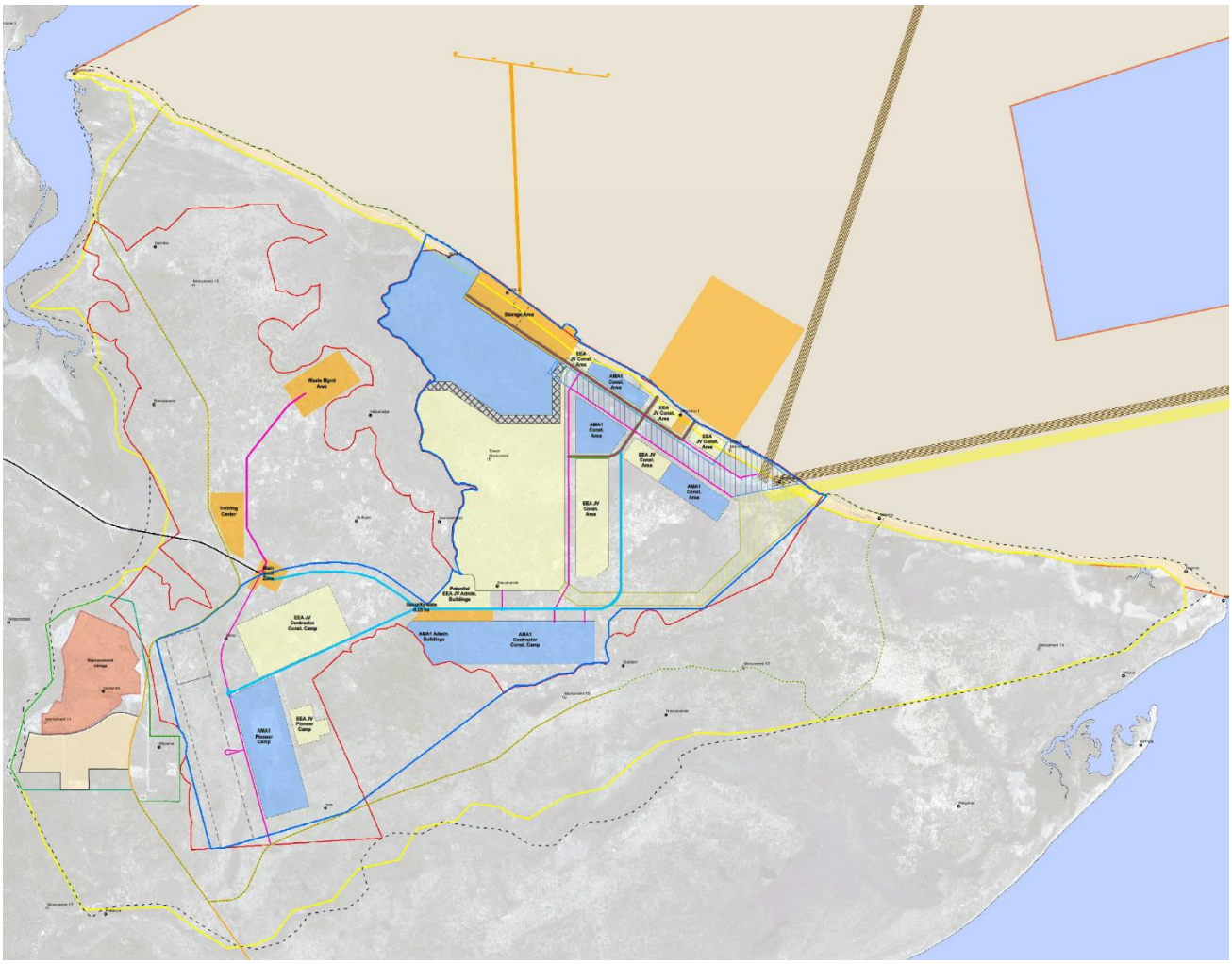
For the purposes of the Unitization and Unit Operating Agreement dated 23 November 2015, the Area 4 Initial Development Facilities consist of the Mamba Straddling upstream network as shown shaded with orange dotted pattern in Figure 1-3.

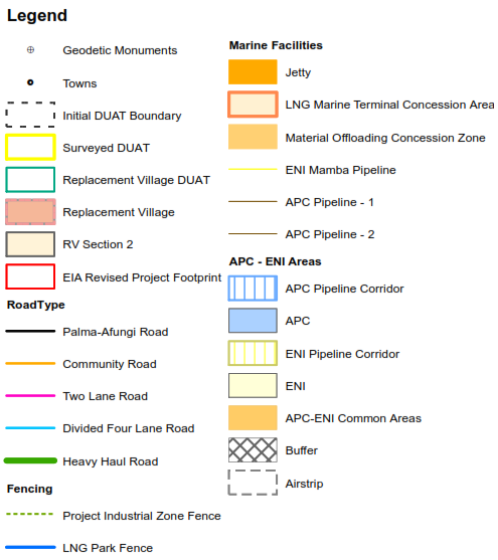
Figure 1-3: Rovuma LNG Layout



The area in Afungi (Palma District, Cabo Delgado Province) identified for the purpose of implementing the Rovuma LNG Project and the subsequent expansions (together, the "Afungi LNG Park") has been subdivided into dedicated adjoining areas to allow the optimal development of the initially independent LNG facilities of Area 1 and Area 4 and future expansions, as shown in Figure 1-4.

Figure 1-4: Afungi LNG Park Layout





1.5. The EIA (2014)

An EIA was undertaken for the proposed LNG facilities and associated infrastructure, onshore and offshore by Environmental Resources Management (ERM) Southern Africa (Pty) Ltd in association with Projectos e Estudos de Impacto Ambiental, Lda. (Impacto). This EIA was approved by the Ministry for the Coordination of Environmental Affairs (MICOA), on June 16, 2014. MICOA has since been restructured and replaced by the Ministry of Land, the Environment and Rural Development (MITADER). The EIA (2014) covered both the onshore and offshore aspects of LNG development. Since the completion of the EIA, both the project proponents and scopes have changed from the early definition, resulting in the need for additional environmental and social studies. This SLIP provides an overview of the changes and studies, either undertaken, in progress or planned.

2. PROJECT OVERVIEW

In addition to developing and producing up to 12 trillion cubic feet (TCF) of gas contained in the Straddling Reservoirs on an independent, but coordinated basis Area 1 and Area 4 Concessionaires are also proposing to develop their own independent, standalone, non-straddling resources. Each project will be designed to produce and gather natural gas from offshore deep waters in the Rovuma Basin, transport the gas onshore to the Afungi Peninsula in Cabo Delgado Province, process the gas in onshore LNG (liquefied natural gas) trains and associated facilities and export the LNG to international markets.

2.1. Upstream

The Rovuma LNG Project consists of a total of 24 wells: 16 for Mamba Straddling Resources (as Initial Development under the UUOA) and 8 for Non-Straddling resources (385E).

The development strategy utilizes direct tieback to shore of the production system to deplete the Straddling Reservoirs, without offshore boosting for the first period of production life. However, in a low-side reservoir outcome, or if otherwise economically justified, one or more stages of compression could be installed offshore to increase recovery and extend the production plateau. The Rovuma LNG network will be developed with the possibility to accommodate a Subsequent Development phases, with additional wells and future connections to boosting units required to supply additional onshore LNG production trains, to ensure maximum gas recovery.

The upstream development of the Rovuma LNG Project includes a long tie-back from the wells to the shore facilities of the LNG plant. The production is gathered offshore and exported in multiphase flow, supported initially by the high pressure of the reservoir to meet the feed gas requirements for the LNG plant. The subsea network will be composed of:

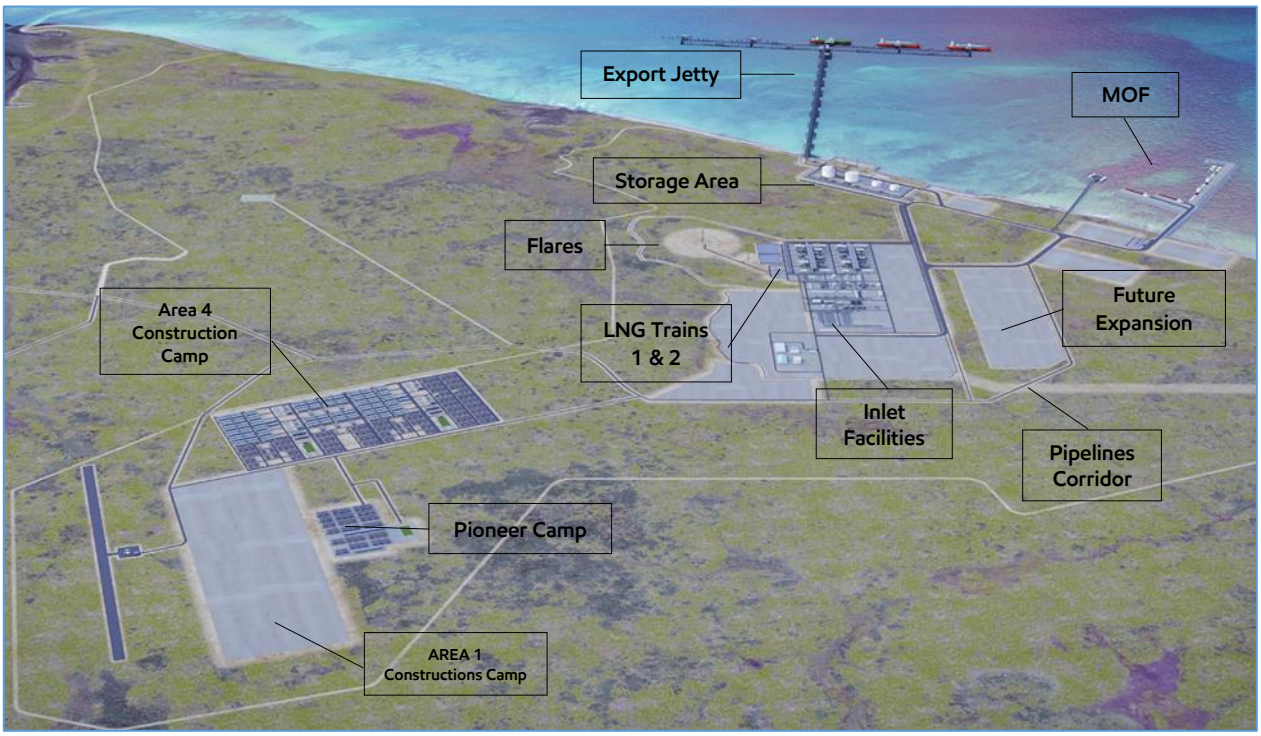
- Subsea Intra-field Architecture - wells gathering system;
- Export Sea line System; and
- Subsea Network Control System from onshore via umbilical.

2.2. Midstream

The Area 1 and Area 4 Operators will separately construct and operate their own respective offshore and onshore LNG facilities. Area 4 is proposing the construction of two onshore LNG liquefaction trains with a nameplate capacity of 2 x 7.6 MTPA as shown in the Figure 2-1 rendering.

The Area 4 LNG facility will receive raw natural gas and associated liquids via three 22 in. production pipelines. This raw gas will undergo separation and then pre-treatment to remove carbon dioxide, heavy hydrocarbons, water, and any mercury traces. The treated gas will then be routed to the liquefaction unit where it will undergo multiple stages of cooling, with each sequential stage resulting in the gas stream being cooled and partially liquefied at the lower temperatures provided by the refrigeration cycle. The product from the final cooling stage will be higher pressure LNG, which will then be transferred, after pressure reduction, to LNG storage tanks prior to export.

Figure 2-1: Area 4 Rendering of Onshore LNG Plant



Two LNG storage tanks of approximately 200,000 m³ capacity each are envisaged for the initial two LNG trains.

Stabilized condensate will be stored in dedicated condensate storage tanks. Development planning is for two 45,000 m³ condensate storage tanks to support production from the two trains. The loading jetty and berths will allow the safe transfer of LNG and condensate from the tanks to the LNG and condensate carriers.

In addition, within the inlet facilities, a service line system will connect two 10 in. service lines from subsea to support pre-commissioning, commissioning and start-up phases of the LNG plant. The system is capable also of supporting several subsea operations (pigging, hydrates remediation, gas recirculation, depressurization, etc.).

The Area 4 and Area 1 Operators, on behalf of their respective Area 4 and Area 1 Concessionaires, have also established, through the Shared Facilities Implementation Agreement (SFIA), the basic principles of their cooperation for the development, construction and operation of MOF and Jetty ("Shared Facilities"). The SFIA also describes the process, the timeline and the governance principles to support the delivery and operation of the Shared Facilities. Further details are provided in Section 3 on the approach being taken by the Operators to address key E&S issues.

The LNG export marine facilities and associated infrastructure will consist of a common jetty extending from the Afungi LNG Park to the loading berths offshore and will include associated mooring structures, loading facilities, navigation channel, and navigation aids. The design basis calls for independent components to allow for fully independent operations of Area 1 and Area 4 LNG berths, at least initially, with provisions to consider a sharing model in future phases. The LNG berths will be designed to accommodate LNG carriers with storage capacities ranging from 125,000 m³ up to 266,000 m³. The condensate berth will be designed to accommodate tankers from 35,000 to 80,000 DWT.

A safety maritime exclusion zone will be established around the nearshore facilities during construction. Once operational, the exclusion zone will be established around the support harbor and export Jetty. No transport vessels or fishing will be allowed within the safety zones.

The MOF will include a pioneer dock and service harbor and together with the export jetty, will serve as the central hub for the development of all aspects of the Project, from the construction of the facilities to support the export of LNG and condensates to the global market.

During the construction phase of the Project, the MOF including service harbour will be developed to accommodate the import of construction materials for Area 4 and Area 1. The MOF will also support the import of construction materials during future developments.

The MOF will be located adjacent to the proposed LNG facility and will be designed to accommodate vessel mooring, materials and fuel offloading, fueling of service fleet, as well as routine vessel maintenance.

EMML plans to develop both temporary and permanent accommodation facilities. The facilities will be located within the Afungi Project Site, and house approximately 18,000 to 23,000 workers.

The Area 4 Final Investment Decision (FID) is anticipated in late 2019.

2.3. Summary of Key Changes to the Project Design from those Described in the EIA (2014)

The EIA (2014) was originally submitted under the names of Anadarko Moçambique Área 1, Lda. (AMA1) and Eni East Africa S.p.A. (EEA) as Co-Proponents. EEA in December 2017 acting through its competent corporate bodies, changed its name to Mozambique Rovuma Venture SpA (MRV). However, the change of name to MRV does not constitute a change of Area 4 Operator nor a change to the Co-Proponents. The original EIA (2014) assessment included the development of 6 LNG trains having an overall liquefaction capacity of about 30 Million tonnes per annum (MTPA), the Co-Proponents will separately construct and operate their own respective offshore and onshore (up to 3 trains and about 15 MTPA each) facilities under their respective Environmental Management Plans (EMPs) and exclusive Environmental Licenses (ELs). In parallel, they will jointly design, construct and use certain onshore shared facilities in the area of the DUAT (e.g. airport, roads, fences, etc.) and nearshore common facilities (i.e. LNG Marine Terminal [LNGMT] and Material Offloading Facility [MOF]), each under joint EMPs and ELs.

The Co-Proponents agreed to request issuance of the Environmental License (EL) from MITADER under a multiple license framework, for the following reasons:

- To enable clear assignment of responsibility for implementing the requirements of the EMPs and allow for separation of liability of each license holder:
  - With separate EMPs for each license submitted by each Proponent, MITADER will be clear about the entities responsible for implementing the requirements under the EMP. This will facilitate internal and external environmental audits.
- To align with Government Agreements entered into after the EIA (2014) submittal and approval.
- To facilitate implementation of Co-Proponents' schedule of activities:
  - Co-Proponents are currently pursuing separate Area 1 and Area 4 projects;
    - Area 1 and Area 4 have different timelines for their respective developments; and
    - Co-Proponents therefore require ability to progress their projects independently.

- To allow for resettlement required prior to commencement of LNG construction activities:
  - Replacement Village – Co-Proponents will be the entities responsible for this activity under the Resettlement Plan. An EIA for the Replacement Village was conducted as an addendum to the EIA (2014). The Replacement Village EIA was submitted in November 2015, and the Environmental License was issued on 8 August 2017.

By means of a letter dated of 24 November 2016 (Ref. No: 2285/MITADER/ DINAB/ GDN/183/16), MITADER agreed to the issuance of the multiple ELs on the condition that separate Environmental Management Plans (EMPs) would be developed and submitted for each discrete Project component, namely Area 1 Exclusive Facilities, Area 4 Exclusive Facilities, Materials Offloading Facility, LNG Marine Terminal, and Area 1 and Area 4 Shared Facilities.

Five separate environmental licenses were issued by MITADER for the associated Project components in February 2018.

With the current phase of engineering work complete, and as MRV readies for construction in 2019, MRV has a clear understanding of the proposed project changes (from the EIA (2014) "base case"). As such, MRV evaluated the proposed project changes, to determine/confirm impact significance, and to update the EMPs accordingly.

To meet the commitment made to MITADER in the EIA (2014), an internal MOC procedure was developed to identify and evaluate the environmental implications of any changes arising from the design optimization process, and then inform the update of the EMPs. The process was developed so that it would capture any significant changes from the EIA (2014) and 2017 EMPs in a consistent and systematic way. The procedure was as follows:

- All changes to the design were identified and documented.
- Each change was then reviewed and evaluated using the same process of evaluation as presented in the EIA (2014) in order to decide if the change was material to the EIA (2014) findings and the mitigation commitments contained in the EIA and EMP.
- Based on the above analysis, a decision was made as to whether:
  - The EIA (2014) and 2017 EMPs adequately address the potential impacts of the change and no further amendments are envisaged for the EMP Update; or
  - There was a need for additional technical assessment and/or review and update of the mitigation and management measures set out in the 2017 EMPs.

The main changes to the design and execution basis since the 2017 EMPs include:

- Optimized pipeline routing
- Revised dredging plans and volumes for the pipeline and nearshore facilities
- Additional dredge spoil location
- Increase in LNG train size with corresponding reduction from three trains to two trains for the initial Area 4 development
- Revision to the Project operational life
- Inclusion of domestic gas delivery point
- Increase in construction workforce
- Increase in permanent workforce accommodation
- Decrease in offshore construction workforce
- Increase in safety exclusion zone
- Refinement of options for raw aggregate delivery

The results of the impact assessment for these changes are included in Section 8.1.

2.3.1. LNG Marine Terminal Design

The EIA (2014) described the LNGMT as comprising a single causeway/ trestle jetty structure (2,000 to 3,000 m long) with two berths and consideration of a future jetty with up to four berths. Since the EIA (2014) the LNGMT design has evolved to take into account engineering and execution planning requirements.

The LNGMT currently comprises a single jetty, which extends approximately 2,600 m from the shore, with five berths (two LNG berths dedicated to Area 4 with a condensate berth shared between Area 1 and Area 4). The jetty will still have a short causeway (a continuous solid structure); however, it will now be predominantly a trestle structure (width of approximately 33 m) which extends out to sea. The trestle will be connected to a short causeway that links to shore. The length of the causeway has decreased to that considered in the EIA (2014). A future jetty remains a consideration for future expansion of the Project.

Potential impacts associated with the LNGMT design are related to the construction and presence of the structure in the marine environment. A particular concern is the disruption of water/particulate matter exchange due to the presence of the causeway. This was assessed in the EIA (2014).

Since the jetty is now predominantly a trestle structure (a rigid frame composed of a number of short spans), the water/particulate matter exchange is greatly improved compared with a causeway. Impacts to the marine environment are therefore anticipated to be lower in extent and intensity in comparison with the findings of the EIA (2014). Therefore, the assessment in the EIA (2014) is still considered to be valid.

2.4. Joint Venture Structure

MRV, ENH, Galp and Kogas (together the "Area 4 Concessionaire") and the Government of the Republic of Mozambique ("GoM") are parties to the Area 4 EPCC (as supplemented by the Coral South Supplemental Agreement dated 1 June 2017 and the Designated Operator Supplemental Agreement dated 7 November 2017, the "Area 4 EPCC"). Each of MRV, ENH, Galp and Kogas are parties to the Area 4 Joint Operating Agreement (as supplemented and novated, the "Area 4 JOA"). MRV is the Area 4 Operator under the Area 4 EPCC and the Area 4 JOA.

MRV holds a 70% participating interest under the Area 4 EPCC, with each of ENH, Galp and Kogas holding a 10% participation interest.

MRV is a joint company incorporated in Italy and is a Società Per Azioni (stock company). MRV shareholders are: Eni S.p.A., a company existing under the laws of Italy, with a shareholding of ~35.7% ("Eni"); ExxonMobil Development Africa B.V., a company existing under the laws of The Netherlands, having a shareholding of ~35.7% ("EMDA"); and CNODC Dutch Cooperatief U.A., a company existing under the laws of The Netherlands, holding the remaining ~28.6% ("CNODC"). Each of Eni and EMDA holds a 25% indirect participating interest in the Area 4 EPCC and CNODC holds a 20% indirect participating interest in the Area 4 EPCC. Pursuant to their direct and indirect participating interests, Eni, EMDA, CNODC, Galp, Kogas and ENH are, together, the "Area 4 Parties".

2.5. Area 4 EPCC

In December 2006, Mozambique Rovuma Venture S.p.A. (formerly known as Eni East Africa S.p.A. or "EEA") entered into an Exploration and Production Concession Contract, effective from February 2007, (the "Area 4 EPCC") and was appointed Operator, with an initial participating interest (p.i.) of 90%, obtaining exclusive rights for the exploration, development and exploitation of the hydrocarbon resources discovered in the Area 4 offshore Block located in the Offshore Rovuma Basin ("Area 4").

In April 2007 EEA entered in a Farm-out Agreement with Galp Exploraçąo e Producao Petrolifera S.A to sell a 10% p.i. in the Area 4 EPCC. In 2011, Galp Exploraçąo e Producao Petrolifera S.A transferred its participating interest to Galp Energia Rovuma B.V. in an intragroup transfer.

In July 2007 KG Mozambique Ltd entered in a Farm-in Agreement to purchase 10% p.i. in Area 4 EPCC from EEA and acceded to the Area 4 EPCC in 2008.

In 2013 CNPC Dutch Cooperatief U.A. purchased 28.57% of shares in EEA from Eni S.p.A. and acquired a 20% indirect p.i. in the Area 4 EPCC.

On December 13th, 2017, Eni S.p.A. completed the sale of half of its shares in EEA to ExxonMobil Development Africa B.V. (EMDA).

As result of this transaction, the revised shareholders composition in EEA (which subsequently changed its name to Mozambique Rovuma Venture S.p.A ("MRV") is now the following:

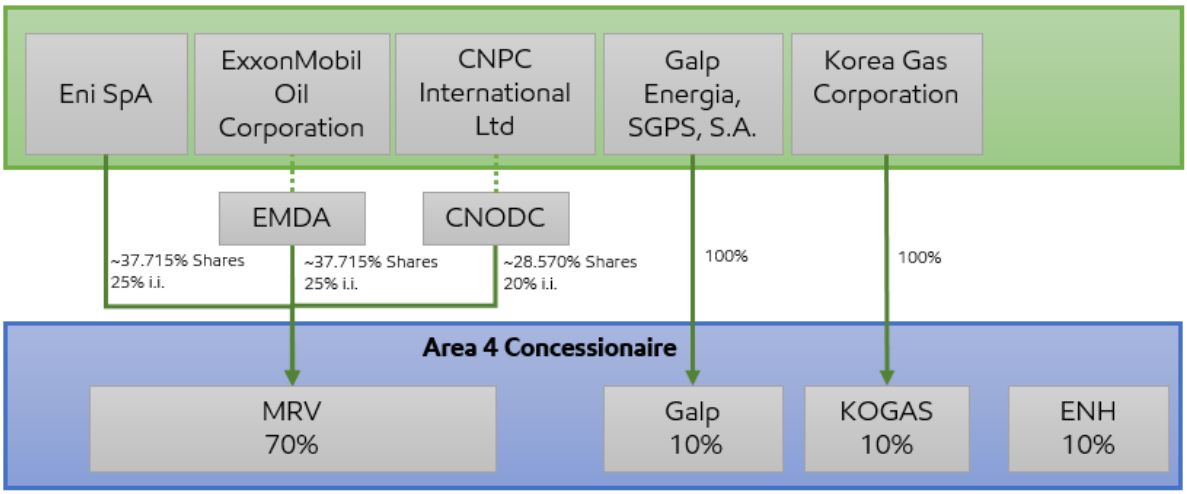
- Eni S.p.A. ~35.715% (therefore holding an indirect participating interest of 25% in Area 4) ("Eni")
- ExxonMobil Development Africa B.V. ~35.715% (therefore holding an indirect participating interest of 25% in Area 4) ("EMDA")
- CNODC ~28.57% (therefore holding an indirect participating interest of 20% in Area 4 ["CNODC"])

MRV currently holds a 70% participating interest in Area 4, with the other Area 4 parties to the Area 4 EPCC, being:

- Empresa Nacional de Hidrocarbonetos, E.P., a state owned company established in accordance with the laws of the Republic of Mozambique ("ENH") with a 10% p.i.,
- Galp Rovuma Basin B.V., a company incorporated under the laws of the Netherlands ("Galp") with a 10% p.i. and
- KG Mozambique Ltd., a company incorporated under the laws of the Marshall Islands ("Kogas") with a 10% p.i.

MRV, ENH, Galp, and Kogas (together the "Area 4 Concessionaire") are also parties to the Area 4 Joint Operating Agreement (the "Area 4 JOA") as amended and novated. EMDA, Eni, CNODC, ENH, Galp, and Kogas, having direct and indirect participating interests in Area 4.

Figure 2-2: Area 4 Concessionaire



Area 4, operated by MRV, borders with Area 1, operated by Anadarko Moçambique Área 1, Limitada (AMA1). Some of the reservoirs of Area 4 straddle the boundary between the two areas (i.e. Oligocene Upper North, Oligocene Upper South, Oligocene Lower e Eocene Upper, together the Straddling Reservoirs). The intention of the Area 4 Concessionaire and Area 1 Concessionaire is to develop and produce the gas contained in these Straddling Reservoirs in a coordinated manner for

the purpose of optimizing the ultimate recovery and value of such resources in compliance with the applicable Mozambican laws and international industry practices for oil and gas production.

The Project will be implemented pursuant to the comprehensive legal and regulatory regime established by the Government of Mozambique ("GoM") for the purpose of enabling the development of the Area 4 and Area 1 projects in the Rovuma Basin and facilitating project financing.

The key elements of such legal and regulatory regime consist of:

- The Petroleum Law of August 2014 and the Petroleum Operations Fiscal Law of September 2014 (as amended in December 2017) which have a general application within Mozambique
- The Petroleum Operations Regulations of December 2015, which have general applications to Petroleum Operations carried out in Mozambique
- The Decree Law no. 2/2014, which establishes a special legal and contractual regime specific to projects within the Rovuma Basin (including the Project) and prevails over the above mentioned laws in respect of the specific matters contained therein (such as procurement)
- The Area 4 EPCC (as supplemented) and Area 4 Joint Operating Agreement (as supplemented and novated)
- A specific Area 4 EPCC supplemental agreement to be entered into by the Area 4 Concessionaire and the GoM for the development of the Area 4 resources (except those developed through the Coral South Project) by means of their liquefaction and sale on the international market.

In accordance with the Designated Operator Supplemental Agreement and the amendment to the Area 4 JOA dated 7 November 2017, and pursuant to the Area 4 EPCC and the Area 4 JOA, responsibility for the conduct of operations is delegated by Area 4 Operator as follows:

- To Eni Rovuma Basin B.V. ("ERB") (and any affiliated company of Eni acting individually and/or collectively with ERB) as the designed Upstream Operator responsible for conducting the Offshore Operations, being all operations relating to the production of hydrocarbons under the Area 4 EPCC and their transportation and delivery to the liquefaction and related facilities
- To ExxonMobil Moçambique, Limitada S.A. ("EMML") (and any affiliated company of EMDA acting individually and/or collectively with EMDA) as the designated Liquefaction and Related Operations Operator (the "Liquefaction and Related Operations Operator" or "Midstream Operator") responsible for conducting the Liquefaction and Related Operations, being all operations related to liquefaction, including the development of associated facilities and assets

The "Development Management System" of Eni is the general framework adopted by ERB for managing and controlling the upstream activities and is based on the Eni Management System Guideline for Development Projects. The ExxonMobil "EMCAPS" Project Management System will be used by EMML for managing and controlling Liquefaction and Related Operations during the Development phase. The two project management systems are similar in nature and allow for coordinated development of project activities. Coordination and alignment are enabled by the definition of common processes and interface and change management procedures.

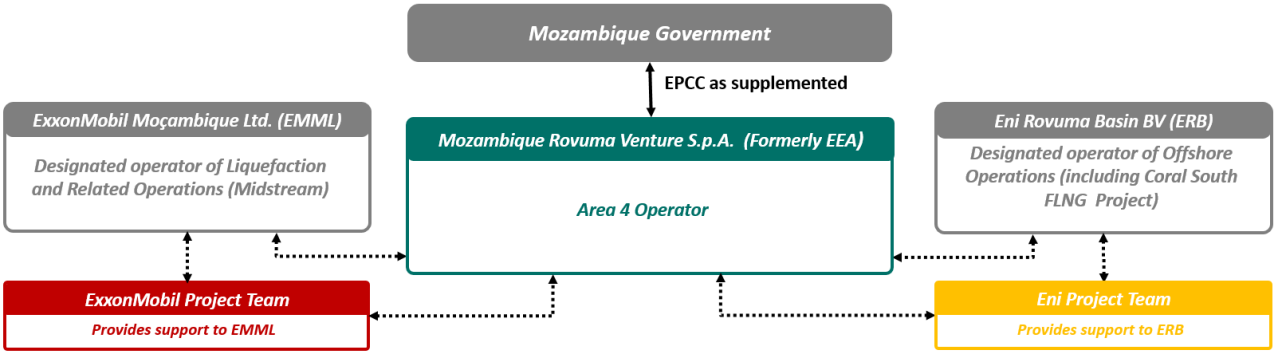
A dedicated department (the Mozambique Program—MPM) has been set up in Eni Head Office, with an experienced project team, to provide oversight, guidance, supervision and coordination over the Offshore Operations (including in relation to the Rovuma LNG Project, other future project phases and the Coral South FLNG Project), to ensure synergies, efficiency and optimization.

EMML is supported by an experienced project team to provide oversight, guidance, supervision and coordination over the Liquefaction and Related Operations, including expert support, as needed, from ExxonMobil Global Project Company based in Houston and ExxonMobil International Limited based in UK (together the "ExxonMobil Project Team").

Key members of the ExxonMobil Project Team are co-located with the Eni Project Team in Basingstoke (UK) to ensure a proper interface and coordination between the Offshore Operations and the Liquefaction and Related Operations.

MRV remains the Area 4 Operator pursuant to the Area 4 EPCC and the Area 4 JOA, maintaining regular interaction with the Offshore Operator, the Midstream Operator, the Area 4 Parties and Government of Mozambique.

Figure 2-3: Area 4 Operatorship Structure



Rovuma LNG Project will be supported by dedicated upstream and midstream teams (based in multiple locations worldwide), under the stewardship of Eni and ExxonMobil respectively, headed by their respective Project Directors, with a structure and composition that will vary and be adaptable throughout the project life, with the aim to assure the successful and timely development of the Project.

The Midstream Operator and the Offshore Operator will assure that the respective technological expertise is maximized to assure delivery of the project with multidisciplinary resources dedicated to the project in each stream.

Following approval of the Plan of Development by the Government and its coming into effect, the Area 4 Concessionaire will have the right to conduct all Petroleum Operations related to the development and production of the Rovuma LNG Resources (including liquefaction of gas) under the terms and conditions of the Area 4 EPCC, the Area 4 JOA, the Area 4 Supplemental Agreement, and in accordance with the Decree-Law, the Petroleum Law and the Petroleum Operations Regulations.

For the purpose of producing the gas of the Rovuma LNG Project in the most efficient manner, the Midstream Operator and Offshore Operator will:

- Conduct all Petroleum Operations related to the production of gas and its delivery to the Onshore LNG Plant,
- Safely design and operate the subsea wells and SURF Facilities necessary to produce and deliver gas to the Onshore LNG Plant,
- Condition and liquefy the gas into LNG, and
- Store and offload (at the relevant Delivery Point) the LNG, Domestic Gas and condensates produced therein.

For the purpose of liquefying the gas in a safe, reliable and efficient manner, the persons constituting the Area 4 Concessionaire (or their affiliate or affiliate of their shareholders) will establish Special Purpose Entities including one to design, procure, finance, build and own the Onshore LNG Plant necessary to treat and liquefy gas and, store, offload LNG, Domestic Gas and condensates produced (the "TrainCo SPE"). The Special Purpose Entities, each a cost pass through entity, will be established and authorized to perform Petroleum Operations and the tolling fee for such service will

be disregarded for the purposes of determining cost recovery and profit petroleum. TrainCo SPE will provide the liquefaction and related operations services pursuant to the Rovuma LNG Liquefaction Services Agreement, to be entered into with MRV (for and on behalf of the Area 4 Concessionaire), (the "LSA"). The services necessary to provide the liquefaction and related operation services and for the operation and maintenance for the Onshore LNG Plant will be provided by EMML pursuant to the Rovuma LNG Operating Service Agreement ("ROSA"), to be entered into between EMML and the TrainCo SPE.

The performance of certain activities may be contracted to third parties, including as needed drilling and completion of wells, installation of subsea facilities, gas transport to the Onshore LNG Facilities, and construction of the Onshore LNG Plant and provision of marine services. At all times these activities will be the responsibility of the Area 4 Operator and under the supervision of the Offshore Operator and Midstream Operator, as applicable.

2.6. Legal and Regulatory Framework

2.6.1. Project E&S Standards

ExxonMobil and its Affiliates are committed to operating in an environmentally responsible manner everywhere we do business. ExxonMobil's Corporate Environment Policy and Protect Tomorrow. Today. Expectations serve as the foundation which are guided by a scientific understanding of the environmental impact of our operations as well as by the social and economic needs of the communities in which ExxonMobil operate. This Corporate Guide addresses identification and assessment of significant environmental aspects consistent with the Environmental Policy and Protect Tomorrow. Today. The guiding principles underlying the Environmental Policy are, namely:

- Deliver superior environmental performance;
- Drive environmental incidents with real impact to zero, through a process of continuous improvement; and
- Achieve industry leadership in focus areas that are valuable to the business.

The Guide is also consistent with the following OIMS requirements and performance expectations:

- Management commitment and leadership;
- Identification and mitigation of environmental risk;
- Integration of Environmental Business Planning (EBP) into base business; and
- Identification and management of community impacts and concerns.

Aligned with Corporate Policy, Expectations and Systems, the Corporate Environmental Aspects Guide is designed to support the implementation of environmental management expectations of OIMS as applicable to ExxonMobil operations, with special emphasis and linkage with:

- OIMS Element 2: Risk Assessment and Management (and all related Expectation)
- OIMS Element 6: Operations and Maintenance (and all related Expectations)
- ISO 14001 Environmental Management System specification.

Specifically, the Guide establishes a consistent approach for identifying environmental aspects and for determining which of those aspects may be significant. As used herein, "significant environmental aspects" are those that meet business specific criteria for significant risk, based on the use of the Corporate risk assessment methodology relating to potential environmental impact and the probability that such impact could occur.

Environmental aspects are activities, products, or services that can interact with the environment. For purposes of this guide, the term "activities" will be used broadly to encompass ExxonMobil office and field activities, operations and services. This Guide is focused on:

- Identifying environmental aspects resulting from ExxonMobil activities,
- Understanding the setting in which our activities interact with the environment (natural, regulatory, and social), including how the surrounding environment may change the interaction,
- Assessing potential environmental risks resulting from those aspects, and
- Prioritizing aspects to identify those that may result in significant risk and for which the operation has direct control or influence as it relates to ExxonMobil activities. These aspects are referred to as an assessable unit's significant environmental aspects.

2.6.2. Environmental Management Plans

A suite of Environmental Management Plans (EMPs) were approved (initially in 2017, and updated in 2019), each with a corresponding license, for the following project components:

- Area 1 Exclusive Facilities
- Area 4 Exclusive Facilities
- Materials Offloading Facility
- LNG Marine Terminal
- Area 1 and Area 4 Shared Facilities

The EMPs broadly cover the following:

- Applicable environmental and social mitigation and management measures identified in the EIA (2014) and in the associated Tabulated Environmental and Social Management Plan (ESMP) (Annex D of the EIA (2014))
- Applicable recommendations provided in the EIA (2014) Approval letter and in the relevant Addendum of the Letter

In order to ensure the 2017 EMPs were updated systematically, a Management of Change Procedure was developed jointly by MRV and AMA1, where each change to the design was identified and documented, then evaluated to determine whether the change was material to the EIA (2014) findings and associated commitments contained in the EIA (2014) and the 2017 EMPs. Where necessary an additional technical assessment was undertaken alongside a review and update of the mitigation and management measures set out in the EMPs that were approved by the Mozambican Government in 2017. The Management of Change Procedure will also be utilized to assess any additional changes as engineering work progresses.

Some of the key updates to the EMPs, arising from further post EIA (2014) assessment work, which were assessed as part of the ongoing EMP update work, are described in the Sections 7 and 9.

2.6.3. Regulatory Compliance

The RLNG project has developed a Regulatory Compliance Plan (RCP) that describes the processes to be followed to achieve regulatory compliance for all Project related activities. A key expectation of the RCP to ensure that all requirements for government reporting are captured in a manner that describes work processes and tools to identify, track, and steward applicable regulatory compliance and reporting requirements. The project's regulatory compliance target is to have zero regulatory non-compliance incidents.

The Project will be developed within a regulatory framework of Mozambican federal, provincial and municipal requirements, where applicable. The RCP outlines the applicable legislation and regulations as well as the existing major permits and approvals and other relevant approvals and licenses.

The RCP outlines processes, tools and organization required to ensure regulatory compliance as well as mechanisms that will be used to integrate regulatory compliance in design deliverables and execution activities, specifically:

- Regulatory compliance, reporting and interface management including: roles; responsibilities; and interface agreements
- Contractors and regulatory compliance and reporting, including: environment and regulatory Contract Coordination Procedures; and expectations of Contractors regarding regulatory compliance
- Regulatory compliance assurance including: required permits and approvals; application and distribution processes; regulatory schedule; regulatory tracking tool; and regulatory management of change
- Engineering design and planning assurance including: design commitments; engineering deliverable compliance close out; procurement; pre-construction design submittals; and engineering planning
- Execution planning including: Contractor Regulatory Compliance Plans; pre-mobilization Contractor compliance readiness; site based environment and regulatory teams; and on site and field level execution planning
- On-site field verification including: compliance inspections; technical monitoring programs; and external regulatory inspections
- Metrics and compliance status reporting
- Compliance incident reporting and investigation
- Regulatory compliance assessments
- Regulatory compliance training

The RLNG Environmental & Regulatory (E&R) Team, working with the Licensing team, will continue to improve the RCP and regulatory compliance management processes by incorporating lessons learned from various regulatory compliance and management systems assessments as well as other ExxonMobil affiliates, Eni, and Eni affiliates.

The Regulatory Compliance Plan does not address all of the regulatory matters the Project will need to manage; for example, topics such as labor, tax, customs and duties, pressure vessels, building standards, etc. are not discussed. Operator Procurement, Law, Tax, Treasurers, etc. groups are responsible for the specific regulatory items unique to their areas of expertise.

2.7. Lender Due Diligence

The Area 4 Concessionaire's parties are seeking to obtain third party financing for a significant portion of midstream Project costs. This requires the assistance of financial and legal advisors to support MRV in the development, implementation and execution of a project financing. The financial and legal advisors have been engaged and under the direction and participation of the Midstream Operator continue to support development of a final Finance Plan, which will include, *inter alia*:

- Potential sources of financing
- Determination of the proposed commercial and financing structure

When EMML finalised their participation in the project, they inherited many environmental and social documents, including the government approved EIA (2014) and Mozambique Gas Development Resettlement Plan (RP), that needed to be reviewed in the context of what would be required to demonstrate conformance with IFC Performance Standards on Environmental and Social Sustainability, 2012, as well as national legislation, international regulations and corporate requirements.

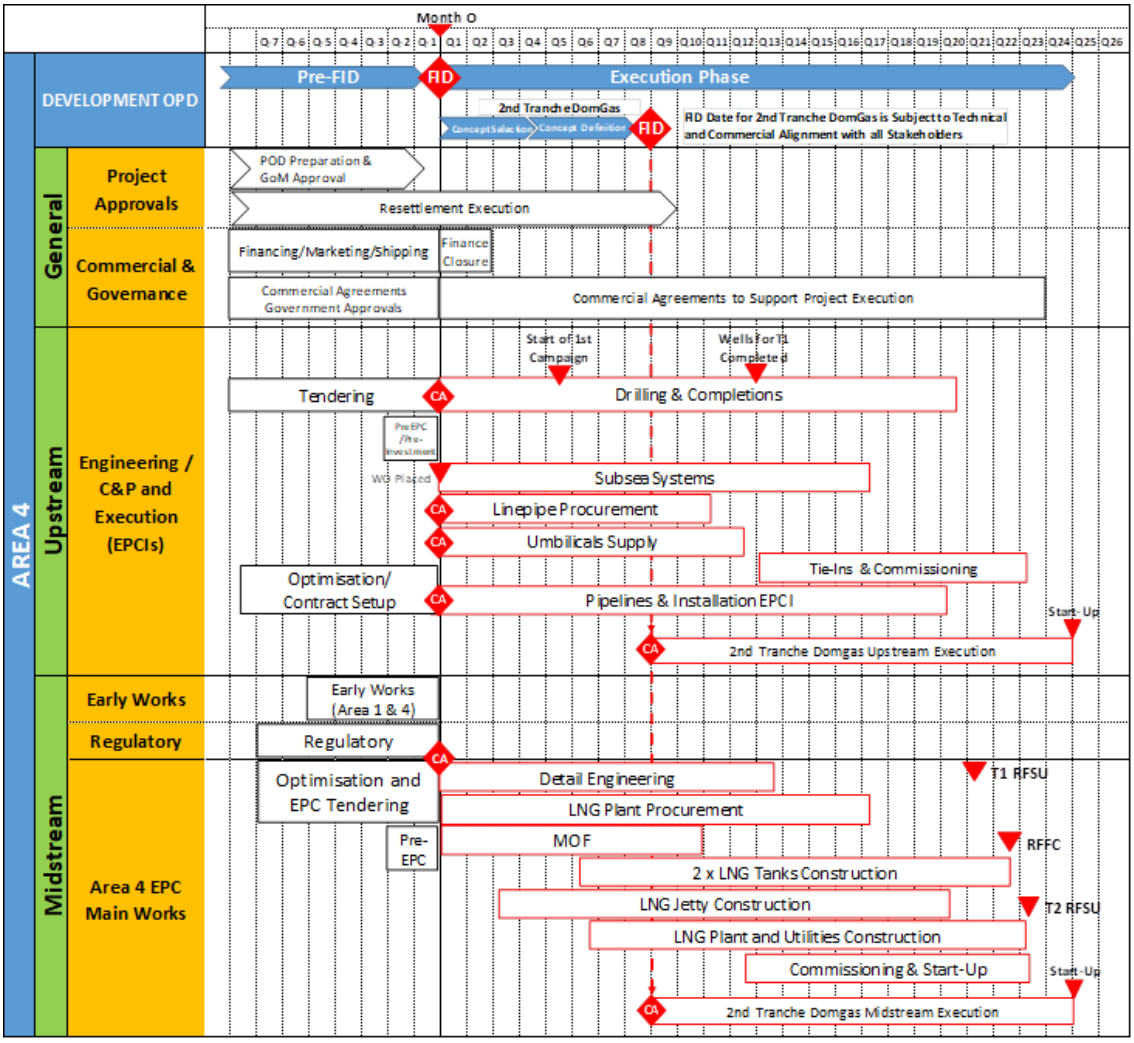
The review of both the documents and the IFC Performance Standards (2012) requirements formed the basis of a work programme developed by EMML and ERB to ensure any gaps that were identified were addressed.

MRV have begun to engage due diligence consultants on behalf of the Lenders to provide independent review of the project and facilitate required support to the Lenders. These consultants will focus on the technical, marketing, shipping, environmental & social, insurance and security aspects of the Project.

2.8. Project Timeline

The planned Rovuma LNG Project activities are summarized in the following Master Schedule (Figure 2-4).

Figure 2-4: Master Schedule



The Master Schedule, developed by the Area 4 Operator on a P50 basis, summarizes the main milestones, activities, and areas of the Project to be closely monitored during the execution of the Project. This schedule will continue to be iteratively developed and updated as the Project progresses through the Midstream and Upstream optimization and tendering phase in the lead-up to contract award.

The final update of this Master Schedule will be subject to the following conditions: final approval from the Government of Mozambique, finalization of financing, Final Investment Decision, selected contractor's final constructability approach for the LNG Onshore Facilities, and upstream installation campaign final plans.

3. ALIGNMENT AND COLLABORATION

Given the unique nature of having an adjacent project, co-located on the Afungi Peninsula that shares key infrastructure, RLNG recognizes the importance of collaboration with the AMA1 operated MZLNG Project. Consistent with this, the projects have developed a number of key interfaces, working groups and synergies task teams to support their respective developments and support planning for common infrastructure. Within this, the alignment of the RLNG and MZLNG Project's environmental and social data, future data collection methodologies, impact assessment work as well as the planning of mitigation, monitoring and reporting has been identified as a critical project activity to enable management of the common areas and indirect effects.

Specific Working Groups have been established for community relations and labor and working conditions. For resettlement, the harmonization process is underpinned by contractually binding agreements such as the Resettlement Joint Operating Agreement (RJOA), which sets out the scope of resettlement operations, participation, ownership, obligation, and liability. In the case of resettlement, AMA1 will continue to implement their existing Resettlement Plan with support from MRV who are an equal partner in the process and to that end have seconded staff into the AMA1 resettlement team.

Other areas of active and on-going collaboration between AMA1 and MRV include but are not limited to:

- Security
- Biodiversity
- PIIM
- Community health, safety and security
- Stakeholder Engagement
- Cultural heritage
- Community investment

As noted above, a number of key interfaces have been identified between Area 4 and AMA 1 where both projects believe alignment on principle areas and approaches are beneficial. Representative examples of the Environmental and Social interface areas and where applicable the associated findings are discussed below.

3.1. Baseline Integration

Following the EIA (2014) preparation, both AMA1 and MRV have been conducting environmental and social baseline studies to collect additional data on the terrestrial, nearshore, and offshore marine environments. These efforts have been carried out to improve understanding of the local and regional baseline, to facilitate the development of assessments and management plans to meet Mozambican and international standards, and to comply with licensing commitments.

Considering the shared and independent Environmental Licenses for developments within the Project Area there was a need to integrate environmental data and create a common consolidated environmental baseline. This process was undertaken in recognition that the data collected by each proponent, while complementary, might present discrepancies or inconsistencies in information. A consolidation exercise was therefore deemed necessary. Consequently, the consolidated environmental baseline will serve as the baseline for both AMA1 and MRV, being a key reference for future data collection, environmental assessments, potential updates to Environmental Licenses and EMPs, and to facilitate refinement of mitigation measures and monitoring programs.

The consolidated environmental baseline work is discussed in detail in Section 4.

3.2. Cumulative Effects Modelling

A cumulative effects modelling program has been developed and carried out in coordination with AMA1 to assess the potential environmental effects from both MRV and AMA1 activities and inform mitigation and control measures. Cumulative effects modelling for groundwater use and air quality impacts have been completed using current MRV and AMA1 design and execution information. Effluent discharge and sediment dispersion modelling from dredging activities are ongoing with anticipated completion in 2Q19. As MRV and AMA1 continue to refine design and execution plans, the results of these assessments will be reviewed and, if necessary, the models will be re-run with updated inputs.

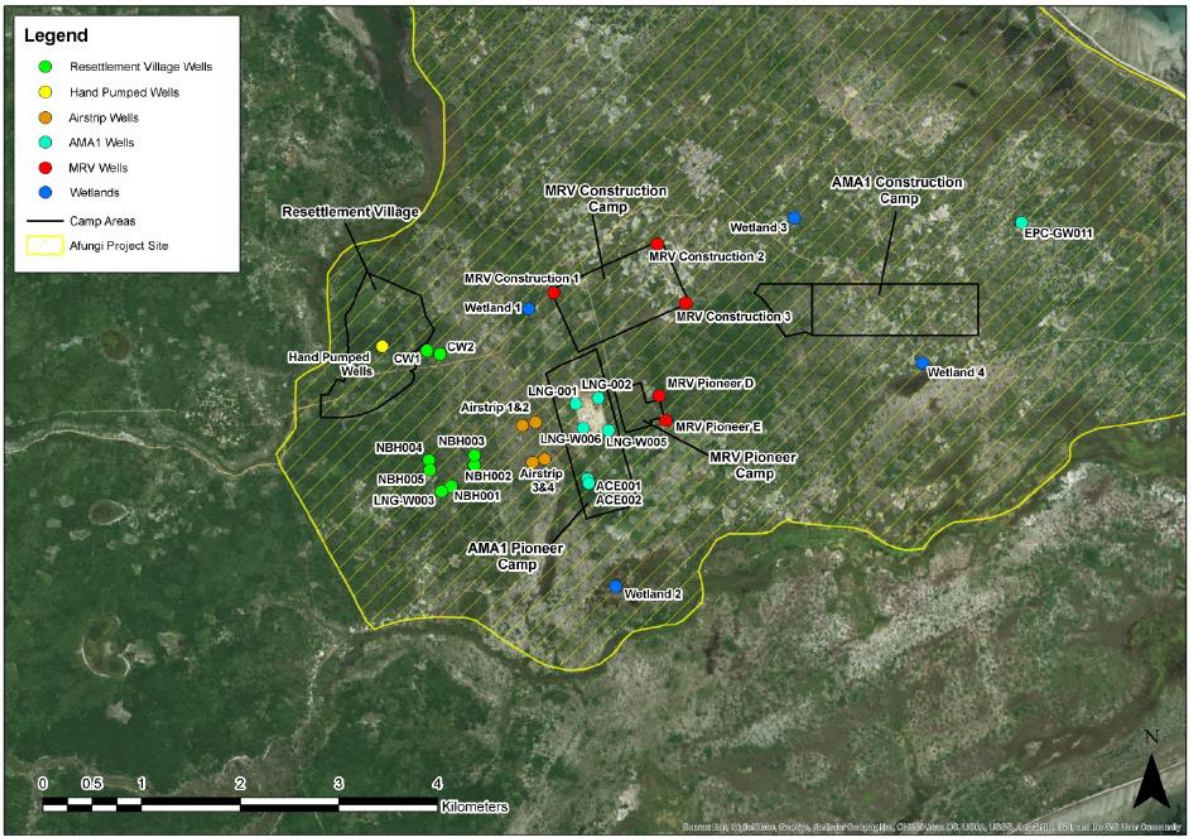
3.2.1. Groundwater Modelling

MRV and AMA1 plan to abstract groundwater within the DUAT to support construction water demands. MRV plans to utilize groundwater to meet the water demands of the Pioneer Camp and support Early Works activities (e.g., EPC Construction Camp water demands, dust suppression, etc.) prior to availability of desalination units. During Operations, a permanent desalination unit(s) is planned to meet the entire water demand of the camp, LNG plant, and other users. While regular groundwater abstraction is not anticipated during Operations, it may be utilized as a back-up or supplementary water source during periods of increased demand, e.g., during major turnaround and maintenance activities.

A 3D numerical groundwater model was developed in MODFLOW using site-specific monitoring data provided by MRV and AMA1 with the objective of understanding the potential impacts of groundwater abstractions at sensitive receptors, namely the resettlement village and surrounding wetland areas. AECOM determined that the aquifer would be protected from saline intrusion as long as groundwater levels remain above river or wetland elevation. Based on groundwater level data near the coast and an assumed high tide level, the groundwater elevation conservatively considered to be protective of saline intrusion into the aquifer is 3 m above mean sea level (amsl). At the resettlement village wells, it was determined that water levels should generally not be drawn down below 30 m depth as the anticipated depth of the resettlement village boreholes is 50 to 60 m.

Preliminary abstraction points in the model are located at the airstrip (to support airstrip construction), MRV and AMA1 Pioneer Camps, and the MRV and AMA1 EPC Construction Camp. The abstraction well locations and the location of sensitive receptors where drawdown impacts were analyzed are shown in Figure 3-1.

Figure 3-1: Modelled Groundwater Abstraction Locations and Sensitive Receptors



Multiple predictive model iterations were conducted in 4Q18 to inform sustainable abstraction rates and borehole locations in order to maintain required water levels at the resettlement village and surrounding wetland areas. Model refinements included relocation of abstraction wells and reductions to abstraction rates to minimize acute impacts (excessive drawdown or saline intrusion) to any single borehole or sensitive receptor. With these refinements, the cumulative effects model did not predict any significant risk to the community groundwater users or sensitive ecological receptors. The anticipated maximum MRV groundwater abstraction rate is approximately 600 m^3 per day for an 18 month period where abstraction from the MRV Pioneer Camp and EPC Construction Camp may overlap, prior to the installation and operation of a desalination unit for the EPC Construction Camp.

Groundwater levels and potential saline intrusion at the abstraction boreholes and wetland areas will be monitored routinely throughout construction. Abstraction rates and locations will be modified if the monitoring results suggest that withdrawals are not sustainable. Community engagements will also occur regularly. If such engagements suggest that MRV-related abstraction activities are adversely affecting water availability of the resettlement village, such grievances will be assessed and action taken where appropriate in accordance with the grievance management process.

3.2.2. Air Emissions Dispersion Modelling

Air emissions dispersion modelling was conducted in 4Q18 to characterize air quality impacts from Operations phase emission sources using the current design basis for MRV and AMA1. The modelling utilized the USEPA-approved AERMOD program and local meteorological data from a station on the DUAT, which was supplemented with prognostic meteorological data for parameters not available from the site station. The use of primarily local meteorological data from this station replaces the prognostic data used to inform the modelling reported in the EIA (2014).

Emissions sources in the model included gas turbine drivers and generators, emergency diesel generators, waste incinerators, thermal oxidizers, and other major contributors to emissions during Operations. While the onshore LNG facilities will be designed such that no routine flaring will occur during steady-state operations, the modeling conservatively included emissions associated with maximum relief flaring for short-term (1 hour or less) averaging periods. Transient marine emissions sources, including emissions from LNG tankers, condensate tankers, and tugs, were also modelled.

As shown in Table 3-1, the cumulative effects modeling indicated compliance with the ambient air quality standards set forth in the EIA (2014) and the 2019 Environmental Management Plan Update at the DUAT boundary. The ambient air quality standards are based on appropriate Mozambican, World Health Organization (WHO), and European Union standards.

Table 3-1. Operational Phase Air Quality Impacts

Pollutant	Averaging Period	Predicted Ground Level Concentration (µg/m^3) and Percent of the Air Quality Standard at the DUAT Boundary	Ambient Background Concentration (µg/m^3)	Air Quality Standard (µg/m^3)
CO	15-Minute(1)	1,541 (2%)	100	100,000
	30-Minute(1)	1,343 (2%)	100	60,000
	Hourly(1)	1,168 (4%)	100	30,000
	8-Hour(1)	244 (2%)	100	10,000
NO_2	Hourly(1)	138 (69%)	8.0	200
	Annual	4.5 (11%)	8.0	40
PM_{10}	Daily(2)	3.6 (7%)	44.4	50
	Annual	0.6 (3%)	14.2	20
$PM_{2.5}$	Daily(2)	3.7 (15%)	13.3	25
	Annual	0.6 (6%)	4.3	10
SO_2	10 Minute(1)	10.9 (2%)	1.6	500
	Hourly(1)	7.6 (1%)	1.6	800
	Daily(1)	2.6 (13%)	1.6	20
	Annual	0.5 (1%)	1.6	40
Benzene	Annual	1.5 (30%)	0.43	5
Toluene	1-week	3.1 (1%)	1.6	260

Air quality will be monitored during Operations phase and the monitoring results will be compared to the predicted model concentrations. The model will be updated, if required, to more accurately characterize pollutant concentrations. If the monitoring indicates an exceedance of the ambient air quality standards, an assessment will be undertaken to determine the cause of the exceedance and determine appropriate corrective measures.

3.2.3. Effluent Discharge Modelling

MRV and AMA1 are in the process of modelling cumulative effects from construction and operations effluent discharges to Palma Bay to understand impacts to ambient water quality and confirm siting and design of seawater intakes and discharge outfalls. Effluent discharges will include desalinated (brine) water, produced water, domestic wastewater, treated storm water, and other streams. This modelling effort will be complete in 2Q19.

The scenarios that are being modelled correspond to a conservative generic design and execution strategy agreed between the parties. The modelling scope builds on the previous work carried out to date, and will simulate the transport and fate of different types of aqueous marine discharges such as treated waste waters and desalination brine water discharges. The modelling will assess both near field and far field effects to look at cumulative ambient water concentrations with respects to the water quality standards and sensitive surrounding habitats, and assessment of the potential for recirculation of effluent into water intakes.

3.2.4. Sediment Dispersion Modelling

MRV and AMA1 are in the process of modelling cumulative effects from dredging operations in Palma Bay. Dredging will be required for installation of nearshore infrastructure and the AMA1 and MRV pipelines. The modelling will also account for disposal of the dredged material at a designated nearshore disposal site in Palma Bay. This modelling effort will be complete in 2Q19.

The scenarios that are being modeled correspond to a conservative generic design and execution strategy agreed between the parties. The modelling scope builds on the previous work carried out to date, and will evaluate the sediment transport due to the nearshore dredging and dredge spoil disposal activities which have the potential for overlap and cumulative effects. The modelling will provide information regarding cumulative water column suspended sediment concentrations and the sediment deposition on the seabed due to dredging and disposal activities, and will be used to shape the dredging plans of each party, and revised during EPC as required.

3.3. Biodiversity

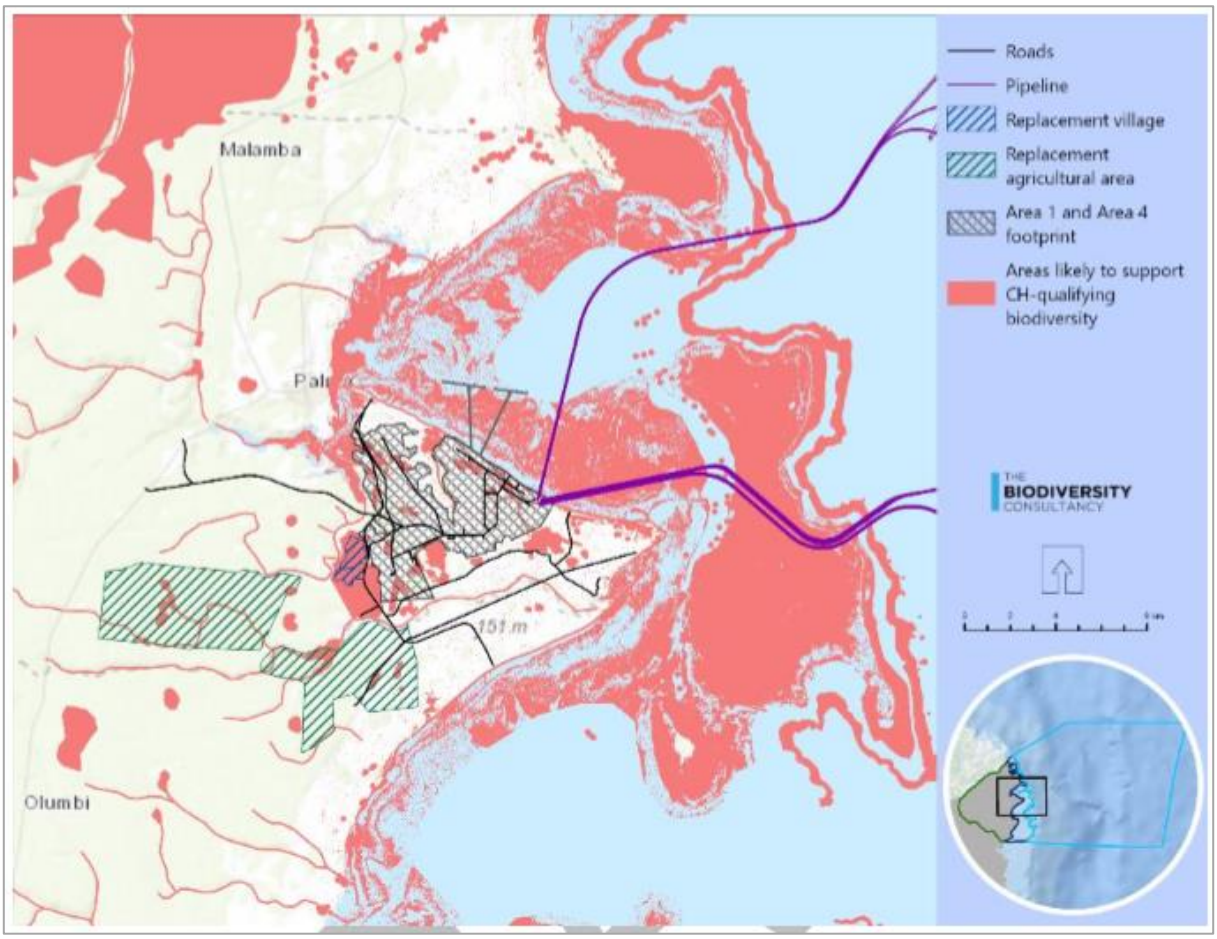
3.3.1. Critical Habitat Harmonization

AMA1 and MRV have individually and independently undertaken critical habitat assessments (as defined by IFC PS 6, 2012) using different environmental data sets generated by various biodiversity contractors. Given both of these variables, there could potentially be variations in the methodological approach and outputs. As the two LNG Projects are co-located in the same environmental setting, it has been agreed that it would be beneficial for both proponents to have a common understanding of habitats and determination of criticality. In order to achieve this the following activities have been undertaken:

- Review of Integrated Environmental Baseline and latest Project Description.
- Development of an appropriate Critical Habitat Assessment (CHA) methodology.
- Implementation of the agreed methodology to create the CHA.
- Define a common approach for assessing residual impacts and metrics for calculating net loss/gain.
- Provide recommendations on options for integrated Biodiversity Offset Planning.

Figure 3-2 below provides a graphical overview of the areas that have the potential to contain Critical Habitat qualifying features.

Figure 3-2: Ecosystems and Sites in the Vicinity of the Project with Potential to Contain Critical Habitat Qualifying Features



3.3.2. Residual Impact Assessment

The Project is progressing on efforts with AMA1 for a combined Residual Impact Assessment (RIA) that covers the AMA1 Exclusive Facilities, Area 4 Exclusive facilities and the Shared Facilities. The RIAs will be undertaken using the harmonized RIA methods framework that has been developed as part of the harmonized critical habitat assessment (CHA) work.

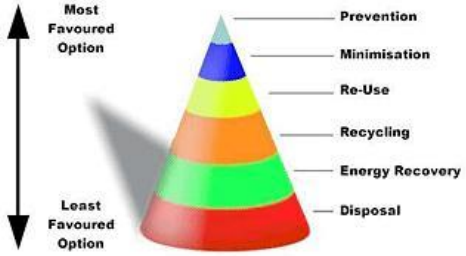
The RIAs will map direct and indirect project impacts for the Project and co-located AMA1 Project supported by information from the ESIA and baseline studies and will quantify residual impacts on priority biodiversity to inform biodiversity offset design and planning.

3.4. Common Waste Management Facility

MRV and AMA1 are currently working on the alignment of the construction and operation of a shared waste management facility, including waste landfills and associated waste management facilities within the DUAT, in a synergized approach to waste management, to be agreed under the DUAT Commons Joint Operators Agreement (JOA).

MRV and AMA1 will manage wastes in accordance with the following aligned principles:

1) Manage wastes according to the standard waste management hierarchy.



2) Reduce and mitigate significant impacts to human health and the environment where technically and commercially feasible.

3) Adhere to applicable national laws, international laws, and global standards.

4) Treat waste at source to reduce the volume and potential hazards prior to transport.

5) Reduce risk of 'spills' during transport of wastes to the WMF through stabilization or reduction of wastes (e.g., drum cleaning/crushing, drying, stabilized prior to transport).

6) Ensure that waste handling facilities are developed in a timely fashion, so that On-DUAT facilities are available to handle waste streams from initial construction phases through to the end of life of the facilities.

Waste Management at a synergized Waste Facility is intended to be operated by a jointly approved third-party specialist contractor and governed by a jointly developed Waste Management Plan that includes jointly agreed-to procedures to properly handle, treat, and dispose of the anticipated waste streams.

The EIA (2014) identified the potential need for on-site waste management facilities and that a Waste Management Facility (WMF) would be part of the Area 4 Exclusive Facilities; however, the location was not specified.

Since the EIA (2014), the potential area for the WMF has now been identified and will now be a shared facility. The WMF will include the following components, among others, within an area of approximately 40 hectares:

- Lined non-hazardous landfill with multiple cells.
- Leachate storage and treatment system.
- Leachate and groundwater monitoring system.
- Landfill gas monitoring system.
- At least three waste incinerators and supporting infrastructure.
- Security fence.
- Gatehouse with scales (weighbridge) to log the volume of waste entering the facility.
- Wood chipper.
- Tire de-beader and crusher/shredder.
- Storage area for inert construction waste.
- Facility for cement stabilization of incinerator ash prior to landfilling.
- The impacts related to WMF have been reassessed. Given that the WMF will be fully located within the Project Footprint Area, and the construction methodology will be in line with the rest of the project, impacts relating to vegetation clearance, habitat loss, and construction were not assessed further. Furthermore, impacts relating to operational processes of the WMF (such as

collection, storage, and transport) are not specific to the WMF as they were already considered in the EIA (2014). As such, these have not been assessed further.

The potential impacts associated with the WMF have been reviewed, and the following were identified as potentially being affected:

- Operational phase air quality impacts due to incinerator emissions.
- Operational phase impact on groundwater due to potential leachate infiltration to subsurface, which may cause a change in water quality within the wetlands (lacustrine and estuarine) and ultimately may have an impact on aquatic ecology and community users of groundwater.

These impacts were re-assessed through a series of quantitative modelling efforts for air emissions, and groundwater as well as more robust qualitative assessments on vegetation and sensitive ecological receptors. The assessment has considered the mitigation measures for WMF design and operation included in the project Waste Management Plan (Annex E of the EIA [2014]). It was concluded that the residual impacts on air quality from the incinerator will be Negligible and the residual impacts on water quality will be Minor. Following the more robust assessment of environmental impacts, the residual impacts originally identified in the EIA (2014) remain unchanged.

3.5. Community Health

Assessed as potentially significant, community health impacts were further assessed in 2018 in a Health Impact Assessment (HIA). The 2018 HIA updated the HIA conducted in 2013 for the nearshore and onshore components and extended the assessment to consider the regional study area (i.e. broader elements in Palma district, Macimboa da Praia, Pemba town, Mueda and transport corridors between these locations). As the potentially direct and indirect impacts on community health are likely to be relatively homogenous, it was considered prudent to consider the impacts of both projects collectively, recognizing that the cumulative nature of both projects may add to the significance of the impacts.

As explained in Section 8.3.2, Area 1 and Area 4 have developed a Framework Community Health Monitoring and Management Plan. This plan provides details of workplace and community-based interventions designed to mitigate risks and potential impacts, roles and responsibilities, key performance indicators, etc.

3.6. Infectious Disease and Vector Control Management

EMML has developed a number of specific specifications for establishing an Integrated Vector Control Program (IVCP), and must include appropriate equipment, pesticides and qualified individuals (e.g., entomologist) that has been approved by EMML. The program includes but is not limited to the following programs:

- Pandemic Illness Management Plan (e.g., flu, severe acute respiratory syndrome (SARS), Middle East respiratory syndrome (MERS), etc.) to prevent / manage impact.
- Infectious Disease Outbreak Management Program equivalent to COMPANY IDOM program
- Blood Borne Pathogen Program consistent with international standards
- Malaria Control Program (MCP) including Chemoprophylaxis Compliance Program (MCCP) equivalent to COMPANY programs for projects located within a malaria endemic area
- Vector Borne Disease Management Program to reduce the risk of vector borne disease
- Tuberculosis Control Program (TBCP)
- Sexually Transmitted Disease and Infection Program (e.g., HIV/AIDS)

3.7. Emergency Response

The Project is leveraging corporate experience in the development of Emergency Preparedness and Response Plans. The Emergency Response (ER) philosophy is to minimize the impact of emergencies on people, the environment, assets, and reputation. Accordingly, the Project is prepared to act as follows:

- If responsible, react rapidly and effectively
- If responsibility is unclear, be prepared to act
- If not responsible, provide technical or advisory assistance with appropriate legal safeguards
- Respond rapidly to life-threatening situations

Project ER planning is scenario based, with site-specific scenarios identified by risk assessment. Scenarios are periodically reviewed and added or deleted through the entire Project life cycle from early works to construction, commissioning, and operations. Scenarios which are considered include but are not limited to:

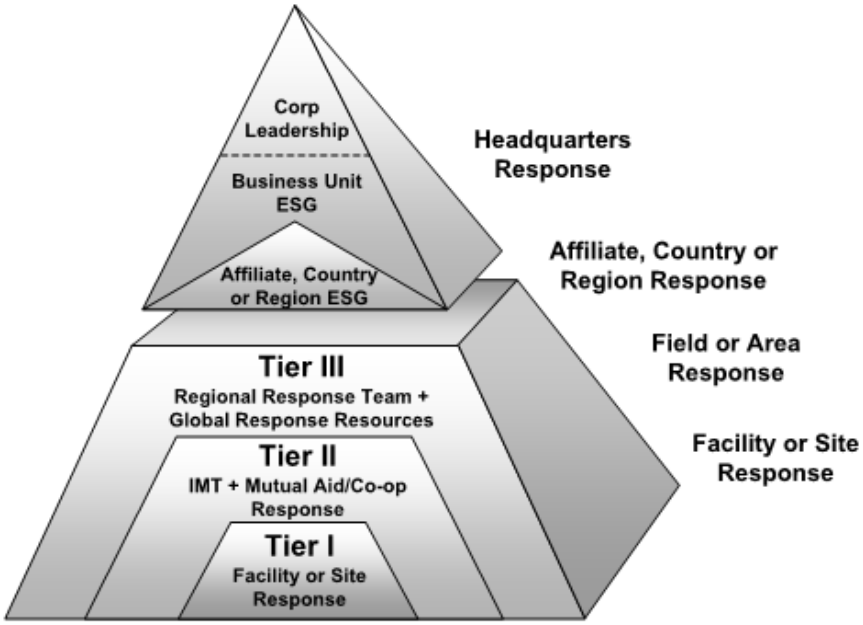
- Injury/illness (including medevac)
- Weather events (e.g., lightning, wind, rain, tidal surge, cyclone)
- Vehicle incident (e.g., collision, rollover)
- Security incidents (e.g., bomb threat, terrorist attack, safe haven, evacuation)
- Fire (bushfire, building fire, process area fire)
- Loss of containment on land (e.g., diesel, condensate, flammable gas)
- Rescue scenarios (e.g., confined space, excavation, high angle, extraction)
- Aircraft rescue and fire fighting
- Ship incident (e.g., oil spill, collision, fire, piracy, etc.)
- Camp scenarios (e.g., fire, muster, safe haven, infectious disease outbreak, riot)
- Outside DUAT scenarios (e.g., security incident, vehicle incident)
- Cyber security event
- Incidents affecting Upstream, which will affect Midstream (for example loss of gas supply or blowout)
- Incidents affecting Midstream, which will affect Upstream (for example plant shut down)
- Mutual aid requests from Area 1

Project will acquire equipment, train personnel, and conduct emergency drills to enable effective emergency response to relevant scenarios.

As illustrated in Figure 3-3, the global resources of the Designated Operator will be engaged as needed to respond to an incident.

- Most incidents will be Tier 1 and tactical response will involve the on-site Emergency Response Team.
- Tier 2 events will engage on-site senior management (the Incident Management Team) in addition to the Emergency Response Team. Mutual Aid support may be requested between Upstream and Midstream or from Area 1.
- Tier 3 events are rare, but in addition to the tactical on-site resources will engage EMML, ERB, and MRV in Maputo as part of the strategic Emergency Support Group. Depending on the scale and potential consequences, support may be provided by the ExxonMobil or Eni regional response team(s), and headquarters in Houston and Milan respectively.

Figure 3-3: Global Response Resources



3.8. Medevac

The medevac process is the same for work related and non-work related causes, but experience shows that most medical evacuations are associated with non-work related medical conditions. Until the Afungi airstrip is operational, medevac will require some combination of road transport, vessel transport, and helicopter to Mocimboa da Praia or Pemba and then fixed wing aircraft to the appropriate medical facility. Once the airstrip is operational, medevac aircraft will depart direct from Afungi.

3.9. Incident Notification

As a rule, the more serious the incident consequence, the higher and faster the notification process will be. Notification consists of known facts. It is unavoidable that early notification will be incomplete, and with more details provided as they are available and verified.

Notification may include, depending on the details of the incident:

- Company senior management
- Regulators
- Provincial government
- Neighbors (e.g., Area 1, local community)
- Associated companies (e.g., MRV, Eni, EMML)

3.10. Communications

Internal communications ensure that employees receive appropriate and accurate information that is consistent with public statements. Just as with external communications, internal communications should convey care and concern and provide factual information.

External communications should convey care and concern and provide factual information about the incident description and the Company's response. External communications can balance external perceptions of the event, which have already been shaped by news reports.

3.11. Incident Investigation

All incident will be investigated to determine direct and root (pre-conditions and underlying) causes and to make recommendations to prevent their recurrence. The degree of investigation is determined by the potential consequence of the incident. The investigation team composition and experience is also risk based, with more experienced teams assigned to High Potential Consequence investigations.

4. ENVIRONMENTAL BASELINE

4.1. Introduction

Since the completion of the EIA (2014), both Area 1 and Area 4 have conducted a number of environmental baseline surveys to collect additional data on the onshore, nearshore and offshore environments. These studies have been carried out to improve the understanding of the local and regional baseline, to facilitate the development of assessments and management plans to meet Mozambican and international standards, and to comply with licensing commitments.

A significant piece of work undertaken in 2018 was to consolidate this work to provide a key reference for the current environmental understanding. The environmental baseline data that has been gathered for both Area 1 and Area 4 has been consolidated into the Integrated Environmental Baseline Report (2018). ERM was contracted to complete this scope of works on behalf of Area 1 and Area 4, in part due to their familiarity with the project area and with the survey data that made up the EIA (2014), which ERM wrote in conjunction with Impacto.

The principal environmental topics addressed in this environmental report are outlined in Table 4-1. Some of these topics are only relevant to onshore, while others span from onshore, through the nearshore area, to the offshore environment.

Table 4-1: Integrated Environmental Baseline Topic Areas

Environmental Aspect	Onshore	Nearshore	Offshore
Soil, Geology and, Geomorphology[1]	✓	✓	✓
Surface Water (Hydrology) and Water Quality	✓	✓	✓
Groundwater (Hydrogeology)	✓	Not applicable	Not applicable
Air Quality	✓	Not applicable[2]	Not applicable[2]
Noise	✓	✓	-
Ecology / Biodiversity	✓	✓	✓

Notes: 1. Inclusive of seabed sediment quality for marine areas.
2. Marine environments are not considered sensitive to localized airborne pollution.

The onshore, nearshore and offshore areas are shown in Figure 4-1 and defined in the following subsections, which include a summary of the consolidated works that makes up the integrated environmental baseline report.

Figure 4-1: Onshore, Nearshore, and Offshore Project Areas

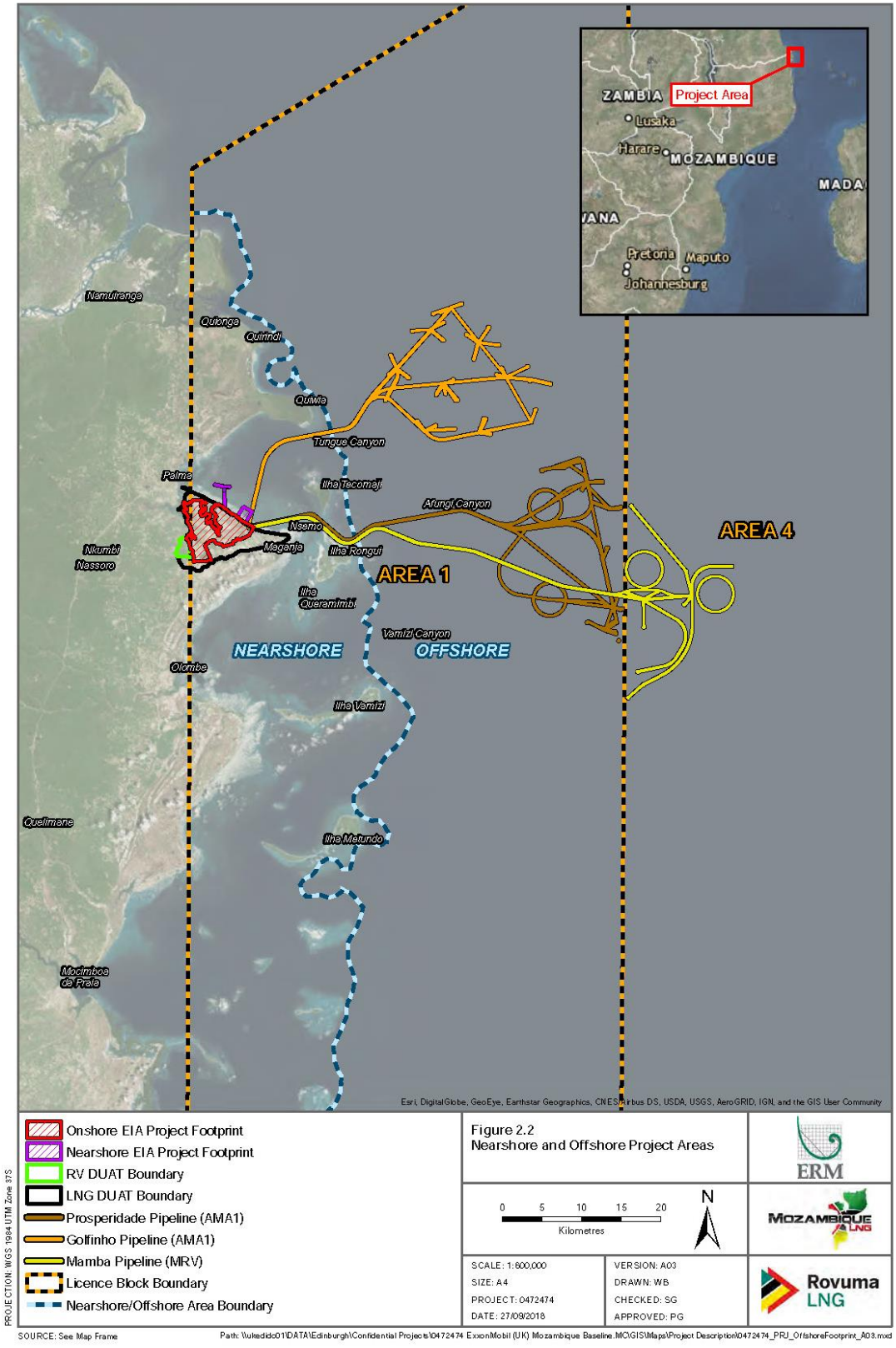


Figure 4-2 and Figure 4-3 indicate the timing of studies carried out since the EIA (2014) for terrestrial and nearshore biodiversity respectively, to given an indication of the additional data collected temporally to date.

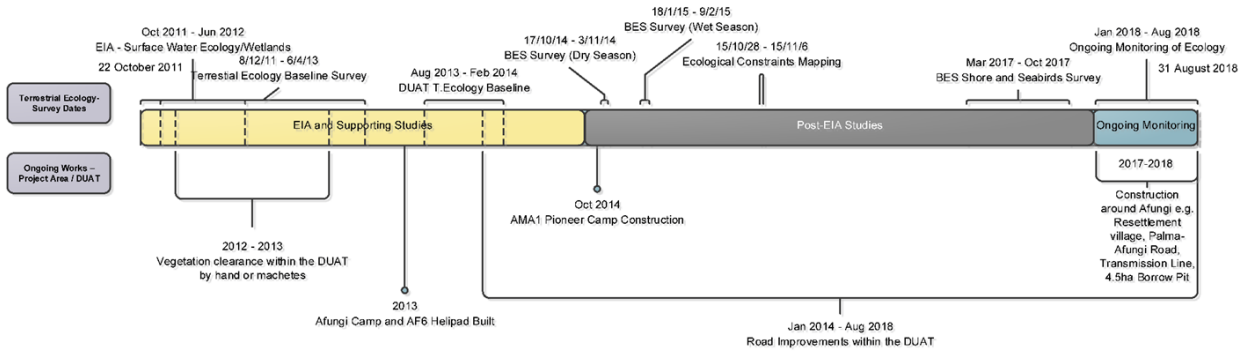
4.2. Onshore

The onshore Project area is represented by the Afungi Project Site (approximately 7,000 hectares) located on the Afungi Peninsula, on the southern shores of Tungue Bay (also known locally as Palma Bay), where the LNG facility and onshore support infrastructure will be constructed.

The Project's onshore facilities are located predominantly on a coastal plain consisting of scrubland and secondary woodland which has seen high historical modification and clearance for agriculture. Several sensitive coastal wetland habitats are fed by seasonal streams and channels that drain into Tungue Bay. These wetlands support a diverse range of species, particularly amphibians and a number of resident and migratory birds. Areas of dry forest are mainly found further west of the proposed Project facilities. Coral rag forest is found on the Cabo Delgado peninsula to the north of Tungue Bay.

The timeline for the terrestrial environmental baseline surveys conducted since the EIA (2014) and consolidated within the Integrated Environmental Baseline report is shown as an example in Figure 4-2.

Figure 4-2: Terrestrial Biodiversity Surveys and Monitoring Timeline



The onshore environmental baseline surveys conducted since the EIA (2014) and consolidated within the Integrated Environmental Baseline report are listed as follows:

- CH2M Hill (2015) Onshore Environmental Baseline in Area 4 Development Projects and their Areas of Influence, Palma District, Mozambique, and Annex 7. Document N. 497201-DOC-G-008-4, final report. June 2015.
- Enviro Insight (2016) Ecological Constraints Mapping.
- Tessellations (2018) Disturbance Analysis for the Direito de Uso e Aproveitamento de Terra/The Right to Use and Utilize (DUAT) Region Image Classification.
- RCT, DIMMS Control SPA (2014). Mozambique Program. Onshore Geotechnical and Geophysical Investigation – Section A: Drilling and Soil Testing Investigations Report.
- CH2M Hill, WE consult (2015). Soil Field Survey Report. Onshore environmental baseline in Area 4 Development Projects and their Areas of Influence, Palma District, Mozambique.
- RCT, DIMMS Control SPA (2016). Mozambique Program. Mamba Straddling Resources.
- RCT, DIMMS Control SPA (2016). Onshore Geotechnical Investigations. Onshore G&G site investigations Afungi Phase 4. Factual Report. Drilling and soil testing investigations (pipeline corridor).

- C2HM Hill (2015) EEA Onshore Baseline Area 4 Palma, Mozambique – Final Baseline Report, June 2015, Annex 5.1: Maps;
- ERM (2018) Freshwater Wetland Quality – In Situ Monitoring for May and June 2018.
- ERM (2018) Freshwater Wetland Quality – Comprehensive Laboratory Analysis Quarterly Report, August 2018.
- MMI, (2014). Compilation of Groundwater Elevation Measurements Afungi, Mozambique.
- CH2M Hill, (2015). Water Field Survey Report. Onshore Environmental Baseline in Area 4 Development Projects and their Areas of Influence, Palma District, Mozambique.
- RCT Dimms, (2016). Mamba Straddling Resources. Groundwater Investigation.
- Enviro-Insight and GCS, (2016). Mozambique LNG Project. Area 1 groundwater monitoring report, February and October 2016.
- Enviro-Insight and GCS, (2017). Mozambique LNG Project. Area 1 groundwater monitoring report, February, May, and November 2017.
- Airshed (2015) Air Quality Field Survey Report- Wet Season Onshore Environmental Baseline in Area 4 Development Projects and their Areas of Influence, Palma District, Mozambique, related to the campaign of 2014/2015.
- Airshed (2015) Air Quality Field Survey Report- Dry Season Onshore Environmental Baseline in Area 4 Development Projects and their Areas of Influence, Palma District, Mozambique related to the campaign of 2015.
- CH2M Hill / Airshed (2014). Acoustic Climate Field Survey Report, December 2014.
- ERM (2018). Replacement Village and Afungi Site Improvements Noise Baseline Report, Cabo Delgado Province, Mozambique, June 2018.
- CH2M Hill (2015) Onshore Environmental Baseline in Area 4 Development Projects and their Areas of Influence, Palma District, Mozambique, and Annex 7. Document N. 497201-DOC-G-008-4, final report prepared for EEA. June 2015.
- Enviro Insight (2016) Ecological Constraints Mapping.
- CH2M Hill (2015) Onshore Environmental Baseline in Area 4 Development Projects and their Areas of Influence, Palma District, Mozambique.
- ERM (2018) Alien and Invasive Fauna June 2018.
- ERM (2018) Large Carnivore and Megafauna Monitoring Location Screening Report July 2018.
- ERM (2018) Road Kill Monitoring Reports for March through August 2018.
- ERM (2018) Response to Wildlife Encounters Reports for March through August 2018.
- ERM (2018) Avifauna Monitoring Location Screening Report August 2018.
- ERM (2018) Palma Skink Annual Survey Report 2018.
- ERM (2018) Fish Monitoring Bi-Annual Report 2018.
- ERM (2018) Macro-invertebrate Monitoring Bi-annual Report June 2018.
- GeoTeam (2018) Nearshore Environmental Baseline Survey Field Report First Season BES (Shore and Seabirds) Field Data Report.
- Tessellations Incorporated. 2018. Disturbance Analysis for the DUAT Region Image Classification.

To summarize the above, the following key environmental baseline studies have been carried out since the completion of the EIA (2014) in 2014:

- Soil testing was carried out on the Afungi Peninsula in 2015 and 2016 to further confirm baseline conditions (physical and chemical properties). This has been followed by ongoing monitoring in connection with site clearance and preparation activities and early construction works.
- Additional baseline surveys of surface waters were conducted in late 2014 / early 2015. Ongoing monitoring in connection with early construction works (e.g., Resettlement Village, Palma-Afungi Road, transmission line, Pioneer Camp etc.) has included in situ wetland water quality monitoring.
- Groundwater surveys were conducted from late 2015 to early 2016 and there has been ongoing monitoring of groundwater quality since September 2016. The borehole monitoring locations are shown in Figure 4-3, and example results are shown in Figure 4-4.
- Additional seasonal baseline surveys of air quality were conducted in late 2014 and 2015, with results summarized in Figure 4-5.
- Monitoring of baseline and construction related noise levels commenced in late 2014 in connection with the construction of the AMA1 Pioneer Camp. More recent investigations have included noise baseline surveys at the airport and Resettlement Village in March-April 2018.
- Baseline surveys of terrestrial/freshwater ecology, biodiversity and ecosystem services were carried out within the Afungi Project Site and wider region during the 2014 dry season and 2015 wet season.
- Additional coastal and wetland bird surveys of the Afungi Project Site were undertaken during the wet and dry seasons in 2017.
- Herpetofauna (reptile and amphibian) surveys targeting the Palma skink and freshwater fish surveys in the Afungi Project Site were undertaken during the 2018 wet season. There is ongoing monitoring of wildlife encounters.
- Updated habitats and flora surveys of the DUAT plus replacement agricultural land (Nov 2019 – Jan 2019, and August 2018 respectively)

These surveys were carried out within the Afungi Project Site and wider Onshore Area of Influence (AoI) during the wet and dry seasons, conducted by either AMA1, ERB or EMML or their consultants.

Figure 4-3: Borehole Monitoring Locations in the Project Site

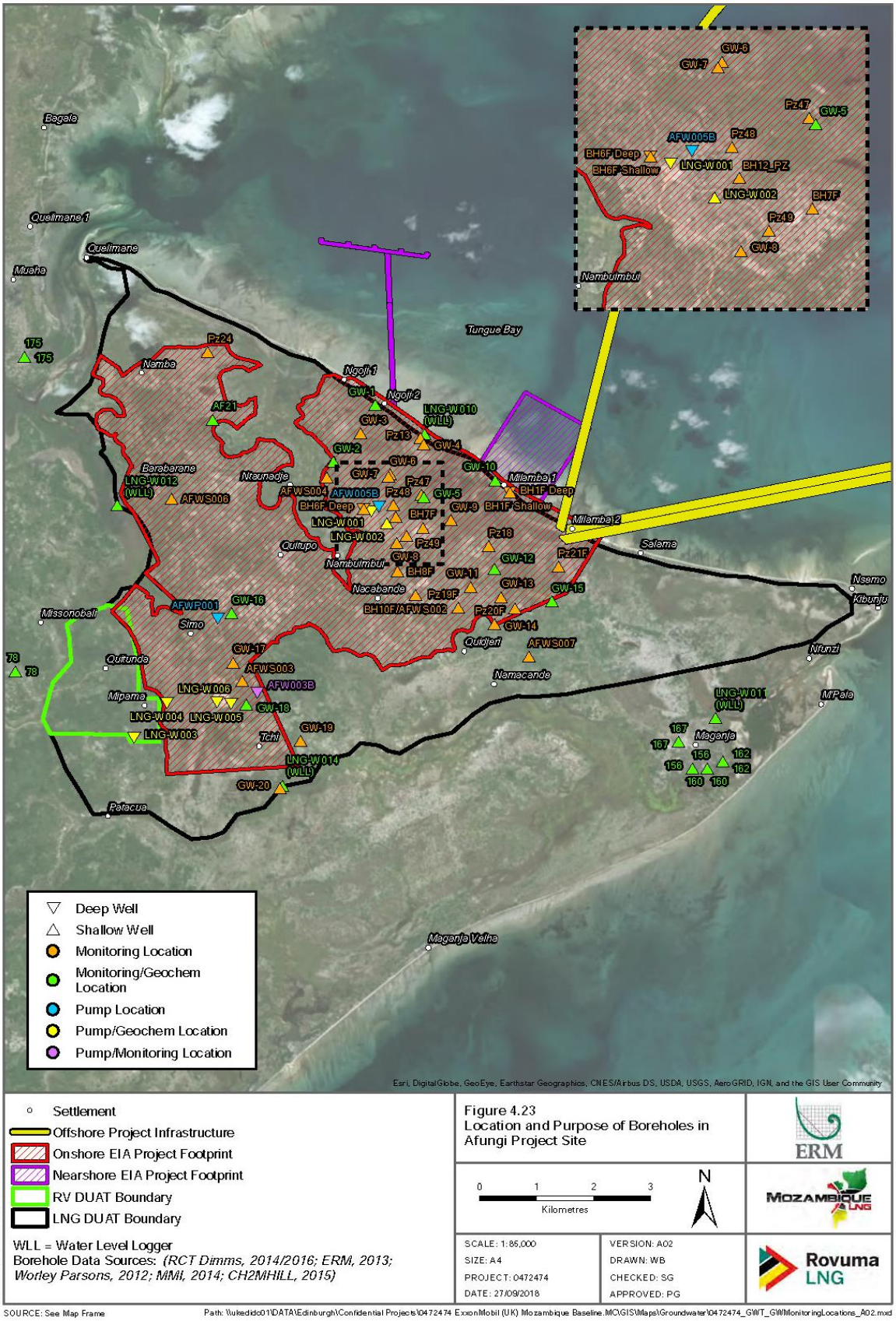


Figure 4-4: Groundwater Chemistry for the Shallower Aquifer

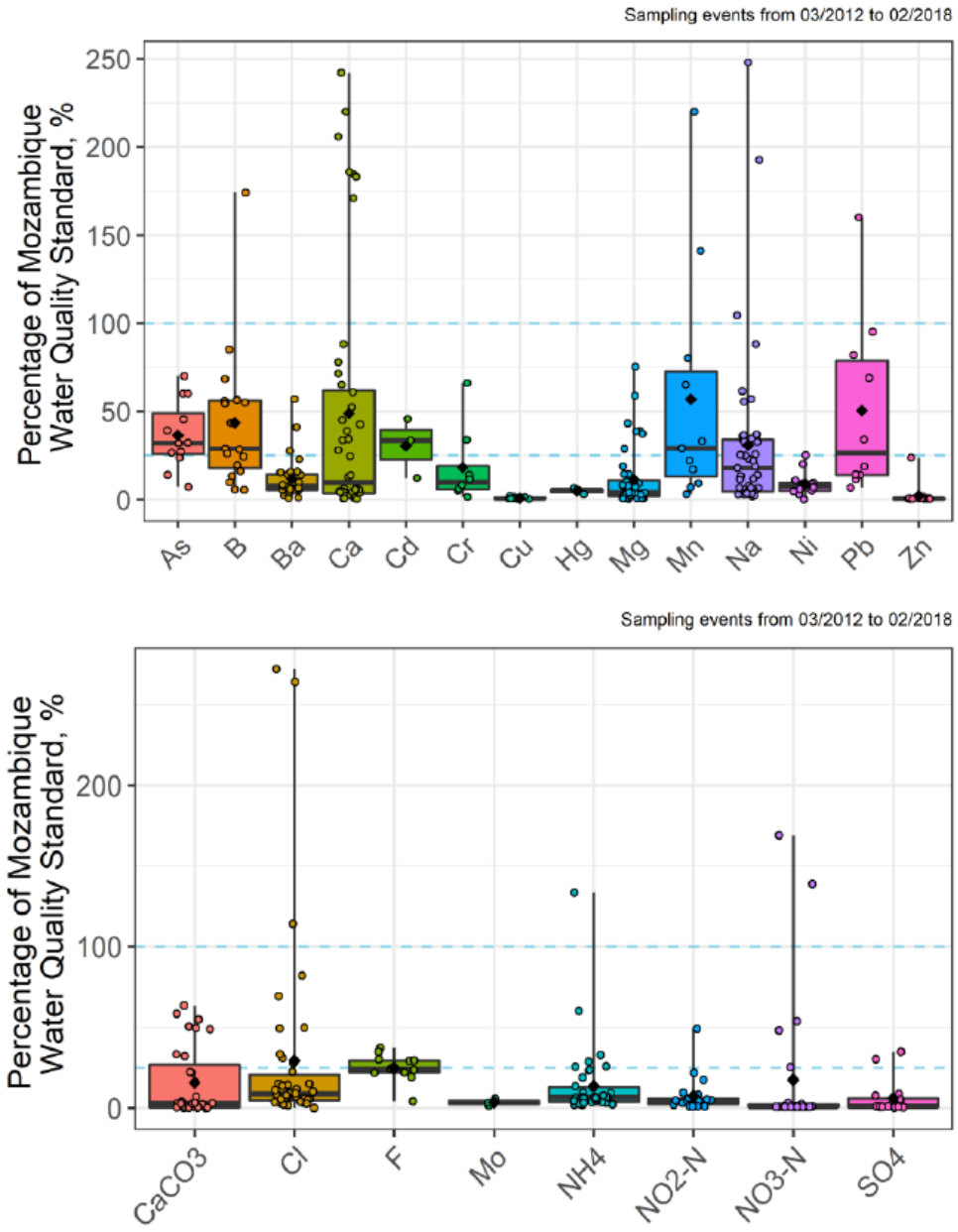
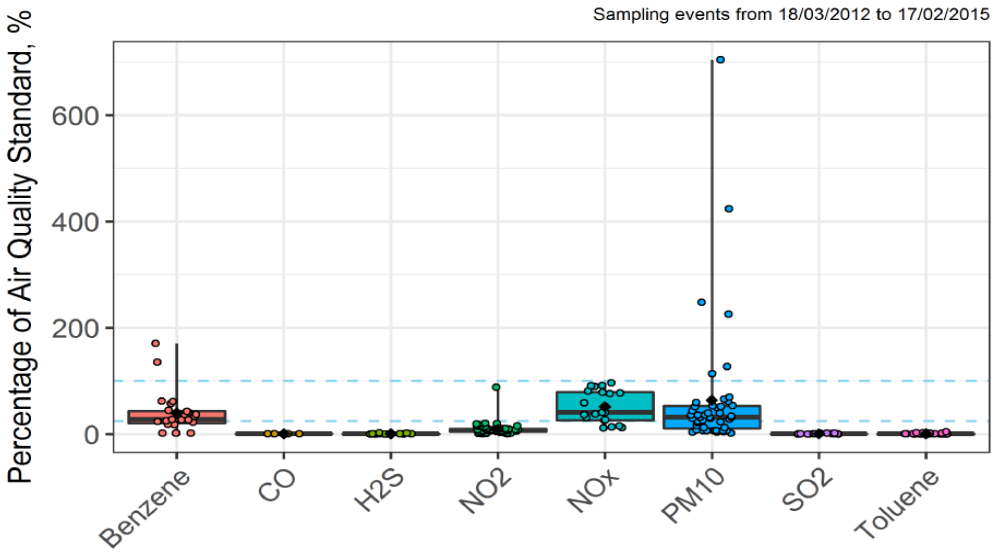


Figure 4-5: Summary of Air Quality Baseline



4.3. Nearshore

The nearshore Project area for the environmental baseline integration report is defined as Tungue Bay from the mainland shoreline highest astronomical tide to an approximate water depth of 35 m on the seaward side of the fringing islands, and is located within the East African Coral Coast Ecoregion. This region is recognized for its high and unique coral diversity. Due to its relative historic isolation and low anthropogenic impacts, the area's marine habitats are also in a comparatively better condition than those in much of the rest of the region. There are signs of increasing human pressure however, and within Tungue Bay, there is evidence of ongoing habitat degradation as a result of overfishing and increasing coastal development. The bay is characterized by intertidal habitats including mangroves and mudflats, as well as shallow-water seagrass beds and coral reefs, supporting a high diversity of marine life. Several islands provide important nesting habitats for sea turtles and separate the bay from the continental shelf, through which several incised canyons extend from the coast out to deeper waters.

MRV has invested considerable efforts post-EIA (2014) to continually improve understanding of the nearshore environment. This has included a focus on understanding and mapping features assessed as Critical Habitat (CH) qualifying features in the nearshore zone (Tungue Bay) include coral and seagrass.

Post-EIA (2014) environmental baseline surveys carried out between 2014 and 2016 focused on seabed habitat and the associated fauna and flora, as well as collecting baseline data on sediment and water quality. The work included video surveys to better understand and map the extent and quality of coral reefs, coral bommies and seagrass meadows in the vicinity of the pipeline corridor and other planned infrastructure including the marine access channel.

This was followed by extensive wet and dry season investigations during 2017, referred to as the Nearshore Environmental Baseline Survey (NEBS) programme. This included dedicated studies of:

- Seabed habitat and associated fauna and flora (including zoobenthos, aquatic vegetation, fish)
- Water and sediments (including levels of contamination)
- Marine mammals

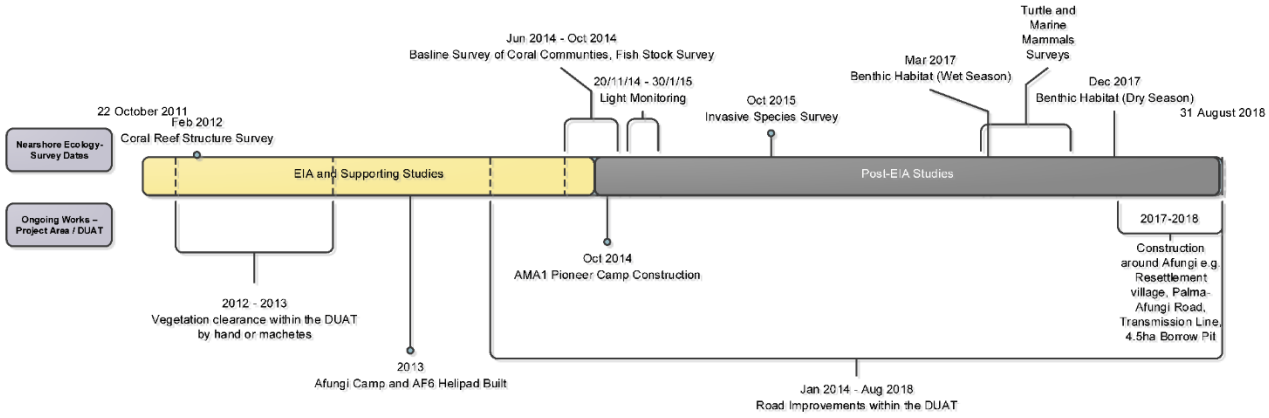
- Marine turtles
- Shore birds and seabirds
- Ecosystem services

The NEBS 2017 surveys consolidated and extended baseline information obtained during the EIA (2014) preparation and subsequent FEED and FEED Optimization stages regarding the distribution and extent of CH qualifying features (coral and seagrass). This information has been used to update habitat maps, re-calculate zones of moderate and high impact associated with dredging along the nearshore pipeline corridor and inform mitigation and offset plans.

The information obtained regarding water and sediment quality during the NEBS largely confirmed previous findings that the shallow, sheltered waters of Tungue Bay are a low energy environment, with low levels of turbidity and low concentrations of anthropogenic contaminants in water and sediments.

The NEBS investigations of marine mammals and turtles addressed an important gap in the existing baseline data set for the nearshore zone. Survey techniques included interviews with fishing communities, field surveys and underwater acoustic monitoring. The results benefit both MRV and AMA1 and the integrated baseline has been utilised to inform ongoing project design, impact assessment and the development of environmental management and monitoring plans.

Figure 4-6: Timeline of Nearshore Environmental Surveys



The nearshore environmental baseline surveys conducted since the EIA and consolidated within the Integrated Environmental Baseline report are listed as follows:

- Eni Nearshore Environmental Baseline Survey – Field Report Underwater Acoustics, May 2018.
- PRDW (2012). Marine Modelling Specialist Report. Prepared for Anadarko.
- Lwandle Technologies (PTY) LTD (2013). AMA1 &Eni LNG Development, Northern Mozambique: Marine Ecology Assessment.
- Enviro Insight (2014). *DUAT* Terrestrial Ecology Baseline.
- PRDW (2014). Post-EIA Marine Discharge Modelling.
- Enviro Insight (2015). Marine Baseline for the Resettlement Action Plan: Fish Stocks and Fish Habitat Mapping Study.
- Lwandle Technologies (2014). Island Intertidal Mixed Sand and Rocky Shore Baseline Surveys in Palma Bay, Northern Mozambique.
- Lwandle Technologies (2015). Palma Bay, Mozambique: Seasonal CTD & Water Quality Surveys 2014 & 2015.

- Lwandle Technologies (2015). Characterisation of Sediment Quality at Proposed Dredging & Dredge Spoil Disposal Sites in Palma Bay, Northern Mozambique.
- Lwandle Technologies (2015). Characterisation of Pock Mark Features in Palma Bay, Northern Mozambique: Report on Visual Inspection of Seafloor Material Samples Palma, Mozambique, July 2014.
- Lwandle Technologies (2015). The Establishment of the Relationship between Submarine Light Levels and Turbidity in Palma Bay.
- Lwandle Technologies (2015). Baseline Assessment of Crown-of-Thorns Starfish and Horn Drupe Snails at Cabo Delgado Peninsula, Tecomaji Island and Rongui Island, Palma Bay, Mozambique.
- Lwandle Technologies (2015). Quantitative Baseline Survey of Nearshore Coral Reef Structures.
- Lwandle Technologies (2015). Baseline Survey of Nearshore Coral Reef Structures.
- Lwandle Technologies (2015). Characterisation of Pock Mark Features in Palma Bay, Northern Mozambique.
- D'Appolonia & Fugro Economic and Monetary Union (EMU) (2015). Mozambique Program - Nearshore Geophysical, Geotechnical and Environmental Survey - Final Report Environmental Survey Tungue Bay - Volumes 1-3. Prepared for Eni reporting on 2014 dry season survey.
- Lwandle Technologies (2016). Mozambique Gas Development: Characteristics of the Seabed in the Marine Facilities Construction and Dredging Areas in Palma Bay.
- D'Appolonia (2017). Mozambique Program - Nearshore Geophysical, Geotechnical and Environmental Survey - Habitat Assessment Report, Tungue Bay. Prepared for Eni reporting on 2016 video survey of the coral areas.
- GeoTeam (2017). Field Report First Season (April/May 2017)/(June 2017)/(July 2017)/August (2017) BES (Marine Mammals) - Vol 3.
- GeoTeam (2017). Field Report Wet Season BES.
- GeoTeam (2018). Field Report: Sediment and Seawater Quality (Wet Season).
- GeoTeam (2018). Field Report: Sediment and Seawater Quality (Dry Season).
- GeoTeam (2018). Field Report First Season BES (Shore and Seabirds) Field Data Report.
- GeoTeam (2018). Biodiversity and Ecosystem Services- Marine Turtles Wet and Dry Season.
- GeoTeam (2018). Field Report Dry Season BES Benthic Habitats and Associated Species.

As an example of the consolidated data available, Figure 4-7 indicates the seawater profiling and quality sample locations. Figure 4-8 highlights some of the survey data gathered on habitat types in Tungue Bay post 2015. The nearshore sediment sampling undertaken involved the collection of up to 97 individual samples, during the dry season, and up to 66 individual samples during the wet season, for various analytes. A graphical summary of the sampling results are shown in Figure 4-9 and Figure 4-10 for the nearshore particle size distributions for the dry season and wet season respectively, whilst Figure 4-11 and Figure 4-12 show the sediment metals concentrations measured. Lastly, Figure 4-13 shows indicate sound detections during one campaign.

Figure 4-7: Seawater Profiling and Quality Sample Locations

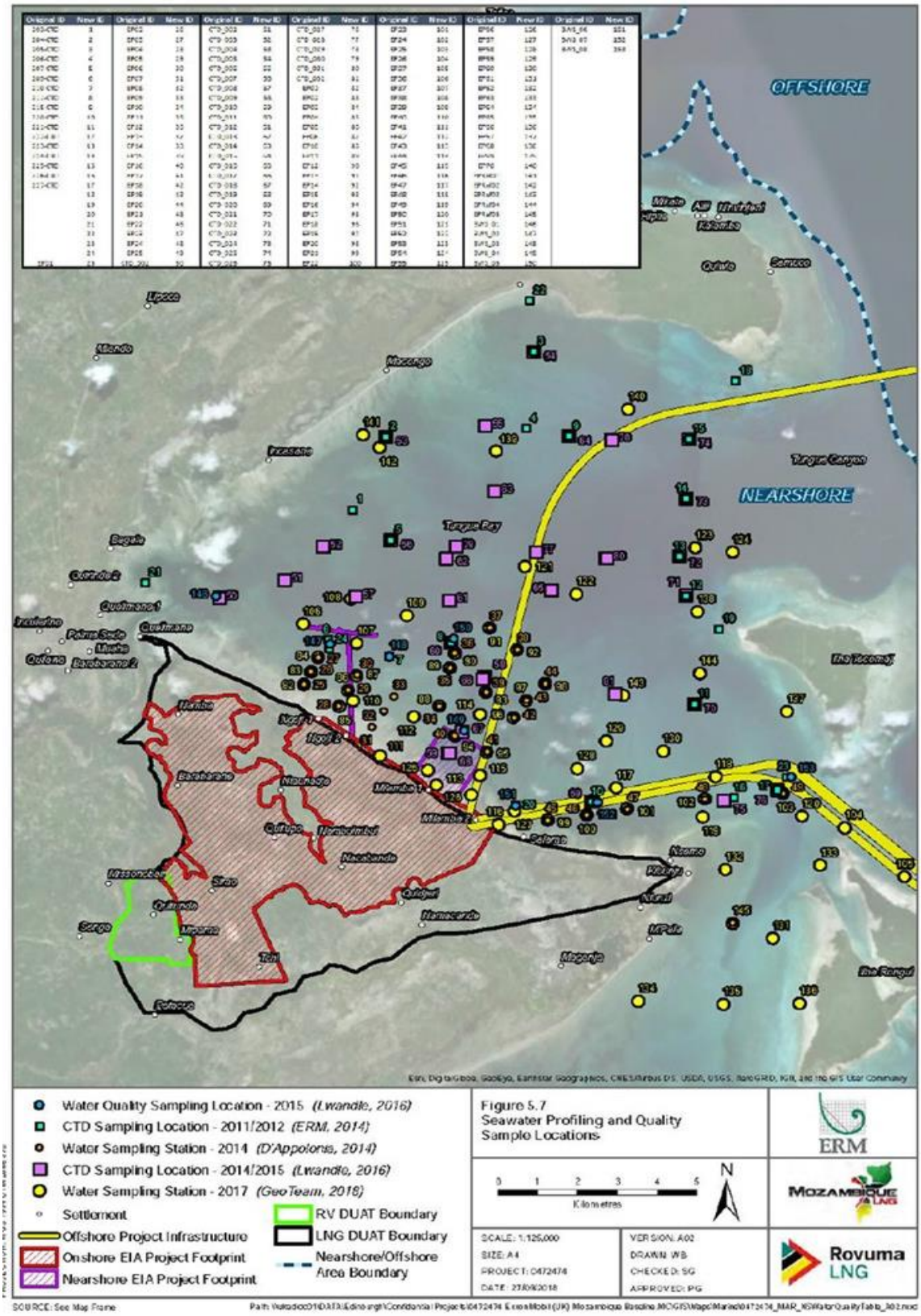


Figure 4-8: New Survey Data Gathered on Habitat Type in Tungue Bay Post 2015

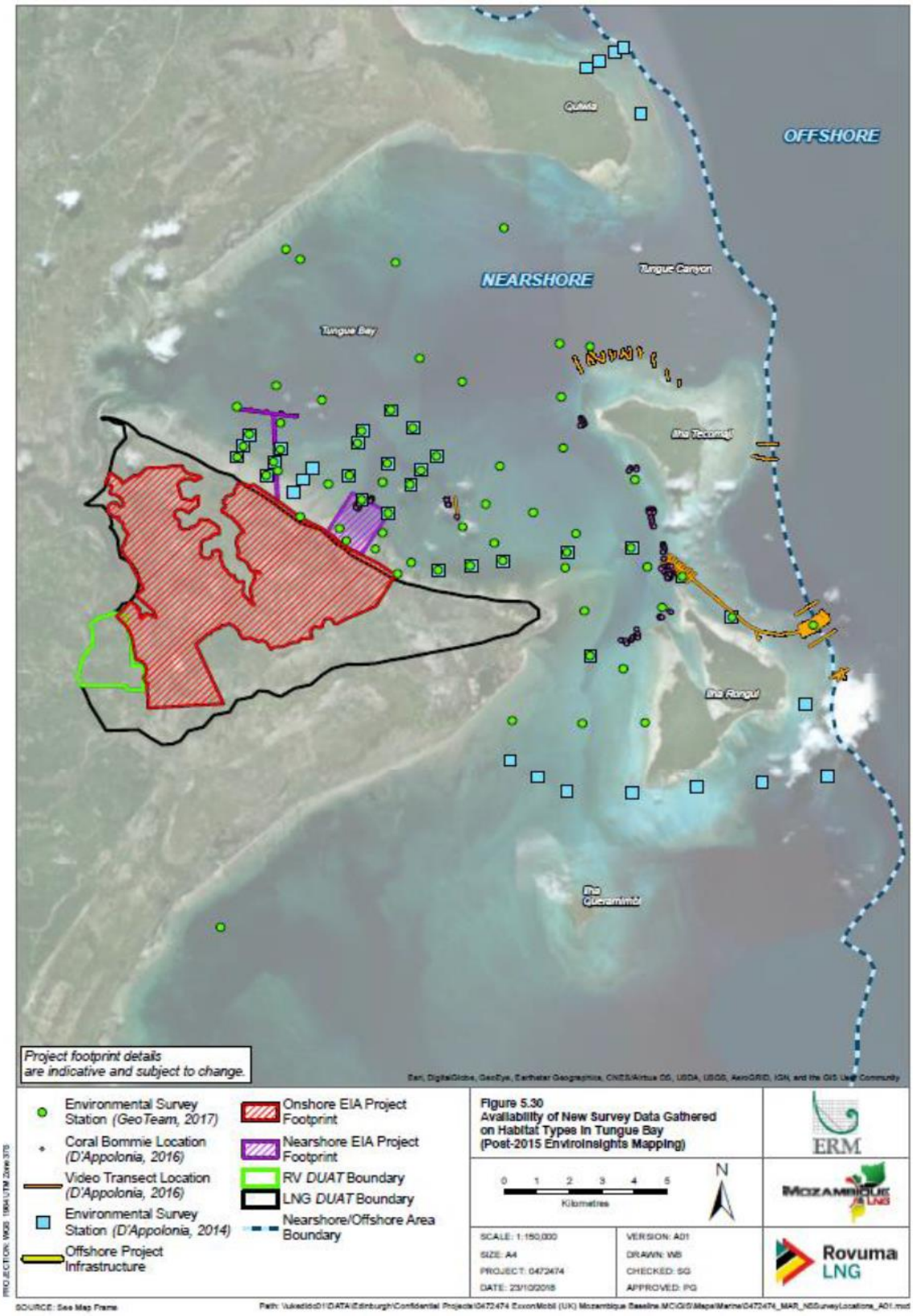


Figure 4-9: Nearshore Particle Size Distribution in the Dry Season

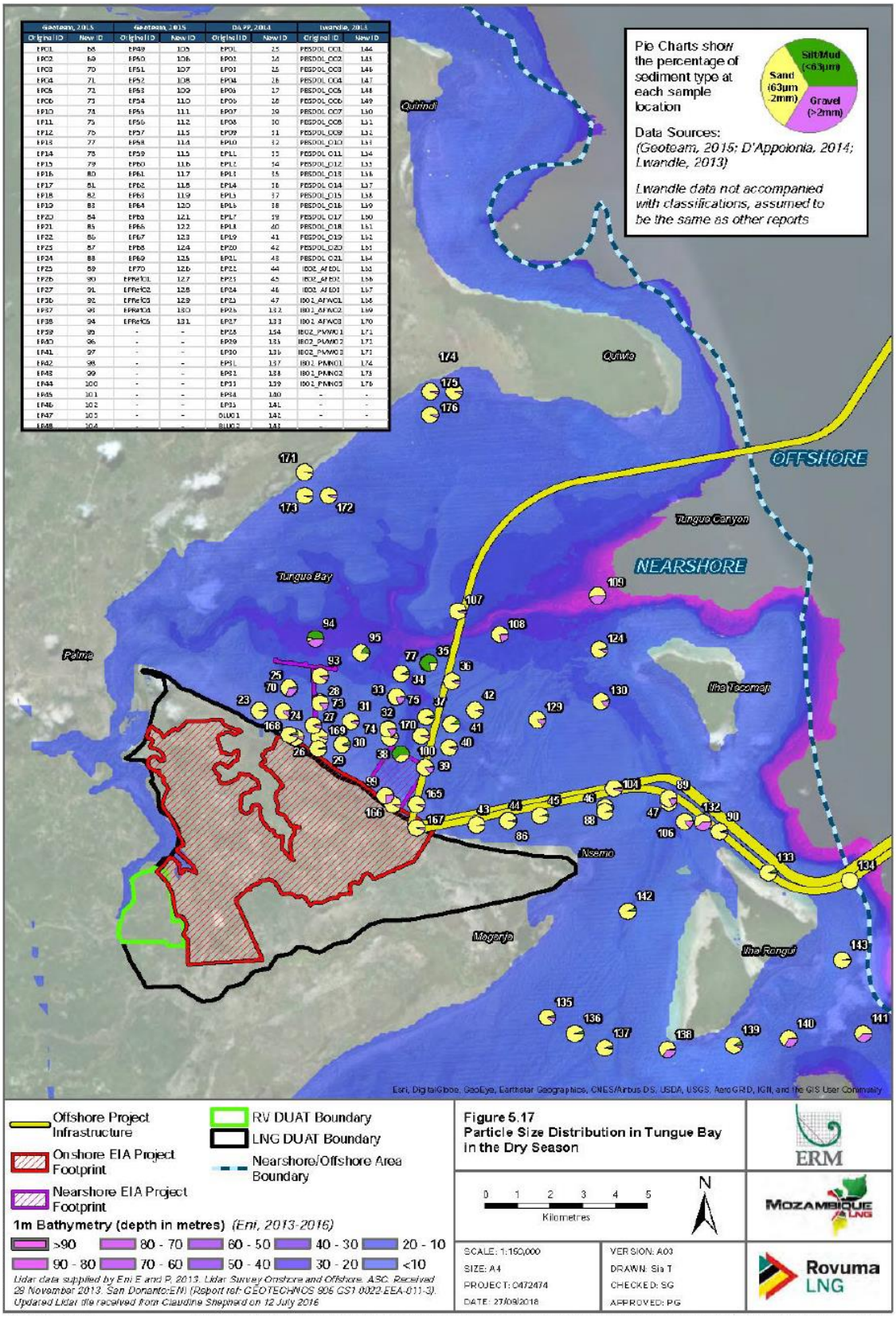


Figure 4-10: Nearshore Particle Size Distribution in the Wet Season

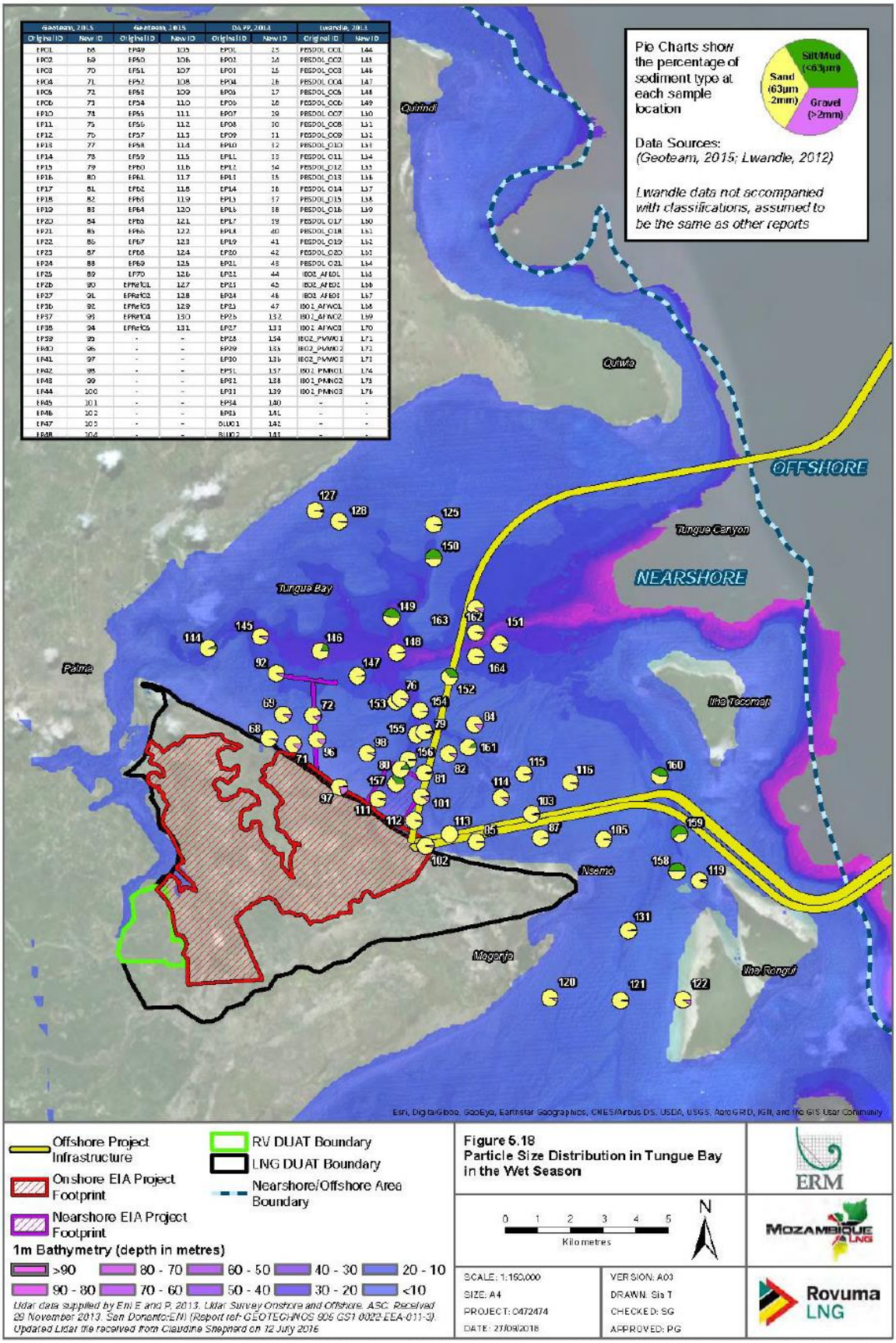


Figure 4-11: Dry Season Sediment Metal Concentrations in Tungue Bay

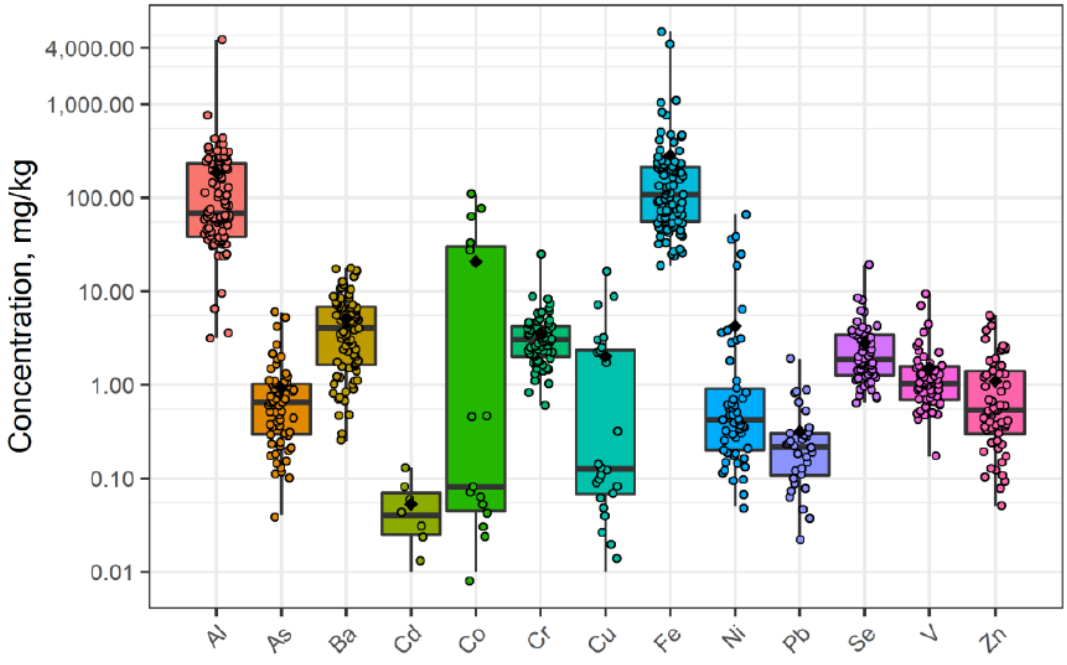


Figure 4-12: Wet Season Sediment Metal Concentrations in Tungue Bay

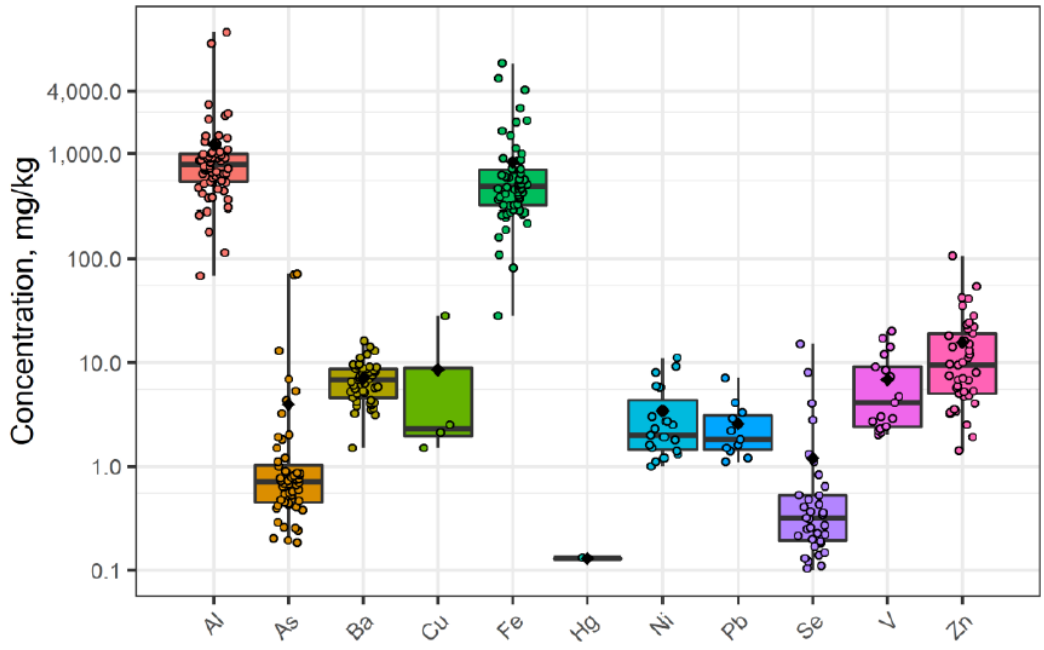
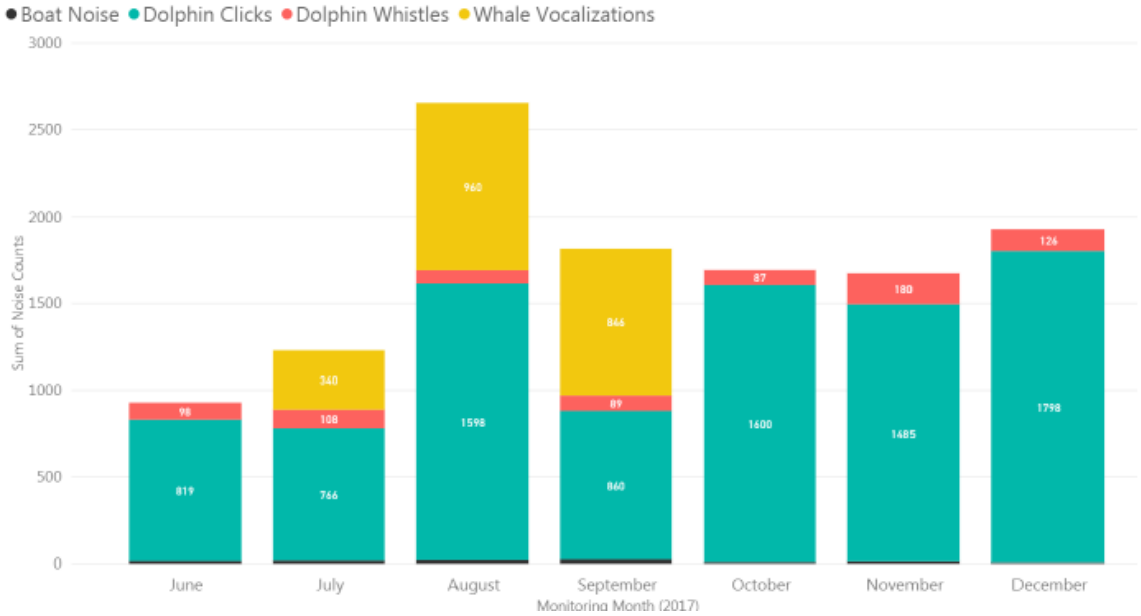


Figure 4-13: Monthly Sound Detections at a Monitoring Location in 2017



4.4. Offshore

The offshore Project area is defined as the marine area, seaward of the nearshore area, to a water depth of approximately 2,000 m which includes the two tier escarpment, and the deepwater habitat of the exploration and production concession areas.

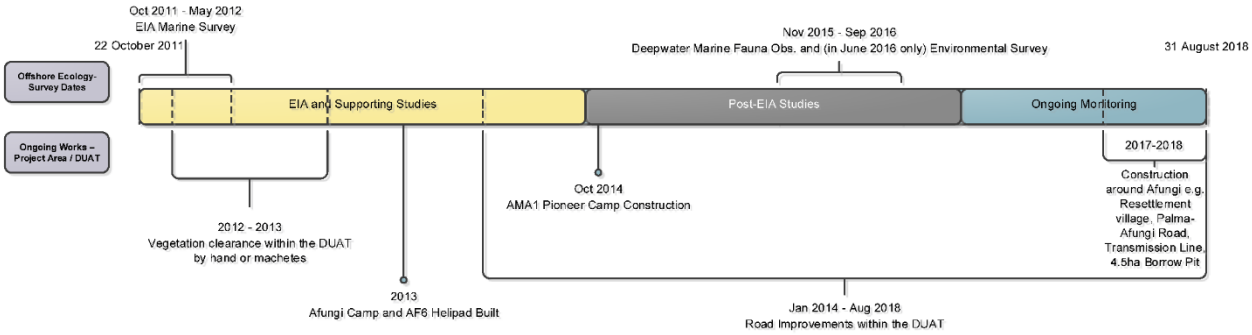
The offshore Project components consist of the Area 1 and Area 4 offshore production wells and the infrastructure necessary to develop the gas reserve. This includes the offshore subsea pipeline system, which will convey natural gas from the offshore production fields to the onshore facilities.

The Rovuma Basin, including the Area 1 and Area 4 Blocks, is characterized by a low-energy environment dominated by low-relief sand and mud substrates, interspersed by several high-relief structures.

During the post-EIA (2014) period geotechnical and environmental baseline surveys were carried out in the offshore area in 2016. This work has further characterized the environment along and near the proposed deep-water pipeline corridor and at the locations for subsea drilling infrastructure. The findings have been used inter alia to evaluate the technical feasibility and environmental sensitivity of different pipeline routes across the steep, two-tier escarpment separating Tungue Bay from deeper waters.

Benthic fauna and habitat surveys were carried out utilizing submersible cameras along subsea transects. A separate survey was undertaken utilizing a submersible ROV to investigate the topography and seabed features along the pipeline route. Marine mammal, turtle, and bird observations were made from survey vessels. Sediment and water quality samples were also collected.

Figure 4-14: Timeline of Offshore Environmental Surveys



The offshore environmental baseline surveys conducted since the EIA (2014) and consolidated within the Integrated Environmental Baseline report are listed as follows:

- Enviro Insight (2015). Marine Baseline for the Resettlement Action Plan: Fish Stocks and Fish Habitat Mapping Study. Prepared for AMA1.
- Fugro (2017). Mozambique Program - Deepwater Geotechnical and Environmental Surveys: Environmental Baseline Survey Report Mamba. Prepared for Eni reporting on 2016 survey.
- Fugro (2017). Mozambique Program - Deepwater Geotechnical and Environmental Surveys: Marine Fauna Observation (MFO) Report Coral and Mamba Fields. Prepared for Eni reporting on 2016 survey.

As an example of the integrated data, Figure 4-15 shows the offshore particle size analysis across the study area, Figure 4-16 summarizes the offshore sediment metals concentrations, Figure 4-17 summarizes the offshore sediment hydrocarbon and polyaromatic hydrocarbon concentrations, and Figure 4-18 indicates the marine mammal sightings during the study period.

Figure 4-15: Offshore Particle Size Analysis Results across the Study Area

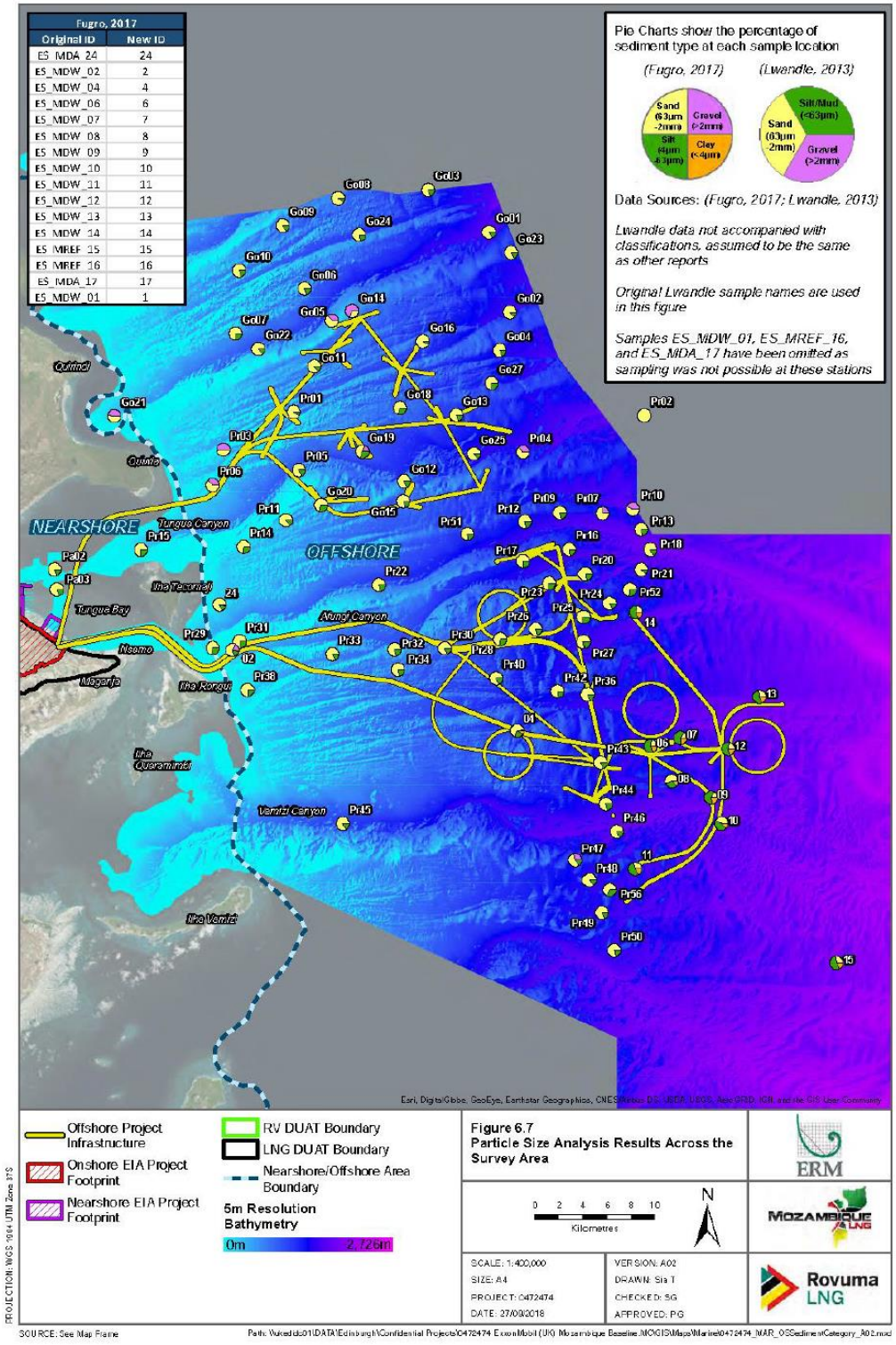


Figure 4-16: Summary of Offshore Sediment Metal Concentrations

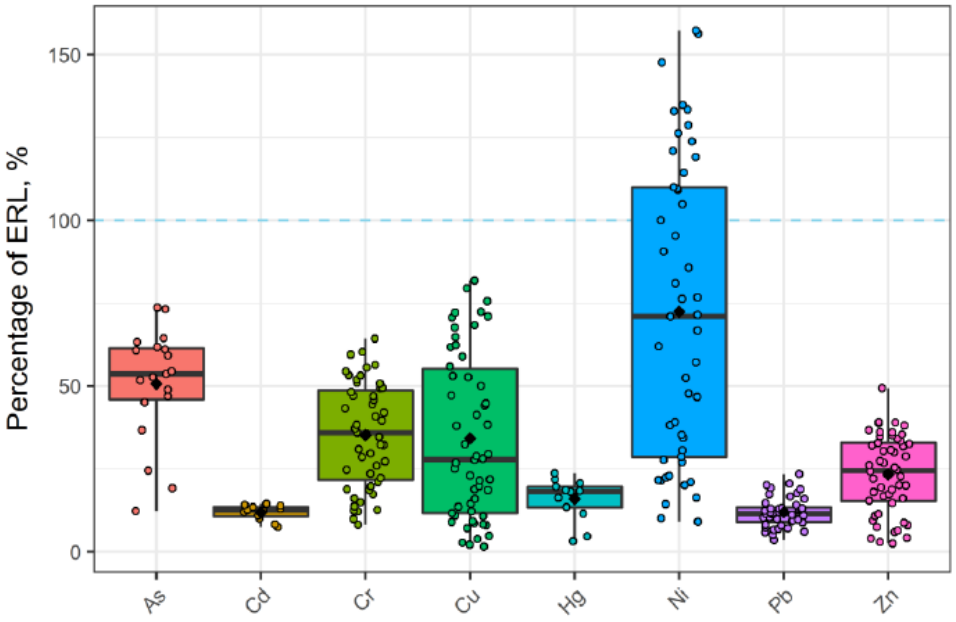


Figure 4-17: Summary of Offshore Sediment Hydrocarbon and Polyaromatic Hydrocarbon Concentrations

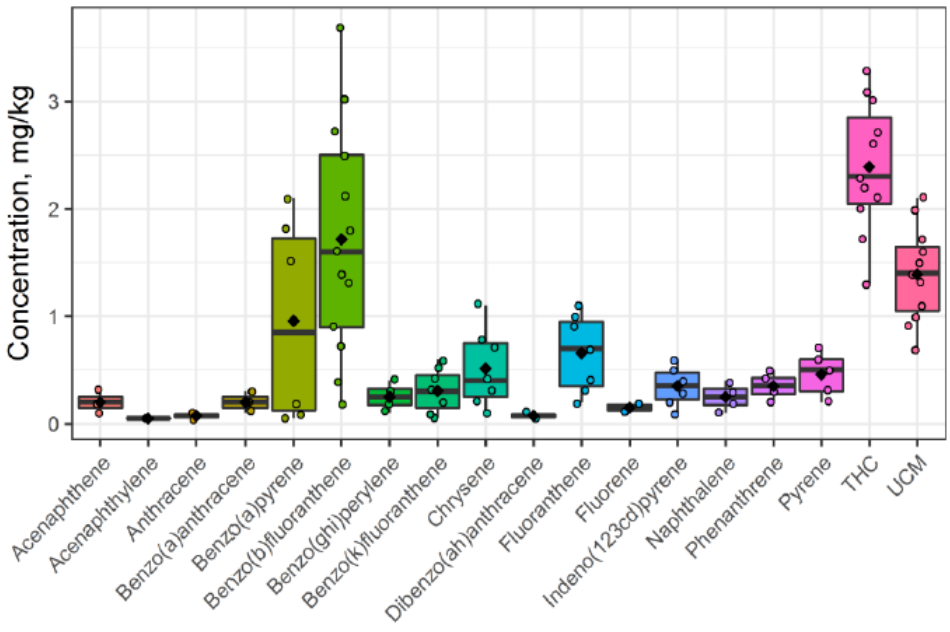
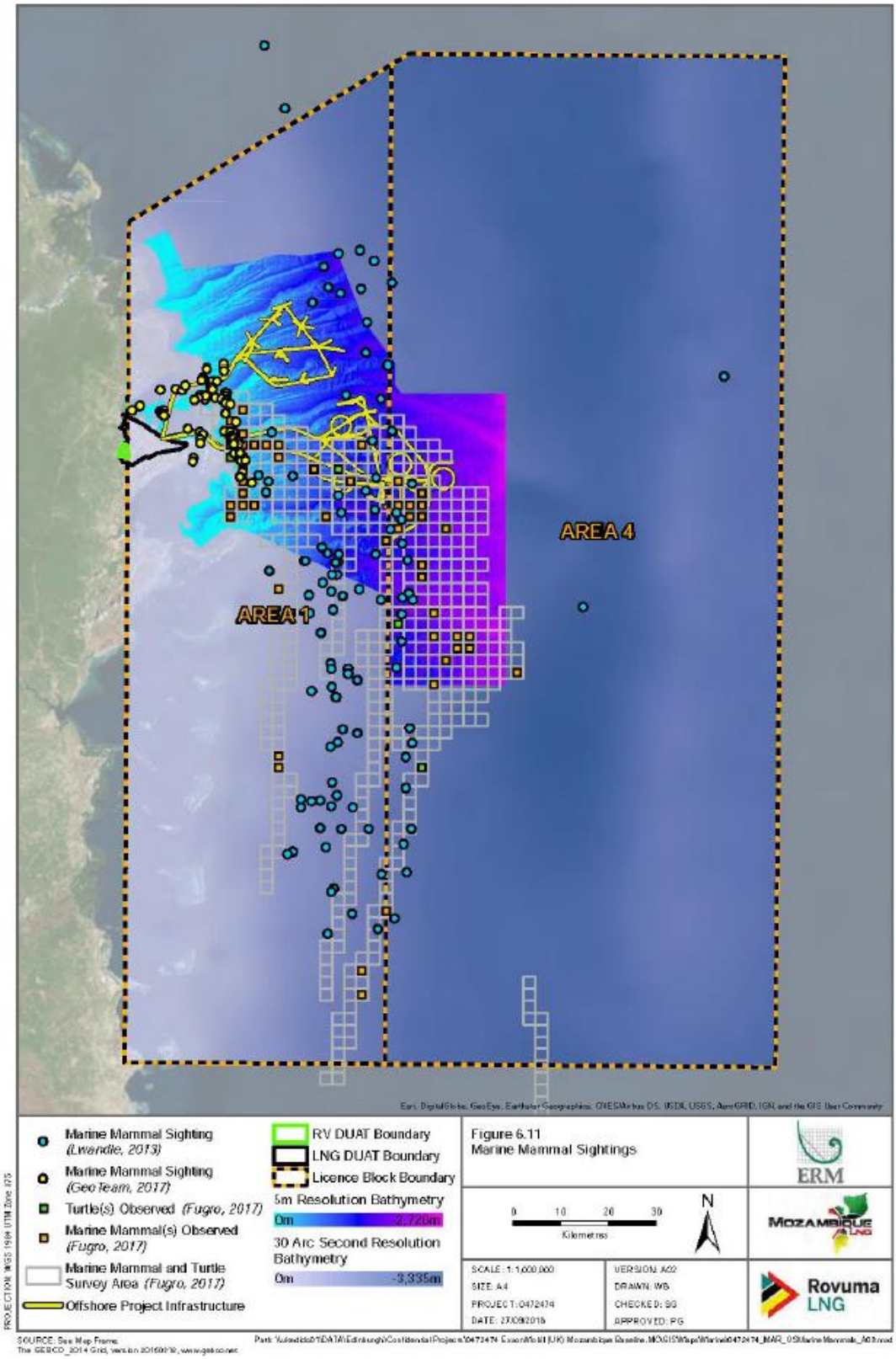


Figure 4-18: Marine Mammal Sightings



5. SOCIO-ECONOMIC BASELINE AND ADDITIONAL STUDIES

Since the completion of the 2014 EIA, several supplementary social, economic and health studies and surveys have been conducted to complement and/or update the baseline data collected for the EIA (2014). These studies and surveys include:

- Studies and surveys conducted by AMA1 in the course of the RP's implementation:
  - **Fisheries Studies** were conducted between 2013 and 2015. Starting in 2013, baseline data was collected for the development of the Fisheries Livelihoods Restoration Plan (FLRP) collating information on the fishing activities in Palma Bay as well as information on specific aspects relevant to the FLRP (such as intertidal activity on the Afungi Peninsula, the fisheries' value chain etc.).
  - A **Socio-Economic Baseline Report** was undertaken between 2014 and 2016 as part of the preparation of the Resettlement Plan. This baseline report describes the population affected by the development and operation of the Project's infrastructure and associated exclusion zones and also describes the host population.
- Joint studies conducted by or for MRV and AMA1:
  - An **Update and Regional Health Impact Assessment** was completed in 2018. The Health Impact Assessment (HIA) updates the HIA conducted in 2013 for the EIA (2014) for the near-shore and onshore components of the Project. It identifies and estimates the lasting or significant changes, due to the Project's activities, on the health status of affected communities. It also anticipates the potential direct, indirect and, where relevant, cumulative impacts on community health.
- Studies and surveys carried out by MRV:
  - A **Stakeholder & Community Needs Assessment** was carried out in 2018. The study provides a snapshot of the most important development issues, challenges and needs in Mozambique with a particular focus on Maputo and the province of Cabo Delgado as well as the Project's key priority areas: agriculture, education, environment, health and women's economic development. It also provides a review of organizations working in Mozambique with which MRV could collaborate.
  - A **Community Investment Strategy** was developed in 2018. This strategy defines a community investment approach and some areas of focus which could be applicable for the construction phase of the Project. To develop this proposed strategy, the development challenges in Mozambique are analyzed, at a national and a local level. The Project's community investment objectives in the areas of education, health, agriculture and women's empowerment are also compared with the factors currently limiting the attainment of these objectives. Finally, the strategy identifies potential community investment projects.
  - A **Conflict Analysis** was undertaken in 2018. The analysis focuses on understanding the historic and current conflict trends in Mozambique. It describes the national and provincial political and economic risks to the Project and also surveys the international dynamics of the East African regional coastline. Given the recent overt conflicts in the province of Cabo Delgado, the analysis also aims to better understand its origins, scale, and impacts.

The Socio-Economic baseline report conducted between 2014 and 2016 for the preparation of the 2016 Resettlement Plan included a number of field surveys (namely a census, an asset survey, a communal asset survey, a socio-economic survey and a community boundary mapping exercise) which were completed by focus group meetings aimed at understanding the issues affecting specific social groups. Specialist livelihood studies were also conducted in the areas of agriculture and fisheries.

The Resettlement Plan's Socio-Economic baseline report relied heavily on the collection of primary data, while the social, economic and health studies and surveys conducted since then have predominantly relied on open source research, including international donor strategies and programs; reports, assessment, surveys and statistics from the Government of Mozambique and international donor community; strategies, reports and news updates published by Mozambican NGOs and civil society; Mozambican legislative documents; official government and organization websites and news articles. Studies have also relied upon the knowledge of the Community Development Team.

In certain cases, limited participatory data collection in the form of key informant interviews with provincial and district officials have been conducted. This was the case for the Regional Health Impact Assessment.

6. RESETTLEMENT

A Resettlement Plan (RP) developed on behalf of Area 1 and Area 4 was approved by the GoM in 2017. The RP describes the policies, principles, procedures, roles, and responsibilities for managing physical displacement impacts (loss of dwellings) and economic displacement impacts (full or partial loss of income sources or other means of livelihood) caused by the construction and operation of the LNG facility and the export terminal.

The resettlement goal is to undertake resettlement in a manner that gives physically and economically displaced households the opportunity to improve or at least restore their livelihoods and standards of living. The Project worked closely with affected communities and GoM whilst developing the RP. Civil society organizations also played an active role in the development of the RP. Consultation and engagement with affected and host communities, all levels of Government and civil society will continue throughout the resettlement implementation period. Area 1 is leading all activities associated with the RP.

6.1. Updates to the Resettlement Action Plan Since 2014

The allocation by the Government of Mozambique of a DUAT (*Direito de Uso e Aproveitamento da Terra* or Right to Use and Benefit from Land) to develop the Afungi LNG Park will result in physical and economic displacement. To manage the resettlement of affected households, the 2014 EIA included (in Annex I) an Initial Resettlement Plan (IRP) which outlined the goals, principles, approach, organization and procedures that would be used to manage all physical and economic displacement.

This section summarizes the additional work that has been carried out since the preparation of the IRP. Since then, the resettlement process has consisted of two phases:

- A planning phase from 2014 to 2016 during which data was collected, communities were engaged and replacement sites were selected and studied. The final output of this phase was the preparation of a Resettlement Plan
- An implementation phase since 2016, which commenced after the Resettlement Plan's approval and includes the signing of household agreements, the construction of a Replacement Village (RV), the completion of physical relocation, and the commencement of livelihood restoration programs

The key activities and studies carried out during these two phases are presented below.

6.2. The Resettlement Planning Phase (2014–2016)

Developed in 2014, the Initial Resettlement Plan provided the framework for the future development of a Resettlement Plan (RP). The preparation of this RP expanded the framework established by the IRP and incorporated specific information about the affected people.

Key activities and studies carried out during the Project's resettlement planning included the following:

- Ongoing village meetings to inform about the resettlement process and activities and to give communities opportunities to participate in the resettlement planning.
- The establishment and training of Community Resettlement Committees (CRCs), composed of representatives of the affected communities, the District Government and the Project, whose role is to assist and advise the resettlement team throughout the entire resettlement process.
- A census to identify and record all people, households and enterprises that will have to be resettled – the census established that 556 households will be physically displaced as they currently reside within the DUAT, that a further 952 households will be economically displaced as a result of losing fixed assets within the DUAT and that 467 vessel owner households will be economically displaced through the imposition of the Marine Exclusion Zone during construction and the Security Zone during operations.

- A socio-economic survey to learn about affected households' characteristics, living standards, livelihoods, income and expenditure patterns and preferences for resettlement.
- Some asset surveys to count, measure and record all dwellings, *machambas*, fruit trees, crops, land improvements, village structures and other assets.
- A community boundary and communal resource mapping to define village boundaries, record tangible and intangible communal property and map resources utilized by each affected community.
- Some agricultural and fisheries studies and baselines.
- The identification and assessment of potential resettlement areas(s), informed by studies to make sure that the areas are suitable for planting crops, for access to fishing and to forests, that there is enough water, and to make sure people who will be displaced are able to reinstate and restore their living and means of livelihood—following feedback received from affected communities, a resettlement site was selected in the southwest of the DUAT.
- The provision of technical support to the District Government to identify and assess potential replacement agricultural land areas.
- The development of a compensation entitlement framework in cooperation with the affected communities and all levels of the government which summarizes who is eligible for compensation, what they are entitled to receive and the basis for the valuation of losses.
- The development of livelihood restoration frameworks and plans focusing on three areas: 1) agriculture and foraging, 2) fisheries, and 3) non-land-based livelihoods and capacity building that will assist people to restore their livelihoods, during and after they have been resettled.

Once developed, the RP was publicly disclosed for review and comments in November 2015, was revised in May 2016 and was approved by the GoM in December of that year. The submission and approval of the RP marked the end of the planning phase.

6.3. The Resettlement Implementation Phase (since 2016)

The resettlement implementation phase started with the approval of the Resettlement Plan and is scheduled to occur over a period of 60 months.

Since the approval of the RP, and as of early 2019, the key activities in the implementation of the resettlement have included:

- The signature of two Memoranda of Understanding in 2017 with the GoM:
  - On the replacement agricultural land, which establishes that the responsibility of identifying these areas lies with the District Government and that the Project will continue providing technical assistance in terms of site investigation and analysis
  - On the Replacement Village Hand-Over, which establishes the terms and conditions that will govern the hand-over process of the RV and the transfer of associated management responsibilities by the Project's Proponents to the Government
- The issuance of the cut-off date by the Governor of Cabo Delgado in 2017, which establishes the moratorium for eligibility on compensation and assistance.
- The signature of a Resettlement Joint Operating Agreement (RJOA) in July 2018 between MRV (as Area 4 Operator) and AMA1 (as Area 1 Operator). As per this RJOA, AMA1 is the Resettlement Operator and has exclusive charge of the resettlement operations.
- The completion of "Land Access Phase 0" in January 2018, which was the first resettlement implementation phase and required that the area where the Replacement Village and its associated infrastructure will be constructed is cleared of residents and other assets.

- The signature of Community Cooperation Agreements, in January 2018, which establish the cooperation between all five Afungi communities and the Project.
- The signing of Household Agreements that state exactly what affected families or individuals will lose and receive.
- The start of construction of the Replacement Village in the first quarter of 2018.

6.4. Updates to the Livelihood Restoration Plans Since 2014

This section provides a summary of the key livelihood restoration activities undertaken by AMA 1 as the Operator for resettlement, since the Initial Resettlement Plan (IRP) prepared for the 2014 EIA (Annex I). The IRP provided a framework for a detailed Livelihood Restoration Plan (LRP) which was to be developed and presented as part of the Resettlement Plan. Since the development of the IRP in 2014, the livelihood restoration process has consisted of two phases:

- A planning and development phase of specific and detailed Livelihood Restoration Plans as part of the preparation of the Resettlement Plan, from 2014 to 2016
- An implementation phase since 2016

6.5. Planning and Development of Detailed Livelihood Restoration Plans (2014–2016)

An important component of the preparation of the Resettlement Plan was the development of detailed Livelihood Restoration Plans. The overall goal of these plans is to provide Project-affected peoples with the opportunity to improve, or at least restore, their livelihoods and income levels. Specialist studies and a range of activities were undertaken to collect and analyse data in order to assist the Project in determining effective and sustainable interventions that would mitigate the Project's impacts and improve livelihoods. These studies and activities informed the development of livelihood restoration programs and included:

- Agricultural studies (e.g., on harvest, on foraging, on soil survey etc.) were carried out to assess the existing agricultural livelihood practices. The studies spanned a two-year period incorporating three production seasons; this allowed data collection for both the wet and dry seasons. In addition to the current practices, the possibilities of introducing new crops and technologies were also investigated. The basis of the investigation included the establishment of various demonstration plots to trial a range of alternative crops. These activities aimed to broaden awareness of, test responsiveness to, and gauge appropriateness, acceptability as well as applicability of potential new agricultural livelihood innovations for local communities.
- Fisheries studies were carried out to obtain baseline information about marine and intertidal fisheries, related trading activities, fish catches, the fisheries value chain, the role of women etc. Vessel owners were also surveyed and registered as were all fishermen and collectors.

Throughout the development of the LRPs, consultation has been undertaken with affected and interested stakeholders in order to collect data from those stakeholders but also to test assumptions and findings with interested stakeholders. Consultation also ensured that affected stakeholders provided input into the findings of the studies undertaken and into the acceptability of the proposed livelihood restoration measures.

The results of the studies and of the consultation with affected stakeholders were used to identify three areas of intervention:

1) **Agriculture and foraging**: An Agriculture Livelihood Restoration Plan (ALRP) was developed which will provide opportunities for displaced households to achieve sustainable levels of food security within 18 months of being physically relocated. The ALRP defines five sector-specific programs: improved agricultural production; crop storage; fruit and vegetable drying; vegetable gardens; and resource facility.

2) **Fisheries**: A Fisheries Livelihood Restoration Plan (FLRP) was prepared. This plan focuses on providing the persons who derive benefits from fishing and marine resources and who are economically displaced the opportunity to improve or restore their livelihoods and income levels. The FLRP defines four program types; material assistance, livelihood programs, transitional support and short-term compensation.

3) **Non-land-based livelihoods and capacity building**: The Project developed programs which seek to diversify households' livelihoods and improve their resilience and capacity to absorb or respond to the changing nature of the local and regional economy. Measures developed include access to vocational and skills training; employment; financial management training; small business training; and replacement house maintenance training.

Households that are physically displaced will have the opportunity to participate in all three livelihood restoration programs. Economically displaced households will have access to some or all of the programs dependent on the type and magnitude of livelihood impact they experience. Households will be consulted on the type of programs that they would like to participate in prior to experiencing displacement impacts. Throughout the program implementation, displaced households will also be consulted on the effectiveness of the programs.

6.6. Implementation Phase (since 2016)

The implementation of the Agricultural Livelihood Restoration Plans is comprised of four work streams:

1) **Securing the replacement agricultural land**: Two replacement agricultural land areas were identified and demarcated during the preparation of the Resettlement Plan: one area of approx. 1,600 ha in the community of Mondlane and one area of approx. 320 ha in the community of Senga. These two areas have been ceded by the communities and are the subject of the Replacement Agricultural Land Memorandum of Understanding signed with the Government of Mozambique in 2017. A third area, of approx. 1,900 ha, also in the community of Senga between Macala and Mangala, was also identified at the end of 2017, demarcated in May 2018 and the ceding process was initiated in November 2018.

2) **Replacement agricultural area master planning and land clearing**: This phase include reconnaissance and detailed soil surveys, asset inventories and land clearing to prepare the allocated plots. The reconnaissance and detailed soil surveys as well as asset inventories were completed for the replacement land areas located in Mondlane and in Senga in 2018. Land clearing also started in the Mondlane area at the end of 2018 and is expected to be completed in Q1 2019. Reconnaissance soil surveys and asset inventories were conducted in 2018 for the replacement agricultural land area between Macala and Mangala and the detailed soil surveys are expected to take place in Q1 2019.

3) **Allocation to displaced households**: Once households have been allocated a plot of land, they will receive tree saplings and will be offered a training program to learn how to prepare their plot and how to plant and manage their saplings.

4) **Implementation of the livelihood restoration projects**. The implementation of the Fisheries Livelihood Restoration Plan has, as of early 2019, essentially consisted of the selection and mobilisation of Implementation Partners. An update of the fishermen's register and of the fisheries baseline data was also conducted in 2018.

In 2017 and 2018, the Project's Implementation Partners also conducted several financial management training workshops with households in Quitupo and Senga as well as some banking literacy training. The Project also started opening bank accounts for the displaced households. Finally, Project-affected communities were given the opportunity to apply for employment with the Project and its contractors; as of November 2018, 35% of the Project's workforce are from the resettled villages.

7. ALTERNATIVES ASSESSED

7.1. Upstream

A major part of the ongoing environmental impact assessment process has related to alternatives analysis. A summary of the HSE alternatives evaluation has been produced in January 2019. The principle analysis has focused on:

- Pipeline corridor route selection
- Pipeline installation (including dredging) methodologies
- Dredge material management
- Drilling waste management

Different scenarios have been assessed for each of these activities and comparative risk rankings produced for each scenario.

There has also been ongoing evaluation of alternatives for habitat restoration and other mitigation/offset options relating to dredging impacts on coral and seagrass, building on the BES studies referred to above.

7.1.1. Pipeline Corridor Route Selection

In respect of the pipeline corridor route the results of post-EIA (2014) baseline surveys were reviewed as part of a wider process that considered not only environmental sensitivity, but also geomorphology complexity, geo-hazards such as fault lines, length of pipeline route, occupational health and safety, and interface issues for the MRV and AMA1 Projects.

There was a detailed investigation of pipeline route options across the two-tier escarpment which separates Tungue Bay from deeper water, considering constructability and environmental sensitivity (principally coral). This led to selection of a more stable crossing point than the location proposed in the EIA (2014). Other changes to the pipeline corridor route included a realignment between Tecomaji and Rongui Islands to follow the northwest coast of Rongui, thereby significantly reducing the impacts of dredging on fringing coral reef in line with recommendations in the EIA (2014).

7.1.2. Pipeline Installation Methodologies

The Upstream has assessed various alternatives for pipeline installation through the FEED (Front End Engineering Design), FEED Optimisation and EPCI (Engineering, Procurement, Construction and Installation) phases supported by a Quantitative Risk Assessment (QRA) for pipelines. A key driver in the evaluation of options has been to reduce the environmental impacts of the installation footprint and the volume of dredge material.

During EPCI, Company stipulated that "Contractor shall develop installation methodology to meet the EIA (2014) requirement and not exceed 2.2 million m^3 of total dredged material volume (including nearshore dredging and any other necessary soil removal planned for all nearshore and escarpment area). Contractor shall also demonstrate that installation methodology and dredging material management and disposal is fully in compliance with regulatory and EIA (2014) limits and requirements as well as industry best practices". Dredging planning work will continue during detailed design, once an EPCI Contractor is selected.

7.1.3. Drilling Waste Management

The subsurface development of the Mamba reservoirs envisages the drilling of deviated wells from subsea clusters, with drilling and completion of the development wells based on a two rig scenario. The wells will be drilled with the following drilling fluids:

- Sea water and pad mud for the open hole top sections (36-in. and 24-in.)
- Low toxicity oil based mud (LTOBM) for the intermediate sections once the blowout preventer (BOP) has been installed and tested
- Either water based mud (WBM) or LTOBM non-damaging fluid will be used for the reservoir.

The following assumptions are currently made in respect of drilling waste management:

- The well cuttings from sections that have been drilled with water based mud can be directly discharged to the seabed.
- In line with ERB/Eni policy non-aqueous drilling fluid (NADF) cuttings can only be discharged to the seabed if they contain less than 10g/kg of residual oil content.
- All NADF cuttings with oil concentration greater than 1% will either be treated through an on-board treatment unit to lower the oil content below 1%, with the cleaned cuttings discharged to sea, or transported to shore for treatment and final disposal as per Mozambique regulatory requirements.

7.2. Midstream

Building upon the alternatives assessment process contained in the EIA (2014) and reflected within revised project footprint, the assessment of alternatives is ongoing. During FEED Optimisation, a number of significant project design decisions have been made, for taking into the EPC phase. A summary of key elements of this are captured below. Additionally the Midstream Project environmental and social requirements includes 3 stages of assessment for a range of topics, the first of which includes an analysis of alternatives for those key EPC phase design and execution decisions which have significant E&S impacts.

7.2.1. Liquefaction Process and Selection of Refrigeration Compression Turbines

The overall plant design and performance is dependent to a high level on the combination of the liquefaction process selected, and the refrigeration compression turbines selected, which together have a significant impact on the overall facility's emissions and efficiency.

The three main liquefaction processes considered for the Rovuma LNG plant are the optimised cascade process, the C3MR process, and the newer AP-X process. The optimised cascade process utilizes progressively colder independent refrigeration sections to liquefy natural gas, whilst the C3MR process uses propane (C_3) and mixed refrigerant (MR) in a main cryogenic heat exchanger. The AP-X process is an optimised version of the C3MR process, and includes a sub-cooling loop in series. The AP-X process has a higher efficiency than the optimised cascade or C3MR process, and is capable of higher production rates, leading to it being chosen as the liquefaction process for Rovuma.

Based on the liquefaction process selected, and the production throughput per train, the refrigeration compression turbines were investigated. Options considered included:

- Single stage industrial turbines;
- 2-Stage industrial turbines; and
- Aero-derivative turbines.

Single stage turbines, whilst proven technology, have lower efficiency and significantly higher emissions than the alternatives considered, particularly due to the large starter motors required. 2-stage industrial turbines and aero-derivative turbines have similar emissions (aero-derivatives have a very slight efficiency advantage, however 2-stage industrial turbines offer lower nitrogen oxides (NO_X) emission rates. Significantly, 2-stage turbines are available at larger sizes, which are capable of meeting the energy demand of the liquefaction process, whereas the aero-derivative turbines are not currently able to meet the refrigeration compression demand required to take advantage of the increased efficiency of the AP-X process. As a result, 2-stage industrial turbines were selected for the Project.

7.2.2. Waste Management Facility

One of the options assessed for the Project includes the decision of whether to utilise an existing waste management facility (WMF) to manage Project wastes, or whether to build a dedicated WMF within the DUAT (either independently, or jointly with Area 1). A review of the existing waste management facilities in the region indicated that there are no suitable facilities in close proximity to the site, where waste will be generated, and as such waste would need to be transported significant distances. An onsite WMF would reduce transportation issues and allow wastes to be managed close to point of source. Further, it was evaluated that a joint WMF with Area 1 would allow for synergies, given the similar waste types to be managed, which would reduce the duplication of infrastructure and equipment, and allow wastes to be managed in a single, cohesive manner. Collaborative work is ongoing to further investigate and align on common waste management facilities necessary to support the project.

7.2.3. Water Abstraction and Use

The Project will require water for personnel and for the construction and operation of the facilities. This water demand changes over the project phases, with the initial pioneering camp activities having a relatively low water demand, followed by the much larger EPC construction water demand, and finally the long-term operational water demand. The water source options considered included ground water, desalinated seawater from Palma Bay, and water sourced from local suppliers and transported to site.

In order to evaluate the ground water option, water abstraction modelling was undertaken for a range of water demand scenarios, and taking into account the Area 1 current and project water demands, and it was determined that the low water demand required for the pioneer camp can be met sustainably, but that the significantly larger construction and operational water demands could not be. Desalination of sea water was evaluated, and modelling carried out of the discharge of desalination brine to the bay, and it was determined this option could be carried out without adverse impact to the marine environment. Trucking in of water from third parties, whilst an option for short-term supply if required, is not considered a suitable long-term water supply, due to the associated increase in road traffic, and supply competition issues for local consumers. As such, ground water was selected for the pioneer camp scenario, and desalinated sea water selected for the EPC construction phase and for operations.

8. ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

8.1. Updates to Environmental Impact Assessments

Table 8-1 summarizes the key project changes since the 2017 EMPs were completed which were considered in the environmental impact assessments undertaken as part of the 2019 EMP updates.

Table 8-1: Summary of Key Changes arising from Design Optimization since the 2017 EMPs

Base Case Project Description from the EIA and 2017 EMP	Changes to Base Case EIA and 2017 EMP Project Description	Addressing the Change and Summary of Findings
Pipeline route: The EIA (2014) assumed that the route of the pipeline will cross between the islands of Rongui and Tecomaji and make landfall on the north-eastern coastline of the Afungi Peninsula. The EIA (2014) recommended that as part of the mitigation that the pipeline trench should be aligned as far south as possible in the proposed corridor between Tecomaji and Rongui islands, within the constraints of engineering and construction feasibility. The EIA (2014) stated that this mitigation, when implemented, will significantly limit the damage to the fringing reef between the islands of Tecomaji and Rongui, where the extent of fringing reef is much reduced in the area closer to the northern tip of Rongui Island.	Following further investigation and design optimization the route of the pipeline trench has been modified to follow the north-west coast of Rongui, which significantly limits the potential damage to the fringing reef. The mitigation as outlined in the EIA (2014) has therefore been implemented and is now part of the Project.	Construction of the pipeline can cause potential effects on the marine environment, such as loss of habitat (coral and seagrass) as well as indirect effects on associated fish and invertebrate communities. Impacts on the marine environment associated with the pipeline were assessed in the EIA (2014) as occurring at the local scale, with high intensity effects. The magnitude of the impact was identified as high, given the high biodiversity value of the damaged biotopes, and the impact significance was therefore expected to be MAJOR before mitigation. With the re-alignment of the pipeline trench, the EIA reduced the residual impact (with mitigation) to MINOR Significance. The new route has been re-located to significantly limit the damage to the fringing reef between the islands of Tecomaji and Rongui, where the extent of fringing reef is much reduced in the area closer to the northern tip of Rongui Island. The impacts assessed within the EIA (2014) are therefore considered worst-case, with the actual impact likely to be less. The findings of the EIA (2014) therefore remain valid, with the residual impact considered to be MINOR Significance, and no further mitigation being required.
Dredging of pipeline corridor: The EIA (2014) assumed that in water depths of greater than 25m at Lowest Astronomical Tide (LAT), the pipelines will be laid directly onto the seabed without the need for dredging.	In the EIA (2014), dredging of the pipeline corridor was assessed up to a water depth of 25m at Lowest Astronomical Tide (LAT), after which the pipeline will be laid on the seabed. Following further investigation and design optimization dredging for the pipeline corridor will be limited to 15m LAT; however, some localized further dredging to the top of an escarpment (30m water depth) may be required. Nevertheless, the quantity of dredge material will be the same or less than projected in the EIA (2014).	Dredging has the potential to cause loss of habitat as well as indirect effects on associated fish and invertebrate communities. The EIA (2014) assessed impacts of dredging-induced turbidity and seabed modification on near shore marine environment as MINOR (with mitigation). Similar or a reduction in dredging would not result in a negative change in the duration, extent, intensity or magnitude of impact originally assessed in the EIA (2014). The findings of the assessment and mitigation presented in the EIA (2014) are therefore still considered to be valid.

Base Case Project Description from the EIA and 2017 EMP	Changes to Base Case EIA and 2017 EMP Project Description	Addressing the Change and Summary of Findings
Quantities of Nearshore Dredged Materials and Areas Dredged It was estimated in the EIA (2014) that dredge volumes for the nearshore Project were likely to be approximately 5.3 million m^3.	Since the EIA (2014) the dredge volume estimates have been revised to take into account further engineering and execution planning, as well as other requirements contained within the Marine Concession Agreements, which provide further details on the requirements for the nearshore infrastructure. As a result, the estimated quantities of materials dredged have increased. While the final quantity of dredged material will depend on the design selected, the most conservative volumes for non-pipeline related dredging impacts are anticipated to be a total of 12.2 million m^3.	Due to the increase in the volume of dredged material an assessment has been performed to evaluate the change in the duration, extent, intensity or magnitude of anticipated impact on the marine environment. It should be noted that the volumes assessed are conservative estimates and final dredge volumes are likely to be less than what has been considered. The assessment has taken into account additional surveys that have been conducted to improve the understanding of marine ecology in Palma Bay, as well as more detailed execution plans and additional sediment dispersion modeling. As a result of the assessment of the revised dredging volumes and dredged areas, it was determined that changes to mitigation measures were required. Specifically, the zone of moderate impact (ZOMI) thresholds have been revised to take account of the improved understanding of baseline conditions in Palma Bay and to improve the effectiveness of compliance monitoring. Following these changes, the residual impacts were generally predicted to be unchanged from what was presented in the EIA (2014). The findings of the EIA (2014) therefore remain valid.

Base Case Project Description from the EIA and 2017 EMP	Changes to Base Case EIA and 2017 EMP Project Description	Addressing the Change and Summary of Findings
Additional Dredged Material Disposal Areas: The EIA (2014) assessed three potential locations for the management of dredge material. The three locations included: • Disposal at predetermined offshore location at the head of the Afungi Canyon through a pipeline laying on the seabed aligned down the canyon; • Temporary stockpile adjacent to the pipeline corridor for future backfill; and • Onshore in sediment ponds for the storage and dewatering.	Further environmental baseline surveys have been completed to enable a better understanding of the marine environment and as a result an additional dredge material disposal area of 10.6km^2 has been identified in a lower environmental sensitivity area. This is further offshore than the original disposal area presented in the EIA (2014), of which a subset would be used for dredge disposal. The 'Additional Dredge Material Disposal Area' as located in Technical Note: Additional Disposal Area for Dredged Materials will be used to dispose of the dredge material from the nearshore and offshore dredging, in addition to the area originally considered in the EIA (2014). The Project will continue to evaluate options for disposal of dredge material as the design progresses, which may include an additional location to the east of Tecomaji Island. Any further additional dredge disposal areas will be evaluated and, if carried forward, will be presented to MITADER in a future EMP update.	Due to the identification of an additional dredge material disposal area an assessment has been performed to evaluate the change in the duration, extent, intensity or magnitude of anticipated impact on the marine environment. The assessment took into account additional surveys that have been conducted to improve the understanding of marine ecology in Palma Bay, as well as more detailed execution plans and additional sediment dispersion modeling. As a result of the assessment of the additional disposal area, it was determined that changes to mitigation measures were required. Specifically, the Zone of Moderate Impact (ZOMI) thresholds have been revised to take account of the improved understanding of baseline conditions in Palma Bay, known seagrass and coral time-dependent tolerances, and total suspended solids (TSS) levels that are reasonably achievable by standard disposal techniques. A further aim of the revised mitigation is to improve the effectiveness of compliance monitoring. Following these changes, the residual impact for the construction phase impact was predicted to be MINOR adverse for the original EIA (2014) disposal area (no change to residual impact in the EIA [2014]), and MINOR adverse for the Additional Dredge Material Disposal Area.
Hydrotest water discharge: Prior to commissioning, the structural integrity of the subsea system is determined using a hydrostatic pressure test, where additives are often added to control potential corrosion. The EIA (2014) stated that to the extent possible, hydrotest water will be reused to hydrotest the onshore facilities. In the event this is not practical (due to the timing of the various construction phases of the overall Project), the hydrotest water used in the testing of the Subsea Production System will only be discharged after treatment to the guideline standards provided by the International Finance Corporation (IFC).	For the offshore hydrotesting, it is confirmed that the project will adhere to the IFC EHS Guidelines for Offshore Oil and Gas Development. The approach is to use low toxicity chemicals during hydrotesting (i.e. treatment is not envisaged to be required). In addition, a hydrotest procedure as per the EIA (2014) requirements will be prepared and implemented.	The discharge of hydrotest water has the potential to impact water quality, marine ecology and/or marine ecological processes; however as assessed in the EIA (2014), these will be negligible or undetectable effects. Hydrotest water discharged offshore will only be discharged as per the EIA (2014) and IFC EHS requirements, therefore would not result in a negative change in the duration, extent, intensity or magnitude of impact originally assessed. The change is deemed to be immaterial to the EIA (2014) findings, i.e. there is no material change to impact assessment or mitigation.

Base Case Project Description from the EIA and 2017 EMP	Changes to Base Case EIA and 2017 EMP Project Description	Addressing the Change and Summary of Findings
LNG Trains: In the approved EIA (2014), assumptions were made on the type of plant likely to be in operation for the LNG trains proposed, and the emissions characteristics of this plant. The EIA (2014) assumed the development of 5.0 MTPA LNG train configuration.	Since the EIA (2014) there has been a change in the number and type of the stationary combustion plant associated with the LNG trains for Area 4 Exclusive Facilities. More accurate information on the emissions sources and parameters, and data from a local meteorological station, are now also available.	Due to the change in number and type of stationary combustion plant associated with each train, an assessment has been performed to evaluate the change in the duration, extent, intensity or magnitude of anticipated impact on air quality receptors. A revised impact assessment has therefore been carried out to consider these changes; the modeling has considered the onshore emissions sources from both Area 1 and Area 4 Exclusive facilities to facilitate the direct comparison with the EIA (2014). The findings show that most of the residual impacts presented in the EIA (2014) remain valid, except for nitrogen dioxide (NO_2). For NO_2, the residual impact has increased from NEGLIGIBLE to MODERATE during the operational phase. This is partly due to the Project changes but primarily due to a change in the assumed conversion rate of oxides of nitrogen to nitrogen dioxide (NO_2). Applying the assumptions presented in the EIA (2014), as a like for like comparison, the updated residual impact is MINOR adverse. Despite the predicted increase in residual impact compared with the EIA (2014), the maximum predicted concentrations for NO_2 are predicted to be a maximum 69% of the air quality standards (when also including background concentrations), and therefore would comply with the national air quality regulations. The concentrations are also representative of conditions at the DUAT boundary and the residual impact is likely to be noticeably less at locations where sensitive receptors are expected to be present. For further details on the impact assessment See Supplementary Information Report, Technical Note: Change to LNG Trains and Impacts on Air Quality

Base Case Project Description from the EIA and 2017 EMP	Changes to Base Case EIA and 2017 EMP Project Description	Addressing the Change and Summary of Findings
Operational life of LNG Facility: The EIA (2014) assumed that the LNG Facility will be designed for a 30-year minimum service life.	Due to changes in design and specifications, the minimum design life of the LNG plant has decreased from 30 to 25 years.	Reducing the life of the LNG plant has the potential to reduce negative impacts associated with the operational phase such air quality and noise. Positive social impacts such as employment, training and skills development, increased government revenue also have the potential to be reduced due to limiting the operational life. Significance Criteria within the EIA (2014) defines how the duration of impacts informs impact magnitude. Long-term duration is defined as "impacts that will last longer than 10 years and cease when the Project stops operating." Medium-term is defined as "impacts that are predicted to last between 5 and 10 years." The reduction of 5 years from 30 to 25 years operation life of the Project would not change the impact magnitude as the operational life of 25 years is still classified as long term and the extent and intensity of the impacts (as detailed above) would remain unchanged. The assessment and mitigation in the EIA (2014) is therefore unchanged and still considered to be valid.
Domestic gas: A domestic gas delivery point was not specified in EIA (2014) or 2017 EMP.	While not originally identified within the description of the EIA (2014), a domestic gas delivery point has now been included as part of the Area 4 exclusive license. This has been included for flexibility to allow extraction of gas for domestic use. This is an additional component; however, this delivery point does not require any infrastructure, and would fall within the existing Project Footprint Area.	The installation of a new domestic gas delivery point falls within the Project Footprint Area, and any impacts during construction have therefore already been assessed within the EIA (2014). No additional impacts are anticipated. The infrastructure required is already within the LNG Facility, and is negligible in comparison with the entire Project. No new mitigation measures are therefore required, and the findings of the EIA (2014) are still considered to be valid.

Base Case Project Description from the EIA and 2017 EMP	Changes to Base Case EIA and 2017 EMP Project Description	Addressing the Change and Summary of Findings
Construction workforce: The EIA (2014) assumed an onshore construction workforce of 7000-10,000 to be housed in a construction camp.	Since the EIA (2014), the onshore construction workforce has increased from 7,000-10,000 to 20,000-25,000, to be housed in construction camps. The allocated project footprint for the construction camps remains the same as that assumed in the EIA (2014)/2017 EMP.	The construction workforce can have a number of potential socio-economic impacts such as those associated with Project Induced In-migration (PIIM), diseases and infections, accidents and injuries, soil, water and waste-related diseases, healthcare services and infrastructure, demand for tourism, health government revenue, employment training and development, and food and nutrition. In the EIA (2014), impacts related to Project Induced In-migration (PIIM), such as pressure on existing infrastructure, water resources, diseases, rising crime, have been assessed as MAJOR (without mitigation) which is the highest level of impact significance. The EIA therefore assumed a worst case for potential impacts and developed a comprehensive suite of mitigation measures to address a worst case scenario. The additional workforce of approximately 15,000 would not increase magnitude classification above major, and mitigation measures would not require adjustment as they are already designed to cater for impacts with a High intensity and magnitude. The assessment and mitigation in the EIA (2014) is therefore considered to be valid. Other socio-economic impacts associated with construction workforce are assessed as being positive, such as healthcare services and infrastructure, demand for tourism, health government revenue, employment training and development, and food and nutrition. Positive impacts may increase/ or remain the same with an increase in workforce; therefore, no new mitigation measures are considered to be required. With respect to potential environmental impacts, the construction camps will be fully located within the Project Footprint Area and the land requirements are the same as assumed for the EIA (2014). The increase in workforce would therefore not result in a negative change in the duration, extent, intensity, or magnitude of impact originally assessed for environmental impacts of construction camps. The findings of the EIA (2014) therefore remain valid, and no additional mitigation measures are required.

Base Case Project Description from the EIA and 2017 EMP	Changes to Base Case EIA and 2017 EMP Project Description	Addressing the Change and Summary of Findings
Permanent accommodation: Permanent accommodation during the operational period is required for 400 workers.	Permanent accommodation is now required for 500 workers during the operational period, which is an increase of 100 worker accommodation from that assumed in the EIA (2014). The footprint required for the additional workers is within the area allocated within the EIA (2014).	Line #8 of this table outlines potential effects associated with an increase in workers. As detailed above, the small change in workforce numbers would not result in a negative change in the duration, extent, intensity or magnitude of impact originally assessed in the EIA (2014). No additional area other than that allocated within the EIA (2014) is required to house these additional workers. The assessment and mitigation in the EIA (2014) are therefore still considered to be valid.
Offshore workforce: The EIA (2014) assumed an offshore construction workforce of 400-750 people.	The offshore construction workforce has decreased from 400-750 to 200-400.	Since the offshore construction workforce has decreased this would not result in a negative change in the duration, extent, intensity or magnitude of impact originally assessed. The assessment and mitigation in the EIA (2014) is still considered to be valid.
Safety Exclusion Zone: The EIA (2014) assumed a Safety Exclusion Zone of 500m around the Area 4 Exclusive zone.	Since the EIA (2014), the Safety Exclusion Zone has increased from 500m to 1,000 m around the Area 4 Exclusive zone.	The safety exclusion zone has the potential to impact on local fishing activities by restricting access to fishing areas. The locations of the nearby towns that may fish in the areas affected have been reviewed. It was found that no additional settlements will be impacted if the exclusion area is increased to 1000 m and would therefore not result in a negative change in the duration, extent, intensity or magnitude of impact originally assessed. The impacts to fisheries related livelihood restoration activities are covered in the Resettlement Action Plan. Since there are no additional affected communities to those presented in EIA, the assessment and mitigation in the EIA (2014) is still considered to be valid.
Transport of aggregate material: The EIA (2014) assumed that aggregate will likely be transported to the site by sea. However, the EIA and EMP included the following commitment (GE-2) "In the event that sea transport of aggregate and gravel is not feasible, a Method Statement and transportation safety analysis will be conducted for the road transport of raw materials".	It has been confirmed that aggregate may arrive by road instead of by sea.	This change will potentially increase the number of traffic movements associated with aggregate delivery. The potential impacts of this change will managed by the existing mitigation measure (Appendix A GE-2 'Method Statement and transportation safety analysis'). As the residual impact stated in the EIA (2014) took account of this mitigation measures the conclusion of the assessment made in the EIA remains unchanged. No additional mitigation is required.

8.2. Upstream-Specific Updates

8.2.1. Focus on Dredging Impacts and Protection of Biodiversity and Ecosystem Services

Given the low energy, shallow water environment in Tungue Bay, the presence of sensitive seabed habitat with associated fauna including threatened species, and the dependence of local communities on the health of this environment, notably for subsistence and income from fisheries, particular emphasis has been placed post-EIA (2014) on further evaluation of dredging impacts on the nearshore environment. This has involved further characterisation of the area and habitat mapping, examination of state of the art mitigation for dredging in/near coral and seagrass, application of the mitigation hierarchy, limiting the dredge footprint and volumes, and planning for the combination of impact avoidance and reduction, habitat restoration and offset measures that will be required to achieve No Net Loss of Natural Habitat and Net Gains for Critical Habitat features (notably coral and seagrass).

The data from additional baseline surveys conducted in the period 2014–2017 increased the spatial scale and accuracy of seabed habitat mapping and enhanced the predictive capacity of the sediment dispersion modelling which has underpinned the ongoing evaluation of environmental impacts arising from dredging and the marine disposal of dredged materials via the formation and spread of turbidity plumes in the water column and the resettlement of suspended sediments on the seabed.

Increased understanding of background conditions along with ongoing consideration of the scientific literature on exposure tolerances of coral and seagrass has resulted in adjustments to target thresholds for total suspended solids (TSS) within, at and outside the boundary of the Zone of Moderate Impact (ZOMI) in which chronic (sub-lethal) effects may occur.

There was an early focus on Biodiversity and Ecosystem Services (BES) protection in line with the requirements of IFC PS6. ERB initially produced a rapid highlevel BES assessment and BES sensitivity maps. Fauna and Flora International were then engaged as advisors in the period leading up to and beyond the completion of the EIA (2014). They undertook a series of BES focused studies with a strong emphasis on application of the mitigation hierarchy to inform project development options, both in the nearshore and offshore zones. The main outputs of this work were:

- Practical guidelines for the interpretation of biodiversity sensitivity maps (pre-FEED). This provided preliminary mapping of the spatial distribution of Critical Habitat qualifying features (habitats and species) in deep water, nearshore and coastal onshore zones and guidance on the relative significance of these features within each of these zones.
- Deep water knowledge workshop (pre-FEED). This involved selected subject matter experts in the review of the ecological context for deep water operations, a summary of potential impacts of gas field operations on BES, recommendations regarding environmental effects monitoring framework and protocols, and the assessment of knowledge gaps.
- Review of practical operational options for breaching shallow water coral reefs in relation to pipeline placement, construction and maintenance (pre-FEED)
- Mitigation hierarchy matrices for deep water, nearshore and coastal onshore habitats (pre-FEED)
- Review of mitigation measures for impacts to coral ecosystems (FEED stage)
- Review of mitigation measures for impacts to seagrass habitats (FEED stage)

This programme of BES-focused studies along with the baseline survey findings provided the foundation for a Critical Habitat Assessment (2017, updated 2018), which in turn supported the Harmonized Critical Habitat Assessment (see Section 3.3) completed in 2019 on behalf of MRV and AMA1.

8.3. Updates to Socio-Economic Impact Assessments

8.3.1. Project-Induced In-Migration and DUAT Encroachment

The EIA (2014) assessed that project-induced in-migration was highly likely in the Project's Area of Influence. Further analysis conducted in 2018 on PIIM confirmed the 2014 EIA assessment and the likelihood of PIIM. The Project is indeed experiencing three factors that often predict in-migration: the existence of a mobile population, the scale and needs of the Project, and the capacity of the area to meet the Project's needs. With a peak construction workforce expected at potentially 35,000 to 40,000 people, the Project's demands will exceed the supply of work-ready labor in Palma District. Considerable expectations of opportunities for local and non-local communities alike will be generated in a region which is already accustomed to population mobility and to national and international movements for trading and resource access.

Population in the Palma District has already increased by 29.7% between the 2007 and the 2017 census (from 48,318 inhabitants to 62,667)[1]. Population growth has also been observed in the villages in the direct proximity of the Project and the DUAT. In-migration could further increase, at an even quicker pace, following the commencement of the resettlement activities, as well as the workforce mobilization for the construction of the Project. Potential jobs, the prospect of compensation and other economic opportunities (such as the provision of goods and services) may trigger further PIIM and the risk of spontaneous settlement(s) within or adjacent to the Project's operations and the DUAT.

Conscious that, if left unmanaged, PIIM could present a significant risk, including the risk of encroachment on the DUAT, the Project further assessed the related potential risks and impacts in two assessments:

- One assessment on PIIM which identified likely hotspots (i.e. a location, typically a town or a village, where opportunistic in-migration is anticipated) in the Project's Area of Influence, outside of the DUAT, and provided a summary of key impacts potentially associated with PIIM.
- One assessment on encroachment on the DUAT which assessed the potential for encroachment as well as the risks and impacts of any encroachment on the Project and its personnel, the encroachers themselves and the local communities.

8.3.2. Community Health

Recognizing the dated nature of the Health impact Assessment conducted in 2013, MRV and AMA1 collaborated to conduct an assessment and update of the results obtained from the original study.

This work scope was adjusted to include the Rovuma LNG Project (managed by ExxonMobil Moçambique Limitada S.A. on behalf of Mozambique Rovuma Venture S.p.A). This adjusted scope therefore considered both Area 1 and Area 4 Projects collectively as their activities are planned in the same area of influence and quite similar in nature.

The scope focused on updating the HIA conducted in 2013 for the near shore and on-shore component (local study area) of the Mozambique LNG Project and extending the assessment to consider the regional study area (broader elements in Palma district, Mocimboa da Praia, Pemba town, Mueda and transport corridors between these locations).

As the potential direct and indirect impacts are likely to be relatively similar it was pertinent to collectively consider the potential cumulative impacts of both Projects, and provide the opportunity to harmonize the assessment approach, findings and proposed management measures. However, each Project may follow independent development timelines that may depend on a host of factors

[1] Sources : Mozambique's Instituto Nacional de Estatistica: http://www.ine.gov.mz/estatisticas/estatisticas-territorias-distritais/cabo-delgado/2008/estatisticas-do-distrito-de-palma.pdf/view (for the 2007 census); http://www.ine.gov.mz/operacoes-estatisticas/censos/censo-2007/censo-2017/divulgacao-os-resultados-preliminares-iv-rgph-2017 (for the 2017 census).

including the definitive investment decisions, government agreements, final scopes and designs and pace of implementation.

The objective of the HIA is to anticipate (prior to implementation) the potential direct, indirect and where relevant cumulative impacts on community health, by the proposed Project, on defined potentially affected communities, so that:

- Potentially significant adverse effects can be avoided or reasonably mitigated.
- Potentially beneficial impacts can be enhanced.
- The probability for sustainable development is increased.

While there is no specific national legislation that requires a standalone HIA, the assessment substantially complies with specific Mozambican regulations (including those under MITADER). The assessment further considers alignment with the Area 1 and Area 4 operator corporate standards and procedures, as well as good international industry practice.

In alignment with these good international industry practice guidelines, the methodology of the HIA has substantially followed a reductionist approach, where 12 environmental health areas (EHAs) are assessed as part of a structured framework.

The current HIA included the following desk and field elements:

- Desktop activities:
  - A literature review initially performed in 2012/2013 for the scoping study and initial HIA. This was updated in 2014 to include regional elements, and for the current updated HIA in February 2018.
  - Review of updated planned Project front end engineering design and activities for both Projects.
  - Consideration of information from specialist biophysical and social studies conducted for the environmental and social impact assessment/s (ESIA).
- Field activities:
  - Scoping study in May 2012 that included primary participatory data collection and reviews of health facilities.
  - Qualitative data collection through structured focus group discussions conducted in July 2012.
  - A qualitative participatory process whereby interested and affected parties in the study areas could make comments or raise concerns related to health impacts related to the Project or highlight existing health challenges/ needs.
  - An epidemiological baseline health survey (BHS) conducted in April 2013 that included the collection of a range of primary quantitative data including household questionnaires, biomedical and environmental health samples.
  - The current update included limited participatory data collection in the form of key informant interviews with provincial and district health officials, conducted in March 2018.

The main outputs of the current HIA include:

- An updated baseline health description developed in April 2018 based on past (data collected up until 2014) and the desk and field activities in February/March 2018.
- The modelling of potential health impacts.
- The development of a community health management plan as an output from the final impact assessment.

The results of the updated HIA have been utilized to develop the Community health safety and Security Plan as well as a key input into the Community Development Plan.

8.3.3. Conflict Analysis

A conflict analysis, whilst not always able to prevent conflicts, can help reduce and better manage them when they do occur, because it enables an understanding of the background and cause-effect relationships. And, while it is not the role of a Project to change structural or even proximate causes of conflict, it can manage its activities so that it does not become a trigger. The Project's Conflict Analysis thus created a baseline conflict risk assessment that aims to guide the various socio-economic components of the Project, both with regard to mitigation and community development. The Conflict Analysis provides support for the Project to: 1) carry out its activities during construction and operation phases with a reduced risk of hindrance from the local conflict; 2) ensure that the Project's activities are sensitive to local dynamics and norms and do not exacerbate or create local conflicts; and 3) create community development projects which can be supportive in reducing the potential for conflicts. Finally, the Conflict Analysis enables monitoring over time so that the Project is always abreast of current and emerging risks.

9. ENVIRONMENTAL AND SOCIAL MANAGEMENT

The Operations Management Systems (the "OMS") for the Midstream Operator, and Operations Integrity Management Systems (OIMS) for the Midstream Operator is the general framework for managing and controlling LNG Operations. They are comprehensive systems that integrate and complement other management systems. It provides the framework to achieve safe, sustainable, reliable and environmentally friendly operations. The Operation Management Systems help to manage every element of operations from basic compliance to excellence in performance.

OMS and OIMS will comply with the Mozambican Law, all statutory requirements and will set the minimum mandatory requirements for performance. Additionally, it will incorporate lessons learned from the oil & gas industry, Area 4 Parties and similar projects Core technical competencies, including safety, security, health and environment, will reside within the resident Eni Project teams and ExxonMobil Project Teams (as applicable). While the technical and construction aspects of the offshore and onshore projects differ significantly, the harmonization and collaboration in managing impacts in the Project Impact Area is being achieved through close cooperation and co-location between the Upstream (HSE) and Midstream (S&SHE) teams. Regular meetings are conducted between key members of the respective HSE/S&SHE teams to discussion common issues, trends, identification of risk, mitigations and other topics necessary to manage area wide impacts.

The Eni Project Team and the ExxonMobil Project Team will be located in the offices of the main contractor with whom they will have primary interface. The expectation is that the team compositions in execution remain largely as they were in pre-FID but with additional personnel required to manage the greater demands on the personnel.

The Project Directors will initially be located in the Eni Mozambique Engineering and ExxonMobil Project Team offices in Basingstoke. As the Project moves into the construction phase the Directorate will in part transition to Maputo and to site. An Execution Manager for each main contract will be appointed with the objective to deliver the respective scope of work. This (or these) Execution Manager(s) will report directly to Offshore Project Director or to the Liquefaction Project Director (as applicable) and will have a structured team.

9.1. Upstream Environmental and Social Management System

9.1.1. Environmental Management

With regard to Upstream EMPs there are three core documents that underpin the ESMS:

- Environmental Impact Mitigation Plan
- Waste Management Plan
- Water Management Plan

Like all EMPs these are live documents, subject to ongoing review and update as additional baseline data, design changes, the results of ongoing impact assessment (including modelling studies), and associated refinements to mitigation are taken into account and incorporated in the documents. The current version of each of these documents was issued in February 2019. The first versions were produced in 2015 during FEED. The plans cover onshore works in a 3.7 km pipeline corridor between the landfall and the LNG facilities and marine works in the nearshore (including beach) and offshore zones.

The Waste Management Plan includes estimated volumes of hazardous and non-hazardous wastes generated by Upstream during onshore and marine construction, testing and pre-commissioning. It stipulates the requirements Contractors must meet to comply with Company standards and legal obligations, and outlines waste minimization and management options for dealing with the different waste streams.

The Water Management Plan provides the general basis for the management of water withdrawal and consumption and for the discharge of wastewaters (including sewage and hydrotest water) associated with development of the onshore and subsea pipelines. It identifies expected water demand and wastewater outputs and describes the necessary actions for Contractors to comply with the required standards and implement the mitigation hierarchy.

The Environmental Impact Mitigation Plan (EIMP) is the core document for ensuring compliance with: Mozambique environmental legislation; relevant international conventions and guidelines; industry standards and guidelines, corporate policy, standards and guidelines; permit requirements; EIA (2014) commitments and obligations; and the detailed Company environmental management requirements established during the assessment of environmental impacts and HSE risks.

Within the EIMP, Environmental Management Frameworks (including legal and corporate requirements, objectives, mitigation measures (split according to the mitigation hierarchy), key performance indicators, monitoring parameters and corrective actions) are defined for different environmental parameters. Some of these parameters are relevant to both onshore and marine (beach, nearshore, offshore) environments, e.g.: habitats; archaeology and cultural heritage; waste management; air quality; spill prevention and response. Others are specific to onshore or marine environments to take into consideration measures for mitigation of impacts including:

- *Onshore*: Terrestrial Habitats; Terrestrial Fauna; Water Quality; Water Use; Dust and Air Quality; Nuisance (Noise, Vibration and Lighting); Archaeology and Cultural Heritage; Hazardous Materials and Dangerous Goods; Waste Management; and Onshore Spill Prevention and Response.
- *Beach, Nearshore and Offshore*: Marine Habitats; Turtles; Marine Mammals; Shorebirds; Dredging and Sediment Related Impacts - Suspended Solids and Turbidity; Marine Water (Non-Sediment Related) Quality - Wastewater Discharges; Atmospheric Emissions; Archaeology and Cultural Heritage; Waste Management; Offshore Spill Prevention and Response; and Marine Vessel Management.

Contractors are required to incorporate the commitments and mitigation described in the Environmental Management Frameworks within their Environmental Management Plans. Depending on the complexity and the significance of managing a specific environmental issue, these plans may either be written as stand-alone documents or incorporated into the overall Contractor and/or subcontractor Environmental Management Plan(s). Supplemental management sections and/or plans to address specific environmental issues shall include the following:

- Onshore Plans/Procedures:
  - Onshore Construction Environmental Management Plan
  - Soils, Erosion Control, Habitat Management and Reinstatement
  - Wildlife Protection and Management
  - Water Management
  - Oil Spill Prevention and Response
  - Hazardous Materials and Dangerous Goods
  - Waste Management
  - Nuisance (Noise, Vibration and Lighting) Risk Reduction
  - Traffic Management
  - Chance Archaeological Finds.
- Offshore Plans/Procedures:
  - Offshore Construction Environmental Management Plan
  - Dredging and Spoil Management and Monitoring
  - Marine Habitat (Seagrass and Corals) Restoration
  - Marine Mammal and Turtle Observation

- Wastewater and Hydrotest Water
- Oil Spill Prevention and Response
- Waste Management
- Chance Archaeological Finds
- Marine Vessel Traffic Management.

In respect of marine habitat (seagrass and corals) restoration ERB has also provided separate, more detailed guidance to Bidders for the EPCI Contract with regard to rigorous application of the mitigation hierarchy to meet the requirements of IFC PS6 regarding No Net Loss of biodiversity in Natural Habitat and Net Gains for biodiversity in Critical Habitat.

The EIMP also sets out requirements for the EPCI Contractor and subcontractors to prepare Environmental Action Plan(s), a Training Strategy and Environmental Training Programme. The Environmental Action Plan is a tracking and progress register that translates environmental management and mitigation measures into appropriate actions.

Contractors bidding for the EPCI Contract for Flowlines and Installation have developed the aforementioned environmental management plans/procedures to an advanced stage as a result of iterative collaboration with ERB through the FEED Optimization phase and beyond.

9.1.2. Socio-Economic Management

Eni developed a Cultural Heritage Conservation Management Plan (CHMP) in April 2017 which covers the offshore archaeology and cultural heritage sites. The CHMP's objective is to outline measures to minimize the impacts of Project's activities on cultural heritage sites and ensure prompt rehabilitation of the cultural heritage sites where required. To mitigate potential impacts on offshore archaeology and cultural heritage site, the Project will use an Autonomous Underwater Vehicle (AUV) or ROV to examine the seabed in the near shore and offshore prior to drilling or laying of the subsea infrastructure or pipelines to identify and, where possible, avoid the cultural heritage artefact. An experienced archaeologist will also be engaged to advice and monitor on offshore construction activities and train staff / Contractors on Chance Find Procedures.

9.1.3. Environmental Monitoring

The EIMP sets out the requirements for the Environmental Monitoring Plans to be developed by the EPCI Contractor. Monitoring parameters and key performance indicators are provided along with indicative information on the location and timing of monitoring. The focus of the Upstream monitoring programme will be: air quality, noise and vibration, water quality (including turbidity monitoring) and marine flora (seagrass) and fauna (benthos, coral, turtles, marine mammals). Further monitoring will also take place to track fuel consumption, solid waste production, waste water quantities etc. The context for all aspects of the planned environmental monitoring is verification of predicted impacts and timely implementation of adaptive management measures and corrective actions where required.

There will be a strong focus on the monitoring of sediment related impacts during dredging in the nearshore environment due to the sensitivity of the receiving environment. This is described both in the EIMP and the BES Management Plan. Monitoring shall be both reactive and informative. Reactive monitoring includes continuous assessment with pre-determined triggers, such as the levels of TSS in the water column, and requires the implementation of corrective actions in a timely manner. Informative monitoring refers to repeated monitoring of environmental responses of potentially impacted habitats during the works to ascertain the effectiveness of the mitigation measures and the state and health of selected environmental receptors (notably coral and seagrass). This will include monitoring the results of habitat restoration and biodiversity offset measures implemented as part of the BES Management Plan. The results will inform decisions on changes to specific mitigation measures and approaches.

The location of sediment related monitoring sites shall be selected to coincide with the expected maximum levels of turbidity (light attenuation) and sedimentation in the predicted zone of moderate impact and zone of influence as determined from the results of sediment dispersion modelling. At a minimum, at least two control sites for each habitat parameter shall be selected. The control sites shall be as similar to the monitoring sites as possible in terms of biological sameness (e.g., species composition, diversity, abundance, dominance, percent coverage) and physical and chemical characteristics. The control sites shall be established well outside the zone of influence of current and future work carried out for MRV and AMA1.

The results of the sediment related monitoring, in particular the real time water quality information, will be used to validate the results from the sediment dispersion model and enable continuous refinement and improvement of predictive modelling throughout the duration of the Project activities.

9.1.4. Socio-Economic Monitoring

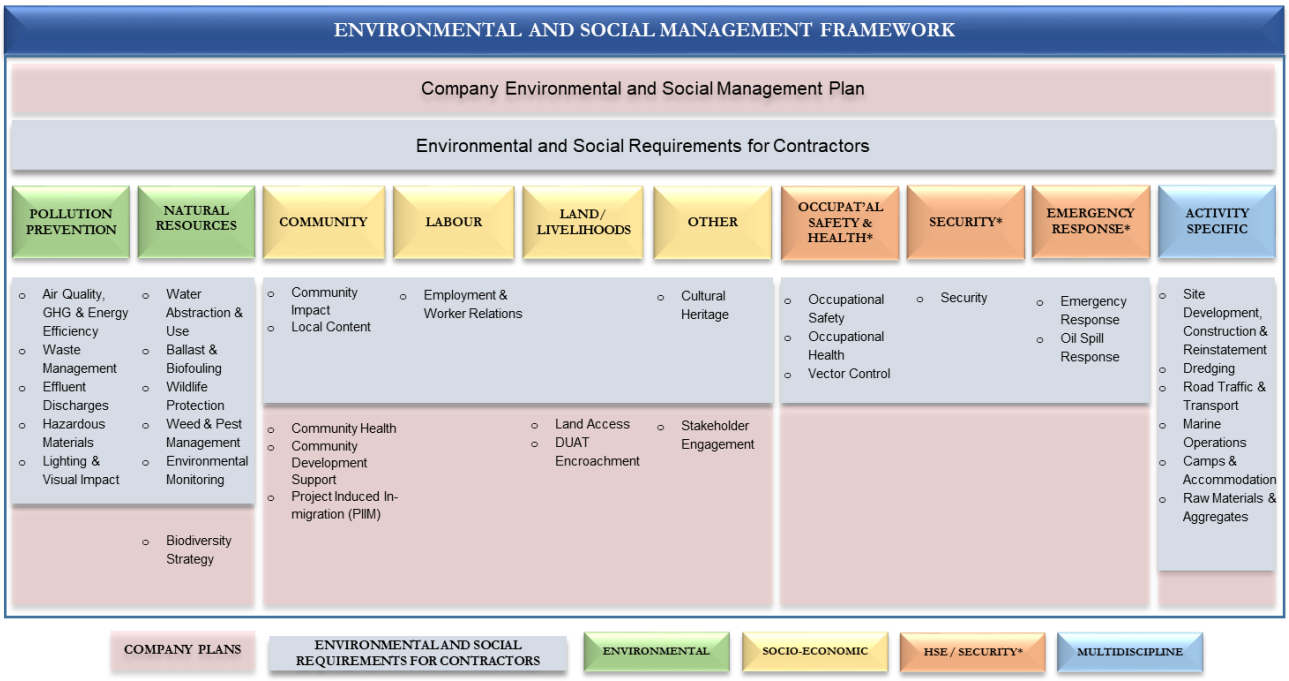
The 2017 Cultural Heritage Conservation Management Plan (CHMP) developed by Eni sets out that the monitoring objective is to check the effectiveness of the implementation of the CHMP and conservation measures. Monitoring will be undertaken by a suitably-qualified person, such as a qualified archaeologist.

9.2. Midstream Environmental and Social Management System

EMML have developed their Project E&S Management System to satisfy national, regional, international and lender requirements as well as the application of GIIP.

EMML has chosen to develop a Project E&S management system framework as illustrated in Figure 9-1, based on the development of four types of Project documentation. These document types collectively demonstrate how the Project's will manage their E&S risks.

Figure 9-1: Environmental and Social Management System Framework



- Specifications for H&S, Security and Emergency Response are covered in the main body of the EPC Contract Form Update rather than as separate documents

The theme and activity-specific documents fall into four categories, based on the allocation of responsibility for implementing defined actions between Company and Contractor, recognizing that many theme and activity-specific actions require a mixture of both. The four categories are as follows:

- **Type 1**: Company Management Plan - Type 1 plans are written and implemented by EMML, examples of such plans include the Project Induced In-migration Plan and the DUAT Encroachment Plan.
- **Type 2**: Type 2 documents are written by EMML and contain both EMML and Contractor requirements. An example of a Type 2 document is the Cultural Heritage Management Plan which includes procedures such as the Chance Find Procedure that will be implemented by the Contractor whilst also including Company responsibilities, such as, stakeholder engagement.
- **Type 3**: Type 3 documents are written by EMML but contain requirements implemented solely by the Contractor. Example of these types of document include the ITT Requirements documents. ITT requirement documents are issued to bidders and cover environmental and social aspects ranging from the air quality, waste management, and wildlife protection through to social aspects such as camp management.
- **Type 4**: Type 4 documents are written and implemented by the Contractor and are referred to as Contractor Implementation Plans (CIP). These plans reflect the requirements issued to bidders in Type 2 and 3 documents and demonstrate how the Contractor plans to execute works in a manner that meets the all applicable requirements.

9.2.1. Environmental Management

9.2.1.1. Biodiversity Strategy and Biodiversity Action Plan

The Biodiversity Strategy is a Company Plan (i.e., Type 1 document) under the ESMP framework, and serves as a framework to guide the implementation of the Project's biodiversity commitments to align with IFC PS, and details the Company policy towards biodiversity and ecosystem services, as well as the relevant Project standards. This document sets the Project's biodiversity objectives and includes a series of commitments that will be applied to meet the objectives, and confirms the Critical Habitat features, Natural Habitat, and Ecosystem Services, which are the focus of the Biodiversity Strategy, and which will be implemented through the Biodiversity Action Plan.

9.2.1.2. Biodiversity / Ecosystem Services Stakeholder Mapping

A Biodiversity-focused Stakeholder Mapping and Engagement Plan ("BSMEP") has been developed in alignment with the Rovuma LNG Midstream Operators' Stakeholder Engagement Management Plan (SEMP) and Environmental and Social Management System (ESMS). The goal of the BSMEP is to identify and map the Project's relevant biodiversity-related stakeholders and to start developing a high-level engagement plan with these stakeholders to help the Project successfully manage biodiversity issues throughout its lifecycle, including developing and implementing its Biodiversity Offset Strategy.

As the BSMEP is intended to be a living document, the list of stakeholders and type of engagement processes will be updated regularly as the Project progresses.

9.2.1.3. EPC Environmental Management

Design, site development and construction / execution of the project components will be undertaken by an Engineering, Procurement, and Construction (EPC) Contractor, with support from subcontractors. The environmental and social expectations of EMML were detailed in a document entitled *Environmental and Social Requirements for Contractors.* This document and associated theme and activity-specific annexes formed an important component of the ITT process.

This documentation includes the EMP commitments in addition to 'additional' environmental and social requirements which were identified in the gap assessment, and consists of the following set of plans and related annexes:

- Environmental and Social Requirements for Contractors
  - Annex 1 Air Quality, Greenhouse Gases and Energy Efficiency
  - Annex 2 Effluent Discharges
  - Annex 3 Waste Management
  - Annex 4 Hazardous Materials
  - Annex 5 Site Development, Construction and Reinstatement
  - Annex 6 Road Traffic and Transport
  - Annex 7 Marine Operations
  - Annex 8 Water Use and Abstraction
  - Annex 9 Raw Materials and Aggregates
  - Annex 10 Dredging
  - Annex 11 Lighting and Visual Impact
  - Annex 12 Ballast Water and Biofouling
  - Annex 13 Weed and Pest Management
  - Annex 14 Wildlife Protection

The *Environmental and Social Requirements for Contractors* document specifies a 3-stage approach to manage environmental and social activities (depending on the topic and the current level of development of the project), namely:

1) Alternatives Analysis: a review of the alternatives including details of the environmental and social baseline, the environmental and social risk and impact evaluation, and other relevant drivers for decision making, leading to confirmation of the project's base case.

2) Base Case Definition: the definition of the project's base case, including updated/refined baseline details as relevant, updated environmental and social risks and impacts assessment, and a refined list of environmental and social control measures.

3) Topic-Specific Contractor Implementation Plans (CIPs): the annexes require Contractors to prepare topic-specific CIPs which include the approved environmental and social control measures, details of how these controls will be implemented, and details of the monitoring, reporting and assessment process.

The overall objective of the topic-specific requirements contained in the Annexes is to set out the environmental and social requirements to be refined and implemented by the Contractor (and approved by Company) as part of the EPC works to complement the Company's overall ESMS which, when implemented, will enable the Contractor's activities to be in conformance with the IFC Performance Standards.

9.2.2. Socio-Economic Management

The Rovuma LNG Project's Socio-Economic Management Plans (SMPs) were developed in accordance with the Mozambican legislation, commitments made in the 2014 EIA, international finance expectations and experience drawn from projects in similar environments.

The different SMPs set out the social requirements that need to be fulfilled to reduce the potential social risks and impacts associated with the Project's activities during the construction period, regardless of whether the activity is carried out by the Company directly or by its construction contractor. The SMPs also establish internal and external monitoring requirements.

The Project developed the following Socio-Economic Management Plans:

- **Stakeholder Engagement Management Plan:** describes the midstream operator's approach to stakeholder engagement and the steps it intends to take during the construction phase of the Project to develop and maintain constructive and mutually beneficial relationships with stakeholders during the Project's development and construction phases. An integral and critical component of the stakeholder engagement management plan is a detailed, specific action oriented plan for the management of grievances.
- **Employment and Worker Relations Requirements:** aim to provide overarching direction on employment and worker relations that will be beneficial to the employer and the employee, including those of contractors and subcontractors. The requirements cover the following activities: the protection of worker rights; the general recruitment and selection of workers; the contracting with workers on terms and conditions of employment that are fair, reasonable and comply with National Labor legislation; the management of the contractor – worker relationship; and the demobilization.
- **Camps and Accommodation Requirements:** aim to design and manage camps in such a way as to promote healthy, safe, secure and comfortable accommodation for Project personnel that does not impact negatively on the communities in the area.
- **Local Content Management Plan:** commits the Project to developing opportunities for Mozambican workforce and businesses in a structured and sustainable manner. The Project's approach to Local Content (whether it be locally, regionally, or nationally sourced) is developed around three key areas: the development of workforce, the development of suppliers and some strategic community investments.
- **Community Impact Requirements:** set out to prevent, reduce and manage potential environmental and social risks and impacts associated with the Contractor's construction activities which have the potential to cause community disturbance, namely: noise, disruption or damage to community infrastructure, disruption and nuisance.
- **Community Development Support Plan:** provides a common approach through which Community Development Support (CDS) activities are identified, planned, executed and support the Project's objectives. Investments in CDS activities fall mainly in three categories: 1) investments to deliver mitigation measures committed to as part of the 2014 EIA; 2) direct investments in community projects which deliver benefit to the community and the Project; and 3) community investments designed to make a positive contribution to the development of host and neighboring communities.
- **Community Health, Safety and Security Plan**: provides guidance on how to avoid or reduce and manage construction-related risks and impacts to the health, safety and security of the community. It also aims to safeguard personnel and property in an appropriate manner that avoids or minimizes risks to the community's safety and security. This Plans addresses safety and security from a community perspective only; workplace safety and Project's security are managed under separate plans.
- **Supplemental Land Access Management Plan**: sets out the framework within which any acquisition of land use rights outside of the DUAT shall take place, including the step-wise land acquisition process and the approach to determining, establishing and delivering eligibility for compensation and livelihood provisions for displaced persons.
- **Project-Induced In-Migration Management Plan**: describes how the Project will manage Project-Induced In-Migration (PIIM) though two distinct strategies: the first seeks to minimize the level of PIIM which is generated by the Project, while the second is focused on managing the impacts of the PIIM (including impacts on ecosystem services) which cannot be prevented.
- **DUAT Encroachment Management Plan**: describes how the Project will identify, prevent, and, if necessary, respond to any new or unauthorized occupation or use of land within the DUAT.
- **Cultural Heritage Management Plan**: aims to avoid cultural heritage sites (including both archaeological sites and oral tradition sites) where necessary and practicable and, where

avoidance is not possible, to minimize impact(s) to the area's unique cultural heritage. The Plan is applicable to all known as well as not yet identified cultural heritage items that may be impacted, either directly or indirectly, by the Project's activities.

9.2.3. Environmental Monitoring

EMML have prepared a Minimum Environmental Monitoring and Reporting Requirements Document, which is a comprehensive document that outlines the minimum requirements for the EPC Contractor to both include in their execution works, and to embed within the project design. The Contractors monitoring plan must meet the monitoring and reporting requirements of this document in conjunction with the Environmental Design Basis as well as the EMP commitments and IFC requirements. The Contractor's Environmental Monitoring Plan will work, where applicable, in unison with an adaptive management strategy. This strategy work to identify threshold exceedances in a timely manner so that corrective actions can be implemented to avoid or mitigate unforeseen impacts. Nearshore and onshore environmental monitoring requirements include; noise monitoring, water quality monitoring, ground water monitoring, suspended sediment and turbidity monitoring as well as monitoring for the presence of invasive species, and so on. Thresholds and performance indicators have been established where suitable against the relevant monitoring activities. Further monitoring and reporting will be carried out to track fuel consumption, solid waste production, waste water quantities and so on.

Verification, monitoring, assessment and evaluation will be conducted by EMML. EMML will conduct regular audits and inspections of the Contractors' performance and monitoring data, as well as audits to ensure compliance with EMP requirements, regulatory requirements and compliance with management systems, standards, policies and procedures. In addition to the routine monitoring described above, the Project will also conduct incident monitoring as described in the Emergency Response Plan.

9.2.4. Socio-Economic Monitoring

Socio-economic performance monitoring is important to provide feedback on the effectiveness of the implementation of the social management plans and the socio-economic mitigation measures. The feedback helps support alignment among key functions in programs and also provides a mechanism for reporting to the GoM, the Midstream Project leadership and other stakeholders on performance. Results from performance monitoring also provide a platform for the long-term result assessment and understanding of social issues and their management. Results are regularly monitored to identify performance and areas where improvements may be necessary.

Verification, monitoring, assessment and evaluation will be conducted by EMML. Nearshore and onshore socio-economic monitoring requirements include stakeholder engagement monitoring; grievances monitoring; employment monitoring; local procurement monitoring; cost of living changes monitoring; community development monitoring; community health, safety and security monitoring; in-migration and encroachment monitoring; archaeological and cultural heritage findings monitoring.

As part of the development of the EMML Stakeholder Engagement Plan, active stewardship mechanisms have been developed to enable the Project to monitor social and economic impacts of the Project through stakeholder engagements with communities, government, and other Project's proponents. Topic-specific monitoring (such as health monitoring) may also be undertaken in partnership with the GoM, NGOs or third parties with the intent to share data with them.

EMML will conduct regular audits and inspections of the Contractors' performance and monitoring data, as well as audits to ensure compliance with the social management plans' requirements, the regulatory requirements and with management systems, standards, policies and procedures.

9.2.5. Resettlement Monitoring

As per the 2016 Resettlement Plan, resettlement monitoring will be conducted to verify that actions and commitments described in the RP are implemented fully and on time. An adapted World Bank monitoring and evaluation framework will be used which is structured around the following:

- Input (or progress) monitoring – measures whether inputs are being delivered in accordance with the schedule and as defined by the RP. Inputs are services, resources or goods that contribute to achieving outputs and, ultimately, desired outcomes. Examples of input indicators are the number of staff in the Resettlement Team, the amount of compensation disbursed in a given month, or the amount of money expended on replacement house construction.
- Output (or performance) monitoring – measures the direct results of inputs (e.g. the number of people receiving compensation for physical or economic displacement or the number of households receiving replacement housing).
- Outcome (or impact) evaluation – evaluates the effectiveness of the RP's inputs and outputs in achieving the objectives of the RP. Outcomes are not usually immediately evident. Time lapses before it is possible to assess whether affected households of enterprises have been able to use compensation payments for investments to produce sustainable income.

Resettlement monitoring will also be augmented by data gathered by other teams on local employment, local procurement, land use change and cost of living changes.

The following three parties are responsible for monitoring resettlement:

- AMA1's Resettlement Team is responsible for internal monitoring and reporting;
- The Technical Commission for Resettlement Monitoring and Supervision (government) is responsible for external monitoring and reporting; and
- The Independent Environmental and Social Consultant (IESC) provides an external third-party assurance that the Project is compliant with the Mozambican legislation, the IFC Performance Standards and the Project's ESMP.

An independent third-party will conduct a Resettlement Completion Audit approximately 36 months following physical relocation of households. Upon completion of a satisfactory audit and close-out of any related corrective actions, the resettlement process will be deemed complete.

10. FUTURE WORK

Additional environmental surveys will be carried out as necessary to support the ongoing project definition.

In addition, the Upstream and Midstream EPC Contractor(s) will be required to undertake Pre-Construction Surveys prior to commencement of any onsite construction activities. Both ERB and EMML have developed preliminary pre-construction procedures describing the requirements for these surveys, which the EPC Contractor(s) are required to meet at minimum.

Revised environmental and social project commitments are being prepared as part of the EMP update process. Following engagement with MITADER and approval of the final EMPs and associated commitments, these will be updated in the relevant project documents, including the Environmental and Social Requirements for Contractors and other Upstream and Midstream project documentation as required.

10.1. Development of the Project Biodiversity Strategy

A high-level Biodiversity Strategy for the Rovuma LNG Project is currently under development. This document will outline:

- The framework that will guide the implementation of the Project's biodiversity commitments to align with IFC PS6.
- How the Strategy fits within the environmental and social management systems of the Midstream and Upstream scopes respectively.
- The Policy and Standards relating to biodiversity and ecosystem services (BES) that will be applied.
- The overarching goal, objectives and commitments that will be applied to meet the BES objectives.
- The priority Biodiversity Features (i.e. Critical Habitats, Natural Habitats) and Ecosystem Services, that will be the focus of the Biodiversity Strategy.

Furthermore, the Strategy will guide the development of the Biodiversity Action Plan (BAP).

10.2. Pre-Construction Survey

Pre-Construction Surveys (PCSs) will be conducted prior to accessing a site for the purposes of conducting construction activities that have the potential to result in the disturbance or alteration of land cover and land surface conditions. The objective of a PCS is to identify any significant E&S issues which could be avoided, reduced or mitigated by refining proposed construction methods or approaches (e.g., micro re-routes of linear infrastructure) or adjusting proposed control measures to account for site-specific conditions. The PCS will also inform revegetation / reinstatement efforts.

PCSs will be initiated in advance of planned clearing / construction activities to allow adequate time to identify potential E&S issues and, where necessary, determine the extent of necessary management and mitigation measures, or, potentially, any changes to the work areas and assessment of alternate locations, should this be required. In order to ensure the findings of the PCS are relevant and up-to-date, surveys will not be completed more than 6 months prior to the scheduled commencement date for the first clearing / construction activities in any given area.

11. DISCLOSURE

Disclosure of relevant information to Affected Communities and other stakeholders is both an essential element of corporate transparency and allows stakeholders to have access to the information they require to have an adequate level of oversight of Project activities. The disclosure of information is generally expected as part of the process of identification of impacts and risks; however, if the Project is expected to create ongoing impacts and risks to the Affected Communities, it is expected that information will be updated and disclosed throughout the life of the project. This SLIP forms an important component of the Disclosure Package. A number of other Project documents will be disclosed on the Project's website. These documents include

- The Company's Environmental and Social Management Plans
- The Contractor ITT Requirement Plans which form the basis of the Contractor's Implementation Plans (CIP)
- The Project's Biodiversity Strategy
- Project Environmental and Social Due Diligence reports.
- Project Environmental and Social Reports

Disclosure of documents will be carried out in a transparent manner, and the disclosed documents will be written in an inclusive manner utilizing non-technical language that can be readily understood. Disclosure timelines will sufficient to allow the intended audience to process the ways in which the Project will impact and benefit their specific circumstances prior to subsequent consultation.

Appendices

Appendix A Acronyms and Terms

A1. Acronyms

Acronym	Meaning
AMA1	Anadarko Moçambique Área 1, Lda
AMSL	Above Mean Sea Level
AoI	Area of Influence
AUV	Autonomous Underwater Vehicle
BAP	Biodiversity Action Plan
BES	Biodiversity and Ecosystem Services
BOP	Blowout Preventer
BSMEP	Biodiversity focused Stakeholder Mapping and Engagement Plan
CDS	Community Development Support
CH	Critical Habitat
CHA	Critical Habitat Assessment
CHMP	Cultural Heritage Conservation Management Plan
CIP	Contractor Implementation Plans
CNODC	CNODC Dutch Cooperatief U.A.
CNODC	China National Oil and Gas Exploration and Development Corporation
CRCS	Community Resettlement Committees
DUAT	Direito de Uso e Aproveitamento da Terra
DWT	Deadweight tonnage
ECAs	Export Credit Agencies
EEA	Eni East Africa
EIA	Environmental Impact Assessment
EIMP	Environmental Impact Mitigation Plan
EMML	ExxonMobil Mozambique Limitada
EMDA	ExxonMobil Development Africa B.V.
EMP	Environmental Management Plan
ENH	Empresa Nacional de Hidrocarbonetos, E.P.
EPCI	Engineering Procurement, Construction and Implementation
ERB	Eni Rovuma Basin B.V.
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management System
EPCC	Exploration and Production Concession Contracts
ERM	Environmental Resources Management
E&P	Exploration and Production
E&R	Environmental & Regulatory
E&S	Environmental and Social
FEED	Front End Engineering Design
FLRP	Fisheries Livelihoods Restoration Plan
GALP	Galp Energia Rovuma B.V.

Acronym	Meaning
GCP	Gap Closure Plan
GIIP	Good International Industry Practice
GoM	Government of the Republic of Mozambique
HIA	Health Impact Assessment
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
HSE	Health, Safety & Environment
IDP	Infrastructure Development Partnership
IESC	Independent Environmental and Social Consultants
IFC	International Finance Corporation
Impacto	Projectos e Estudos de Impacto Ambiental, Lda.
IRP	Initial Resettlement Plan
ITT	Invitation to Tender
IVCP	Integrated Vector Control Program
JOA	Joint Operating Agreement
KOGAS	KOGAS Mozambique Ltd.
LNG	Liquefied Natural Gas
LRP	Livelihood Restoration Plan
LTOBM	Low Toxicity Oil Based Mud
MCCP	Malaria Chemoprophylaxis Compliance Program
MCP	Malaria Control Program
MERS	Middle East Respiratory Syndrome
MFO	Marine Fauna Observation
MICOA	Ministry for the Coordination of Environmental Affairs
MIREME	Ministry of Mineral Resources and Energy
MITADER	Ministry of Land, the Environment and Rural Development
MOF	Materials Offloading Facility
MPM	Mozambique Program
MRV	Mozambique Rovuma Venture (the EPCC designated operator)
MTPA	Million Tonnes per Annum
NADF	Non-Aqueous Drilling Fluid
NEBS	Nearshore Environmental Baseline Survey (
NGO	Non-Government Organization
NO2	Nitrogen Dioxide
PCSs	Pre-Construction Surveys
PEAR	People, the Environment, Assets and Reputation
PIIM	Project-induced in-migration
PS	Performance Standard
QRA	Quantitative Risk Assessment
RP	Resettlement Plan
RBLL	Rovuma Basin LNG Land, Lda.
RCP	Regulatory Compliance Plan

Acronym	Meaning
RIA	Residual Impact Assessment
RJOA	Resettlement Joint Operating Agreement
RP	Resettlement Plan
ROSA	Rovuma LNG Operating Service Agreement
ROV	Remote Operated Vehicle
RV	Resettlement Village
RLNG	Rovuma LNG
SARS	Severe Acute Respiratory Syndrome
SEMP	Stakeholder Engagement Management Plan
SFIA	Shared Facilities Implementation Agreement
SIP	Supplementary Information Pack
SLIP	Supplementary Lender Information Pack
SMP	Socio-Economic Management Plan
SPE	Special Purpose Entities
SPS	Subsea Production System
STCF	Trillion Cubic Feet
TBCP	Tuberculosis Control Program
TCF	Trillion Cubic Feet
TSS	Total Suspended Solids
UK	United Kingdom
USEPA	United States Environmental Protection Agency
UUOA	Unitization and Unit Operating Agreement
WBM	Water Based Mud
WHO	World Health Organization
WMF	Waste Management Facility
ZOMI	Zone of Moderate Impact

A2. Terms

Term	Meaning
Affected Communities	Local communities directly affected by the Project.
AMA1	Anadarko Moçambique Área 1, Lda (AMA1) is the Area 1 operator
Area of Influence	The area likely to be affected by (i) project activities and facilities that are directly owned, operated or managed (including by contractors) and that are a component of the project or an Associated Facility); (ii) impacts from unplanned but predictable developments caused by the project that may occur later or at a different location; or (iii) indirect project impacts on biodiversity or on ecosystem services upon which Affected Communities' livelihoods are dependent; (iv) cumulative impacts that result from the incremental impact, on areas or resources used or directly impacted by the project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted.
Associated Facilities	Facilities that are not funded as part of MRV's loan arrangements and that would not have been constructed or expanded if MRV did not exist and without which MRV would not be viable.
Contractor Implementation Plan	The documents which describe how the Engineering and Procurement Contractor proposes to implement the control measures in order to mitigate and manage identified E&S risks and impacts.
Control Measures	A subset of overall requirements comprising mitigation measures directed at controlling planned and unplanned events identified through E&S risk and impact evaluation processes.
EMML	ExxonMobil Moçambique Limitada (EMML) is the delegated Midstream Operator.
ERB	Eni Rovuma Basin B.V (Upstream Operator) is the delegated Upstream Operator.
Good International Industry Practice	The exercise of professional skill, diligence, prudence, and foresight that would reasonably be expected from skilled and experienced professionals engaged in the same type of undertaking under the same or similar circumstances globally or regionally. The outcome of such exercise should be that the project employs the most appropriate technologies in the project-specific circumstances.
MRV	Mozambique Rovuma Venture (MRV) is the Exploration and Production Concession Contracts (EPCC) designated Operator and an incorporated joint venture owned by ExxonMobil (25%), Eni (25%) and CNPC (20%), which holds a 70% interest in the Area 4 concession alongside its partners Galp Energy, Kogas and Empresa Nacional de Hidrocarbonetos (ENH), each of which hold 10%.
Project	The development of the onshore and nearshore facilities for Area 4 by MRV (EMML and ERB), in conjunction with its nominated contractors.