



**Timor Resources – Timor Leste      External****TERM OF REFERENCE (ToR) – DRILLING ACTIVITY  
PSC TL – OT – 17 - 08 BLOCK A**

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### REVISIONS

Revision	Date	Author	Change Description
0	02/09/2019	Scott McLaughlin Aries Diana C. Carlos	Issuance of ToR
1	12/09/2019	J. Hulse, N. Reis	Non-technical summary



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## ABBREVIATIONS

ADB	: Asian Development Bank
AIA	: Assessment Impacto Ambiental
AKO	: Adjustable Kick Off
ALARP	: As Low as Reasonably Practicable
ANPM	: Autoridade Nacional do Petróleo e Minerais
API	: American Petroleum Institute
BATs	: Best Available Technologies
BHA	: Bottom Hole Assembly
BOD	: Biological Oxygen Demand
BOP	: Blowout Preventer
BoWD	: Basis of Well Design
BPF	: Blows Per Foot
BTEX	: Benzene, Toluene, Ethylbenzene and Xylene
BWPD	: Barrels of Water Per Day
CCE	: Community Consultation and Engagement
CEC	: Cation Exchange Capacity
CWD	: Conceptual Well Design
DNCPIA	: Direcção Nacional de Controlo da Poluição e Impacto Ambiental.
DNSMA	: National Directorate of Environmental Service
DNTP	: Direcção Nacional de Terras e Propriedades
DMTSPSC	: Directorate for Land, Property and Cadastral Services
DST	: Drill Stem Test
DVH	: Douglas Valley Holding
ECD	: Equivalent Circulating Density
EIA	: Environmental Impact Assessment
EIS	: Environmental Impact Statement
ELL	: Environmental license law



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EMP	: Environmental Management Plan
EMW	: Equivalent Mud Weight
ERP	: Emergency Response Plan
HS&E	: Health, Safety & Environment
IADC	: International Association of Drilling Contractors
IBA	: Important Bird Area
IFC	: International Finance Cooperation
IPM	: Integrated Project Management
IUCN	: International Union for Conservation of Nature
IWCF	: International Well Control Forum
JV	: Joint Venture
KCL	: Potassium Chloride
LOT	: Leak Off Test
LSM	: Linear Swelling Meter
MoAF	: Ministry of Agriculture and Fisheries
MoJ	: Ministry of Justice
MPRM	: Ministro do Petróleo e Recursos Minerais
MW	: Maximum Working
PD	: Project Document
PDC	: Polycrystalline Diamond Compact
PDM	: Positive Displacement Motor
PGA	: Plano Gestão Ambiental
pH	: Potential Hydrogen
PPE	: Personal Protective Equipment
PSC	: Production Sharing Contract
ROP	: rate of Penetration
SAS	: Serviços de Água e Saneamento
SCI	: Statement of Community Involvement
SEO	: Statement of Environmental Objective
SoW	: scope of Work



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TD	: Total Depth
TG	: Timor Gap
TL	: Timor Leste
ToC	: Top of Cement
TOC	: Total Organic Carbon
ToR	: Term of Reference
TR	: Timor Resources
WB	: World Bank
WOC	: Wait on Cement
ZEESM	: Zona Especial de Economia Social de Mercado





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## Non-Technical Summary - English

Timor Resources proposes to drill for Oil in up to five locations in the Covalima District. The Oil Wells will be located in a minimum of three of the areas as provided in Table 1 of this report:

1. “Karau Prospect” – Suco Matai, Debos, Camanasa, Labarai
2. “Kumbili Prospect” – Suco Camanasa
3. “Laisapi Prospect” – Suco Raimea, Beko li
4. “Lafaek Prospect” – Suco Labarai
5. “Raiketan Prospect” – Suco Belekasac, Labarai, Holbelis

Each Well will require a site of 1 Hectare during the drilling operation, for a period of approximately 2 months. If Oil is discovered a smaller area around the hole will be required for a longer term.

Access roads will be constructed to the Well Site. Additional work may include building of water storage and supply facilities, laying of pipelines and other associated infrastructure.

The drilling will be conducted on a 24-hour, 7 day a week basis. Driving and non-essential operations will be restricted to daylight hours as much as possible. Dust, Fumes, Noise and Light will be monitored and kept within the allowable limits as set by ANPM.

Timor Resources will minimise the impact on the neighbouring communities and environment as much as is reasonably possible. Any concerns that are raised by the public will be considered and a mutually acceptable agreement will be sought.

Timor Resources will employ persons from the local area as much as possible, providing that they have appropriate qualifications for the position and are medically fit for the work.



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## Non-Technical Summary - Tetum

Timor Resources propoen atu fura mina iha fatin to'o lima iha Munisipiu/Distritu Covalima. Mina matan sira ne'e sei lokaliza minimu iha fatin/area tolu hanesan fornese iha Tabela 1 iha relatorio ne'e:

“Karau Prospect” – Suco Matai, Debos, Camanasa, Labarai

“Kumbili Prospect” – Suco Camanasa

“Laisapi Prospect” – Suco Raimea, Beko li

“Lafaek Prospect” – Suco Labarai

“Raiketan Prospect” – Suco Belekasac, Labarai, Holbelis

Kada mina matan ida sei presija fatin ho luan hektar ida durante halao perfurasaun, ba tempu mais ou menus fulan 2. Se mina hetan iha area nebe kiik halaeu koak sei presija ba tempu naruk.

Asesu Estrada/dalan sei konstroe ba fatin mina matan. Servisu adisional bele inklui hari'i tanki tau be'e no facilidade forneseimentu, tau pipa sira no facilidade infraestrutura seluk ne'ebe presija.

Perfurasaun sei hala'o iha oras 24 nia laran, loron 7 semana ida nia laran. Movimentu kareta no servisu/operasaun la importante sira sei limita de'it durante tempu loron-matan nian wainhira posivel]. Rai rahun, suar, barullu no ahi lakan sei monitoriza no sei lao tuir limitasaun ne'ebe autoriza ona hanesan hatur iha ANPM nia regulamentu.

Timor Resources sei minimiza impaktu ba comunidade viziñu sira no ambiente wainhira de'it posivel tuir padraun industria nian. Preokupasaun ruma ne'ebe levanta husi públiku sei konsidera no akordu mutual ne'ebe aseitavel sei hare'e no halao tuir.

Timor Resource sei uza pesoal sira husi area lokal ho numeru barak wainhira posivel, naran katak sira iha kualifikasaun ne'ebe apropiadu ba pozisaun ne'e no saude diak hodi servisu.



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## 1 INTRODUCTION

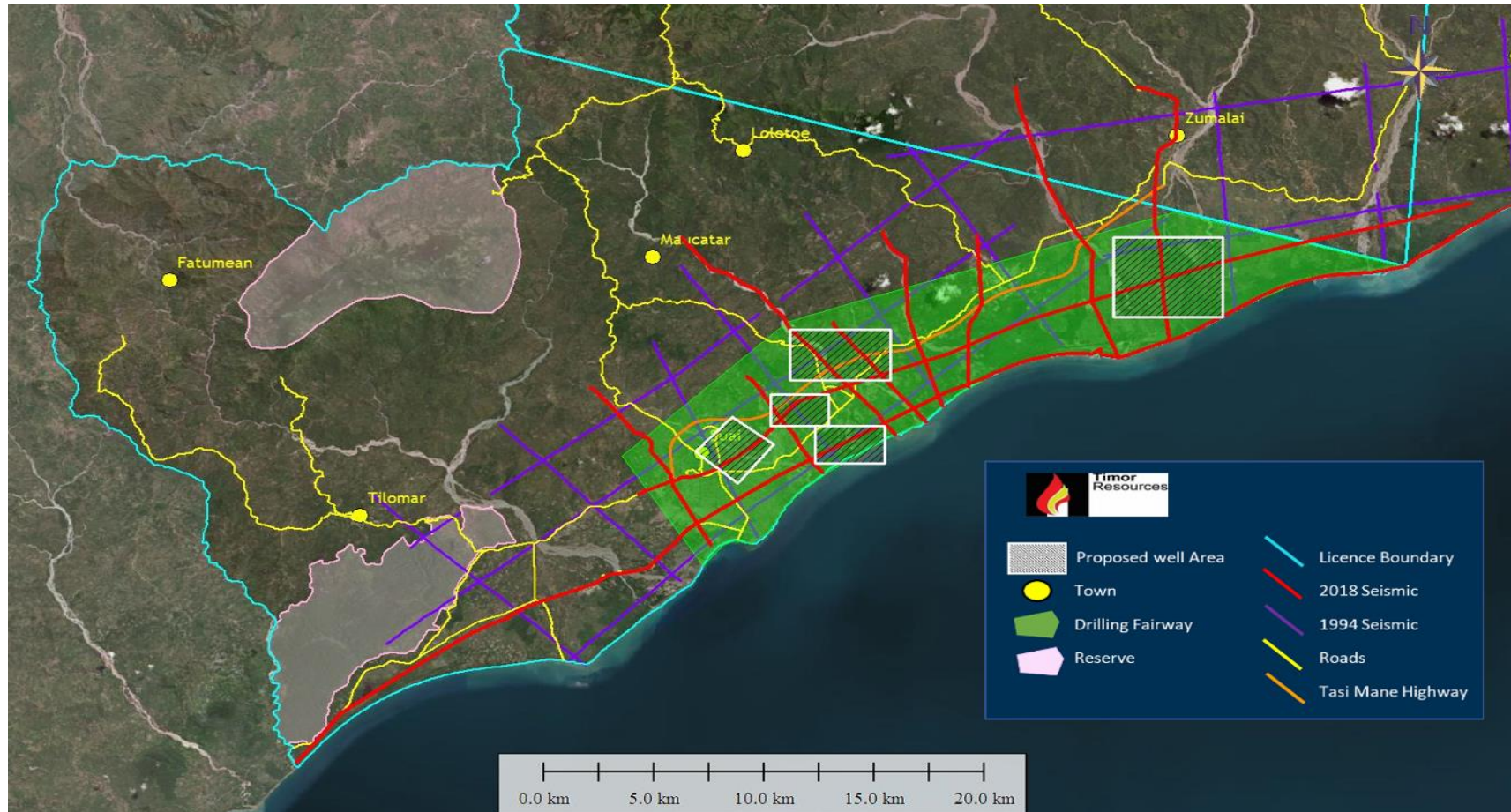
Timor Resources (TR) is a privately-owned Australian oil and gas corporation that is in joint venture with Timor Gap (TG), a national oil company of the Timor-Leste (TL) Government. On 7 April 2017, TR engaged an agreement with the Timor Leste Government (Onshore PSC TL OT-17-08) permitting the company, with its partners, to begin the process of exploration, development, and exploitation of petroleum resources in the contract area, identified as Block A. The Ministry desires to promote Petroleum Operations in the Contract Area and the Contractor requests to join and assist the Ministry in doing so in the Contract Area. Exploration, development, and exploitation of petroleum resources in the contract area is encouraged and is based on data collected from 1969 to present day.

Timor Resources current campaign seeks to conduct “exploration drilling” near Camenasa, Labarai, Debos, Matai, Belecacasac, Tashilin, and Raimea directorially under Suai, Zumalai and Maucatar Post-Administrative (Figure 1).

Based on article 5 (defining project scope) chapter III environmental assessment information phase under Decree Law No.5/2011 Environmental Licensing and ANPM decision on category for drilling project in PSC TL-OT-17-08 ANPM/HSE/S/18/228 dated 27th December 2018, the proposed Term of Reference (ToR) for the project that falls in Category A is a requirement to set complementary legislation. The scoping phase shall establish the framework of activities and impacts that will require further investigation during the environmental impact assessment study for Category A proposed projects.

For drilling activities taking place in PSC TL-OT-17-08 Block A, the following list represents the scoping phases TR expects to address prior to, during and after project execution (post project monitoring programs). With “perpetual improvement” in view and formal Risk Assessment pending, the list below may not be all inclusive as other environmental aspects, impacts and issues may be realized and require time focus and/or action at phase of the project.





**Figure 1: Map of Proposed Project Location and Well Area PSC TL-OT-17-08**



All technical assumptions, conceptual well planning, fluid and drilling programs referenced in this ToR cannot be presented as finalized aspects of the projects. They are all subject to review and adjustment immediately prior / during final DWOP (Drill Well on Paper), which will be the most critical technical gate process of the project. The DWOP requires participation, input and feedback from the major proponent / contractors in the project such as the drilling contractor and primary third-party services (Drilling & Measurement, Mud Logging, Drilling Fluids, Cementing, Open Hole Logging, etc.) whose specific equipment and service processes need to be factored into final well plans and drilling programs. The selected Rig Contractor will also be a major proponent of the TR led Risk Assessment processes:

- i. Define the study area within PSC TL-OT-17-08 Block A
- ii. Define the area that *may be affected* by the project;
- iii. Define the project phases, including and as relevant; *pre-construction, construction, operation, and post operation phases*;
- iv. Provide an indication of what *baseline data and information* will be required;
- v. Identify the *policies and legislation*, including that from other line ministries, with which the proposed project must comply;
- vi. Identify any best available techniques and good environmental practices and international standards with which the proposed project must comply;
- vii. Identify the likely key environmental impacts, including *biological, physical, social, and economic impacts, that require detailed assessment*;
- viii. Identify the *methodologies* that will be used for the impact assessments;
- ix. Identify the issues to be focused upon when discussing *mitigation and abatement measures*.

The key assumptions for the design are:

- The Exploration Wells will be drilled in line with “Industry Standard” margins of safety.
- Up to five exploration wells will be drilled with a land drilling rig with specifications required to safely reach the prognosed targets. In the event of success, appraisal drilling would take place in the vicinity of the discovery.
- The 2019 Estimated Tops for the proposed location areas are presented in Table 1 below.



Well	Karau	Kumbili	Laisapi	Lafaek	Raiketan
Prospect	Top Pinchout	Upper/Lower Viqueque	Middle Viqueque	Mesozoic	Lower Allochthon
Trajectory	Vertical	Vertical	Vertical	Vertical	Vertical
Seismic Line	Fafulu 12	Fafulu 14	Fafulu 17	SBT 07	Fafulu 07
Easting and Northing (Surface) of the proposed area	747419 8970183 749081 8972000 751000 8970557 749373 8968529	752868 8971525 756000 8971525 756000 8969580 752868 8969580	766413 8981485 771345 8981485 771345 8977259 766413 8977259	750850 8973183 753476 8973183 753476 8971525 750850 8971525	751734 8976611 756295 8976611 756295 8973939 751734 8973939
Latitude and Longitude (Surface) of the proposed area	9.309139°S 125.252415°E 9.292621°S 125.267432°E 9.305551°S 125.284976°E 9.323975°S 125.270291°E	9.296694°S 125.301915°E 9.296509°S 125.330410°E 9.314087°S 125.330526°E 9.314272°S 125.302030°E	9.205871°S 125.424527°E 9.205566°S 125.469383°E 9.243755°S 125.469649°E 9.244061°S 125.424788°E	9.281827°S 125.283457°E 9.281674°S 125.307348°E 9.296658°S 125.307446°E 9.296812°S 125.283554°E	9.250795°S 125.291299°E 9.250527°S 125.332790°E 9.274675°S 125.332949°E 9.274943°S 125.291455°E
GL (mSS)	-33	-16	-16	-54	-92
<b>Formation Tops</b>					
Shallow Unconformity	269	220	282	258	0
Upper Viqueque	520	417	623	NP	NP
Middle Viqueque	NP	NP	855	NP	NP
Lower Viqueque	770	649	1260	NP	NP
Upper Allochthon	NP	NP	NP	820	NP
Lower Allochthon	NP	1045	NP	1397	1355
Deep Decollement	NP	NP	NP	2364	NP
TD (mMDRT)	1087	1470	1770	2908	1946
TD (ft)	3566	4823	5807	9541	6385

**Table 1: 2019 Estimated Wells tops**





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- Pore and fracture pressures, chemical composition of produced fluids and Thermal Gradients for the five exploration wells will not substantially deviate from the offset well data provided by Timor Resources.
  - A requirement is to minimise expenditure on the Wells on a dry hole basis whilst retaining the option to case the Well for completion in the success case.
  - A standard evaluation Programme to identify oil pay and reserve potential is planned. If any Well is deemed to be potentially commercial an accelerated transition to appraisal is anticipated.



## 2 BACKGROUND INFORMATION

Onshore PSC TL-OT-17-08 Block A is an area that covers of approximately 1.000km<sup>2</sup>, extending along the coast for approximately 55 km and up to 30 km inland was identified as an area of commencement the process exploration, development and exploitation of petroleum resources under contract between Timor Resources and TL Government officially signed on 7th April 2017.

Timor Resources will conduct exploration drilling campaign is naturally, to discover a commercial volume of oil in order with complacency to Environmental, Safety, Health and Technical objectives based on a collective interpretation of new and existing surface geology and analyses, reprocessed 1994 2D seismic (Velseis Pty Ltd 2107, Geomage 2018), original 1969-70 2D seismic, core holes and oil and gas exploration wells.

This project was decided to entitle a Category A for drilling project Licence under Decree Law No.5/2011. Environmental A categories were granted for Onshore PSC TL-OT-17-08 Block A with a reference letter ANPM/HSE/S/18/228 on December 27th, 2018. As per Autoridade Nacional do Petróleo e Minerais (ANPM) opinion result based on Annex I of the Decree-Law No.5/2011 Environmental Licensing, Timor Resources were required to follow:

- Article 5.4 (g) of Decree Law No.5/2011 – Submission of Term of Reference (ToR).
- Article 9.1(h) of Decree Law No.5/2011 – Submission of EIS including its non-technical summary, and
- Article 9.1(h) of Decree Law No.5/2011 – Submission of EMP.

Timor Resources and its partner are striving to achieve a profitable volume of oil as part of visible contribution to government of Timor Leste through petroleum exploration and development, for the benefit of Timor Leste people.





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### 3 DETAIL OF THE PROPONENT AND CONSULTANT

#### 3.1 Detail of Proponents

Operator : TIMOR RESOURCES

Address : Suite #303, Level 3, CBD 3, Timor Plaza  
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#### 3.2 Details of the Consultants and Specialists

Timor Resources as the proponent – in this case the selected Operator - will appoint the consultants, who will prepare the EIA and the Environmental Management Plan (EMP) and provide the details upon the commencement of the EIA.



## 4 LEGAL REQUIREMENTS

Government licensing (or approval) of the Drilling Campaign is required under Timor-Leste Decree-Law 5/2011 Environmental Licensing prior to the commencement of construction. In accordance with Decree-Law 5/2011, Drilling Campaign by Timor Resources is classified as a Category A project as it may have significant environmental impacts, and as such it is subject to the preparation of an EIA and an EMP.

The EIA required under national law is equivalent to an Environmental and Social Impact Assessment (ESIA) required for IFC Category A projects. This ToR has been prepared to meet the GoTL requirements and IFC Performance Standards, to guide the preparation of the EIA in accordance with the project approval conditions. The EIA will be prepared by the Block A Operator, deemed to be the Project “Proponent”.

The EIA shall identify and assess the environmental and social risks and impacts of the Drilling Campaign, and design and incorporate appropriate impact avoidance and mitigation measures into Project design, construction and operation. This shall be done in accordance with:

- 1) National legislation and regulations;
- 2) IFC Performance Standards (PS);
- 3) WBG Environmental, Health and Safety (EHS) Guidelines (WBG Guidelines); and
- 4) other relevant best practices (BPs).

The EIA shall be prepared using suitably qualified and experienced environmental and social specialists. The level of detail provided in the EIA shall be commensurate with the Project’s environmental and social risks and impacts. The EIA shall assess the likely impacts of Drilling Campaign construction and operation and plan appropriate impact avoidance and mitigation measures. The EIA will be prepared at the same time as the detailed design of the Drilling is prepared, with close collaboration occurring between the EIA team and Drilling design team to optimize the design.

### 4.1 Environmental Assessment and Approval Process

Regulatory approval of development projects is undertaken by the ANPM under Decree-Law 5/2011 Environmental Licensing that defines the environmental licensing system for public and private projects that are likely to produce environmental and social impacts. The licensing system sets out the process, procedures, roles and responsibilities of the Project Proponent. The Project ‘proponent’ is defined as “a person, including a legal person, both public and private, who requires a license to carry out a project” in the Decree. The Block proponent will be the private sector entity awarded the concession by GoTL to design, build and operate the Block.



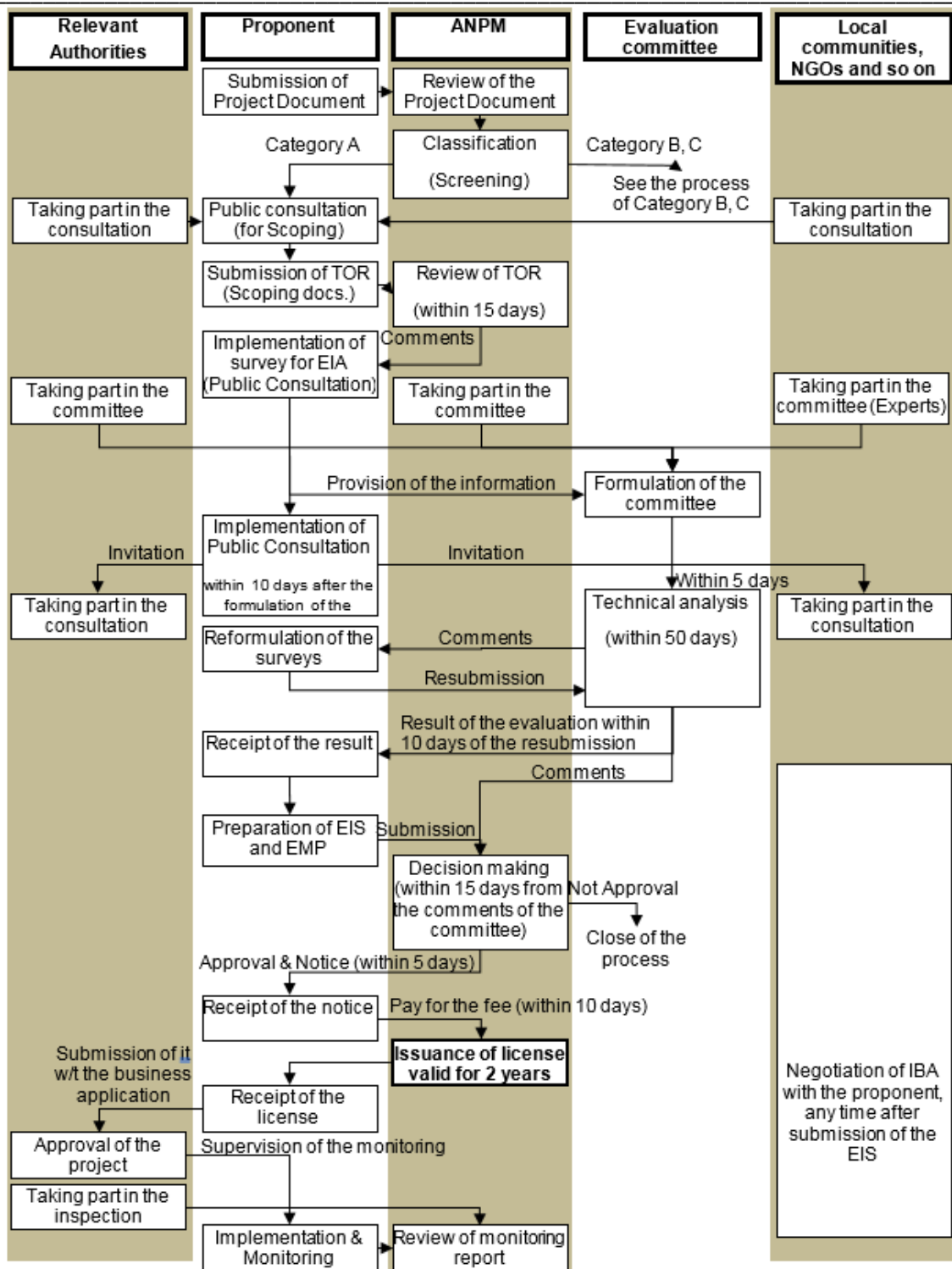
The EIA process as shown in Figure 2 commences when the project proponent prepares a Project Document (PD) and submits this to ANPM. The PD identifies the proponent, describes the project, outlines the major likely impacts, provides layout drawings and site maps, and provides copies of any permits or government support already obtained. This has been completed by the ANPM as of October 30, 2018.

In accordance with Decree-Law 5/2011, Drilling Campaign by Timor Resources PSC TL-OT-17-08 is classified as a Category A development as it has “the potential to cause significant adverse impacts”, and therefore requires a detailed EIA. For Category A projects the proponent must prepare a Scoping Report and Draft ToR for the EIA for review by GoTL. GoTL has a maximum of 10 Business Days to review the ToR and provide comments to the proponent. The Scoping Study would be completed by September 2019, and the initial version of this document is the draft ToR.

The proponent – in this case the selected Operator of The Block A – then prepares the Draft EIA in compliance with the approved ToR, incorporating an Environmental Management Plan (EMP), and submits this to ANPM for assessment. ANPM establishes an Evaluation Committee consisting of representatives of relevant agencies and institutions to review the Draft EIA, and the report is made available for public review. The maximum Draft EIA review period, including technical review and consultation, is 50 days.

The Final EIA is prepared by the proponent taking into account the comments received from the Evaluation Committee’s technical review and public consultation, then submitted to ANPM for approval. If the project is approved, an Environmental Permit is issued and may contain conditions of consent, including the requirement to implement the mitigation and monitoring measures set out in the EIA, EMP and other Project management plans.





**Figure 2: EIA process for Category A**

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## **4.2 Applicable Guidelines, Regulation, Standard Quality Control of HSE and International Good Practices**

The Table below summarizes the Timor Leste applicable law, international agreement, guideline, and applicable standard, good practices on this proposed area including:



TITLE	OBJECTIVE TO THE PROJECT	RELEVANCE TO THE PROJECT
Decree Law No.5/2011 Environmental Licencing	<ul style="list-style-type: none"> <li>• The procedure for directing the environmental assessment, the review of application for environmental license, issuance and renewal of license.</li> <li>• Categorization of the project category according to severity of the environmental impacts.</li> <li>• Procedures and information requirement for Category A project</li> <li>• Organization and composition of the review committee and its duties and responsibilities.</li> <li>• Specific provisions for public consultation and the protection of the traditional customs and cultural practices.</li> <li>• The issuance of the decision by the Environment Authority on the review of the application and the rights of the project owner to appeal the decision.</li> <li>• Classifications of environmental license, its duration and renewal; change of conditions of the license.</li> <li>• The requirement for projects issued environmental license prior to the enactment of this decree law to register with the Environmental Authority.</li> <li>• The requirement for environmental monitoring, reporting obligations and duties of the license holder.</li> </ul>	Provides the Environmental Licensing procedure to regulate actions to encourage and protect the nature as an important instrument for sustainable development of economy of Timor-Leste
Decree Law No.5/2011 Environmental Licensing Article 4 (1) a	<ul style="list-style-type: none"> <li>• To understand definition of the categories and type of Environmental Assessment Procedure.</li> <li>• To understand the classification of the project Category A according to Annex I.</li> </ul>	Environmental assessment and licensing procedure for category A for drilling project subject to the AIA that is based on the analysis of the impact on the EMP.
Decree Law No.5/2011 Environmental Licensing	<ul style="list-style-type: none"> <li>• To understand the timeframe of duration and renewal of Environmental License.</li> </ul>	<ul style="list-style-type: none"> <li>• Supply the information timeframe of the Environmental License of Category A.</li> </ul>



Article 24 (1 and 2)		<ul style="list-style-type: none"> <li>• Explain the possibility of the renewal process.</li> </ul>
Ministerial Diploma No.46/2017  Chapter III Article 6 Scope of ToR	<ul style="list-style-type: none"> <li>• To comprehend the scope definition phase should establish the framework activities and impacts that require more in depth during the impact assessment study for the proposed Category A projects.</li> <li>• To guide a project proponent for identifying the impacts likely ecological risks and project risk including impacts on the conditions social, health and subsistence.</li> </ul>	The project proponent requires to submit a ToR based as part of legal requirement for the proposed Category A project.
Ministerial Diploma No.46/2017 Annex III Scope of ToR	<ul style="list-style-type: none"> <li>• To direct and establish a TOR of the proposed projects category A detailed following template in Annex III.</li> </ul>	Provide template of establishment ToR for the proposed Category A project.
Decree Law No. 5/2016 National System of Protected Areas Article 22	<ul style="list-style-type: none"> <li>• This article briefs the proponent of the project to understand typical of natural reserve in order with Timor Leste law and regulation. The nature reserve is an area with special characteristics ecological, scientific, geological or geomorphological interest, with local Lulik or destined for to protect specific species or habitats.</li> <li>• Decree Law 5/2016 explains to the project proponent for a classification of a natural reserve is intended to protect the interests referred by preserving its natural condition, maintaining and recovering species and habitats and controlling the human impact on them.</li> </ul>	PSC TL-OT-17-08 Block A Drilling Project
Decree Law No. 5/2016		



<p>National System of Protected Areas</p> <p>Annex I – List of Timor Leste Protected Area</p>	<p>This decree laws describes administrative location of protected areas within terrestrial Timor Leste, along with estimated species per Hectare. The project proponent is fully aware with the location which officially categorized as natural reserve and protected area (e.g.Tilomar reserve).</p>	<p>PSC TL-OT-17-08 Block A Drilling Project will not encroach onto the Tilomar reserve area</p>
<p>Decree Law Onshore Petroleum Operations in Timor Leste</p> <p>Article 6 – Operating Standards</p>	<p>TR shall comply with Article 6 (Operating Standards) by selecting the appropriate operating standards, references and guidance that best represent "Good Oilfield Practice" for HSE Management. This will include reference to the list provided in sub-article 6.4 ("Internationally Recognized Organizations") and other Good Oilfield Practices such as those within the IADC Drilling Manual, specifically Chapters K Well Control, Chapter O Drilling Fluids and other sections that impact HSE Management.</p> <p>TR intends to utilize the IADC HSE Case guidelines for compiling the project Safety Case so reference to the IADC Drilling Manual and the IADC HSE Guidelines will provide continuity in International Good Oilfield Practice.</p>	<p><i>Decree Law Onshore Petroleum Operations in Timor Leste is the primary compliance regulation for drilling activities onshore</i></p>
<p><b>IADC Health, Safety and Environment Case Guideline</b></p>	<ul style="list-style-type: none"> <li>• Provide a HSE Case methodology specifically that addresses the requirements and scope of operation related to business activities and that is aligned with or meets international standards.</li> <li>• Assist National Regulator/stakeholders in reviewing Drilling Contractor HSE Case enabling Land Drilling Unit/rigs.</li> </ul>	<p>Provide a detailed HSE guideline structure and contents from:</p> <ul style="list-style-type: none"> <li>- Part I HSE Case Introduction</li> <li>- Part II Drilling Contractor Management System</li> <li>- Part III Rig Description</li> <li>- Part IV Risk Management</li> </ul>





	<ul style="list-style-type: none"> <li>This guideline was developed and recommended as a demonstration of good industry practice for drilling program and contractor thru HSE case.</li> </ul>	<ul style="list-style-type: none"> <li>- Part V Emergency Response</li> <li>- Part VI Performance Monitoring</li> </ul>
WHO 2008 Guideline for Drinking-water Quality	To consider drinking water safety including minimum procedures and guideline values and how these are intended to use	<ul style="list-style-type: none"> <li>• Community ground water</li> <li>• Community pump water</li> <li>• Surface Water assessment</li> </ul>

**Table 2: Applicable Timor Leste Law, Guidelines, Regulations & Standards (TR HSE,2018)**



## 5 STUDY AREA

The proposed study area as per below identification and activities concluded that there is no cross-border environmental impact which is the practices are the environmental bridge between headquarters and foreign affiliates.

### 5.1 Geographical Areas

The proposed drilling programme is designed to test three play types within the area of Block A (PSC TL-OT-17-08) which are:

- a. The Pliocene-Pleistocene age Viqueque Formation, syn-orogenic Basin.
- b. Lower Allochthon (Permian-Eocene)
- c. The Triassic-Jurassic age Babulu/Aitutu and Wai-Luli Formations beneath a regional metamorphic overthrust.

The three play types to be tested within the five wells to be drilled are: Karau, Kumbili (have two targets, one is primary and the other one is secondary target), Laisapi, Lafaek and Raiketan. The wells proposed are located on the coastal fringe approximately between Suai in the west and Zumalai in the East, up to 7km inland from the Coastline. The drilling location will be subjected to further geological investigation, assessment of the ground conditions, infrastructure, and environment, proximity to habitation and agriculture and community and government agreements.

In addition to the locations proposed, a drilling “*Play Fairway*” is required to maintain the flexibility of the drilling campaign to take into account the Well results and optimise the chance of success during the course of the operation. For this reason, the Project Document sets out a number of areas for which drilling approval is sought



The proposed drilling operations for PSC TL OT-17-08 will carry out within three posts administrative, namely: Suai, Maucatar, and Zumalai. Within these PAs, seven sucos are identified as proposed drilling area such as: Debos, Labarai, Camanasa, Matai, Belecasac, Tashilin, and Raimea. Table below indicates the total population per Suco in the proposed drilling area:

No	Post Administrative - Sucos	Total Households	Population Size
<b>Post Administrative Suai</b>  <b>Total Population: 25,815</b> <b>Total Households: 4,790</b> <b>Female: 12,752</b> <b>Male: 13,063</b>			
1	Suco Camenaca	693 Households	Female:1,836 Male: 1,845
<b>Total Population</b>			<b>3,681</b>
2	Suco Labarai	578 Households	Female:1,593 Male: 1,682
<b>Total Population</b>			<b>3,275</b>
3	Suco Debos	1946 Households	Female:5,617 Male: 5,719
<b>Total Population</b>			<b>11,336</b>
<b>Post Administrative Maucatar</b>  <b>Total Population: 8,895</b> <b>Total Households: 1,651</b> <b>Female: 4,398</b> <b>Male: 4,497</b>			
1	Suco Matai	549 Households	Female:1,470 Male: 1,543
<b>Total Population</b>			<b>3,013</b>
2	Suco Belecasac	378 Households	Female:1,170 Male: 1,198

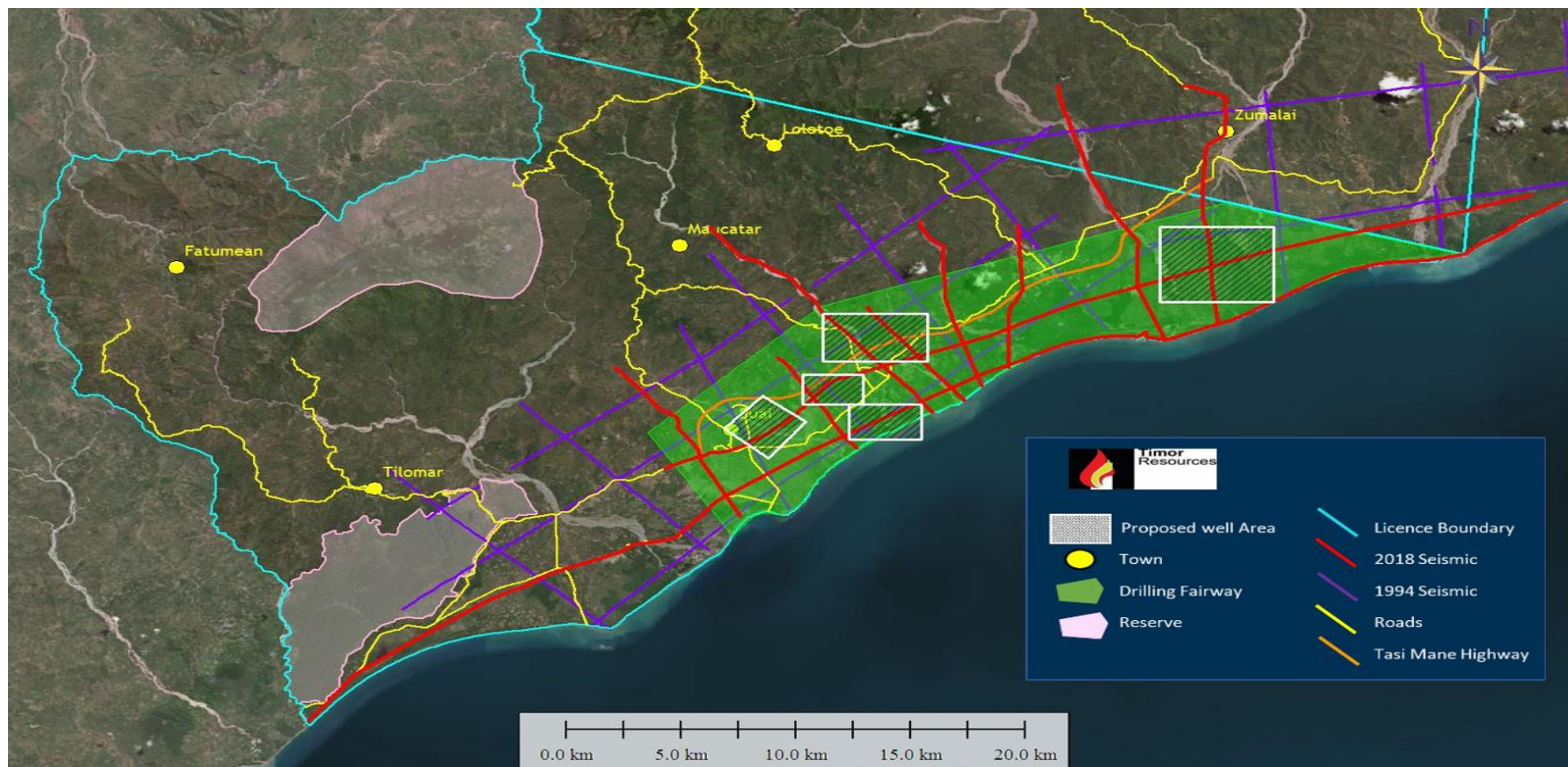


<b>Total Population</b>			<b>2,368</b>
<b>Post Administrative Zumalai</b>			<b>Total Population: 13,263</b> <b>Total Households: 2,419</b> <b>Female: 6,561</b> <b>Male: 6,702</b>
1	Suco Tashilin	422 Households	Female:1,084
			Male: 1,191
<b>Total Population</b>			<b>2,275</b>
2	Suco Raimea	672 Households	Female:1,764
			Male: 1,680
<b>Total Population</b>			<b>3,444</b>
<b>Total Population Estimation Along Proposed Drilling Area</b>			<b>5,238 Family</b> <b>29,392 Persons</b>

**Table 3: Population Size within Proposed Study Area (Covalima Census Delegation, 2018)**

Covalima municipality is situated in the South West corner of Timor-Leste. In the north Bobonaro Municipality is their neighbour, to the west they are connected to the Indonesian border, the southern boundary is the coastline of the Timor Sea and the eastern part adjoins Ainaro municipality.





**Figure 3: Administrative Layout Along Proposed Drilling Area**





The PSC TL-OT-17-08 Block A landscape is characterized by narrow coastal plains and lagoons, rugged hills, and a central mountain range, with vegetation ranging from dry grassland, savannah forests, and gullies, to dense rainforest (EcOz, 2017). The location of the proposed drilling within Block A identifies are flat to low relief. Examples of the physiography are included in Figure 4 below.

The project area along Debos, Labarai, Camanasa, Matai, Belecasac, Tashilin, and Raimea are broadly categorized into coastal plain. The former contains a mix of undeveloped and cultivated areas with large alluvial fans. Within the project areas, there are coastal alluvium and fluvial soils (EcOz, 2017), inland Mesozoic and Cainozoic clastic sediments and Uderts soils, and to a lesser extent, Mesozoic and Cainozoic Carbonates (EcOz, 2017). To the north of the project there are also areas of Permo-Triassic Carbonates, Udolls soils, and Usterts soils (EcOz, 2017).



**Figure 4: Aerial and Panorama Images within proposed drilling area (TR photo courtesy, 2017)**



## 5.2 Timeline

The EIA process is envisaged to take about 4 months, of which 2 months will be intensive data collection in the field as per Task 13 Collection of Baseline Data described below. The Stakeholder Engagement and Public Consultations will start prior to the field work and will last until the end of the EIA process. A detailed timeline will be provided by the consultant appointed by TR. Table 4 below provides an estimate of the times for each task.

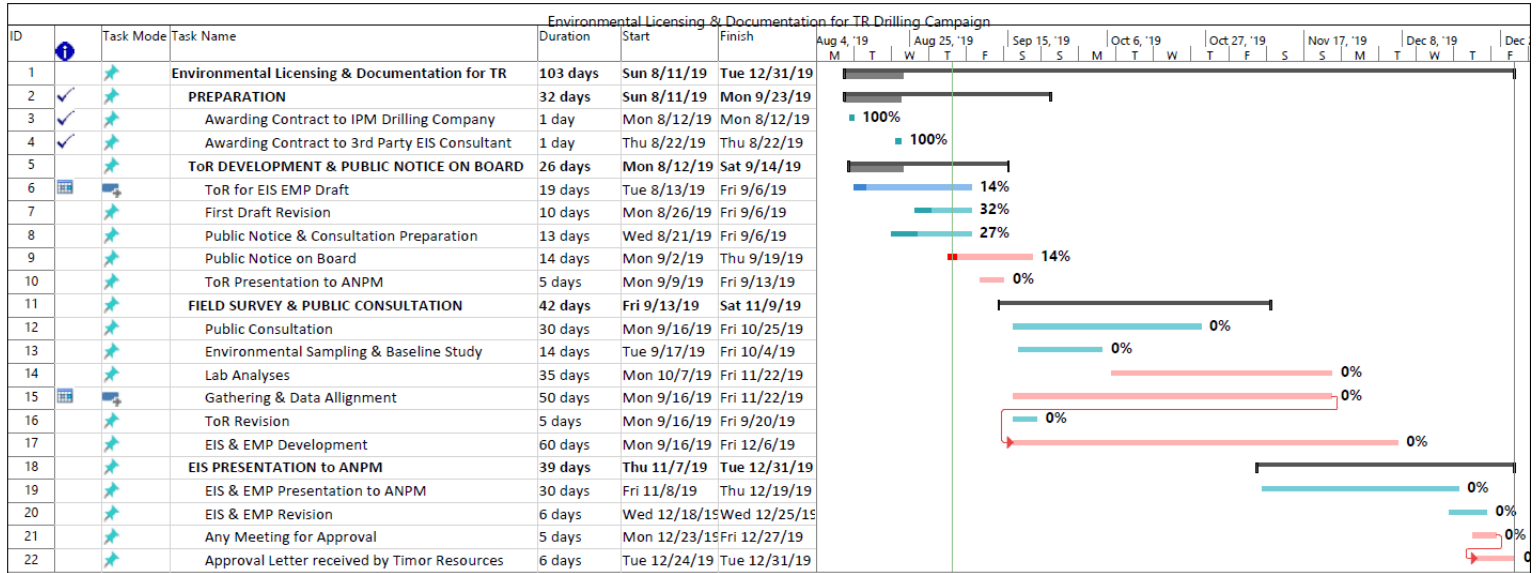


Table 4: Project Timeline





## 5.3 Maps of Proposed Drilling Locations

### 5.3.1 KARAU

Flat area, clay and silty, corn and green bean field, east side of the location full of teak wood. The community area is approximately 180 m from Karau Ulun river in the eastern. The river is dry seasonally.



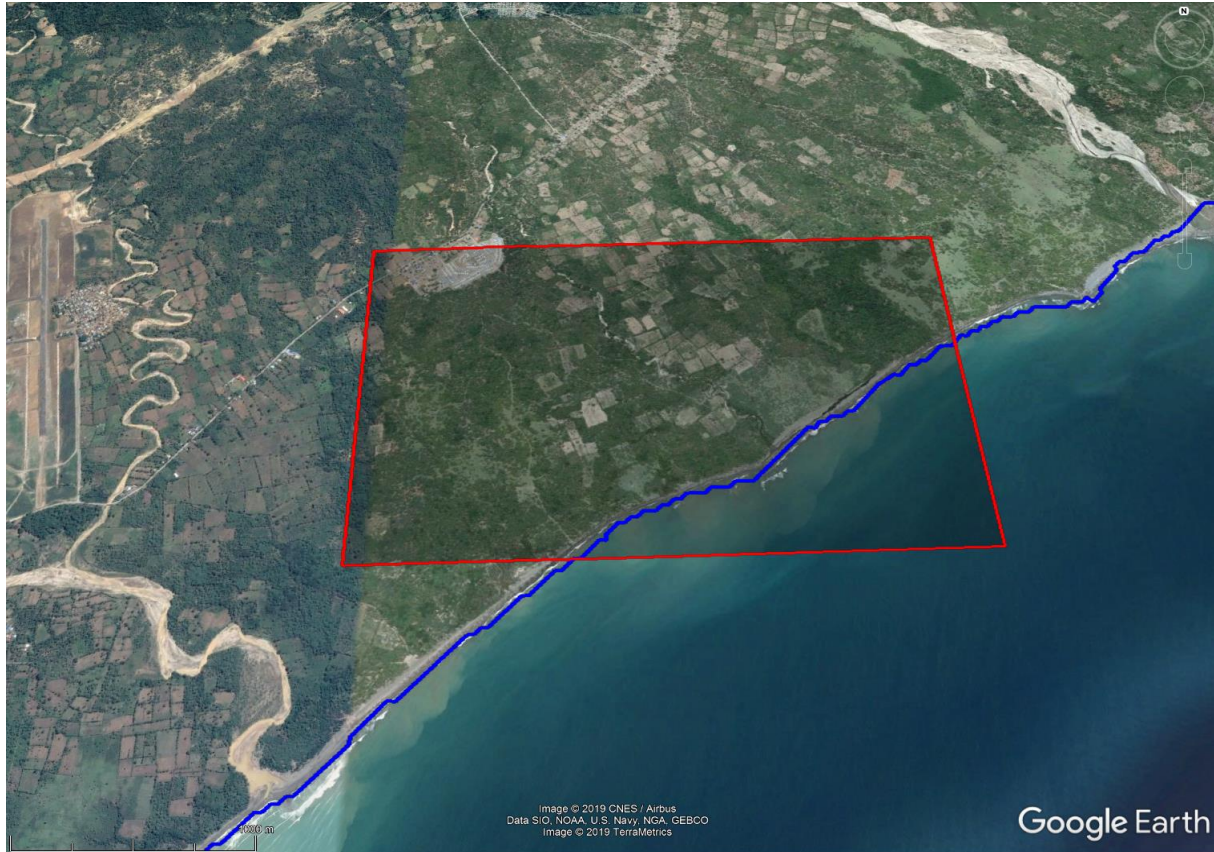
**Figure 5: Overall Layout of Karau location (Source:Google Earth)**





### 5.3.2 KUMBILI

Flat area, clay with silt, dominantly clay, sago trees, and occasionally teak wood. Around 619m west of Malilook

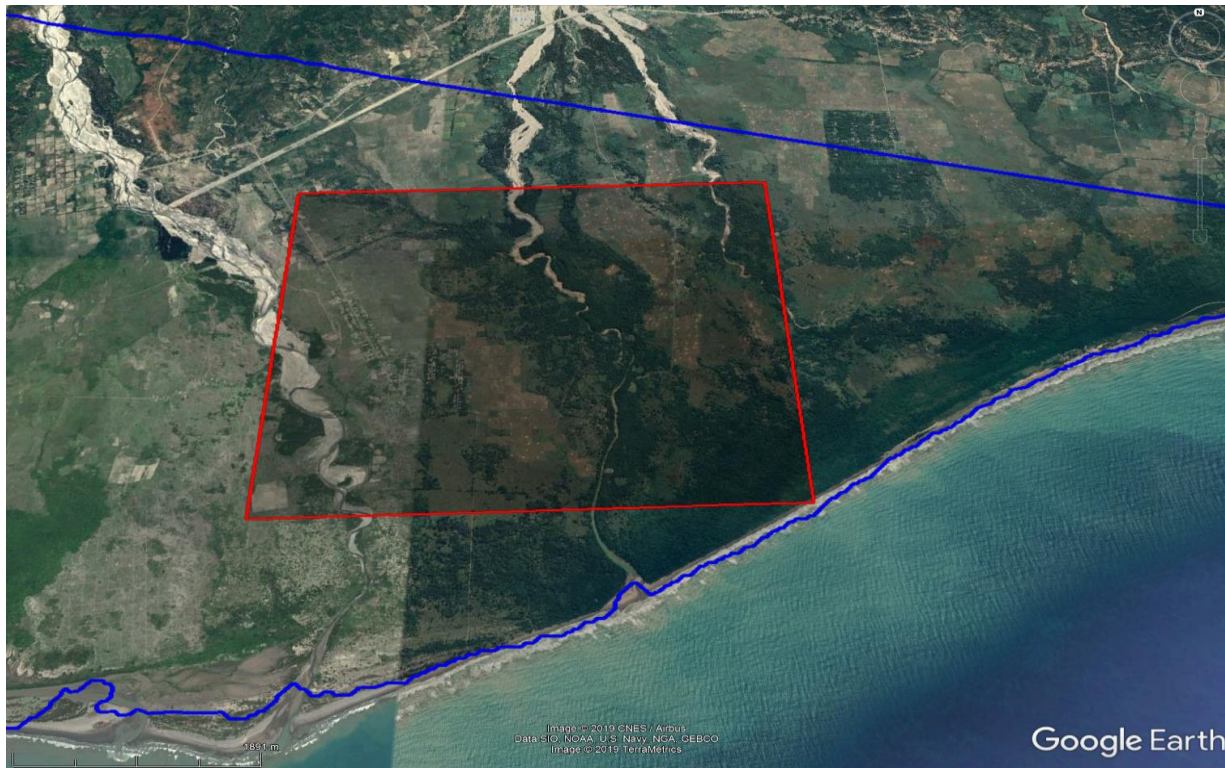


**Figure 6: Overall Layout of Kumbili location (Source:Google Earth)**



### 5.3.3 LAISAPI

Dominantly clay with sand, a few sago trees, flat area, in north of padi field.



**Figure 7: Overall Layout of Laisapi location (Source:Google Earth)**





#### 5.3.4 LAFAEK

Located on the hill slope but can be move down to flat area. Dominantly sandstone with gravels



**Figure 8: Overall Layout of Lafaek location (Source:Google Earth)**

#### 5.3.5 RAIKETAN

Located in the middle of the river and plan to move a few hundred meters to west part of the river as first option. Second option move to North West which flat and on the alluvial deposit. Both locations are on the riverbank.





**Figure 9: Overall Layout of Raiketan location (Source:Google Earth)**

## **5.4 Review of Previous Studies and Information**

Review PROJECT DOCUMENT FOR DRILLING ACTIVITY Block A, Re-Submission: 30 October 2018 - Timor Resources PSC TL-OT-17-08 prepared by Timor Resources Exploration Team-Timor Resources HSE & Local Content Department to identify and understand likely the engineering design for drilling activities.

### **5.4.1 Basis of Well Design (BOD)**

The aim of this Basis of Well Design is to supply several economical, alternative designs to be considered by Timor Resources. Information used in the development of this BoWD came from several sources, predominantly Timor Resources, DVH CWD document, Timor web-based historical drilling data etc. Each design section has been addressed and has been checked as far as feasible with the information at hand (at this time) for their technical integrity and viability. These alternative well designs are provided in as the most cost-effective order or concern. Costing for these designs will require approved market surveys based on SoW and a predefined project timeline (this report utilizes API and standard units – follow-on report will be metric units).



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#### **5.4.1.1 Operation and Pre-Drilling Operation**

According to the deepest well to be drilled, it is recommended to use minimum 400,000# static hook load land rig with 800hp tri-plex pumps x 2.

Pre-drilling operations should include:

- (1) Location soil boring survey.
- (2) Soil integrity evaluation of the location and access road land for construction purposes.
- (3) Road Surveys with road and bridge upgrade plan (as required).
- (4) Establish water supply (may include trucking, existing or new water wells, pumping from watercourse)
- (5) Well Site (including mini Camp) – Size requirement to be determined by rig footprint, ancillary equipment lay-out and local regulatory requirements
- (6) Cellar construction with recess for air pump.
- (7) Mud pits (sump)
- (8) Water storage pits, if required, lined

#### **5.4.1.2 Well Design**

It is proposed to drill up to 5 wells with a cumulative depth of approximately 9,000m

The proposed well(s) designs are based on geological data supplied and interpreted predominantly by Timor Resources and the Joint Venture partner. Pore pressure and fracture pressure predictions are based on offset well drilling information.

### **5.4.2 Well Program, Schematic Design and Casing Program**

#### **5.4.2.1 Design Principles and Foundation**

##### **(1) Casing Setting Depth Principle**

The first criteria of selecting casing setting depth is the overbalance pressure without fracturing shallow formations. Kick tolerance volume is also considered for determining the casing setting depth. The formation that has been cased, needs to withstand the operation of drilling, tripping in/out, and well control for the next holes section.





## (2) Safe Operation Principle

Well design will:

- Comply with regional laws, regulations, and industrial standards.
- Be designed to avoid drilling different formation pressures in same hole section.
- Be designed to have enough overbalance pressures to control well and to mitigate possible differential sticking mechanisms.
- Be designed to consider wellbore stability and/or weak/lost circulation formations.

## (3) Economic Principle

To deliver reduced drilling time and cost, optimise hole sizes and subsequent casing sizes. General standardisation of well design and where applicable should be considered for all wells to optimize cost. **Contingency plan** for using a liner hanger instead of additional casing is one of the options to reduce both tangibles cost and rig operating days.

### 5.4.3 Material Selection

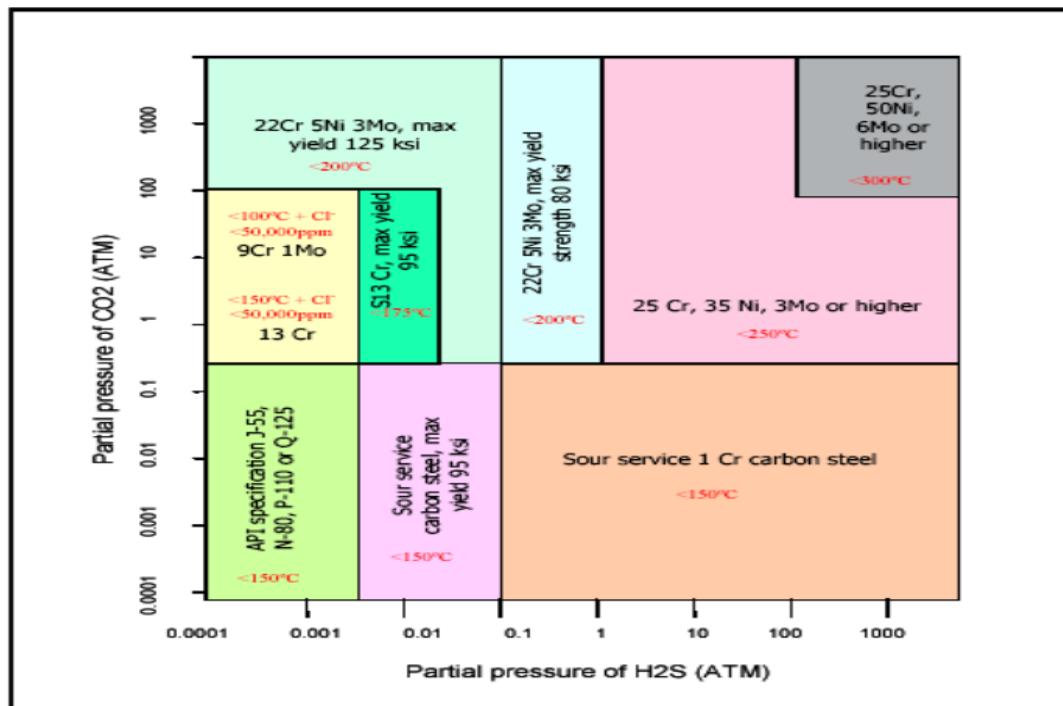


Figure 10: Material Selection Chart (CO2 and H2S)



#### 5.4.4 Well Design and Casing Selection

A 13-<sup>3</sup>/<sub>8</sub>" external/internal flush joint conductor casing should be set below the deepest aquifer at approximately 85m and will also cover the unconsolidated sand in the Suai formation.

Drill next section with 12-<sup>1</sup>/<sub>4</sub>" Bit. Start with a MW (mud weight) from <9.0ppg and increase gradually dependent on real time hole conditions. Limit the maximum MW based on the leak-off test and control the ECD (Equivalent Circulating Density) to avoid breakdown of the 13-<sup>3</sup>/<sub>8</sub>" shoe while drilling through the lower unconsolidated sand formations.

The 9-<sup>5</sup>/<sub>8</sub>" surface casing should be set as deep as possible to cover the remaining unconsolidated sand. Casing shoe should be set in a competent shale formation to provide enough shoe strength for the next hole section. The 9-<sup>5</sup>/<sub>8</sub>" casing shoe LOT will determine the maximum EMW, with the objective of attaining an acceptable kick tolerance volume (10bbbls is accepted industry minimum).



**Excessive** hydrostatic overbalance (high mud density) will result in skin damage to the reservoir formation (possibly restricting future recovery) or break-down of the formations at or below the previous casing shoe.

CONDITION	CRITERIA	SCENARIO
Burst	1.1	<ul style="list-style-type: none"> <li>Pressure test after WOC.</li> <li>Fracture at shoe with gas gradient above.</li> <li>Drill ahead.</li> <li>Gas over mud ratio.</li> </ul>
Collapse	1.125	<ul style="list-style-type: none"> <li>Full evacuation of gas.</li> <li>Loss return with mud drop.</li> <li>Drill ahead.</li> </ul>
Axial	1.6	<ul style="list-style-type: none"> <li>Running in hole – avg speed 1 ft/s.</li> <li>Overpull force 100,000 lbf.</li> <li>Post-cement static load.</li> <li>Green cement pressure test 1000 psi</li> <li>Service Loads.</li> </ul>
Triaxial	1.25	N/A

**Table 5: Ratio of Condition, Criteria and Scenario for Drilling (TR & DVH, 2018)**



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The 8-1/2" hole, where possible, will be drilled to well/section TD through the target reservoir formation. Offset wells show that the target reservoir could be over pressured if below a compacted shale formation. To avoid well flow, hydrostatic overbalance will need to be maintained during drilling and tripping operations. In a trouble-free success case a Casing or Liner will be run to TD and cemented to cover the reservoir zone. If the hole size at TD is reduced, due to additional intermediate casing strings, it may be necessary to set a temporary plug after evaluation.

#### **5.4.5 Casing Program**

The casing program will be determined by the geological interpretation at each location and be subject to the down hole conditions encountered during drilling. Two generic designs are provided in Section 6.1.6, these are expected to be similar to the final configuration.





## 5.4.6 Typical Well Diagram

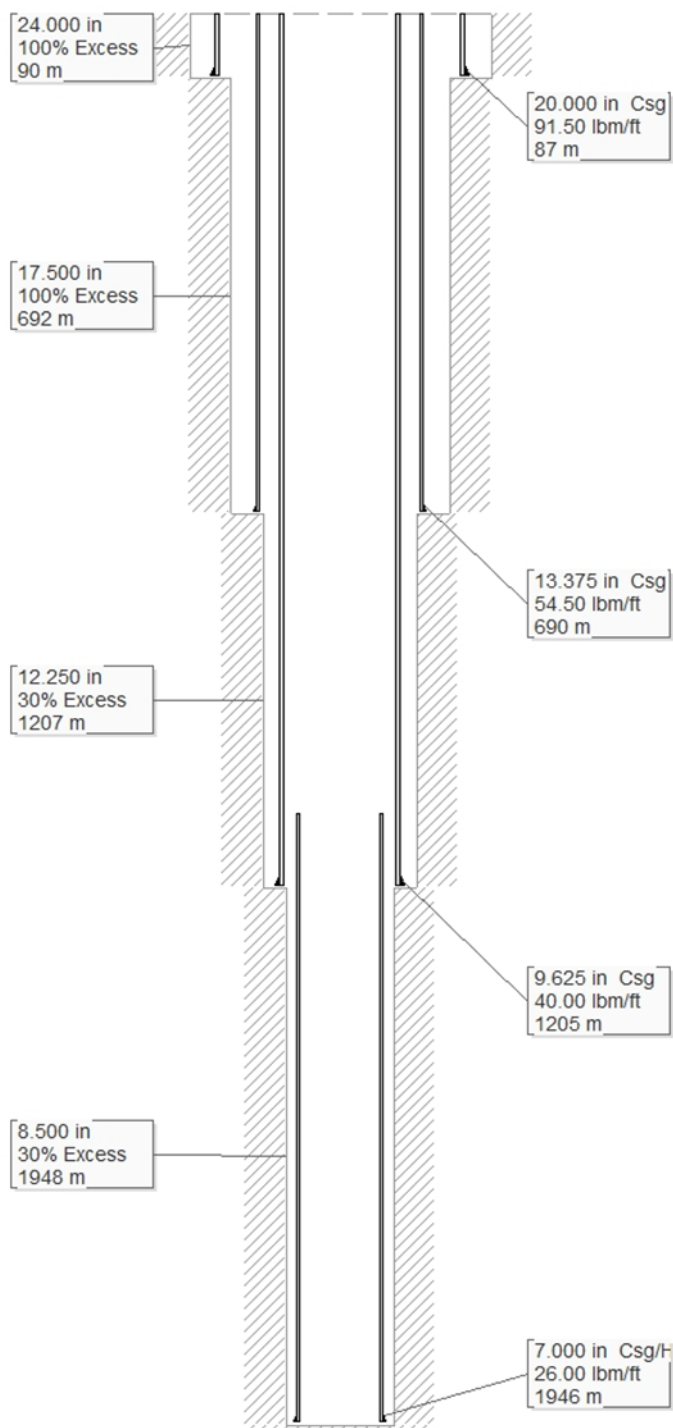
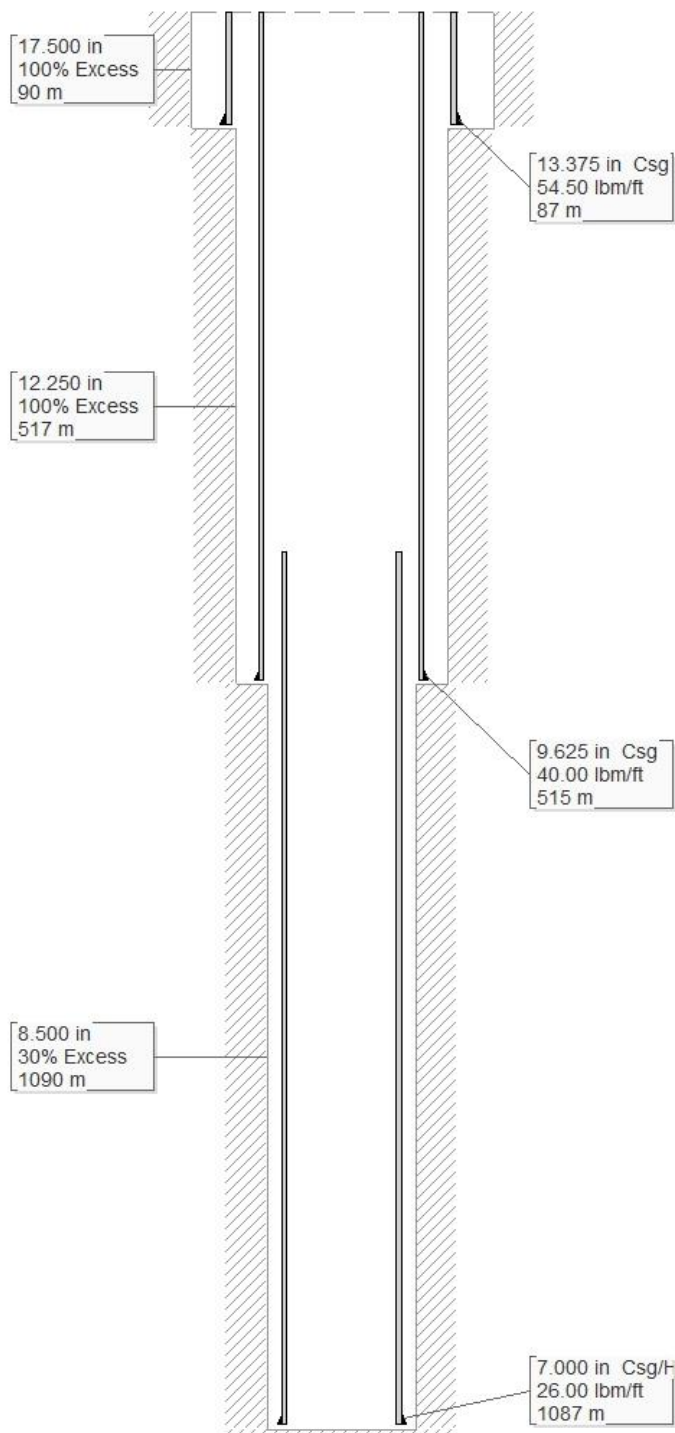


Figure 11: Typical Well Profile A (TR,2019)





**Figure 12: Typical Well Profile B (TR 2019)**



## 5.4.7 Drilling Operation Overview

### 5.4.7.1 13 3/8" Conductor Casing

The objective of the conductor casing is to case the hole through the ground water and shallow aquifer and the unconsolidated sand that is found in Suai formation. Based on research for aquifer depth at Suai, Timor Leste, the deepest aquifer was found at 82m.

Casing used for conductor driving should have external and internal flush joint and comply with API 5L, PSL-2.

To avoid loss circulation during cementing job, using light weight cement (10.5ppg tail and 12.5ppg lead) is recommended. Remedial cementing job (top job) is also required if there is no return to surface.

### 5.4.7.2 12 – 1/4" Hole Section

The objective of intermediate casing is to isolate the shallow formations before entering the target reservoir and to provide sufficient LOT and kick tolerance to safely reach next section TD.

Offset well shows that the shallow formations contain shale and/or clay. KCl will be added to the pre-hydrated Bentonite drilling fluid to prevent bit balling.



**KCL = Potassium chloride**, which is a metal halide salt composed of potassium and chlorine. It is odourless and has a white or colourless vitreous crystal appearance. The solid dissolves readily in water and its solutions have a salt-like taste.

Positive Displacement Motor (PDM) is recommended to be used in this hole section. With the same top drive rotation, BHA with Mud Motor will provide higher bit RPM, compared to conventional drilling with slick BHA. Higher ROP will result with Mud Motor BHA, which translates to reduction in drilling operational time. For Mud Motor BHA usage on the vertical wells, a 0.78° AKO bend angle setting on the motor is recommended, while for the directional wells, a 2°AKO bend angle setting on the motor is recommended.

The objectives for formation logging and directional surveys can be achieved by using electric line logging, gyro runs for directional kick-off and multi-shot surveys for direction. MWD Measurement While Drilling) may be used to collect near bit real-time inclination and GR data.



Increasing MW to equal ECD value prior to logging operation is necessary in order to maintain the hydrostatic overbalance. Wiper trips and circulation to ensure a clean hole condition will have a significant effect on the logging data and successful logging operation.

Casing grade is chosen to withstand the worst burst and collapse load scenario. Setting the casing seat as low as possible is required to provide an acceptable kick tolerance volume for well control operations.



**\*\* Training is very critical for drilling crews to react quickly in order to minimize the volume of influx into the well bore\*\***

Cementing is the most critical operation in the 9-5/8" surface hole section. Quality cementing operations will provide good isolation of well bore to surface. Good planning on the cementing sequence and cement slurry weight is required to prevent loss circulation during the cementing operations.

#### **5.4.7.3 8 – 1/2" Hole Section**

Ideally, the objective of the 8 1/2" hole section is to drill the reservoir formation and case same with 7" casing to surface. If two formations are drilled in one hole section, there is increased risk of loss circulation on the weaker formation. Therefore, reservoir wellbore strengthening material (Liquid Casing\* or similar type mud additive) should be considered as an addition to the drilling mud (pre-treated) for mitigation.

Reservoir evaluation is required with at least Neutron-Density log to confirm the hydrocarbon existence. Wireline logging will be used for preliminary evaluation. Further evaluation by open hole/cased hole Drill Stem Test (DST) will be advised dependent on the logging data.

The reservoir zone will be covered with 7" long string casing to surface or liner hanger, this is to comply with the oil and gas industry standard for well integrity.

Cementing slurry should cover all the open hole formation until surface. Option to have the TOC at least 500ft above the previous casing shoe can be considered to allow for a Sidetrack hole. With this option, Operator can cut and pull the 7" casing, set a Whipstock and drill a Sidetrack hole, if desired or required.

#### **5.4.7.4 Contingency Plan**

Contingency is planned for an additional 6" hole section, if the secondary target formation



cannot be drilled as one-hole section. The 6" hole section can be completed with 4-1/2" or 5" flush joint liner. The objective of using a liner hanger instead of long string casing is to minimize the wellhead sections, it's cost effective and complies with oil and gas industry standard practice. If the secondary target is proven to not be hydrocarbon bearing, the open hole can be directly plugged and permanently abandon.



**Excessive** hydrostatic overbalance (high mud density) will result in skin damage to the reservoir formation (possibly restricting future recovery) or break-down of the formations at or below the previous casing shoe.



## 6 SCOPE OF THE WORK TO BE CARRIED OUT DURING THE STUDY PHASE

EIA preparation shall involve the following minimum scope of work (but not necessarily be limited to these tasks), with many tasks to be undertaken concurrently. The structure of the EIA shall generally comply with the outline or format of ToR for Category A projects, but subject to change as required for the Project.

### 6.1 EIS Methodology

Scoping coverage process are conducted to define the study so that aspects of activities and environmental components are focused on the important things. The process of the coverage is conducted through 3 (three) stages as shown below:

- 1) Identification of potential impacts;
- 2) Evaluation of potential impacts;
- 3) Classification and priorities

Identifying Potential Impacts aims to determine all impacts that may arise as a result of interactions between components of the activity and environmental components. Identification of potential impacts obtained through consultation and discussion with experts, each team member of the EIS study, related government agencies, interested communities, study of similar activities, literature and also field observation results. Further identification of the impact is done using simple check list and then write down in the interaction matrix between activities with potential component/parameters will be impacted.

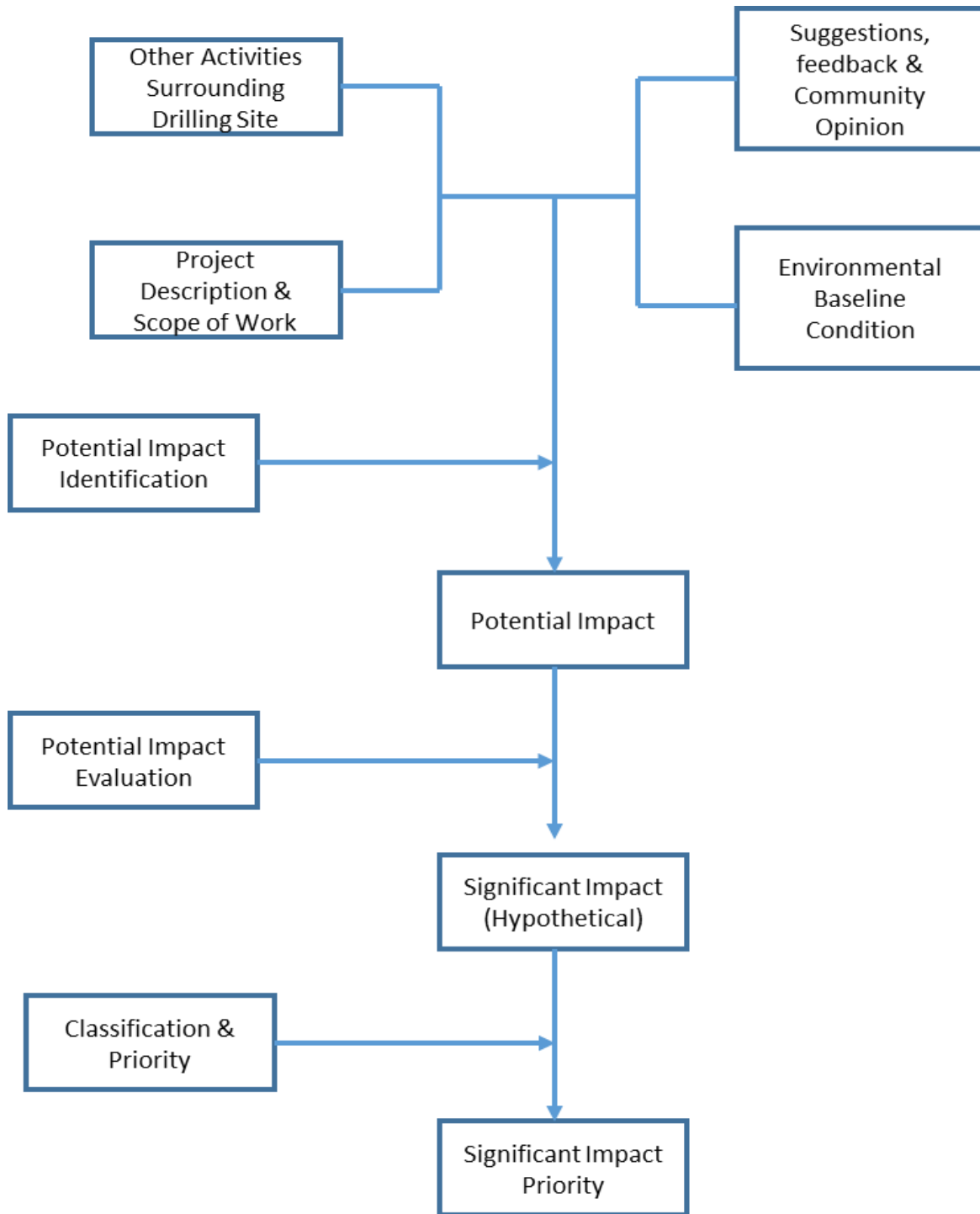
The result of identifying the potential impacts as described in identifying potential impacts and write down in the table then further examined for evaluation and defined activities that really cause hypothetic impact on the environment component including its parameters. Hypothetic essential impacts are determined by studying each potential impact and eliminating potential irrelevant impacts.

Methods used for the evaluation of hypothetic important impacts are through discussions among the team members, literature studies, field observations, reviewing environmental condition or base line data, the activities and professional judgment. The evaluation description to determine the hypothetic impact of the potential impacts expressed in the below information.

The results of the hypothetic important impact evaluation written in the interaction matrix between the activities with the component/environmental parameters that will be affected by hypothetic importance as shown in Table 6. While the linkage between one's significant hypothetic impacts with other hypothetic important impacts to determine primary, secondary,



and tertiary impacts as well as to determine a component/environmental parameter that has received the most impact.



**Figure 13: The Methodology of Study (TR Cons ,2019)**





PROJECT ACTIVITES			PRE CONST. PRE-OPERATION		CONSTRUCTION			OPERATION			POST OPERATIO NS/ DECOMISS IONING	
ENVIRONMENTAL COMPONENT/PARAMETER			Permit, License, & Engineering	Land Acquisition	Employment	Mobilization (Material & Equipment)	Land Clearing & Preparation	Rig Up & Setting Equipment	Drilling	Well Testing	Rig Down & Removed Material/Equipment	Well Abandonment
Physical & Chemical Component	Air Quality	TSP				•	•	•	•	•	•	
		SO <sub>x</sub>				•	•		•	•	•	
		NO <sub>x</sub>				•	•		•	•	•	
		CO				•	•		•	•	•	
		CH <sub>4</sub>				•	•		•	•	•	
		H <sub>2</sub> S							•	•		
		Opacity/Black Smoke								•		
		Light Illumination							•	•		



PROJECT ACTIVITES			PRE CONST. PRE-OPERATION		CONSTRUCTION			OPERATION			POST OPERATIO NS/ DECOMISS IONING	
ENVIRONMENTAL COMPONENT/PARAMETER			Permit, License, & Engineering	Land Acquisition	Employment	Mobilization (Material & Equipment)	Land Clearing & Preparation	Rig Up & Setting Equipment	Drilling	Well Testing	Rig Down & Removed Material/Equipment	Well Abandonment
		Heat Radiation								•		
	Noise	Noise				•	•	•	•	•	•	
	Water Quality (River, Well Water)	TSS					•		•	•		
		TDS					•		•	•		
		Oil & Grease					•		•	•		
		pH					•		•	•		
		Heavy Metal							•	•		
		Phenol							•	•		



PROJECT ACTIVITES			PRE CONST. PRE-OPERATION		CONSTRUCTION			OPERATION			POST OPERATIO NS/ DECOMISS IONING	
ENVIRONMENTAL COMPONENT/PARAMETER			Permit, License, & Engineering	Land Acquisition	Employment	Mobilization (Material & Equipment)	Land Clearing & Preparation	Rig Up & Setting Equipment	Drilling	Well Testing	Rig Down & Removed Material/ Equipment	Well Abandonment
		NH3							•	•		
		TSS					•		•	•		
		Groundwater Dependent							•			
Biological Component OR Biodiversity	Flora & Fauna	Vegetation clearance		•		•	•					
		Habitat Destruction		•		•	•					
		Transit Corridor Changes		•		•	•					



PROJECT ACTIVITES			PRE CONST. PRE-OPERATION		CONSTRUCTION			OPERATION			POST OPERATIO NS/ DECOMISS IONING	
ENVIRONMENTAL COMPONENT/PARAMETER			Permit, License, & Engineering	Land Acquisition	Employment	Mobilization (Material & Equipment)	Land Clearing & Preparation	Rig Up & Setting Equipment	Drilling	Well Testing	Rig Down & Removed Material/ Equipment	Well Abandonment
		Migration routes				•	•		•	•		
	Water Biota	Abundance				•	•		•	•		
Social, Economic, Cultural and Public Health Component	Social Economic	Employment			•	•	•	•	•	•	•	
		Income / business opportunity		•	•	•	•	•	•	•	•	
		Cultural Heritage & Concern		•	•	•	•	•	•	•	•	•
		Loss or reduction in livelihoods		•	•	•	•	•	•	•	•	•
	Social Culture	Social Jealousy	•	•	•	•	•	•	•	•	•	



PROJECT ACTIVITES			PRE CONST. PRE-OPERATION		CONSTRUCTION			OPERATION			POST OPERATIO NS/ DECOMISS IONING	
ENVIRONMENTAL COMPONENT/PARAMETER			Permit, License, & Engineering	Land Acquisition	Employment	Mobilization (Material & Equipment)	Land Clearing & Preparation	Rig Up & Setting Equipment	Drilling	Well Testing	Rig Down & Removed Material/Equipment	Well Abandonment
		Public Complaints	•	•	•	•	•	•	•	•	•	•
		Pain Numbers				•		•	•	•		
	Transportation	Traffic Disruption				•	•	•	•	•	•	

**Table 6: Project Activities Pre-Post Commissioning (TR Cons,2019)**



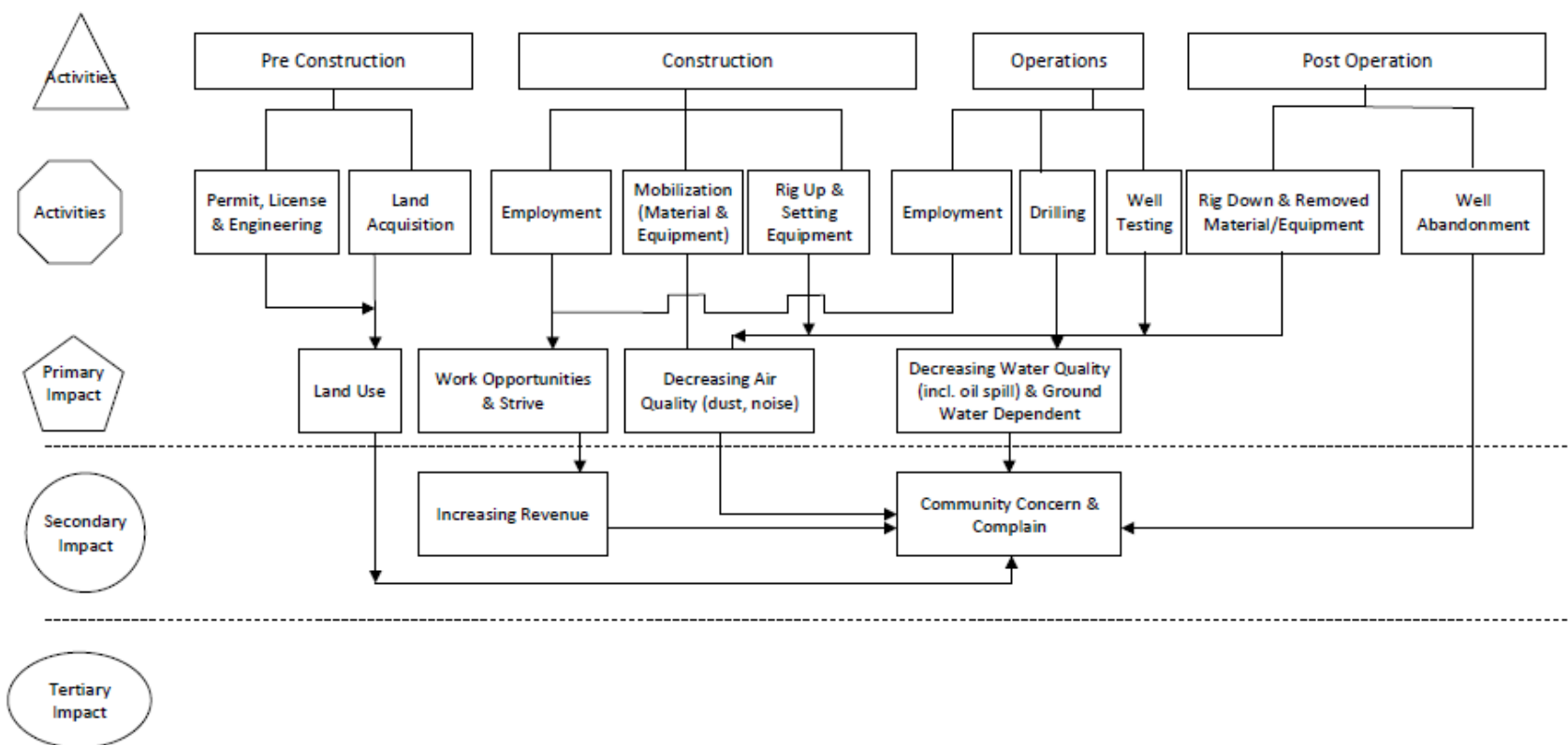


Figure 14: Hypothetical Impact for Drilling Exploration diagram (TR Cons,2019)



## 6.2 Description of the Proposed Project

The drilling positions have been selected based on a collective interpretation of new and existing surface geology and analyses, reprocessed 1994 2D seismic (Velseis Pty Ltd 2107, Geomage 2018), original 1969-70 2D seismic, core holes and oil and gas exploration wells. The formations to be encountered can be referenced to the Figure below.

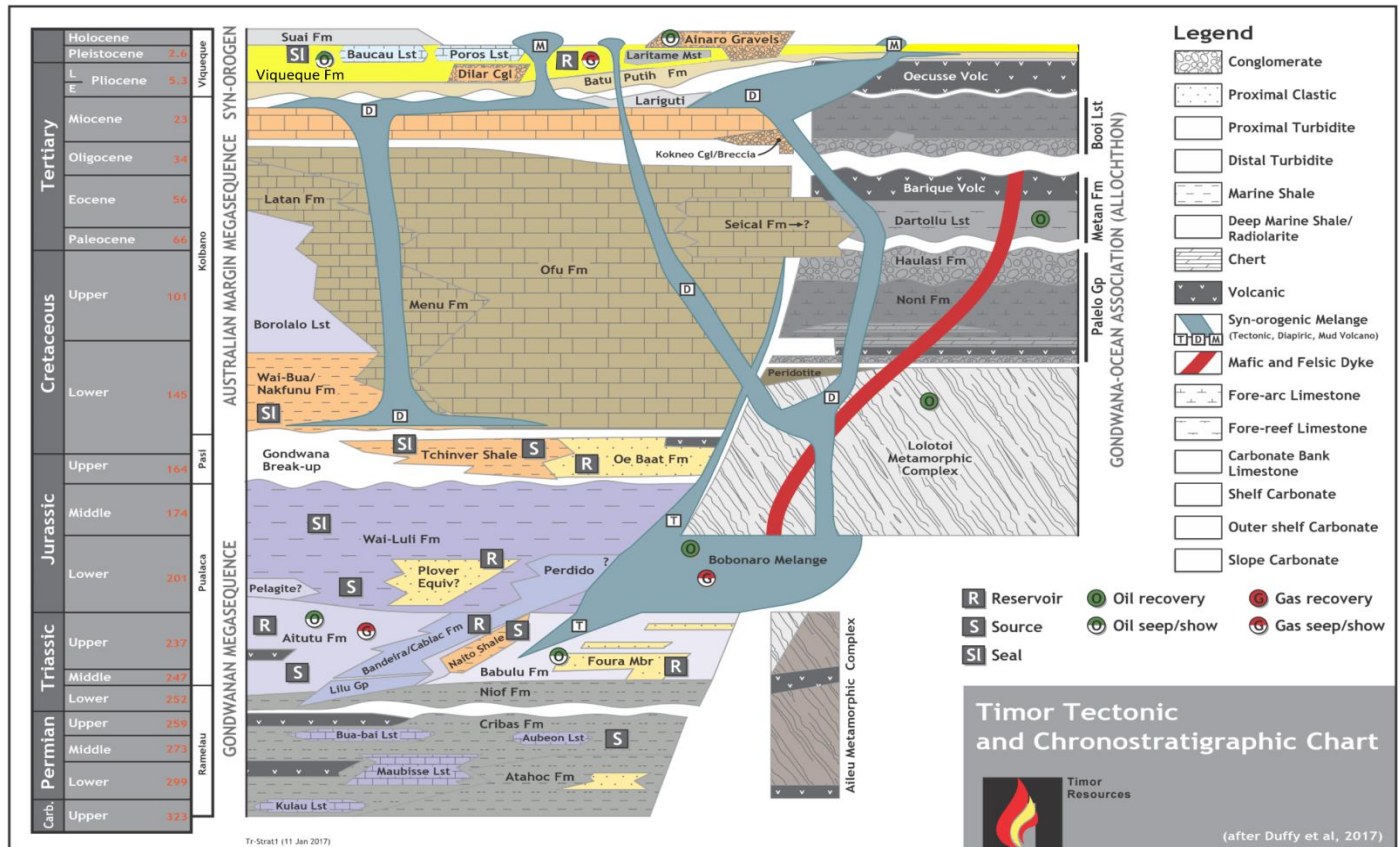


Figure 15: Timor Tectonic & Chronostratigraphic Chart (Source: TR Exploration Team, 2018)





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### 6.3 Description of the Environmental Conditions

Block A is centred around Suai town in the Covalima municipality, in the south-west of Timor Leste to the west is the TL Indonesian border, and to the south, is the Timor Sea. The northern and eastern boundaries border the Bobonaro and Ainaro municipalities respectively. Block A encompasses 30 suco's (villages), the largest being Debos, with a population of over 11,000. (*Ecoz,2017*). The area has access to the recently upgraded Suai Airport and basic facilities at Suai Port. Road access to Dili is approximately 6 hours and current Zona Especial de Economia Social de Mercado (ZEESM) flight service only takes 25 minutes flying from Dili.

There are no significant manufacturing industries in the area which is predominantly agricultural including low intensity farming of rice, corn, cattle, pigs, goats and chickens. The only large development activities are associated with the Tasi Mane south coast development project, in particular the construction of the Suai to Zumalai section of the South Coast Highway (*EcOz, 2017*).

#### 6.3.1 Geology

The three play types within the area of Block A (PSC TL-OT-17-08) which are:

- a. The Pliocene-Pleistocene age Viqueque Formation, syn-orogenic Basin.
- b. Lower Allochthon (Permian-Eocene)
- c. The Triassic-Jurassic age Babulu/Aitutu and Wai-Luli Formations beneath a regional metamorphic overthrust



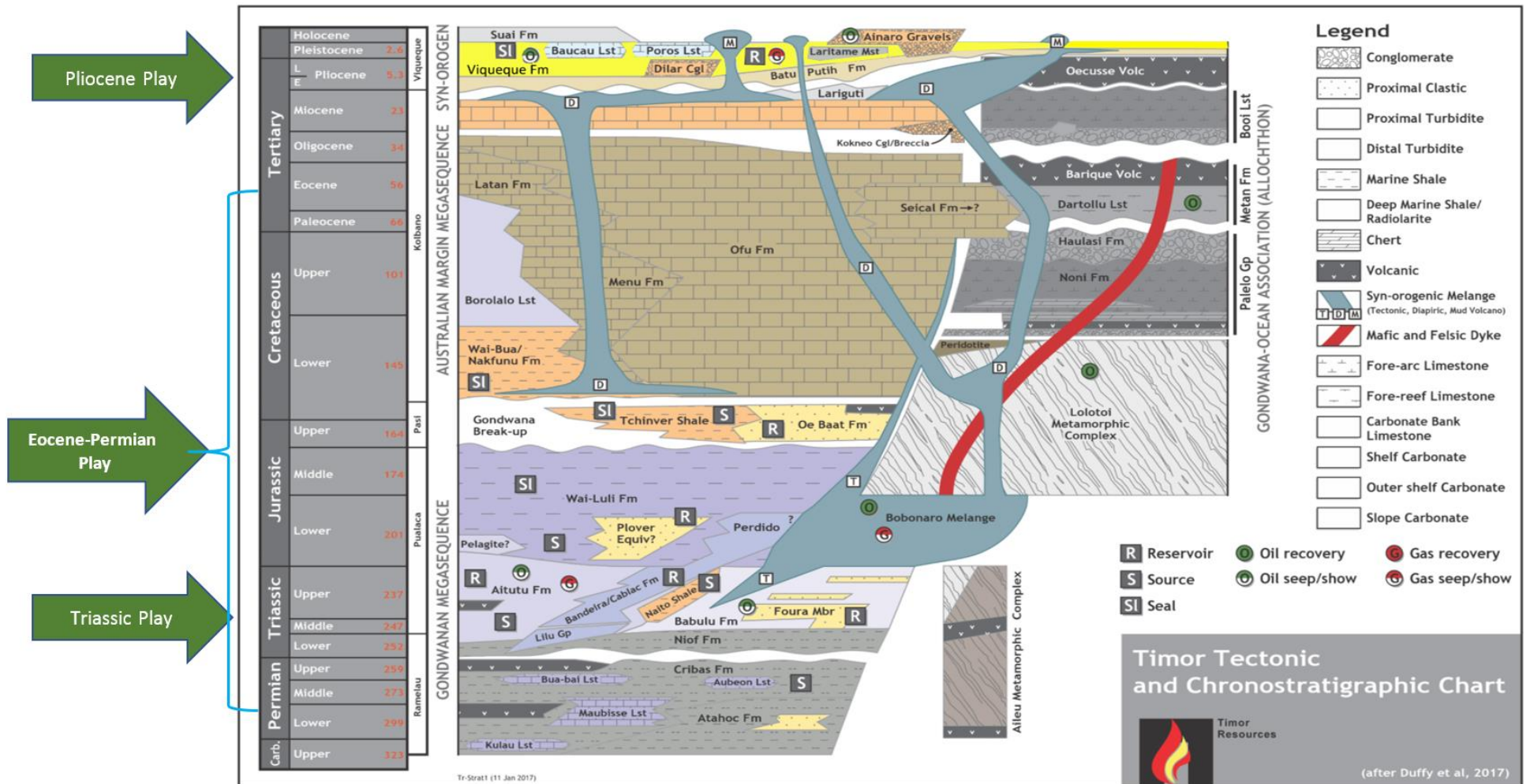


Figure 16 Geological Play Types (TR, 2018)

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### 6.3.2 Soil

The PSC TL-OT-17-08 Block A landscape is mostly characterized by narrow coastal plains and lagoons, rugged hills, and a central mountain range, with vegetation ranging from dry grassland, savannah forests, and gullies, to dense rainforest (EcOz, 2017). The location of the proposed drilling within Block A identifies as flat and nearly flat.

Within the project areas, there are coastal alluvium and fluvial soils (EcOz, 2017), inland Mesozoic and Cainozoic clastic sediments and Uderts soils, and to a lesser extent, Mesozoic and Cainozoic Carbonates (EcOz, 2017). To the north of the project there are also areas of Permo-Trias Carbonates, Udolls soils, and Usterts soils (EcOz, 2017). The project area along sucos Camenasa, Labarai, Matai, Debos, Belecasac, Tashilin, and Raimea are broadly categorized very flat area into coastal plain.

Below are examples of existing land use from a previous study of proposed wells. The existing land use in the Matai-Suai area is recognized as community dwelling and farmhouse with intensive care of soil treatment (Figures 18 and 19). Other locations (Figure 21-22) are abandoned, non-productive wetland dominantly with pines and *Typha* spp, *Scirpus californicus* (species of wetland grass). A comprehensive environment sampling and analysis programme will be conducted around the final locations with results provided in the relevant documentation (e.g. EMP/EIA)

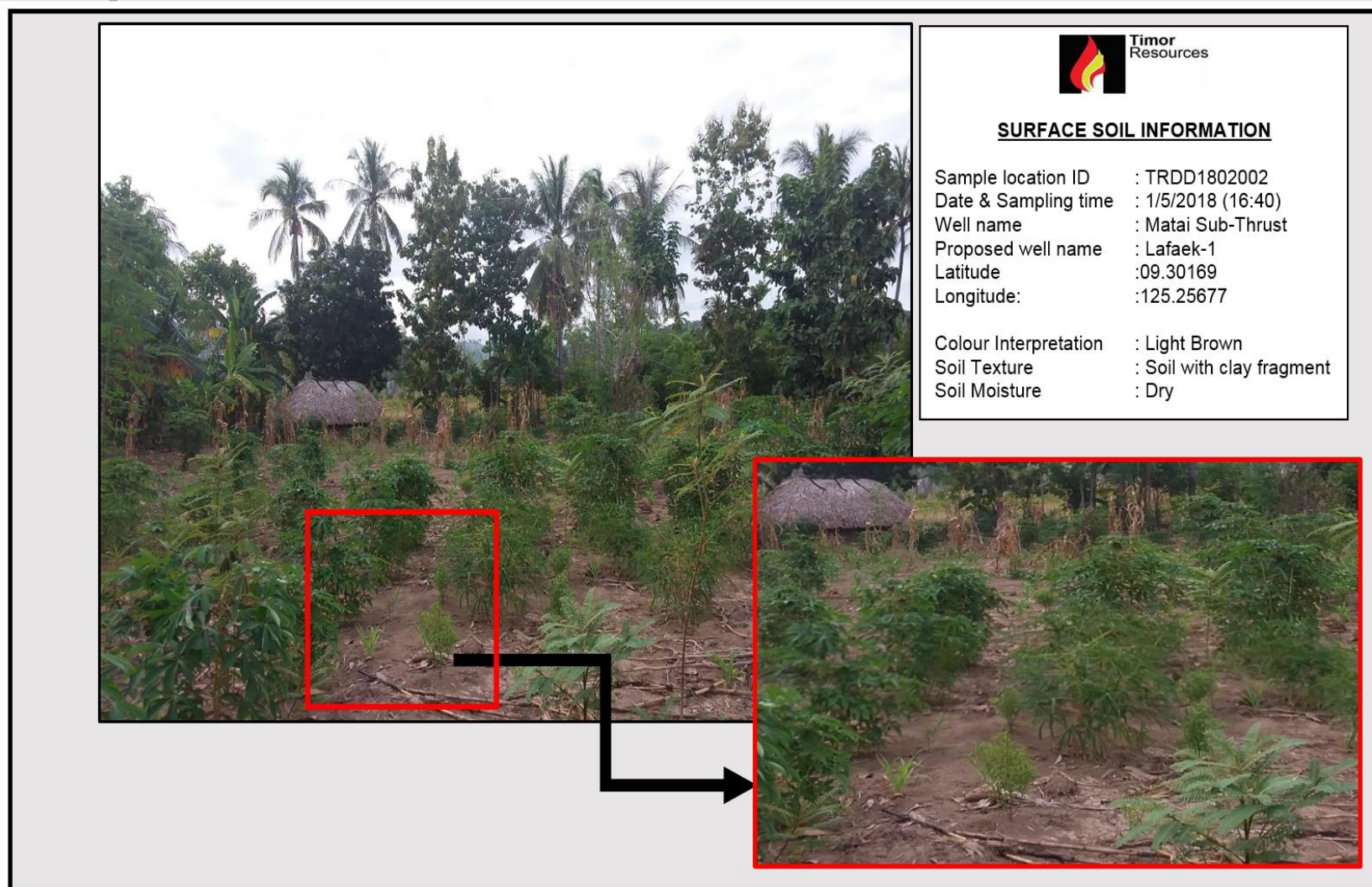




**Figure 17: Surface Soil Interpretation in Matai-Suai Area**







**Figure 18: Surface Soil Interpretation in Matai-Suai Area**





*Figure 19: Surface Soil Interpretation near Raiketan River mouth*







**Figure 20: Surface Soil Interpretation Grasslands west of Loumea River mouth**







**Figure 21: Surface soil interpretation near Mola River**





### 6.3.3 Groundwater

Groundwater is the principal source of drinking water in Timor-Leste and natural groundwater springs are the dominant sources of water supply in rural areas, supplying potable water to approximately 60% of the population (ADB, 2001). A previous study was conducted by TR field staff, the data will be incorporated with results from the areas surrounding the final well locations to build a water quality database for any future comparison of the areas as the project develops.



**Figure 22: Example of existing water well west of Loumea River**

As per industrial good practice, TR applies World Health Organization (WHO) drinking water guidelines as a parameter to assess the current state of groundwater quality. The outcomes of the groundwater and surface water sampling will be included in the Baseline Water Quality Study as an Appendix of the EIA for the survey project.



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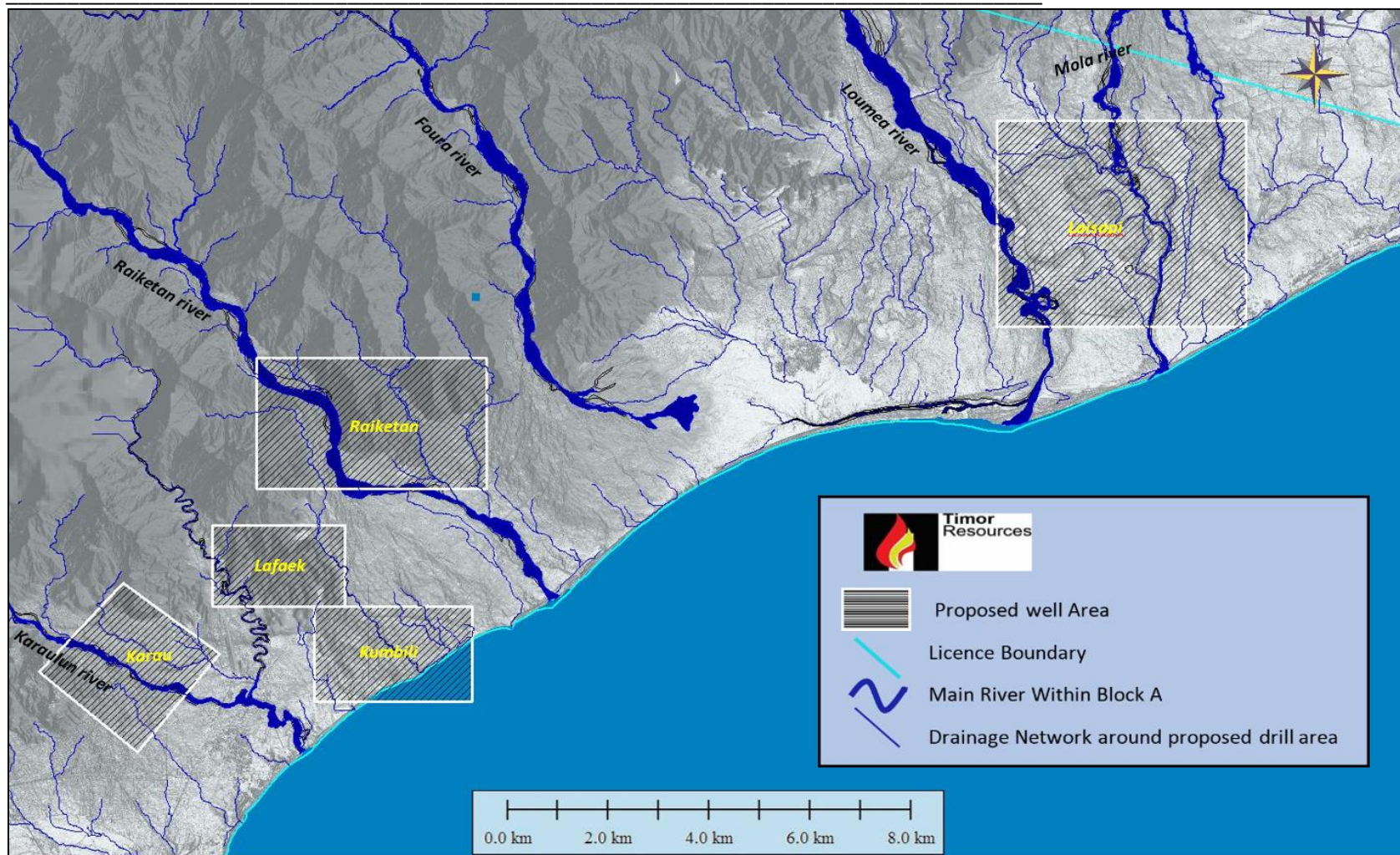
#### 6.3.4 Surface Water

It has been identified that within the proposed drilling area exists five (5) large rivers (Mola, Loumea, Foura, Raiketan, and Karaulun) as per below figure. The water quality is expected to vary seasonally in response to agricultural practices and rainfall. It is assumed that higher pollutant loads are expected during the wet season with high levels of rainfall generating erosion and mobilizing pollutants. In addition, there are also three (3) swamps and two (2) crocodile reserves area identified within the project.

More information will be collected regarding the quality, utility and detail of water resources in the proposed location, including rivers as well as other identified surface water. The ecosystem value of each swamps in the project area will be examined through on-site investigation.







**Figure 23: Drainage network interpretation within proposed drilling location PSC TL-OT-17-08**



### **6.3.5 Noise and Vibration**

The noise around community area is normal and it is estimated around 55dBA.

### **6.3.6 Air Quality**

An air quality survey and lab analysis will be conducted to provide a baseline.

### **6.3.7 Method of Collecting Data**

#### **6.3.7.1 Secondary Data Collection**

Secondary data that will be used for developing EIA and EMP will be obtained from various sources and collated into a useable reference. Data sources and data years will be also included in tables, maps and descriptions.

#### **6.3.7.2 Primary Data Collection**

##### **6.3.7.2.1 Geology**

An extensive surface geological database is available, as obtained from the results of surveys conducted by Timor Resources and its JV field geologists.

##### **6.3.7.2.2 Ground water and surface water quality**

Water Quality sampling will be collected using Water Sampler tool. At each sampling location one water sample (not composite) will be taken. Water samples are stored in Polyethylene bottles and glass bottles, which are then stored in ice boxes. For certain parameters, preservatives reagents are added. The surface water and groundwater quality parameters analysed are presented in Tables below.



**Table 7: Parameter and Method for Surface Water and Groundwater Quality Analysis**

Parameter	Unit	Test Remarks	Requirement	Methods
<b>Physical &amp; Chemical <sup>*)</sup>:</b>				
• Colour	Pt. Co scale	3	15	Colorimetric
• Odour	Pt. Co scale	negative	odourless	Organoleptic
• pH	Pt. Co scale	6.50	6.5-8.5	Electrometric
• Taste	Pt. Co scale	normal	tasteless	Organoleptic
• Turbidity	FTU	1	5	Turbidity
• Aluminium	mg/l	below 0.20	0.2	AAS
• Copper	mg/l	below 0.03	1.0	AAS
• Iron Total	mg/l	below 0.04	0.3	AAS
• Manganese	mg/l	0.06	0.1	AAS
• Sodium	mg/l	96.93	200	AAS
• Zinc	mg/l	0.047	5	AAS
• Chloride	mg/l	140.41	250	Argentometric
• Fluoride	mg/l	0.09	1.5	Colorimetric
• Nitrate	mg/l	below 0.11	10	Colorimetric
• Nitrite	mg/l	0.96	1	Colorimetric
• Sulphate	mg/l	below 0.94	400	Turbidimetric
• Arsenic	mg/l	below 0.001	0.05	AAS
• Barium	mg/l	below 0.10	1	AAS
• Cadmium	mg/l	below 0.005	0.005	AAS
• Cyanide	mg/l	below 0.01	0.1	Colorimetric
• Chrom Hexavalent	mg/l	below 0.006	0.05	Colorimetric
• Lead	mg/l	below 0.01	0.05	AAS
• Mercury	mg/l	below 0.001	0.001	AAS
• Selenium	mg/l	below 0.007	0.01	AAS
• Organic Matter by KMnO <sub>4</sub>	mg/l	3.06	10	Permanganantometric
• Dissolved Solid	mg/l	431	1000	Gravimetric
• Hydrogen Sulphide as H <sub>2</sub> S	mg/l	below 0.01	0.05	Colorimetric
• Total Hardness	mg CaCO <sub>3</sub>	95.49	500	AAS
<b>Bacteriological:</b>				
• Total Bacteria	per ml	6.9 x 10 <sup>2</sup>	1.0 x 10 <sup>2</sup>	Pour Plate
• Coliform	per 100 ml	nil	nil	Filtration
• E. Coli	per 100 ml	nil	nil	Filtration

<sup>\*)</sup> Standard Methods





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#### **6.3.7.2.3 Noise**

Noise samples are measured with a Sound Level Meter with noise range of 35-125 dB with measurement for 10(ten) minutes with an interval of reading every 5 (five) seconds. Noise measurement at the proposed drilling locations around Block A will be carried out during the day and night.

#### **6.3.7.2.4 Air Quality**

Air Quality sampling will be carried out using the Impenger Air Quality. Hydrocarbon samples will be using a vacuum gas sampler tube, while dust samples are taking using the High-Volume Sampler. Samples that have been taken will be stored for further analysis laboratory.

Several requirements in the collection of primary air quality data namely:

- The height of the tool/gas inlet is 1.5m from the ground surfaces
- Wind direction and speed
- Times(hours) measurement only 2 hrs not continuously
- Weather conditions at the time of air sampling
- Conditions surrounding including activities
- Only do when there is no rain



**Table 8: Methods and Parameters Measured**

Pollutant	Type	Standard	Averaging Time	Form <sup>a</sup>	Regulatory Citation
<a href="#">Sulfur dioxide</a> (SO <sub>2</sub> )	Primary	75 ppb	1-hour	99th Percentile of 1-hour daily maximum concentrations, averaged over 3 years	<a href="#">40 C.F.R. 50.17a</a>
	Secondary	0.5 ppm (1,300 µg/m <sup>3</sup> )	3-hour	Not to be exceeded more than once per year	<a href="#">40 C.F.R. 50.5a</a>
<a href="#">Particulate matter</a> (PM <sub>10</sub> )	Primary and Secondary	150 µg/m <sup>3</sup>	24-hour	Not to be exceeded more than once per year on average over 3 years	<a href="#">40 C.F.R. 50.6a</a>
Fine particulate matter (PM <sub>2.5</sub> )	Primary	12 µg/m <sup>3</sup>	annual	Annual mean, averaged over 3 years	<a href="#">40 C.F.R. 50.18a</a>
	Secondary	15 µg/m <sup>3</sup>	annual	Annual mean, averaged over 3 years	<a href="#">40 C.F.R. 50.7a</a>
	Primary and Secondary	35 µg/m <sup>3</sup>	24-hour	98th percentile, averaged over 3 years	<a href="#">40 C.F.R. 50.18a</a>
<a href="#">Carbon monoxide</a> (CO)	Primary	35 ppm (40 mg/m <sup>3</sup> )	1-hour	Not to be exceeded more than once per year	<a href="#">40 C.F.R. 50.8a(2)</a>
	Primary	9 ppm (10 mg/m <sup>3</sup> )	8-hour	Not to be exceeded more than once per year	<a href="#">40 C.F.R. 50.8a(1)</a>
<a href="#">Ozone</a> (O <sub>3</sub> )	Primary and Secondary	0.12 ppm (235 µg/m <sup>3</sup> )	1-hour <sup>b</sup>	expected number of days per calendar year, with maximum hourly average concentration greater than 0.12 ppm, is equal to or less than 1	<a href="#">40 C.F.R. 50.9a</a>
	Primary and Secondary	0.070 ppm (140 µg/m <sup>3</sup> )	8-hour	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years	<a href="#">40 C.F.R. 50.19a</a>
<a href="#">Nitrogen dioxide</a> (NO <sub>2</sub> )	Primary and Secondary	0.053 ppm (100 µg/m <sup>3</sup> )	annual	Annual mean	<a href="#">40 C.F.R. 50.11ab</a>
<a href="#">Lead</a> (Pb)	Primary and Secondary	0.15 µg/m <sup>3</sup>	Rolling 3 months	Not to be exceeded	<a href="#">40 C.F.R. 50.12a</a>

- Each standard has its own criteria for how many times it may be exceeded
- Source: [USEPA](#)



#### **6.3.7.2.5 Biodiversity**

##### **a. Land Use**

The data to be used is secondary data obtained from the results of a survey conducted by Timor Resource, and previous studies.

##### **b. Vegetation**

The data of vegetation would be collected by site survey using the Transect method or any available methods.

#### **6.3.7.2.6 Social-Economic and Cultural**

The secondary data to be collected include the field population. The data will be collected from the General Directorate of Statistics of Timor-Leste.

#### **6.3.7.2.7 Public Health**

The primary data will be collected by field survey such as monitoring, interview, dialogue with community, leaders, government etc. The data to be collected include sanitation, endemic and pandemic disease, water resource uses, lakes, rivers, land water etc.

#### **6.3.7.2.8 Method of Data Analysis**

Having the data gathered the analysis conduct by using statistical method through table, graphic, maps, diagram, and calculation and interpretation could be made. If possible, regression or any mathematic equation also will be used.



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## 6.4 PSC TL-OT-17-08 Block A Drilling Scope of Work

The project proponent commits to describe a detail drilling scope of work or campaign within proposed project area with a sequence below :

1. Drilling work step
  - a. All equipment materials and construction process used will be in accordance with 1989 ASME B31.8 CODE provisions. Equipment and materials needed for the project would be transported mainly from Dili and Suai port. The Rig and Pipe would be transported to the site by mean of trailer trucks. Other materials used during construction and operation phase will include concrete, cement and chemical
  - b. Rig moves to well location.
  - c. Rig up the drilling rig and all drilling equipment, ensure all in working order.
  - d. Set and cement conductor
  - e. Drill 12.25" hole, set and cement 9.625" surface casing
  - f. Drill 8.5" production hole
  - g. Carry out logging program
  - h. Set and cement 7" production casing
  - i. Perforate the 7" casing
  - j. Carry out Well abandonment or suspension program by setting either temporary or permanent plugs into the wells.
2. Access
  - a. Where available the access to the location will make use of existing roads and infrastructure.
3. Water Requirement
  - a. The water supply will be taken either from the closest river/creek by digging out a pool, trucking from another place, using an existing water well or if no alternatives then drilling a water well.
  - b. For the more coastal wells it may be possible to use sea water
4. Cutting & Cements Pits
  - a. The drilling well will generate cuttings and excess cement.
  - b. The cuttings and cement can be dumped and permanently stored in a pit and covered with soil can be constructed on location. The option is concluded after specialist studies on various environmental matters are investigated to follow the regulation. If the decision is made that the cuttings and or cement cannot be dumped into pits on location, then other options need to be addressed.



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## 5. Well Construction Program

- a. Pore and Fracture pressure, chemical composition of produced fluids and thermal gradients for the exploration wells should not substantially deviate from the offset well data provided by Timor Resources.
- b. Requirement is to minimize expenditure on the wells on a dry hole basis whilst retaining the option to case the well for completion in the success case.
- c. A standard evaluation program to identify oil pay and deliverability is planned.
- d. If any well is deemed to be potentially commercial a transition to appraisal is anticipated.
- e. Well design as per Figure 11 and 12
- f. Equipment Layout Figure 15



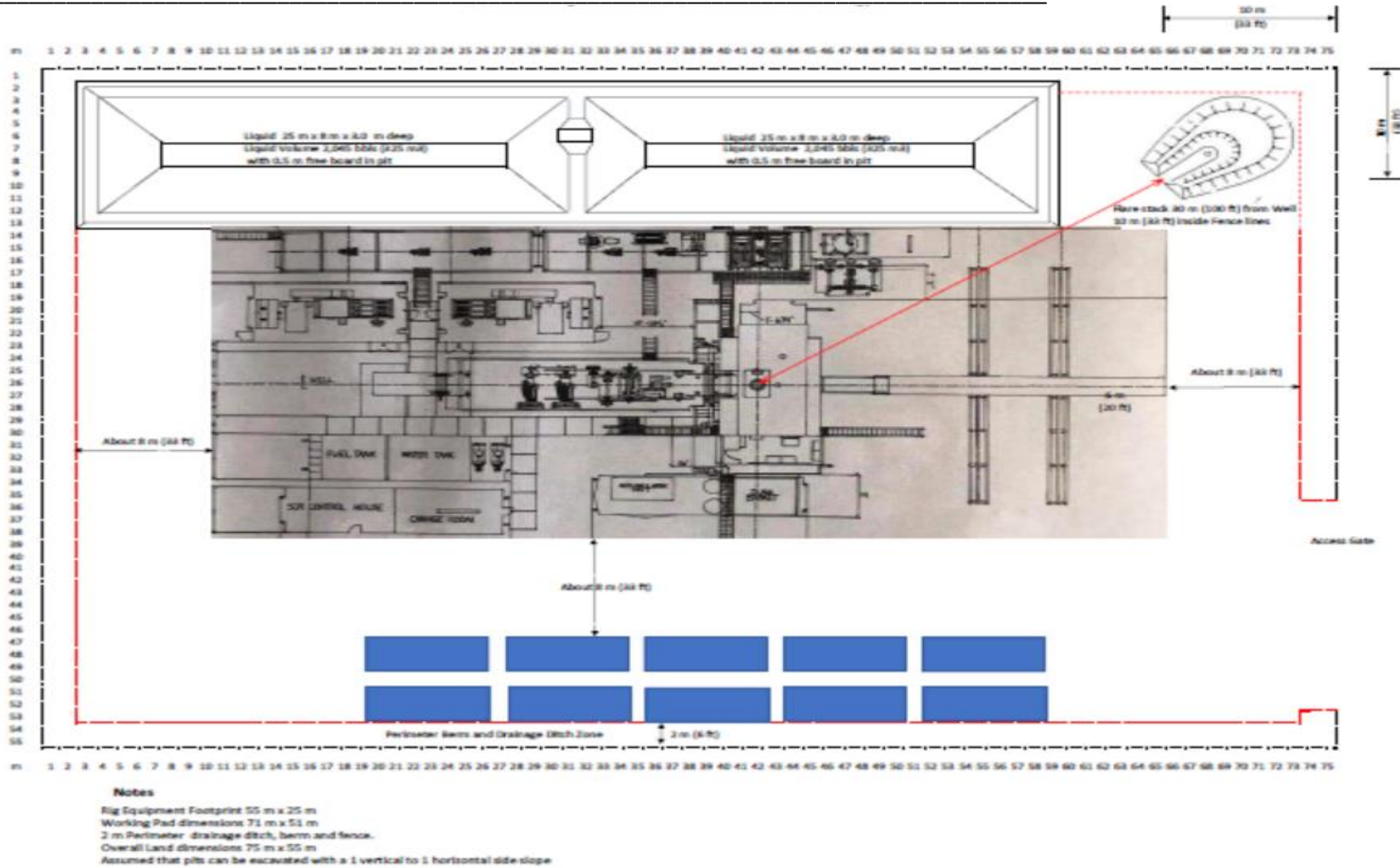


Figure 24: Well Pad & Drilling Equipment Layout (TR Cons, 2019)





## 6. Drilling Land Dimension

- a. The overall land dimension is approximately 100 x 100m but will be minimised to reduce impact where practicable. The Rig location contains all equipment and buildings, storage, workshops, etc. Two (2) meters perimeter drainage ditch, berm and fence will be installed.
- b. Earthen and compacted clay flare pit places 30m from the well and inside the fence lines.
- c. Pits to contain excess water, mud and cement will be dug on location.

## 7. Site Preparation on Land

- a. The well located a minimum 100 meters away from public roads, public works, houses or other places in which a source of ignition may arise. Safe distances from any radio transmitters will be established so that use of explosives and detonators may proceed without danger of external activation. All practicable means should be taken to minimize or avoid any detrimental effect on the surrounding environment by virtue of the construction of the location or the operation of the drilling rig.
- b. Material such as trees, undergrowth and other combustible material will be cleared from the sites and for a safe distance outside of the site perimeter.
- c. Excavation work would be carried out in such a manner that the collapse of side walls is precluded. Measures will be taken to prevent persons accidentally falling into an excavation. Proper illumination at night will be provided during excavations.
- d. Source of ignition, naked lights, unprotected electrical equipment, smoking and all other sources of ignition will be prohibited or restricted to specific areas (e.g. hot work area) on all drilling/well sites. When internal combustion engines are permanently used within a hazardous area, they will be equipped with the spark arrestor.
- e. Vent, flare pits and extremities of flare lines located at least 90 meters from railways, roads, public works, processing units or tanks. They will be located at least 30 meters from the wellhead, gas/oil separator, site drainage or other possible source of ignitable vapours. Means to ensure that noxious gases, e.g. H<sub>2</sub>S, should they be present, are disposed of safely. Prevailing winds will be considered when constructing flare pits
- f. Warning and other notices stating restrictions prominently displayed. Notices will be displayed indicating where fire-fighting equipment, breathing apparatus and first-aid equipment are stored. They will be written in both English and Tetun language.



- 
- g. Access and escape to/from drilling location will be investigated during site survey.
  - h. Fuel storage will be segregated away from the general accommodation area, surrounded by an adequate bund wall and adequately marked with hazard signs and cautionary notices (e.g. 'no smoking'). Explosives and radioactive sources together with any other hazardous substances shall not be kept at the camp site but in defined areas at the well site.
  - i. Fire extinguishers provided for all accommodation units including kitchens, mess room, recreation rooms, clinic and radio room (if applicable). Further firefighting facilities provided around fuel tanks, vehicle parking areas and the camp generator.
  - j. Full earthing provided, verified, and documented. The maximum permissible resistance to earth is 4 ohms. Where necessary boreholes to provide a ground to earth will be provided.
  - k. Vent, flare pits and extremities of flare lines located at least 90 meters from roads, public works, processing units or tanks. They will be at least 30 meters from a well, gas/oil separator, site drainage or other possible source of ignitable vapours. Means to ensure that noxious gases, e.g. H<sub>2</sub>S, should they be present, are disposed of safely. Prevailing winds will be considered when constructing flare pits
  - l. Warning and other notices stating restrictions prominently displayed. Notices displayed indicating where fire-fighting equipment, breathing apparatus, and first-aid equipment are stored. They written in both English and Tetun language.
  - m. Access and escape to/from drilling location will be investigated while site survey.
  - n. Fuel storage segregated away from the general accommodation area surrounded by an adequate bund wall and adequately marked with hazard signs and cautionary notices (e.g. 'no smoking'). Explosives and radioactive sources together with any other hazardous substances shall not be kept at the camp site, but in defined areas at the well site.
  - o. Fire extinguishers provided for all accommodation units including kitchens, mess room, recreation rooms, clinic and radio room (if applicable). Further firefighting facilities provided around fuel tanks, vehicle parking areas and the camp generator.
8. Type of Rig
- a. Type Land Rig minimum capacity 1000 HP.



- 
- b. There will be equipment associated with the drilling rig such as Air Compressor, Cementing Unit, Mud Logging Unit, Wireline Logging Unit, Generators, Pumps and Heavy Vehicles
  - c. The project proponent will submit a verification report prior to the commencement of drilling operations.
  - d. The verification report by will include a detailed inspection of the drilling installation, equipment, and system prior to undertaking drilling operations.
  - e. The project proponent will comply with Article 37 onshore decree law regardless to provide a third-party to verify the equipment, system and operational practices for well control based on Good Oil Field Practice.
  - f. As a condition to undertaking any Drilling Operations, the Ministry may require that TR Authorized Person submits to the Ministry a verification report prepared by Third Party prior to the commencement of Drilling Operations.
  - g. The verification report based on a review of the relevant documents, including the Drilling Program, as the case may be, and a detailed physical inspection of the Drilling Installation and equipment and systems, and the performance of such tests as may be appropriate.
  - h. The Third-Party Consultant verify, that taken as a whole, the equipment, systems and operational practices for Well control comply with the requirements of this Decree-Law and Good Oil Field Practice.
  - i. TR Authorized Person ensure that equipment used for carrying out Drilling Operations is maintained in good working condition and fit for purpose prior to and at all time during the execution of the Drilling Operations and Subjected to inspections required by Onshore Decree Law and Good Oil Field Practice.
  - j. TR Authorized Person ensure that equipment, materials and operational practices used for Well control, including those used in Drilling Operations and any associated equipment or systems satisfy the requirements of the Decree-Law and Good Oil Field Practice. He/she shall not remove installed Blowout Prevention Equipment until all necessary steps are taken to ensure the Well is safe.
  - k. A secondary control system and a secondary power source capable of activating the Blowout Prevention Equipment established in case the primary control system or primary power source fails.
  - l. A Production Test or drill stem test on a Well, not being a producing well, not be conducted without prior approval of the Ministry.



- 
- m. A Well not be abandoned or suspended without prior approval of the Ministry. An application for abandonment or suspension of a well will be submitted to the Ministry at reasonable time prior to the commencement of abandonment or suspension operation. The application for abandonment or suspension of a Well includes the details for safe abandonment or suspension plan, including casing removal plan, location of abandonment plug, length and quality of cement plug and fluid to be used in completed abandonment or suspended well.
  - n. TR Authorized Person ensure that where a well or a portion of a well is suspended or abandoned, such suspension or abandonment takes place in a manner that: prevents any formation fluid from flowing into another interval within that well-bore or escaping from the well-bore, facilitates location of every well that is suspended or abandoned, and provides for isolation of all petroleum bearing zones, discrete pressure zones and potable water zones.
  - o. A Drilling Rig is not removed from a Well drilled unless the Well has been completed, suspended or abandoned in accordance with the Decree-Law and Good Oil Field Practice. TR Authorized Person ensure that upon completion or abandonment of any Well the surface area is cleared of any material or equipment, unless the Ministry otherwise approves.
9. Employment Opportunities
- a. Labour in the exploration well drilling activities are generally experienced and certified experts and coupled with the support force. The number of workers needed for the drilling campaign approximately 112 people (Table below). Skilled manpower must be certified and meet the requirements as stipulated by the Decree-Law and Good Oil Field Practice.



NO	TITLE /POSITION	CERTIFICATION	NATIONALITY	NUMBER (ESTIMATE ONLY)
1	<i>Company Man</i>	Yes	Expatriate	1
2	<i>Drilling Engineer</i>	Yes	Expatriate/Timor Leste	1
3	<i>Well Site Geologist</i>	Yes	Expatriate +Timor Leste	2
4	<i>Material Man - Logistic</i>	No	Timor Leste	1
				<b>5</b>
<b>DRILLING CONTRACTOR</b>				
1	<i>Rig Superintendent</i>	Yes	Expatriate	2
2	<i>Tool Pusher</i>	Yes	Expatriate	2
3	<i>Electrical Supervisor</i>	No	Timor Leste	2
4	<i>Mechanical Supervisor</i>	No	Timor Leste	2
5	<i>Driller</i>	Yes	Expatriate	3
6	Assistant Driller	Yes	Expatriate + Timor Leste	3
7	<i>Derrick man</i>	Yes	Expatriate + Timor Leste	3
8	<i>Floor man</i>	Yes	Expatriate + Timor Leste	12
9	<i>Roustabout</i>	Yes	Expatriate + Timor Leste	15
10	<i>Mechanic</i>	Yes	Expatriate + Timor Leste	3
11	<i>Electrician</i>	Yes	Expatriate + Timor Leste	3
12	<i>Welders</i>	Yes	Timor Leste	3
13	<i>Crane Operator</i>	Yes	Expatriate + Timor Leste	3
14	<i>Radio Operator</i>	Yes	Timor Leste	3
15	<i>Catering Personnel</i>	No	Timor Leste	9
				<b>68</b>



NO	TITLE /POSITION	CERTIFICATION	NATIONALITY	NUMBER (ESTIMATE ONLY)
<b>SERVICE COMPANY</b>				
1	<i>Mud loggers</i>	Yes	Expatriate / Timor Leste	2
2	<i>Mud Engineers</i>	Yes	Expatriate / Timor Leste	1
3	<i>Electric Logging Engineers</i>	Yes	Expatriate	1
4	<i>Electric Logging Technician</i>	Yes	Expatriate / Timor Leste	3
5	<i>Cementing Engineers</i>	Yes	Expatriate	1
6	<i>Cementing Technicians</i>	Yes	Timor Leste	4
7	<i>Cementing Helpers</i>	NO	Timor Leste	3
				<b>15</b>
<b>UNSKILLED LABOR</b>				
1	<i>Labour</i>	NO	Timor Leste	14
2	<i>Load masters</i>	NO	Timor Leste	3
3	<i>Security Guard</i>	NO	Timor Leste	4
				<b>21</b>
<b>Total</b>				<b>109</b>

*Table 9: The number of workers used for the Drilling Campaign (TR,2019)*





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## 6.5 Analysis of Alternative

The following alternatives were sequentially considered during the project design and preparation: Vertical Drilling versus Directional Drilling.

### 6.5.1 Vertical Drilling

A vertical well is a borehole that is aimed directly at a target beneath it. A vertical well does not have a truly vertical borehole, but it is more or less aimed straight down at a reservoir of oil or gas rather than being turned horizontally at a designated point.

Vertical well drilling is considered a conventional method of oil and gas extraction. Vertical wells differ from directional wells, such as horizontal wells, because they do not require the use of directional boring. This usually makes them less expensive to develop. Moreover, vertical wells have traditionally depended on the pressure on the deposit to facilitate extraction, something that is not possible in tight oil and other unconventional oil formations.

Historically, natural gas and oil exploration involved the use of vertical wells because directional drilling technology was expensive and complicated.

### 6.5.2 Directional Drilling

Directional drilling is a drilling technique in which a well is bored at multiple angles. Directional drilling most often refers to drilling at non-vertical angles, including horizontally.

Directional drilling allows access to areas where a vertical approach would not be possible, such as deposits that are below a body of water, or underneath a community or with difficult surface topography. Directional drilling can be more efficient and cause less surface disturbance of the environment.

The second option directional drilling would have required further consideration, not only cost but because the technology introduces additional operational risk.



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## 6.6 Determination of the Potential Impacts of the Proposed Project

The Environmental Impact Statement will identify, and report related potential impact of the drilling campaign of Block A on various environmental elements as described in section 6.1. Impacts shall be described in terms of being adverse or beneficial, direct / indirect, cumulative, localized / regional / cross-border / global, duration, and permanent / temporary / reversible. Wherever possible impacts shall be objectively described (quantified) rather than simply subjectively described.

The potential impacts will be addressed, but not be limited to, the following impact issues:

### Environmental

- 1) Decreasing Air quality – construction and operation, including dust and vehicle emissions;
- 2) Noisy area - increasing noisy condition during construction and operation phase; drilling activities, increased traffic along the main road – predicted noise levels compared to existing background levels
- 3) Water quality degradation and ground water dependent – changes pH, ammonia, sedimentation and other parameters also ground water dependent
- 4) Land use change – conversion of public and private land uses into drilling site, facilities, areas, current land use and cover;
- 5) Habitat destruction/degradation and biodiversity loss - loss of benthic and pelagic habitat, degradation from increased turbidity / sedimentation, oil and chemical spills;
- 6) Solid waste - solid waste management, garbage from drilling camp and employee;
- 7) Wastewater and stormwater – sewage treatment and discharge; process water (container wash-down, vehicle and machinery cleaning bays, workshops); hazardous material spills;

### Social and Economic

- 1) Land acquisition and physical displacement – number of households and people affected, land types and areas acquired, etc;
- 2) Economic displacement and livelihoods – local businesses and employment
- 3) Loss of cultural heritage sites – types and significance of sites;
- 4) Safety – worker and community safety during drilling construction and operation;
- 5) Traffic – during construction and operation, primarily between Suai and the drilling site
- 6) Employment- increased employment opportunities, and increased support services opportunities, e.g shops and transport services.



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The impact will be addressed in accordance with the different phases including pre-operation, construction, operation, and post operation.

- Pre-Operation/ Pre- Construction phase involves completion of all legal formalities Category A requirements from ANPM, drilling studies required, finalization of Public Consultation on the proposed well location, procurement of rig/machinery, long lead item manpower and other facilities such water supply, disposal of waste to be used for operations.
- Operation / Construction phase shall comprise of land drilling process.
- Decommissioning phase will be guided by rehabilitation of the drilling site including revegetation



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## 6.7 Assessment & Evaluation

The specialist for each area determines the method for evaluation of environmental impacts for each specific area. The reasons for the identification and selection of the method are stated. Generally, a methodology for classification of impacts and weighing of significance can be based on receptor exposure, covering:

- Vulnerability; type and number of receptors, resilience, and avoidance.
- Duration; short term, medium term, long term, and permanent.
- Location; localized or further spread of the impact.
- Cost; exposure reduction, and restoration to baseline.

Analysis and evaluation will be started by determining the:

- Scope of the work
- Type of information to collect
- The collection procedure
- The time periods
- Required personnel (both quantity and expertise level),
- The instruments
- The test (laboratory) agencies,
- The standardized of reference and
- Compulsory sections of the final reports for each area of interest.

Subsequently reports from respectively topic of interest are received and assessments are done, the further steps are a specific proposed action that will be determine by:

- Redefining criteria or indicators
- Further data collection, e.g. to evaluated new impacts
- Significance of identified impacts
- Determination of baseline readings
- Proposed mitigation measures and
- Residual risk level.



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## 6.8 Environmental Management Plan (EMP) Performance

Execution and implementation of this project is in accordance with the context provided by this section shall ensure that environmental risks are reduced to 'As Low As Reasonably Practicable' (ALARP) and that all environmental obligations are met.

The content of the EMP includes a sequence of organization sub-plans which framework to definite actions and procedure to be applied for avoiding and reduce environmental impacts relevant to the project objectives. Routine inspection as a one of standards and monitoring requirements are outlined for each relevant sub-plan. Reporting requirements, corrective actions and responsibilities are also provided.

In detailed, the project proponent similarly will be more focus on several components of an EMP-EIS such:

- Coverage from start of project to operations to decommissioning.
- In addition to environmental factors, economic and social factors are also included.
- Listing the impacts, the significance of each impact, the mitigation measures to completely avoid, to reduce or to compensate for impacts, and the residual risks.
- Monitoring requirements, e.g. methodology, locations, frequencies and responsibilities.
- Estimated costs of the mitigation measures.
- Types of reports and persons responsible for the reports.
- Training needs to build-up local competency in environmental management matters.
- Continuous improvement of environmental management actions.

The risk assessment was commenced to detect possible influences on the environment as well as socio- economic, human health and safety, and heritage. The risk assessment process identified those happenings in project aspects that could result in a greater environmental risk, for which specific management procedures must be applied. The content of this section of the EMP emphasizes on those risks ranked as moderate or above.

To guarantee that the mitigation procedures and monitoring requirements are appropriately applied and subsidized, this upcoming drilling EMP will describe the section that contains cost estimates for monitoring and mitigation works.

The management approach of EMP was prepared based on technological, economic and institutional approaches (see table below)



NO	POTENTIAL IMPACT	ASPECT – IMPACT (Likely Negative and Positive Impact)	MITIGATION MEASURES & MANAGEMEN PLAN
<b>PRE-CONSTRUCTION PHASE</b>			
1	Permit, license, land acquisition	Cultural Heritage & Concern, Loss or reduction in livelihoods, Social Jealousy, Public Complain	<ul style="list-style-type: none"> <li>• Public hearing &amp; Public Consultation</li> <li>• Implement good engineering design</li> <li>• Socialization to the community &amp; close work with Government</li> </ul>
<b>CONSTRUCTION PHASE</b>			
2	Air Quality	Vehicle & drilling (motor) engine operations & movement-emission, decreasing air quality parameter such SOx, NOx, particulate, etc.	<ul style="list-style-type: none"> <li>• Employed speed limit rule</li> <li>• Installation signs along the road</li> <li>• Guard officer &amp; Security Man provided</li> <li>• Vehicle movement optimization</li> <li>• The vehicle passed the emission test</li> <li>• The use of an open cabin truck is avoided</li> </ul>
3	Noise	Vehicle and drilling rig noise, drilling operational noise, blasting, pipe/drill pipe breaker noises, and heavy machinery	<ul style="list-style-type: none"> <li>• Same as above</li> <li>• Employed speed limit rule</li> <li>• Movement at night crossing the community housing is prohibited</li> <li>• Implement journey management plan</li> </ul>
4	Biodiversity	Vegetation clearing, habitat destruction, transit corridor changes, migration routes, caves, roosting areas, wetlands, and groundwater dependent.	<ul style="list-style-type: none"> <li>• Minimum coverage of land clearing, only on the drilling pad</li> </ul>
5	Solid Waste	Increase in waste materials generated, location of disposal of waste material	<ul style="list-style-type: none"> <li>• Installation signs along at the location</li> <li>• Provide trash can then sent to garbage dump</li> </ul>
6	Traffic Disruption	Increased truck movements, personnel movements and increased vehicles and motorcycles in the	<ul style="list-style-type: none"> <li>• Employed speed limit rule</li> <li>• Installation signs along the road</li> <li>• Guard officer &amp; Security Man provided</li> <li>• Vehicle movement optimization or journey management plan</li> </ul>





NO	POTENTIAL IMPACT	ASPECT – IMPACT (Likely Negative and Positive Impact)	MITIGATION MEASURES & MANAGEMEN PLAN
		community and on roads	<ul style="list-style-type: none"> <li>• movement at night crossing the community housing is prohibited</li> </ul>
<b>OPERATION PHASE</b>			
7	Employment local community	Increased employment opportunities, and increased support services opportunities, e.g. shops and transport services Impacts to cultural heritage, and community cultural sites	<ul style="list-style-type: none"> <li>• Increase the number of local people to be recruited as much as possible</li> <li>• Used local vendor as supplier</li> <li>• Increase local content</li> </ul>
8	Decreasing (ground) water quality & ground water dependent	Drilling operation, drilling waste (wastewater, excess cement), household/camp waste, well testing	<ul style="list-style-type: none"> <li>• Develop lined/concreted drilling waste pit</li> <li>• Implement drilling waste management by reused &amp; recycle as per plan</li> <li>• Use nontoxic &amp; friendly chemical</li> </ul>
9	Safety	Well blow out, gas escape, fire, community evacuation and another emergency situation	<ul style="list-style-type: none"> <li>• Implement drilling safety (equipment, personnel &amp; procedures) such BOP, well integrity, inspection and maintenance</li> <li>• Conduct drill &amp; table top exercise</li> <li>• Implement good drilling best practices</li> </ul>
10	Traffic Disruption	Increased truck movements, personnel movements and increased vehicles and motorcycles in the community and on roads	<ul style="list-style-type: none"> <li>• Employed speed limit rule</li> <li>• Installation signs along the road</li> <li>• Guard officer &amp; Security Man provided</li> <li>• Develop &amp; implement journey management plan</li> </ul>
<b>Post Operations</b>			
11	Air Quality & Noise	Rig down & rig moved Vehicle & drilling (motor) engine operations & movement-emission, decreasing air quality	<ul style="list-style-type: none"> <li>• Employed speed limit rule</li> <li>• Installation signs along the road</li> <li>• Guard officer &amp; Security Man provided</li> <li>• Develop &amp; implement journey management plan</li> </ul>



NO	POTENTIAL IMPACT	ASPECT – IMPACT (Likely Negative and Positive Impact)	MITIGATION MEASURES & MANAGEMEN PLAN
		parameter such SOx, NOx, particulate, etc.	<ul style="list-style-type: none"> <li>• Conduct vehicle emission test</li> <li>• The use of an open cabin truck is avoided</li> </ul>
12	Well abandonment	Well integrity, crater, seepage	<ul style="list-style-type: none"> <li>• Implement drilling safety (equipment, personnel &amp; procedures) such as BOP, well integrity, inspection and maintenance</li> <li>• Implement good drilling best practices</li> </ul>



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## 6.9 Public Consultation

Comprehensive stakeholder engagement shall be undertaken by the Block Operator/EIA team during the preparation of the EIA in accordance with Decree Law 5/2011, relevant IFC Performance Standards and the IFC Stakeholder Engagement Handbook (2007), commensurate with Project risks and impacts. This will form a significant component of the Block Operator's early stakeholder engagement, which will continue over the life of the Block.

This engagement process will build upon GoTL's initial engagement, learning lessons from the effectiveness of this with different stakeholder groups, to focus on the detailed project design and EIA preparation phases of the project. As such, the Block Operator will coordinate its activities with those of GoTL to ensure that the process continues in a structured manner, with both parties contributing to the activities as required.

Public consultations will be undertaken by Timor Resources tentatively after public announcement at end of September 2019. Participants included the heads of both provincial and regency-level environmental planning boards as well as a cross section of regional and local representatives of stakeholder groups: government agencies, local people, local businesses, NGOs, and academics. Major issues discussed would be included the implementation of EIA, the coordination with relevant authorities, impacts of the project on local communities, interests of local communities, stake holders, safety issues during the project operation stage, etc. The socialization also would be conducted by Timor Resources PGN with the local affected people in and around Suai. Informal interviews of local people around the proposed drilling rig site in five (5) various sites along the project would be conducted. The project also would be announced and published in the local and national newspapers.

Key elements of stakeholder engagement during EIA preparation shall include:

- 1) Systematic identification of project stakeholders and their interests;
- 2) Review of regulatory requirements for stakeholder engagement on projects;
- 3) Seeking input from stakeholders on how they wish to be consulted;
- 4) Preparation of a stakeholder engagement plan commensurate with project impacts;
- 5) Provision of information ahead of consultations on environmental and social impacts;
- 6) Using consultation to enhance mitigation and agree compensation and benefits;
- 7) Maintaining involvement with government-led consultation;
- 8) Reporting changes in the evolving project design to stakeholders on a regular basis;
- 9) Documenting the process and results of consultation;
- 10) Integrating stakeholder information across the project planning functions.



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The Block Operator (Timor Resources) will prepare a Stakeholder Engagement Plan that covers the above elements and how stakeholder engagement activities will be integrated into the Concessionaire's environmental and social management system.

Engagement will primarily be with the affected people to: (i) gather baseline information and discuss mitigation, compensation and benefits (livelihood restoration, land use planning and other project mitigation measures); (ii) keep people informed about Project developments; and (iii) respond to issues as they arise. Engagement will also involve the broader community, Government agencies and NGOs.



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## 7 FLEXIBILITY

The EIA study area, project alternatives and impact issues being assessed may be subject to change as the EIA process proceeds and new information is obtained. Where this occurs the TOR of the EIA and the EMP will be expanded to ensure that these new issues are adequately covered, without any compensation being due to the Block Operator (unless otherwise expressly provided for in this Agreement).

