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PSC TL-SO 22-23 MARINE SEISMIC SURVEY SIMPLIFIED ENVIRONMENTAL IMPACT ASSESSMENT

[ENI-AH08-EXP-1000281]

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Document Title

PSC TL-SO 22-23 MARINE SEISMIC SURVEY SIMPLIFIED ENVIRONMENTAL IMPACT STATEMENT

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ACRONYMS AND DEFINITIONS USED IN THIS DOCUMENT

Acronym/Term	Definition
°C	degrees Celsius
µPa	micropascals
AEMTL	Asociacao Empresaria Mulher Timor-Leste (Association of Women Enterprises in English)
ALARP	as low as reasonably practicable
AMN	National Maritime Authority
ANLA	National Authority for Environmental Licensing
ANP	Autoridade Naçional do Petróleo; National Petroleum Authority
BP	boiling point
CCI-TL	Chambers of Commerce and Industry, Timor-Leste
CH_4	methane
CO_2	carbon dioxide
COLREGS	Convention on the International Regulations for Preventing Collisions at Sea, 1972
CSIRO	Commonwealth Scientific and Industrial Research Organisation
dB	decibels
DNIC	National Directorate for Communication Infrastructure
EMP	Environmental Management Plan
Eni	Eni Timor 22-23 B.V.
ENVID	Environmental Impact Identification
EP	Environmental Plan
et al.	and others
FLO	Fisheries Liaison Officer
FONGTIL	Forum ONG Timor-Leste
g/m^2	grams per square metre
GHG	greenhouse gas
ha	hectares
hr	hour(s)
HSE	health, safety and environment
Hz	hertz
IMO	International Maritime Organization
IMS	invasive marine species
in^3	cubic inches
IPIECA	International Petroleum Industry Environmental Conservation Association
ISO	International Standards Organization
ITOPF	International Tanker Owners Pollution Federation Limited
IUCN	International Union for the Conservation of Nature
JNCC	Joint Nature Conservation Committee
JPDA	Joint Petroleum Development Area
kHz	kilohertz

Acronym/Term	Definition
km	kilometres
L	litres
L_E	accumulated sound exposure levels
L_{pk}	peak pressure levels
m	metres
m/s	metres per second
ms	millisecond
MARPOL 73/78	International Convention for the Prevention of Pollution from Ships 1973, as modified by the Protocol of 1978
MDO	marine diesel oil
mm	millimetres
MMO	marine mammal observer
N_2O	nitrous oxide
NC	no contact
NM	nautical miles
NMFS	United States National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
occ/y	occurrences per year
OPEP	Oil Spill Emergency Plan
PAM	passive acoustic monitoring
PK	peak pressure
PMS	planned maintenance system
ppb	parts per billion
ppm	parts per million
ppt	parts per trillion
PSC	Production Sharing Contract
PTS	permanent threshold shift
R_{max}	maximum horizontal distance
SEIS	Simplified Environmental Impact Statement
SEL	sound exposure level
SEL_{24}	sound exposure level over 24 hours (cumulative)
SEL_{cum}	cumulative sound exposure levels
SOLAS	International Convention for the Safety of Life at Sea
SPL	sound pressure level
SundaGas	SundaGas Banda Unipessoal
t	tonnes
t CO_2-e	tonnes of carbon dioxide equivalent
the Treaty	Treaty Between Australia and the Democratic Republic of Timor-Leste Establishing their Maritime Boundaries in the Timor Sea
TTS	temporary threshold shift
UNCLOS	United Nations Convention on the Law of the Sea
UNDP	United Nations Development Programme

Acronym/Term	Definition
UNTL	National University of Timor-Leste

EXECUTIVE SUMMARY

This Simplified Environmental Impact Statement (SEIS) has been prepared for submission to and acceptance by Timor-Leste Autoridade Naçional do Petróleo (ANP).

Proponent Details

Eni Timor 22-23 B.V. ('Eni') is the operator (87.5% equity) of Production Sharing Contract (PSC) TL-SO 22-23 ('TL 22-23') with TIMOR GAP E.P. as Joint Venture partner (12.5% equity, carried) located in Timor-Leste offshore waters. In December 2023, Eni signed a PSC with ANP for PSC TL 22-23, which became effective on 22 April 2024. There is a work program commitment to acquire seismic data in the first exploration term.

Activity Overview

Eni proposes to acquire seismic data within the survey area over a period of up to ten weeks, using towed streamer operations commencing between July and September 2025. There is also a contingent option for acquiring an extra ~35km² of 3D seismic data over the Sikatan-1/ST1 well location, in addition to the firm 2D seismic line.

Project Location, Scale and Duration

Project Location

The survey area is in the Timor Sea, south of the Sunrise-Troubadour Gas Field in Timor-Leste waters (Figure 3-1). The survey area is approximately 175km from the southeast coast of Timor-Leste, 300km southeast of Dili and 370km northwest of Darwin, Australia.

Project Scale

The proposed seismic survey covers an area of approximately 1,500km² (50km by 30km) and is located on the Sahul Shelf in water depths ranging from 40m to 180m. Herein this area is referred to as the 'survey area'.

Project Duration

Dependent on vessel availability, the seismic survey is anticipated to commence between July and September 2025. The survey is expected to take up to ten weeks to complete, including mobilisation, scouting, data acquisition, streamer deployment and recovery. Seismic data acquisition will occur with 24-hour operations, although temporary shutdown periods may be required in the event of poor weather or other adverse conditions.

Overview of Survey Activity

In towed streamer operations, seismic surveys are conducted by large, specialised vessels, which tow an array of receivers (streamers) and pneumatic sources below the water surface and generate sound waves using pulses of compressed air, to take images of geological features in the subsurface for the purpose of hydrocarbon exploration.

The sound waves, reflected from horizons at and below the seafloor, are detected and recorded by an array of receivers (hydrophones, attached to streamers), towed by the same vessel to gain images of subsurface geological features. These operations are usually escorted by support and chase vessels to protect the tow vessel and towed equipment from other vessel traffic, and to protect other users of the sea from entanglement or other damage from collisions with towed seismic source.

The seismic survey, hereafter referred to as 'survey activity', will comprise a seismic vessel towing 10 to 12 streamers up to 8km long, with 75 to 112m spacings between streamers. Streamers will be towed at a depth of approximately 20m. Each streamer will have a tail buoy attached to ensure the streamer remains straight and afloat. The tail buoy will also provide a visual reference for survey activity crew and global positioning system.

Triple source airguns will be used, towed at a depth of around 8m, with a volume up to 3,500in³. The airguns will fire at a maximum interval of 37.5m with an eight-second recording length. The final streamer configuration, sound source array and shooting configuration will be finalised after award of the tender. Approximately sixty kilometres of 2D seismic data will also be acquired to tie the Sikatan-1/ST1 well, located in PSC TL-SO 19-16 ('TL 19-16), into the new 3D seismic dataset. There is also a contingent option for acquiring an extra ~35km² of 3D seismic data over the Sikatan-1/ST1 well location, in addition to the firm 2D seismic line. The activity may also include acquisition of gravity and magnetic data.

The seismic vessel will traverse the survey area along pre-determined 'sail lines'. Sail lines will be surveyed once, unless interruptions to the survey activity occur. If data acquisition is disrupted along a sail line, infill data acquisition may be required. During recording, the support vessel and a chase vessel will scout ahead of the main vessel to ensure the sail lines ahead of the seismic vessel are clear of obstacles and other users of the survey area, such as fishers. After each sail line is completed, the seismic vessel will be required to complete a line turn. All vessel manoeuvring and line turns will be completed within Timor-Leste waters, with no entries into Australian waters.

The survey activity will be performed using the seismic vessel with one support vessel and three chase vessels. Crew changes, if required, will be undertaken either via the support vessel or potentially via helicopter. The seismic vessel and support vessels may be refuelled (bunkered) at sea if required. All vessels will use marine diesel oil (MDO) with a sulphur content not exceeding 0.5%, in accordance with International Convention for the Prevention of Pollution from Ships 1973, as modified by the Protocol of 1978 (MARPOL 73/78) Annex VI.

Linear and Transport Components

There are no linear or transport components within the survey area. The nearest linear infrastructure is the Timor-Leste South Submarine Cable, a fibre optic cable located approximately 55km west of the survey area. The nearest offshore oil and gas pipelines include the Bayu-Undan to Darwin pipeline (approximately 160km south) and the Barossa export pipeline (approximately 205km east), significant distances from the survey area.

Marine National Parks, Marine Protected Areas and Other Environmentally Sensitive Areas

There are no marine National Parks or marine protected areas within the survey area. The closest marine protected area in Timor-Leste waters is the Nino Konis Santana National Park, located approximately 167km northwest of the survey area on the eastern tip of Timor-Leste. Two designated marine protected areas are located on the northern coast of Timor-Leste, including the Batugadé Marine Natural Reserve (342km to the northwest) and the Suco de Vila Marine Natural Reserve (315km to the northwest). Two proposed marine protected areas are located on the north coast of Timor-Leste, including the Lamsanak and Behau marine protected areas, located 252km and 270km to the northwest respectively. The nearest protected area in Australian waters is the Oceanic Shoals Australian Marine Park, located approximately 19km southeast of the survey area.

There are no Ramsar wetlands or World Heritage properties within 300km of the survey area. The nearest marine key biodiversity area is Perairan Nino Konis Santana (Timor-Leste), 167km north of the survey area.

Fisheries and Fishing Areas

Local (Indonesian and Timorese) fishers traditionally fish in the Timor Sea. Fishing occurs from April to December, with most activity in September and October. Fishing is typically concentrated in the vicinity of Hibernia Reef, about 520km southwest of the survey area in Australian waters. The nearest reef at which local fishing may occur is Pulau Meatimiarang (Indonesia), located 180km north of the survey area.

Fishing vessel activity from 2020 (Office for Coastal Management, 2024) indicates fishing vessels may occur within the survey area. However substantial activity is not expected, given the offshore location of the survey area and lack of suitable fishing grounds.

Illegal fishing activities have been reported in the Timor-Leste waters. These activities may involve using destructive methods such as fish aggregating devices, explosives or poisons, which pose significant threats to marine ecosystems. Given the offshore location and lack of suitable fishing grounds, substantial activity is not expected in the survey area.

Shipping Lines

Shipping traffic in proximity to the survey area is anticipated to be infrequent. The main shipping routes relevant to the survey area are predominantly northwest to southeast routes, linking Darwin and Wyndham in Australia with ports in Southeast Asia. The routes accommodate various vessels, including vessels supporting offshore oil and gas operations situated to the west and east of the survey area.

Feasibility Studies of the Proposed Project

Eni performed a seismic feasibility study to determine the most appropriate survey area and acquisition parameters to fully image a prospective subsurface feature identified on existing vintage 2D seismic data. The exact acquisition parameters will be finalised after

award of the seismic tender but will not deviate significantly from those outlined in this document.

Other Users of the Sea

Approximately 4km of 2D seismic data acquisition, along with vessel manoeuvring and line turns, will occur in the northern part of SundaGas Banda Unipessoal ('SundaGas') operated PSC TL 19-16. There is also a contingent option for acquiring an extra ~35km² 3D seismic data over the Sikatan-1/ST1 well location, in addition to the firm 2D seismic line. Eni will obtain the necessary approvals to enter and carry out manoeuvring and acquisition operations within TL 19-16. Eni is in direct contact with SundaGas with regards to 2025 operational activity for both companies and will maintain a dialogue to ensure there are no adverse impacts to operations in the survey area.

Environmental Impacts

Physical and Biological Components

There are numerous environmental sensitivities within the survey area and within the greater region that have been assessed and considered during planning of the proposed survey activity. These are summarised below:

- Benthic habitats: Key benthic habitats within the survey area include mostly flat and featureless shelf rise habitat and small areas of likely rocky reef. Key benthic habitats that do not occur within the survey area but are present in the greater region include:
  - shoals and banks, the closest being Troubadour Shoals, approximately 22km to the northeast
  - emergent coral reefs, the closest being Pulau Meatimiarang (Indonesia), approximately 180km to the north
  - shelf flats, with the nearest seamounts located approximately 260km to the north.
- Marine mammals: Whales, such as sperm and sei whales, have been recorded in the greater region but are unlikely to be found within the survey area. The pygmy blue whale is known to occur in Timor-Leste waters, with a migratory corridor along the Timor Trough, so it is possible the pygmy whale will occur within the survey area. Dolphin species considered likely to be found in the survey area include the pygmy killer whale, the common bottlenose dolphin, and the common dolphin.
- Sharks and rays: Possible shark species that may be encountered in the survey area include whale sharks and oceanic whitetips. It is also possible that the oceanic manta ray may be present. Crocodiles are considered unlikely, given the distance offshore.
- Marine reptiles: There are six marine turtle species that may be found in the survey area, including green, hawksbill, leatherback, flatback, olive ridley and loggerhead turtles. Given the distance offshore and lack of shoals, banks and emergent coral reefs, turtle numbers are expected to be low.

Cross-border Impacts

Cross-border impacts from underwater noise may occur during the survey activity. Underwater noise may travel across the Timor-Leste/Australian maritime boundary, as confirmed by the underwater noise modelling (JASCO, 2024). Cross-border impacts and

receptors are expected to be the same as those in Timor-Leste. No impacts to habitats in Australian waters are anticipated. Potential impacts are expected to be limited to behavioural responses from marine fauna (see Section 8.2.2 for more information).

Global Impacts, Including Climate Change Impacts

The combustion of fossil fuels to power the seismic and support vessels undertaking the survey activity is expected to result in atmospheric emissions. Given the very low levels of atmospheric emissions expected and the distance of the survey area offshore, air quality impacts to local communities, habitats and protected areas are not expected.

Greenhouse gas emissions will be similar to other vessels operating in the region for both petroleum and non-petroleum activities. Based on the duration of the survey activity and the vessel requirements, it is expected approximately 16,000 tonnes of (carbon dioxide equivalent) greenhouse gas will be emitted. These emissions are not expected to contribute significantly to greenhouse gas contributions. Climate change impacts are not anticipated to result from the survey activity.

Socio-economic Impacts

No significant impacts to current users of the sea are expected. Potential impacts to local fishers may occur; however, these are expected to be low. No adverse economic impacts are expected. The survey activity is expected to provide positive economic benefits to Timor-Leste through employment opportunities, and potentially provide a future opportunity for oil and gas development. Adverse impacts to the local population and their quality of life are not expected, given the distance of the survey area from populations and communities.

Minor seismic data acquisition, along with manoeuvring and line turns, will be carried out in the northern part of TL 19-16. SundaGas, the operator of TL 19-16, is planning to carry out drilling activity during the third quarter of 2025. Drilling operations may therefore take place within TL 19-16 at the same time as the survey activity. However, as their planned well is located 20km south of the manoeuvring area for the seismic survey, there will be no spatial overlap of activities. Eni will obtain the necessary approvals from SundaGas to enter and carry out manoeuvring and acquisition operations within TL 19-16. There are no operational activities planned in the Greater Sunrise blocks in 2025, which are located directly north of the survey area. No adverse impacts to existing hydrocarbon exploration and operations as a result of the survey activity are therefore expected.

The survey area is in offshore waters that are not accessed for tourism activities, so no adverse impacts to tourism are expected.

Risk Assessment Process

Eni has implemented its Health, Safety and Environment (HSE) Risk Management and Hazard Identification Procedure (ENI-HSE-PR-001) for identifying and assessing risks. The purpose of the procedure is to ensure the HSE, asset and reputational hazards are identified, risk-assessed and managed in a systematic and consistent way. In this way, risks associated with Eni projects and operational changes are effectively managed and addressed in compliance with company and legislative requirements.

With robust controls in place, all risks associated with planned impacts from the survey activity have been assessed as Low, except the risk of underwater noise from the seismic source, which has been assessed as Medium. Noise has been modelled (refer to Section 8.2.2) to ensure a robust impact assessment is presented, and control measures have been applied to reduce the impacts from the seismic source to as low as reasonably practicable. All risks associated with unplanned events have been assessed as Low and therefore acceptable when the control measures are implemented.

The planned and unplanned risks associated with the survey activity include:

Planned activities:

- Interaction with Other Marine Users
- Underwater Noise – Seismic Source
- Noise Emissions – Vessels and Mechanical Equipment
- Atmospheric Emissions
- Light Emissions
- Planned Vessel Discharges.

Unplanned events:

- Vessel Collision or Entanglement with Marine Fauna
- Loss of Equipment and Dropped Objects
- Non-Hazardous and Hazardous Waste Loss to Marine Environment
- Minor Hydrocarbon or Chemical Leaks
- Introduction of Invasive Marine Species
- Marine Diesel Oil Spills to Sea.

The potential environmental impacts and risks associated with the survey activity are summarised in Table 0-1. Controls to manage the impacts and risks are presented within Table 0-1 and in Sections 8.2 and 8.3. Control implementation is expanded on in the PSC TL 22-23 Seismic Survey Environmental Management Plan (EMP) (Eni-AH08-EXP-1000282).

Public Consultation

Eni's objective for stakeholder engagement is to develop and maintain long-term relationships with stakeholders in and around its general areas of operations. Identifying and understanding stakeholders, with particular attention to those affected directly and indirectly, is key in understanding the potential or perceived impacts Eni's operations can have on them. Leveraging previous operations or activities in Timor-Leste, Eni was able to identify stakeholders with an interest in and potentially affected by the survey activity. Eni undertook early consultation when this document was being prepared, and public consultation will take place when the draft SEIS and EMP are submitted. Eni will also maintain engagements with stakeholders during the duration of the survey activity as required.

Consultation with Other Authorities

Eni will consult relevant authorities to identify immigration, customs and quarantine requirements applicable to the survey activity.

Classification of the Proposed Project

Eni submitted the PSC TL-SO 22-23 Marine Seismic Survey Project Document to ANP on 10 January 2025. In accordance with Decree Law No. 39/2022, ANP assessed the survey activity as a Category B (Ref: ANP/HSE/S25/011), on the basis that the survey activity meets the criteria to be considered 'oil and gas exploration' and Eni is required to apply for an environmental licence in accordance with Decree Law No. 39/2022, including preparing and having this SEIS and accompanying EMP assessed.

Table 0-1: Impact assessment summary

Risk ID	Activities/ Products/ Services	Description of Hazardous Event and Potential Impact	Inherent Risk			Risk Reduction Measures	Residual Risk		
			Frequency	Severity	Risk		Frequency	Severity	Risk
PLANNED									
P1	Interaction with Other Marine Users	The presence of vessels (the seismic vessel and support vessels) and seismic survey equipment (streamers, buoys).	E	1	L	• Navigation lighting and aids in accordance with the International Regulations for Preventing Collisions at Sea (COLREGS) and Chapter V of International Convention for the Safety of Life at Sea (SOLAS). • Support/chase vessels used to deter non-survey activity vessels from the survey area, as well as identify debris and fish aggregating devices. • Support/chase vessels will be able to identify, tow and recover fishing equipment and debris. • Fisheries Liaison Officers onboard vessels. • Streamers marked with tail buoys. • Stakeholder engagement	B	1	L
P2	Noise Emissions – Seismic Source	Noise emissions generated by operation of the seismic source during the survey activity. Potential impacts: • Change in ambient noise. • Behavioural impact to or displacement of marine fauna (masking, avoidance).	E	3	H	• Vessels will adhere to the Joint Nature Conservation Committee (JNCC) Guidelines for Minimising the Risk of Injury to Marine Mammals from Geophysical Surveys (2017). • Vessels will adhere to Eni Minimum HSE requirements in Geophysical Operations, including requirements for offshore seismic surveys. • Use of sufficient marine mammal observers (MMO) and passive acoustic monitoring (PAM) operatives on vessels.	B	3	M

Risk ID	Activities/ Products/ Services	Description of Hazardous Event and Potential Impact	Inherent Risk			Risk Reduction Measures	Residual Risk		
			Frequency	Severity	Risk		Frequency	Severity	Risk
		• Injury/mortality to marine fauna (temporary threshold shift (TTS)/permanent threshold shift (PTS)).				• Marine megafauna interaction requirements included in survey activity inductions. • No equipment testing outside of the survey area. • Airgun firing (including testing) must not exceed the planned maximum production volumes outlined in the environmental licence application. • Pre-shooting survey searches and soft starts incorporated into the survey activity. • Cetacean sighting and compliance reports to be submitted to ANP (End of Activity Report). • Incorporate JNCC mitigations for night-time and poor visibility conditions, including use of PAM operatives in addition to MMO visual mitigation. • If unplanned break in operations occurs during night-time or poor visibility conditions, mitigation zone is to be monitored using PAM procedures. • If PAM operatives are not available, the survey activity will be delayed until conditions are suitable for visual conditions.			

Risk ID	Activities/ Products/ Services	Description of Hazardous Event and Potential Impact	Inherent Risk			Risk Reduction Measures	Residual Risk		
			Frequency	Severity	Risk		Frequency	Severity	Risk
P3	Noise Emissions – Vessels, Mechanical Equipment and Helicopters	Noise emissions generated by operation of the seismic, support and chase vessels, helicopters, and mechanical equipment during the survey activity. Potential impacts: • Change in ambient noise. • Behavioural impact to marine fauna (masking, avoidance). • Injury/mortality to marine fauna (TTS/PTS).	E	1	L	• Vessels to be maintained in accordance with the applicable preventative maintenance systems (PMS). • Marine megafauna interaction requirements included in survey activity inductions.	B	1	L
P4	Atmospheric Emissions	Atmospheric emissions will be released from the seismic and support vessels as a result of combustion for power generation and transport. Potential impacts: • Impact to local air quality. • Contribution to greenhouse gas emissions.	E	1	L	• International Air Pollution Prevention Certificate – in accordance with MARPOL 73/78 Annex VI. • Fuel type used (marine diesel) – in accordance with MARPOL 73/78 Annex VI. • Equipment (engines, thrusters, generators, etc) is maintained in accordance with the applicable PMS. • Vessel incinerators will be maintained to manufacturer's specification and in accordance with MARPOL 73/78 Annex VI. • Ozone depleting substances shall not be deliberately released – in accordance with MARPOL 73/78 Annex VI.	E	1	L

Risk ID	Activities/ Products/ Services	Description of Hazardous Event and Potential Impact	Inherent Risk			Risk Reduction Measures	Residual Risk		
			Frequency	Severity	Risk		Frequency	Severity	Risk
P5	Light Emissions	Lights on the seismic vessel and support vessels will be required on a 24-hour basis for safety and navigational purposes, which could lead to changes in marine fauna behaviour. Potential impacts: • Behavioural impact (e.g. avoidance/attraction/ disorientation) to marine fauna (note the activities are distant from sensitive turtle nesting areas or sensitive features such as protected areas).	E	1	L	• Management of lighting in accordance with the COLREGS and Chapter V of SOLAS.	B	1	L
P6	Planned Vessel Discharges	Sewage, greywater, food waste, deck drainage, bilge water, cooling water and brine will be routinely discharged to the marine environment from the seismic vessel and support vessels. Potential impacts: • Localised decrease in water quality.	E	1	L	• Sewage treatment system in accordance with MARPOL 73/78 Annex IV. • Waste management procedure in accordance with MARPOL 73/78 Annex V. • Oily water treatment system in accordance with MARPOL 73/78 Annex I. • Control oily water discharge in accordance with MARPOL 73/78 Annex I.	B	1	L

Risk ID	Activities/ Products/ Services	Description of Hazardous Event and Potential Impact	Inherent Risk Frequency	Inherent Risk Severity	Inherent Risk Risk	Risk Reduction Measures	Residual Risk Frequency	Residual Risk Severity	Residual Risk Risk
		• Behavioural impact (e.g. avoidance/attraction) to marine fauna.				• Valid International Oil Pollution Prevention Certificate, which confirms that required measures to reduce impacts of planned oil discharges are in place on vessels. • Vessels will have and be compliant with a Garbage Management Plan in accordance with MARPOL 73/78 Annex V, as appropriate to vessel class. • Equipment/machinery involved in the treatment of wastes will be routinely maintained. • Chemical selection process in Eni is followed and all chemicals to be used must be submitted for approval to ANP before use. • All crew will participate in the vessel and environmental induction prior to the commencement of the survey activity.			
UNPLANNED									
U1	Vessel Collision or Entanglement with Marine Fauna	Potential for vessels to collide with marine fauna, including cetaceans and turtles, and for marine fauna entanglement with towed seismic streamers, buoys and attached equipment. Potential impacts: • Injury/mortality to fauna.	B	2	L	• Vessels will adhere to the JNCC Guidelines for Minimising the Risk of Injury to Marine Mammals from Geophysical Surveys (2017). • Vessels will adhere to Eni Minimum HSE requirements in Geophysical Operations, including requirements for offshore seismic surveys. • Use of sufficient MMOs and PAM operatives on vessels. • Marine megafauna interaction requirements included in survey activity inductions.	A	2	L

Risk ID	Activities/ Products/ Services	Description of Hazardous Event and Potential Impact	Inherent Risk Frequency	Severity	Risk	Risk Reduction Measures	Residual Risk Frequency	Severity	Risk
						• Any vessel strike incident to marine mammals shall be reported to ANP as soon as possible. • Turtle guards on seismic tail-buoys			
U2	Loss of Equipment and Dropped Objects	Loss of seismic survey equipment or accidental dropped objects, including loss of streamers and other seismic survey equipment (due to human errors, equipment failures, etc). Potential impacts: • Localised impact to seabed. • Localised impact to benthic fauna. • Localised impact to marine fauna from ingestion/ entanglement.	B	1	L	• Approved procedures for streamer deployment. • Routine maintenance and inspection of streamer equipment. • Streamers will be fitted with: – streamer recovery devices (self-inflating) – surface marker buoys – secondary retaining devices – tail buoys. • Support and chase vessels will search for and recover lost in-water equipment where possible and safe to do so. • Relevant persons will be notified via radio in the event of a loss of in-water equipment. • All wastes will be collected and segregated into clearly marked containers before onshore disposal by a licenced waste management contractor. • All bins on deck will be covered to prevent rubbish blowing overboard. • Records will be maintained of solid and hazardous waste volumes generated and transferred for onshore recycling or disposal.	A	1	L

Risk ID	Activities/ Products/ Services	Description of Hazardous Event and Potential Impact	Inherent Risk			Risk Reduction Measures	Residual Risk		
			Frequency	Severity	Risk		Frequency	Severity	Risk
						• Waste management procedure will be implemented, including safe handling, treatment, transportation and appropriate segregation and storage of all waste generated. • Lost waste will be recovered when safe and practicable to do so.			
U3	Non-hazardous and Hazardous Waste Loss to Marine Environment	Hazardous (e.g. rags, oil filters, personal protective equipment), and non-hazardous (e.g. plastic, cardboard) solid waste losses (from human errors, equipment failures, improper storage, etc). Potential impacts: • Change in water quality. • Marine fauna ingestion/ entanglement. • Localised impact to benthic fauna.	B	1	L	• Hazardous and non-hazardous waste management process in place in accordance with MARPOL 73/78 Annex V: – All wastes will be collected and segregated into clearly marked containers before onshore disposal by a licenced waste management contractor. – All bins on deck will be covered to prevent rubbish blowing overboard. – Records will be maintained of solid and hazardous waste volumes generated and transferred for onshore recycling or disposal. – Waste management procedure will be implemented, including safe handling, treatment, transportation and appropriate segregation and storage of all waste generated. • Lost waste will be recovered when safe and practicable to do so. • All crew will participate in the vessel and environmental induction before the survey activity begins.	A	1	L
U4	Minor Hydrocarbon or Chemical Leaks	Minor quantities of chemicals or hydrocarbons can be accidentally released to the marine environment from human errors (including incorrect management	B	2	L	• Spill response plan in place for vessels. • Spill response kits located close to hydrocarbon storage/bunkering areas and appropriately stocked and replenished as required.	B	1	L

Risk ID	Activities/ Products/ Services	Description of Hazardous Event and Potential Impact	Inherent Risk Frequency	Inherent Risk Severity	Inherent Risk Risk	Risk Reduction Measures	Residual Risk Frequency	Residual Risk Severity	Residual Risk Risk
		or disposal of hazardous wastes), equipment failures (hydraulic hoses), improper storage or incorrect handling and spills during MDO bunkering. Potential impacts: • Change in water quality. • Localised behavioural impact to marine fauna (avoidance). • Injury/mortality to marine fauna.				• A waste management procedure will be implemented, including safe handling, treatment, transportation and appropriate segregation and storage of all waste generated. • Chemical selection process in Eni is followed and all chemicals to be used must be submitted for approval to ANP before use. • Hydrocarbon or chemical storage containers will be properly stored with lids that are tight and secured to prevent spillage during vessel movement or rough weather. • Storage containers will be managed in a manner that provides for secondary containment in the event of a spill or leak. • Storage containers will be labelled with the technical product name as per the Safety Data Sheet. • Hazardous substances will be stored, segregated, handled and used in accordance with the product's Safety Data Sheet. • Vessels to be maintained in accordance with the applicable PMS. • Refuelling transfer procedures to prevent bunkering spills.			

Risk ID	Activities/ Products/ Services	Description of Hazardous Event and Potential Impact	Inherent Risk			Risk Reduction Measures	Residual Risk		
			Frequency	Severity	Risk		Frequency	Severity	Risk
U5	Introduction of Invasive Marine Species	Introduction of non-endemic marine species from the vessels used to complete the survey activity, leading to colonisation and displacement of native species. Potential impacts: • Change in ecosystem dynamics. • Change in the functions, interests or activities of other users.	B	3	M	• Seismic, chase and support vessels will comply with Timor-Leste entry requirements and International Maritime Organization's International Convention for the Control and Management of Ships Ballast Water and Sediments 2004-MARPOL 73/78 (as appropriate to vessel class), including: – Ballast water exchanges conducted >50NM from land and in >200m water depth. • International Convention on the control of harmful anti-fouling systems on ships, which requires vessels (applicable to vessels only, of appropriate class) have a valid international anti-fouling systems certificate. • Implementation of invasive marine species risk assessment tool (by Eni Logistics).	A	3	L
U6	Marine Diesel Oil Spills to Sea	Vessel collision causing a large-scale hydrocarbon release with widespread impacts to water quality. Potential impacts: • Change in water quality. • Behavioural impact to marine fauna (avoidance). • Change in the functions, interests or activities of other users (fisheries).	B	3	M	• Navigation equipment and procedures on vessels compliant with COLREGS and Chapter V of SOLAS. • Fuel type used (marine diesel) – in accordance with MARPOL 73/78 Annex VI, which limits the sulphur content of fuels. • Vessel Spill Response Plan in place for vessels. • Oil Spill Contingency Plan in place for survey activity. • Support and chase vessels used to deter non-survey vessels from survey area. • Support and chase vessels will have a communication sheet in Bahasa and Tetum with key survey information, to be provided to fishers encountered during the survey activity.	A	3	L

Risk ID	Activities/ Products/ Services	Description of Hazardous Event and Potential Impact	Inherent Risk			Risk Reduction Measures	Residual Risk		
			Frequency	Severity	Risk		Frequency	Severity	Risk
						• Support and chase vessels will have Fisheries Liaison Officers onboard who are Bahasa and Tetum speakers. • Refuelling transfer procedures to prevent bunkering spills.			

1 PROPONENT DETAILS

Eni Timor 22-23 B.V. (Eni) is the operator of Production Sharing Contract (PSC) TL-SO 22-23 (87.5%) in conjunction with TIMOR GAP (12.5%), who is the joint venture partner. As operator of PSC TL-SO 22-23 ('TL 22-23'), Eni assumes overall responsibility for the PSC area and direct responsibility for the survey activity.

Eni's Timor-Leste office is in Dili. Eni also has offices in Australia, with the Australian head office located in Perth (address below) and a secondary office in Darwin, Australia. Eni is a subsidiary of Eni S.p.A., one of the world's major integrated energy companies, operating in 70 countries around the world, with headquarters in Milan, Italy.

Eni's contact details are:

Eni Australia Limited
226 Adelaide Terrace
Perth WA 6000
Telephone: (08) 9320 1111
Email address: eniaus.info@eni.com

The nominated contact person for this Simplified Environmental Impact Statement (SEIS) is:

Joe Covic
Eni Health, Safety, Environment and Quality Manager
Eni Australia Ltd
Tel: (08) 9320 2611
Email: joe.covic@eni.com

2 DETAILS OF SIMPLIFIED ENVIRONMENTAL IMPACT STATEMENT CONSULTANT

Worley Consulting (formerly Advisian) has been engaged to assist Eni in preparing all necessary environmental documentation relating to the survey activity, including the SEIS and Environmental Management Plan (EMP).

Worley Consulting maintains a team of skilled professionals with proven success in developing and providing environmental services to the oil & gas and mining industries. The consultants in the Worley Consulting Environment & Society team include environmental, engineering and social professionals who enable accurate, informed and reliable decisions for successful project outcomes. The team provides environmental and social services to customers, providing support across the project lifecycle, from concept through to operations and decommissioning. Worley Consulting's combined offering of engineering and science allows it to develop technically practical solutions that result in benefits to the environment and society. Additionally, Worley Consulting has experience with projects in the Timor region (Table 2-1), demonstrating the consultancy's capabilities. With a proven record and a commitment to excellence, Worley Consulting is well equipped to deliver successful outcomes for this survey activity.

Details of the SEIS consultant engaged by Eni to prepare this document are as follows:

Name:	Worley Consulting
Business address:	Level 14, 240 St Georges Terrace, Perth, WA 6000
Telephone number:	(08) 9278 8111
Email address:	sam.dell@worley.com

Eni acknowledges approval of this document by key personnel within the organisation via the signatory page at the beginning of this document.

The selected recent experience of the SEIS consultant (Worley Consulting) is provided in Table 2-1. Projects specific to Timor-Leste have been highlighted.

Table 2-1: Experience of the Simplified Environmental Impact Statement consultant

Organisation/Project	Description	Status
Eni: Kitan Decommissioning Environmental Impact Statement and EMP, Timor-Leste	Decommissioning Environmental Impact Statement and EMP for the Kitan Field (Phase 2)	In preparation
Eni: Blacktip Operations Environment Plan (EP), Australia	Five-year Operations EP revision	Approved in 2024
Eni: Blacktip Drilling EP, Australia	Drilling EP and Oil Pollution Emergency Plan (OPEP)	Approved in 2024
Eni Woollybutt Decommissioning, Australia	Decommissioning EP for the Woollybutt field	Approved in 2022

Organisation/Project	Description	Status
Santos: Bayu-Undan Environmental Management Plan, Timor-Leste	Preparation of the EMP for decommissioning the Bayu-Undan platform for submission to Autoridade Nacional do Petróleo (ANP)	Approved in 2023
ConocoPhillips: Bayu-Undan Environmental Management Plan, Timor-Leste	Preparation of the EMP for the cessation of operations for submission to ANP	Approved in 2018
Santos: Bedout Basin Multi Well Drilling EP, Australia	Preparation of an EP and OPEP to support drilling activities	In preparation
Santos: Dorado Fixed Facilities Installation EP, Australia	Preparation of an EP and OPEP to support installation of fixed facilities, including noise modelling and detailed assessment of underwater noise from piling activities	In preparation
Santos Ningaloo Vision Cessation of Production and Floating Asset Removal EP, Australia	Preparation of an EP and OPEP to support cessation of production and asset removal	Approved in 2024
Santos Bedout Drilling EP, Australia	Multiple well drilling over a period of five years	Approved 2021
Santos: Spar Halyard Infill Project EP, Australia	EP and OPEP for drilling, installation and pre-commissioning activities	Approved in 2024
Santos: Barossa Development Drilling and Completions, Australia	Drilling campaign for six subsea production wells	Approved in 2023
Santos: Barossa Operations, Australia	Operations of the Barossa facilities	In preparation
Santos: Harriet Joint Venture Approvals Package, Australia	Environmental approvals for cessation of operations, equipment removal and end-state decommissioning of 16 platforms, associated infrastructure and 211km of pipeline	Approved in 2024
Santos: Ningaloo Vision Life Extension and Decommissioning EP Package, Australia	At least three EPs and OPEPs to cover life extension and decommissioning activities associated with end of life of the Ningaloo Vision Floating Production, Storage and Offloading Facility	In preparation
Woodside: Griffin Field Decommissioning, Australia	Four EPs and OPEPs for equipment removal and end-state decommissioning of Griffin Field infrastructure and gas export pipeline	Approved in 2024
Woodside: Stybarrow Field Decommissioning, Australia	Three EPs and OPEPs for equipment removal and end-state decommissioning of Stybarrow Field infrastructure and gas export pipeline	Approved in 2024
Woodside: Okha Operations EP, Australia	Five-yearly revision of the Okha Operations EP and OPEP.	In preparation

3 SURVEY ACTIVITY DESCRIPTION

3.1 Survey Activity Overview

In December 2023, Eni signed a PSC with ANP for PSC TL 22-23, which became effective on 22 April 2024. There is a commitment to acquire seismic data in the first three-year exploration period. As such, Eni proposes to acquire seismic data from the survey area using towed streamer operations with a duration of up to ten weeks. This will involve acquiring approximately 1,500km² of 3D broadband towed streamer seismic and 60km of 2D seismic data within the southeast part of the survey area. There is also a contingent option for acquiring an extra ~35km² of 3D seismic data over the Sikatan-1/ST1 well location, in addition to the firm 2D seismic line.

3.2 Category of the Survey Activity

Article 4 of Decree Law 39/2022, entitled Definition of Categories and Type of Environmental Procedure, provides the following:

1. The classification of projects is made in accordance with Annex I and Annex II and is structured in the following categories:
    a. Category A – includes projects that may potentially cause significant environmental impacts and are subject to the procedure of Environmental Impact Assessment, based on impact analysis and an EMP in accordance with the provisions in this law.
    b. Category B – includes projects that may cause environmental impacts and are subject to the procedure of Initial Environmental Examination, based on the EMP in accordance with the provisions of this law.
    c. Category C – includes projects where environmental impacts are negligible or non-existent, and not subject to any procedure for Environmental Assessment in accordance with the provisions of this law.
2. In the following cases, the category is determined by considering the severity of likely impacts:
    a. A project that might raise some or significant adverse impacts that do not fall into the category of Appendix I and II.
    b. A project that may raise significant adverse impacts falls under the category of Appendix II.

On 10 January 2025, Eni submitted the Project Document for the survey activity for assessment, which included an assessment of the survey activity against the criteria in Appendix I and Appendix II of Decree Law 39/2022; Classification of Category A Projects and Classification of Category B projects respectively.

After the Project Document was assessed and in accordance with Decree Law No. 39/2022, ANP gave the survey activity a Category B classification (*Ref: ANP/HSE/S25/011*). Eni must therefore submit a Simplified Environmental Impact Statement (SEIS) (this document) and an EMP for the survey activity. This SEIS was prepared in accordance with the requirements of Appendix V of the Ministerial Diploma

No. 46/2017 – Minimum Requirements for the Simplified Environmental Impact Statement.

3.3 Survey Activity Nature, Size and Location

3.3.1 Location

The survey area, which encompasses the 3D area and 2D seismic line, as well as manoeuvring and shooting areas, is located in the Timor Sea, south of the Sunrise Troubadour Gas Field in Timor-Leste offshore waters (Figure 3-1). The survey area is approximately 175km from the southeast coast of Timor-Leste, 300km southeast of Dili and 370km northwest of Darwin, Australia. The survey area covers approximately 1,500km² (50km by 30km) in water depths ranging from 40 to 180m. There is also a contingent option for acquiring an extra ~35km² of 3D seismic data over the Sikatan-1/ST1 well location, in addition to the firm 2D seismic line.

The location of the survey elements (comprising the 3D seismic, shooting, manoeuvring and contingency 3D seismic areas, as well as the 2D seismic line end points) is shown in Figure 3-1 and Figure 3-2, with the coordinates for the corner points provided in Table 3-1, which also includes the Sikatan-1/ST1 well location.

Table 3-1: Location of the survey elements

Point	Longitude	Latitude
3D Seismic Full-fold Area		
1	128° 17' 10.0683" E	10° 13' 58.0220" S
2	128° 22' 38.5976" E	9° 58' 02.6655" S
3	127° 54' 43.7083" E	9° 57' 58.3756" S
4	127° 49' 13.8484" E	10° 13' 53.1484" S
2D Line		
1	127° 47' 46.5042" E	10° 16' 12.4404" S
2	128° 15' 26.2941" E	9° 58' 38.5212" S
Shooting Area		
1	127° 45' 00.1139" E	10° 19' 45.9622" S
2	127° 53' 25.5166" E	9° 55' 23.9371" S
3	128° 23' 31.5320" E	9° 55' 28.5627" S
4	128° 16' 17.0246" E	10° 16' 32.0984" S
5	127° 57' 14.7195" E	10° 16' 28.9732" S
6	127° 56' 05.8325" E	10° 19' 48.3505" S
7	127° 45' 00.1139" E	10° 19' 45.9622" S
Manoeuvring Area		
1	128° 14' 54.6663" E	10° 22' 06.0149" S
2	128° 25' 59.8389" E	9° 49' 54.8730" S
3	127° 52' 01.9203" E	9° 49' 54.7547" S
4	127° 39' 47.2705" E	10° 25' 18.7528" S
5	127° 54' 10.4737" E	10° 25' 22.0367" S

Point	Longitude	Latitude
6	127° 55' 19.4065" E	10° 22' 02.6714" S
7	128° 14' 54.6663" E	10° 22' 06.0149" S
Sikatan-1/ST1 Well		
Well	127° 49' 37.17" E	10° 15' 02.19" S
Contingent 3D		
1	127° 48' 04.8946" E	10° 17' 12.4855" S
2	127° 49' 13.8484" E	10° 13' 53.1484" S
3	127° 52' 19.3966" E	10° 13' 53.8059" S
4	127° 51' 10.4596" E	10° 17' 13.1573" S

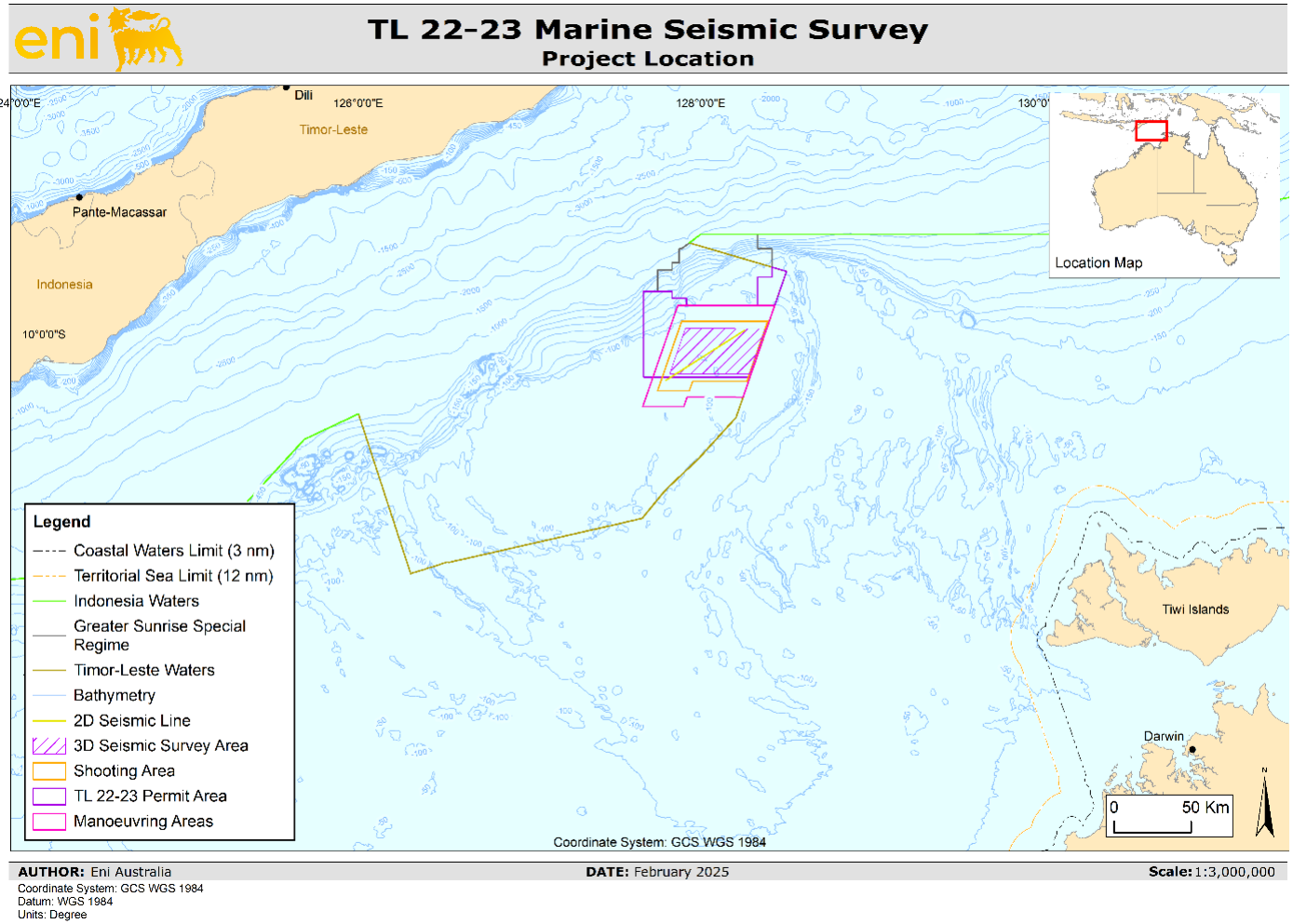


Figure 3-1: Project location (regional)

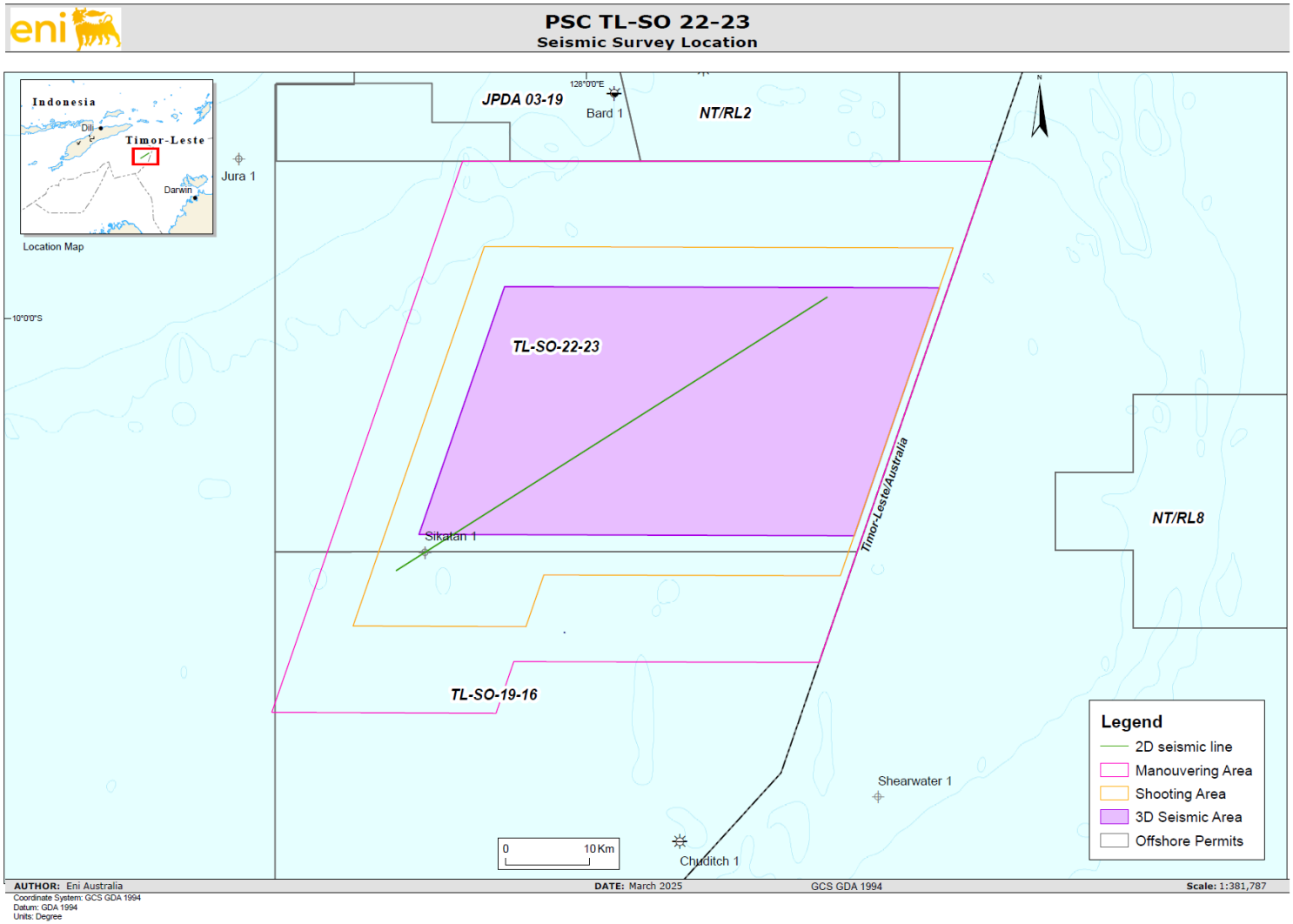


Figure 3-2: Project location (close-up)

3.3.2 Duration

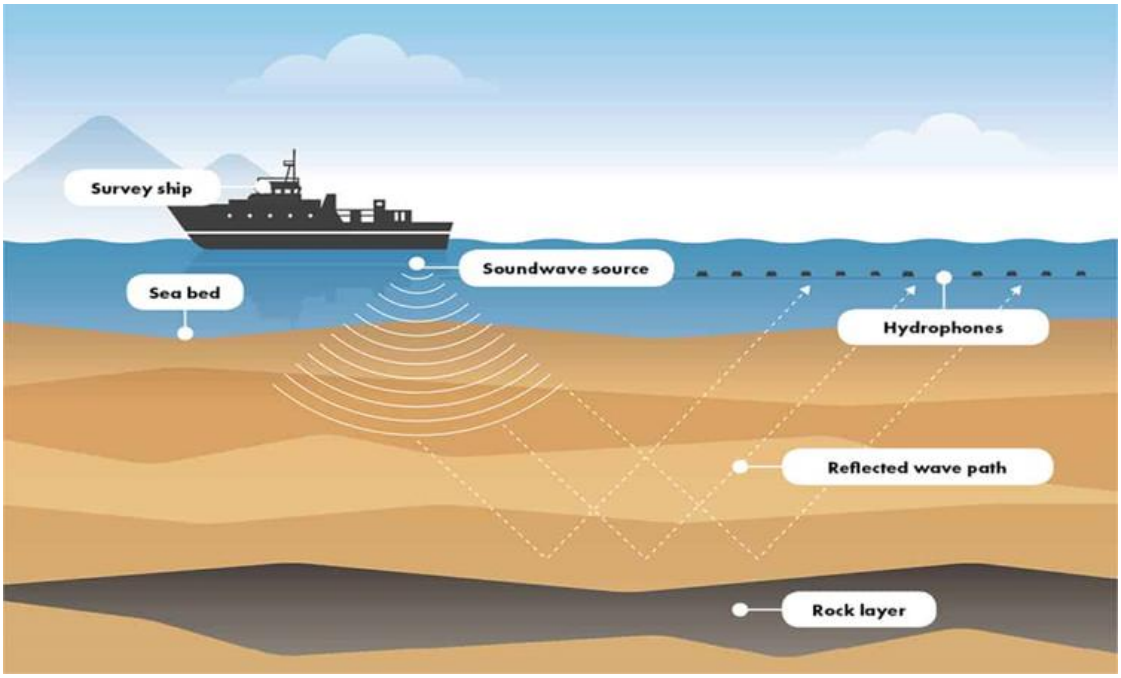
The survey activity is planned to commence between July and September 2025. The survey activity is expected to take up to ten weeks to complete, including mobilisation, scouting, data acquisition, streamer deployment and recovery.

Seismic data acquisition will occur 24 hours a day, although temporary shutdown periods may be required in the event of poor weather or other adverse conditions. Once confirmed, the actual survey start and end dates will be communicated to all relevant persons in accordance with regulatory requirements.

3.3.3 Seismic Survey Operations

In towed streamer operations, seismic surveys are conducted using large, specialised vessels, which tow an array of receivers (streamers) and pneumatic sources towed below the water surface that generate sound waves using pulses of compressed air in order to image geological features in the subsurface for the purpose of hydrocarbon exploration.

The sound waves, reflected back from horizons at and below the seafloor, are detected and recorded by an array of receivers (hydrophones, attached to streamers), towed by the same vessel in order to image subsurface geological features. These operations are usually escorted by support and chase vessels to protect the tow vessel and towed equipment from other vessel traffic, and to protect other users of the sea from entanglement or other damage from collisions with towed seismic source. An indicative schematic of these activities is shown in Figure 3-3.



Source. Australian Energy Producers (2024).

Figure 3-3: Indicative seismic survey schematic

3.3.3.1 Streamer Configuration

The survey activity will comprise a seismic vessel towing 10 to 12 streamers, approximately 8km long, with 75 to 112.5m spacings between streamers. Streamers will be towed at a depth of approximately 20m. Each streamer will have a tail buoy attached to ensure it remains straight and afloat. The tail buoy will also provide a visual reference for seismic vessel crew and global positioning system. The final streamer configuration will be confirmed after award of the seismic contract.

3.3.3.2 Seismic Sound Source Configuration

The survey activity will have a shooting configuration that allows the use of a triple source array. The survey activity will use airguns as the sound source, with a volume less than 3,500in³. The sound sources will be towed at a depth of 8m. The airguns will fire at a maximum interval of 37.5m with an eight second recording length. The sound source array and shooting configuration will be finalised after award of the tender, and included in the final seismic acquisition plan.

Before the survey activity begins, the seismic source will be tested within the survey area and soft-start procedures will be implemented before reaching the full volume planned for the seismic source. The same equipment and methods will be used to acquire the 2D seismic data as for the 3D data, with the only differences related to data processing.

3.3.3.3 Survey Activity Plan

The seismic vessel will traverse the survey area via an array comprised of 'sail lines'. Sail lines are typically parallel and adjacent to each other and will be surveyed by the seismic vessel, with the seismic sound source and streamers active throughout the survey activity. The sail lines are expected to be 31km long on average. During recording, the seismic vessel will travel at a speed of approximately 4.5 knots.

Sail lines will be surveyed once, unless interruptions to the survey activity occur as a result of weather. If data acquisition is disrupted along a sail line, infill data acquisition may be required.

During recording, the support vessel and a chase vessel will ensure the sail lines ahead of the seismic vessel are clear of obstacles and other users of the survey area, such as fishers. After completing each sail line, the seismic vessel will be required to complete a line turn to complete the next adjacent sail line and allow the streamers to straighten out. Additional vessel manoeuvring areas will therefore be required to ensure adequate coverage of the survey area, as shown in Figure 3-1 and Figure 3-2. All vessel manoeuvring and line turns will be completed within Timor-Leste waters, with no entries into Australian waters.

The parameters of the survey activity are provided in Table 3-2.

Table 3-2: Parameters of the survey activity

Parameter	Survey Activity
Survey Area (refer to Figure 3-1)	
Permit area	PSC TL-SO 22-23
Survey area	Approximately 1,500km² 3D seismic
2D seismic	Approximately 60km 2D seismic
Contingent option	Approximately 35km² 3D seismic over Sikatan-1/ST1
Survey Activity	
Survey timing	Commencing July to September 2025
Survey duration	Up to 10 weeks
Length of sail lines	Average of approximately 31km
Speed	Approximately 4.5 knots during recording
Seismic Source	
Type	Airgun
Number of sources	3
Volume	Up to 3,500in³
Pressure	Approximately 75bar-m
Sound source tow depth	8m
Firing interval	37.5m
Record length	8 seconds
Streamers	
Number	10 to 12
Streamer length	Approximately 8km
Distance between streamers	75 to 112.5m
Streamer tow depth	Approximately 20m
Vessels	
Seismic vessel	One seismic vessel – to be determined with contractor
Support vessels	One support vessel Three chase vessels
Refuelling	Refuelling (bunkering) will occur at sea, depending on the specific vessel and contractor
Crew changes	Crew changes if required via support vessel or helicopter

3.3.3.4 2D Seismic Data Acquisition

Approximately 60km of 2D seismic data will be acquired to tie the Sikatan-1/ST1 well into the 3D seismic data. The Sikatan-1/ST1 well is located approximately 75m south of PSC TL-SO 22-23, in SundaGas-operated PSC TL-SO 19-16 ('TL 19-16'). Approximately 4km of seismic sail line will be required within TL 19-16 for full imaging of the Sikatan-1/ST1 well location. Seismic operations for the 2D seismic line will therefore extend south into TL 19-16. The 2D seismic data will be acquired within the seismic shooting area of the survey area, as shown in Figure 3-1 and Figure 3-2.

3.3.3.5 Contingent Extra 3D Seismic Data Acquisition

There is a contingent option to acquire an extra ~35km² of 3D seismic data over the Sikatan-1/ST1 well location, in addition to the firm 2D seismic line. This would be achieved by continuing the sail lines southwards in the south-west corner of the full fold area, to a total sail line length of around 37km. The total width of this extra 3D seismic area would be approximately 6km and would be acquired within the seismic shooting area of the survey area.

3.3.3.6 Gravity and Magnetic Data Acquisition

The planned survey activity may also include acquiring gravity and magnetic data. Gravity data may be acquired using a gravity meter mounted onboard the seismic vessel. Magnetic data may be acquired using a magnetometer towed behind the seismic vessel.

3.3.4 Crew and Vessel Services

The survey activity will be performed using a seismic vessel (Figure 3-4) with one support vessel and three chase vessels. Crew changes will be undertaken via the support vessel or possibly helicopter.

The seismic vessel and support vessels may be refuelled (bunkered) at sea if required. All vessels will use marine diesel oil (MDO).

Source. Petroleum Exploration Society of Australia (2024).

Figure 3-4: Indicative survey activity vessel

3.3.4.1 Vessel Selection

Selection of the vessels will depend on technical requirements for the survey activity operations and Eni's vessel selection criteria. Selection criteria include:

- The contractor must be able to meet Eni and Timor-Leste environmental and safety standards.
- The contractor must meet Eni's prequalification assessment.

All vessels will have all necessary certification and registration and will fully comply with all relevant regulations, including the International Convention for the Prevention of Pollution from Ships (MARPOL), and International Convention for the Safety of Life at Sea (SOLAS), as appropriate. The vessels must also comply with necessary approvals and vessel inspections before entry into the survey area.

3.3.5 Justification and Necessity of the Survey Activity

Acquisition of approximately 1,500km² of 3D and 60km 2D seismic data are work commitments for the first exploration period of PSC TL-SO 22-23. There is some coverage of the PSC area by existing vintage 2D seismic lines, which were acquired in the 1990s and early 2000s. The proposed 3D survey activity is located over a prospective geological feature identified on the vintage 2D seismic data. The new data acquisition will significantly improve imaging and definition of the subsurface feature in the survey area for the purpose of hydrocarbon exploration and for locating a well.

A seismic feasibility study was carried out by Eni to determine the most appropriate survey area and acquisition parameters to fully image the subsurface feature. The acquisition parameters will be finalised after award of the seismic tender.

3.3.6 Proponent's Approval of the Simplified Environmental Impact Statement

The project proponent, Eni, endorses this SEIS prepared by its consultant, Worley Consulting. Evidence of this endorsement is confirmed by the signatories on the cover page.

3.3.7 Structure of the Simplified Environmental Impact Statement

This SEIS consists of the information shown in Table 3-3, as required by Appendix V of Ministerial Diploma No. 46/2017.

Table 3-3: Structure of the Simplified Environmental Impact Statement

SEIS Requirements	Relevant Section of this Document
Executive summary	0
Proponent details	1
Details of SEIS consultant	2
Project description	3
Political, legal, and institutional structure	4
Description of the environment	5
Alternatives	6
Climate change	7
Impact assessment and mitigation measures	8
Summary of the Environmental Management Plan	9
Disclosure of information and public consultation	10
Difficulties encountered	11
Conclusions and recommendations	12
Non-technical summary	13
References	14

4 POLITICAL, LEGAL AND INSTITUTIONAL STRUCTURE

4.1 Treaty Establishing Maritime Boundaries in the Timor Sea

On 6 March 2018, the Timor-Leste and Australia governments signed the Treaty Between Australia and the Democratic Republic of Timor-Leste Establishing their Maritime Boundaries in the Timor Sea (the Treaty). The Treaty delimited the maritime areas between Australia and Timor-Leste in the Timor Sea; it provides Timor-Leste sovereignty over the waters and seabed within the previously defined Joint Petroleum Development Area (JPDA). The Treaty was ratified on 31 August 2019.

PSC TL-SO 22-23 is a new PSC that was awarded after the Treaty and is entirely under Timor-Leste jurisdiction.

4.2 Timor-Leste Legislative Framework as Relevant to the Survey Activity

Activities in the survey area are governed by Decree-Law No. 25/2019 (dated 27 August 2019), which is pursuant to Article 31 of the Petroleum Activities Law (Law No. 13/2005), of 2 September 2005, as amended by Law No. 1/2019, of 18 January 2019 and Law No. 6/2019, of 4 December 2019. Decree Law No. 25/2019 applies to all petroleum operations with respect to offshore petroleum resources conducted under the Petroleum Activities Law.

Autoridade Naçional do Petróleo Timor-Leste (ANP) is responsible for administering Decree Law 25/2019.

The legislation that apply to survey activity are outlined in Table 4-1.

4.2.1 Environmental Licencing

Decree Law 39/2022 on Environmental Licensing (first amendment to Decree Law 5/2011 on Environmental Licensing) provides the procedures and other requirements related to obtaining an environmental licence before starting development activities, including for offshore oil and gas activities in Timor-Leste waters. Decree Law 39/2022 defines the environmental licencing procedure for projects likely to have environmental or social impacts, then assigns a project category classification based on the nature, size, technical characteristics, location and potential environmental impacts, and defines the requirements for the environmental impact assessment process based on the category classification (Category A, B or C).

Ministerial Diploma No. 46/2017 supports Decree Law 39/2022 and provides the minimum content requirements for the environmental licence process, including for this SEIS and the accompanying EMP.

Table 4-1: Summary of Timor-Leste legislative framework as relevant to the survey activity

Permit / Authorisation / Licence	Activity	Legislation
Environmental Licence: • Project Document • Terms of Reference (Category A only) • Environmental Impact Statement (EAI) (Category A and B) • Environmental Management Plan (PGA) (Category A and B)	Survey activity	• Decree Law 26/2012 Environmental Basic Law • Decree Law 5/2011 Environmental Licencing • Ministerial Diploma 46/2017 Regulation on Requirements of Detailed Screening, Definition of Scope and Terms of Reference, Environmental Impact Statements and Environmental Management Plans for Environmental Evaluation • Decree Law 6/2020 Establishing the Legal Regime for the Protection and Conservation of Biodiversity • UNTAET Reg. 19/2000 On Protected Places • UNTAET Guideline on Ambient Noise (2002) • Constitution of the Democratic Republic of East Timor • National Cultural Policy
Sanitary Quarantine Inspection and Entry Approval	Vessel entering Timor-Leste waters	• Decree Law 21/2003 Quarantine and Sanitary Control on Goods Imported and Exported (Ch. IV Art. 46)
Vessel Declaration	Vessel customs requirements	• Decree Law 11/2004 Customs Code of Timor-Leste (Ch. II, Art.28)
Import Permit Application	Import (temporary) of materials and equipment	• Decree Law 1/2006 General Regulation on Quarantine
Import / Export License	Domestic (offshore / onshore) temporary transfer of plastic materials	• Decree Law 37 / 2020 Sale, Import and Production of Bags, Packaging and other Plastic Objects

4.3 International Agreements and Conventions

The key international environmental agreements and conventions that apply to the survey activity are outlined in Table 4-2. Information is also provided on how the survey activity will comply with relevant agreements and conventions.

Table 4-2: International agreements and conventions applicable to the survey activity

Agreement/Convention	Description	Relevance to SEIS
Convention for the Prevention of Pollution from Ships 1973/1978 (MARPOL 73/78)	This convention aims to preserve the marine environment by eliminating pollution from oil and other harmful substances and by minimising accidental discharge of such substances. It contains six Annexes, each dealing respectively with oil, noxious liquid substances, harmful packaged substances, sewage, garbage, and air pollution. Detailed rules are laid out as to the extent to which (if at all) such substances can be released in different sea areas.	Vessels will comply with MARPOL 73/78 annexes, including: • Annex I (Prevention of pollution by oil) • Annex II (Control of pollution by noxious liquid substances in bulk) • Annex III (Prevention of pollution by harmful substances carried by sea in packaged form) • Annex IV (Pollution by sewage from ships) • Annex V (Pollution by garbage from ships) • Annex VI (Prevention of air pollution from ships).
International Convention for the Safety of Life at Sea 1974 (SOLAS)	This convention sets out minimum standards for construction, equipment and operation of merchant ships. The convention requires signatory flag states to ensure the ships flagged by them comply with these standards as a minimum.	Vessels will fully comply with SOLAS requirements, including navigation lighting and aids.
Convention on the International Regulations for Preventing Collisions at Sea 1972 (COLREGS)	These regulations outline internationally recognised navigation rules to be used by vessels at sea to avoid collisions. The regulations are published by the International Maritime Organization (IMO).	Vessels will comply with COLREG navigational requirements as implemented in Timor-Leste waters.
United Nations Convention on the Law of the Sea (UNCLOS)	Article 60 of the UNCLOS in Part V states '*Any installations or structures which are abandoned or disused shall be removed to ensure safety of navigation, taking into account any generally accepted international standards established in this regard by the competent international organization. Such removal shall also have due regard to fishing, the protection of the marine environment, and the rights and duties of other States'.*	Relevant only in that IMO Resolution A.672(16) recognises that structures on the continental shelf should be removed, but coastal states may make decisions to leave structures partially or completely in the sea. Timor-Leste is a member state of the IMO. Applicable vessels will also comply with MARPOL 73/78 annexes relating to marine pollution prevention, including: • Annex I (Prevention of pollution by oil)

Agreement/Convention	Description	Relevance to SEIS
	IMO is considered the competent organisation to deal with this requirement. IMO published Resolution A.672(16) Guidelines and Standards for the Removal of Offshore Installations and Structures on the Continental Shelf and in the Exclusive Economic Zone (IMO, 1989). Part XII of the UNCLOS sets up a general legal framework for protecting the marine environment. The convention imposes obligations on State Parties to prevent, reduce and control marine pollution from the various major sources, including pollution from land, the atmosphere, vessels and dumping (Articles 207 to 212). Subsequent articles provide for enforcing national marine pollution laws in different situations that may arise. Timor-Leste is a State Party under the convention.	• Annex II (Control of pollution by noxious liquid substances in bulk) • Annex III (Prevention of pollution by harmful substances carried by sea in packaged form) • Annex IV (Pollution by sewage from ships) • Annex V (Pollution by garbage from ships) • Annex VI (Prevention of air pollution from ships).
Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972 (the London Protocol)	The London Protocol contributes to the international control and prevention of marine pollution by prohibiting the dumping of certain hazardous materials.	Hazardous material will not be dumped at sea as part of the survey activity.
International Convention for the Control and Management of Ships Ballast Water and Sediment 2004	The convention aims to prevent the spread of harmful aquatic organisms from one region to another via ballast water and sediment.	Internationally sourced vessels that could introduce invasive marine species and potential from ballast water exchange.
International Convention on the Control of Harmful Anti-fouling Systems on Ships 2008	The convention prohibits the use of harmful organotins in anti-fouling paints used onboard vessels. It establishes a mechanism to prevent the potential future use of other harmful substances in anti-fouling systems.	Vessels of applicable classes will have a valid International Anti-fouling Systems Certificate.
Convention on Biological Diversity 1992	The objectives of the convention are the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources.	Relevant insofar that the survey activity may impact biological diversity, including protected species or species listed under the International Union for the Conservation of Nature (IUCN) Red List.

Agreement/Convention	Description	Relevance to SEIS
World Heritage Convention 1972	This international convention is intended to protect examples of the world's natural or cultural heritage sites of outstanding universal value. Ratification of the convention indicates a commitment to protect these properties and their values. Timor-Leste has ratified the World Heritage Convention.	There are no World Heritage properties within 300km of the survey activity.
International Convention on Civil Liability for Oil Pollution Damage 1969	The Civil Liability Convention ensures adequate compensation is available to persons who suffer oil pollution damage resulting from maritime casualties involving oil-carrying ships by placing liability for such damage on the owner of the ship.	Relevant to potential oil spills from all survey vessels.
International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties 1969	The convention gives State Parties powers to intervene on ships on the high seas when their coastlines are threatened by an oil spill from that ship.	Relevant to potential oil spills from all survey vessels.
Kyoto Protocol	This is an international treaty that extends the 1992 United Nations Framework Convention on Climate Change, which commits state parties to reduce greenhouse gas (GHG) emissions. Timor-Leste has ratified the Kyoto Protocol.	To reduce impact of GHG emissions associated with survey activity, vessels will comply with MARPOL 73/78 Annex VI and applicable planned maintenance system (PMS).
The Paris Agreement	The Paris Agreement aims to limit global temperature rise this century to well below 2°C above preindustrial levels and to pursue efforts to limit the temperature increase even further to 1.5°C. Timor-Leste has ratified the Paris Agreement.	To reduce impact of GHG emissions associated with survey activity, vessels will comply with MARPOL 73/78 Annex VI and applicable PMS.
United Nations Framework Convention on Climate Change 1992	The convention is an international environmental treaty with the objective of stabilising GHG concentrations at a level that would prevent dangerous anthropogenic interference with the climate system. Timor-Leste has ratified the United Nations Framework Convention on Climate Change 1992.	To reduce impact of GHG emissions associated with survey activity, vessels will comply with MARPOL 73/78 Annex VI and applicable PMS.

Agreement/Convention	Description	Relevance to SEIS
Vienna Convention for the Protection of the Ozone Layer 1985 and the Montreal Protocol on Substances that Deplete the Ozone Layer 1987	The Vienna Convention is a multilateral environmental agreement that acts as a framework for international efforts to protect the ozone layer. The accompanying Montreal Protocol specifies goals for reducing the use of chlorofluorocarbons, the main chemical agents causing ozone depletion. Timor-Leste has ratified the Vienna Convention.	To reduce use and prevent the release of ozone-depleting substances, vessels will comply with MARPOL 73/78 Annex VI for air emissions and use low sulphur fuel.
Joint Nature Conservation Committee (JNCC) Guidelines for Minimising the Risk of Injury to Marine Mammals from Geophysical Surveys (2017)	These guidelines outline measures to reduce the risk of injury to marine mammals during geophysical surveys, including visual monitoring, passive acoustic monitoring (PAM), soft-starts, and pre-shooting searches to detect marine mammals in the survey area.	The guidelines will be followed during the seismic survey to ensure marine mammals are protected. This includes the use of marine mammal observers (MMO) and PAM operatives, as well as pre-shooting surveys and soft starts to minimise noise impacts on marine fauna.

5 DESCRIPTION OF THE ENVIRONMENT

5.1 Physical Environment

5.1.1 Climate

The climate of the Timor Sea is monsoonal, with a wet season and a dry season. The wet season starts between September and November as the southeast trade winds weaken. The early part of the wet season is marked by frequent thunderstorms and, as the season progresses, several days of heavy rain may occur. During dry season, trade winds become re-established over northern Australia and the monsoon retreats. The local climate of Suai, the largest community on the southern coastline of Timor-Leste. approximately 295km to the northwest of the survey area, is tropical and generally hot, characterised by the distinct wet and dry seasons referred to above.

From June to October (the approximate dry season), the average monthly rainfall in Dili is around 30mm, while from November to May (the approximate wet season), the monthly average rainfall is around 165mm.

The climate of Timor-Leste is heavily influenced by the El Nińo Southern Oscillation and generally relatively low seasonal variability in average monthly temperatures (World Bank Group, 2021). Monthly average maximum temperatures in November are 26°C, while July has the lowest monthly average temperature of 21.9°C (World Bank Group, 2021).

5.1.2 Air

The survey area is in an open offshore environment, far away from potential sources of air pollution such as coastal communities or industry. Existing point sources of air emissions within the survey area are limited to vessels that traverse it. Air quality within the survey area is therefore expected to be very high, due to the localised and temporary nature of the emissions from vessels.

5.1.3 Marine Waters

5.1.3.1 Bathymetry

The survey area is located on the Sahul Shelf, on the continental slope, in an area of largely flat and featureless seabed ranging in depth from 40 to 180m. The Sahul Shelf extends about 300km out from and runs parallel to the northern Australian coastline. To the northwest, the continental slope continues to decline steadily, reaching depths of more than 2,000m in the Timor Trough.

There are no shoals or banks located within the survey area. However, a system of shoals and banks does occur to the east, north and northwest. These systems occur along the northeastern outer edge of the Sahul Rise, in the vicinity of the Greater Sunrise Field (refer to Section 5.2.7.1).

5.1.3.2 Geology and Marine Sediments

The survey area is located on a rise of the Sahul Shelf, situated on the northern continental Australian shelf bordered by the Timor Trough to the north. Benthic substrate within the survey area is mapped as calcareous gravel, sand and silt (CSIRO, 2015). The edge of the Sahul Shelf is predominantly comprised of carbonate sediments (Sinclair Knight Merz, 2001).

The Echuca Shoals horizon is the primary objective of the survey activity, located at approximately 2,000 to 3,000m below the seabed in the survey area. The secondary objective is the Permian horizon, located at approximately 3,700 to 4,800m below the seafloor in the survey area. The Early Cretaceous Echuca Shoal Formation is a strong marker horizon on seismic and well logs (Ahmad and Munson, 2013; Pattillo and Nicholls, 1990) and typically consists of glauconitic marine claystone and siltstone. The Top Permian is marked by a regional limestone (Dombey Formation), which is a strong seismic reflector. Both horizons can be tied to offset wells such as Troubadour-1 and Sikatan-1/ST1.

No sediment sampling is available over the survey area. However, sampling of marine sediments in the nearby Greater Sunrise Field (approximately 30km north of the survey area) show that sediments are predominantly carbonate sandy silt below a depth of approximately 0.7m, with the layer above being of marginally coarser grading. Sediments over the survey area are expected to be similar (Woodside, 2001).

5.1.3.3 Currents and Tides

The main forces contributing to surface water motion in the survey area are:

- wind stress
- astronomical tides
- general oceanic circulation.

Surface currents reflect seasonal wind regimes, with summer easterly to north-easterly currents, and winter westerly to south-westerly currents. Typical values for current speed are 2 to 4% of the wind speed. Local wind-driven surface currents may attain maximum speeds of 0.7m/s during extreme monsoonal or trade wind surges. More typically, speeds would be in the range of 0.2 to 0.4m/s.

The tides in the vicinity of the survey area are semidiurnal (two highs and lows each day) with a slight diurnal inequality (difference in heights between successive highs and low). There is a well-defined spring-neap lunar cycle, with spring tides occurring two days after the new and full moon. Near-surface tidal currents in the region are anti-clockwise rotational, directed towards the south-southeast during mid flood and towards the north-northwest during mid ebb. Speeds will range from about 0.2m/s on neap tides to 0.4m/s on spring tides.

Table 5-1 provides the estimated tide levels for the Greater Sunrise Field, located about 30km north of the survey area. The highest astronomical tide is 3.1m above lowest astronomical tide and the mean ranges for spring and neap tides are 2.4m and 0.2m respectively.

Table 5-1: Estimated tide levels for the nearby Sunrise Gas Field

Tide	Level (m)
Highest Astronomical Tide	3.1
Mean High Water Spring	2.8
Mean High Water Neap	1.9
Mean Sea Level	1.7
Mean Low Water Neap	1.7
Mean Low Water Spring	0.4
Lowest Astronomical Tide	0.0

Source. WNI (2001) Preliminary Metocean Conditions Sunrise Pipeline Timor Sea, R1032

The Pacific Indian Throughflow flows south through the Indonesian Archipelago and into the Eastern Indian Ocean. This current may introduce a small south-westerly component to the current regime in the survey area. The throughflow appears to be subject to the pronounced interannual variations of El Niño Southern Oscillation events. Current speeds vary depending on the season. Lowest speeds would occur in April at the end of the northwest monsoon, when winds blow towards the Pacific, while highest speeds would occur in September, associated with the southeast monsoon (Wijffels et al., 2002).

5.1.3.4 Sea and Swell

Waves at the survey area comprise contributions from:

- Southern Ocean swells
- summer monsoonal swells
- winter easterly swells
- locally generated seas.

The most persistent swell arrives from the west and southwest, with typical heights of 2m in dry season and 1m in wet season. Since longer period swell suffers less dissipation, periods of long-travelled swell commonly reach 18 seconds and occasionally exceed 20 seconds. Shorter period swell (six to 10 seconds) may result from tropical cyclones, dry season easterlies over the Arafura Sea and the eastern portions of the Timor Sea, and wet season westerlies over the western portions of the Timor Sea.

Local wind-generated sea is highly variable but typically ranges in period from two seconds to six seconds, with heights of up to 6m in strong persistent forcing at some locations (Swan et al., 1994).

5.1.3.5 Marine Water Quality

A baseline environmental survey of the Kitan Field (located approximately 190km southwest of the survey area) was conducted by Gardline Marine Sciences Pty Ltd (Gardline) in May 2010. Profiles were taken during day and night at all sites, down to water depths of 200m.

Surface seawater temperatures recorded were between 29.0°C and 29.6°C. Subsurface temperatures were steady to about 60m depth. Below this, temperatures dropped steadily, indicating a consistent thermocline among all sampling sites. At depths close to 200m, temperatures reached as low as 12.4°C. This pattern of vertical stratification is typical of tropical seas (Geoscience Australia, 2003). Salinity levels were lower in the surface mixed layer (34.0 to 34.2ppt) and showed a consistent halocline from around 60m, with increasing salinity at depth (up to 34.6ppt at 190m depth).

5.1.3.6 Seismicity and Tsunamis

The island of Timor is a thrust fold belt formed when the Australian continental plate collided with the Asiatic plate. It is bounded to the south by a deep marine foreland basin (Timor Trough). The basin formed by lithospheric flexure in response to thrust loading. The survey area is located south of the Timor Trough on the Australian continental plate, which is moving northwards at approximately 77 mm/year.

The subduction zone beneath the island of Timor is no longer active, due to choking of the collision zone by continental crust. The first phase of deformation of the Timor area by continent-arc collision and jamming of the subduction zone by thicker continental crust is reported to have occurred between 9.8 to 3 million years, once all the oceanic crust had been subducted.

While the Timor Trough and onshore Timor area remain tectonically active and numerous earthquakes occur every year, associated with ongoing collision of the Asiatic and Australian plates and the sinking subducted slab, seismicity is considered to be low in the survey area, as it is not within the active collision zone.

5.2 Ecological Components

5.2.1 Forests

The survey area is located offshore in marine waters. Forests are therefore not relevant to this survey activity.

5.2.2 Wetlands

There are no wetlands within the survey area. The nearest wetlands are located on the southern coast of Timor-Leste, about 170km to the northwest. These include wetland areas within the Tilomar, Sungai Clere and Lore important bird areas (Trainor et al., 2007). There are no Ramsar wetlands within 300km of the survey area.

5.2.3 Mangroves

There are no mangroves within the survey area. The nearest mangroves are located on the southern coast of Timor-Leste, east of Betano, approximately 230km northwest of the survey area.

5.2.4 Coastal Resources

Coastal resources, including coral reefs, beaches, and nursery or foraging areas for coastal and oceanic species, are not within the survey area. The closest of these coastal

resources is located approximately 180km northwest of the seismic survey area along the south Timor-Leste coast. Coastal resources are therefore not relevant to this survey activity.

5.2.5 Protected Areas and National Parks

There are no marine National Parks or marine protected areas within the survey area, as shown in Figure 5-1. There are, however, marine protected areas within the greater region, including five designated or proposed marine protected areas in Timor-Leste waters. The closest marine protected area in Timor-Leste waters is the Nino Konis Santana National Park, located approximately 167km northwest of the survey area on the eastern tip of Timor-Leste (Figure 5-1). Two designated marine protected areas are located on the northern coast of Timor-Leste, northwest of the survey area. These are the Batugadé Marine Natural Reserve (342km to the northwest, in western Timor-Leste) and the Suco de Vila Marine Natural Reserve (315km to the northwest, on the eastern coast of Atauro Island). There are also two proposed marine protected areas on the north coast of Timor-Leste. These are the proposed Lamsanak and Behau marine protected areas, located 252km and 270km to the northwest respectively (Figure 5-1, Table 5-2).

Timor-Leste's first National Park, the Nino Konis Santana National Park, which includes 55,600ha of the Coral Triangle, is located approximately 167km northwest of the survey area.

The Oceanic Shoals Australian Marine Park is located approximately 19km southeast of the survey area and is the closest protected area (Figure 5-1).

The nearest marine key biodiversity areas, as shown in (Figure 5-1, are Perairan Nino Konis Santana (Timor-Leste), 167km north of the survey area, Perariran Kepulauan Lemola (Indonesia), 175km north, Sungai Klere (Timor-Leste), 225km northwest, and Tiwi Islands and Seagull Island (Australia), 250km and 204km southeast respectively.

Protected areas in the region and all designated and proposed marine protected areas in Timor-Leste are summarised in Table 5-2.

Table 5-2: Summary of protected areas in the greater region

Name	Type of Protected Area	Distance to Survey Area (km)	Direction
Oceanic Shoals	Australian Marine Park	19.6	South-east
Nino Konis Santana National Park	National Park	167.2	North-west
Lagoa Maurei no Alafalu	Protected Area	178.2	North-west
BeMatanIrabere	Protected Area	187.3	North-west
Monte Legumau	Protected Area	190.6	North-west
Monte Burabo'o	Protected Area	191.7	North-west
Monte Matebian	Protected Area	198.5	North-west
Monte Builo	Protected Area	202.1	North-west
Monte Laretame	Protected Area	216.9	North-west
Monte Cutete	Protected Area	217.3	North-west
Ribeira de Clere	Protected Area	228.1	North-west
Lagoa Modomahut	Protected Area	228.1	North-west
Monte Bibileo	Protected Area	232.9	North-west
Monte Aitana	Protected Area	234.7	North-west
Lagoa Welenas	Protected Area	234.7	North-west
Makfahik	Protected Area	236.4	North-west
SamikSaron	Protected Area	243.0	North-west
Monte Diatuto	Protected Area	250.3	North-west
Lamsanak	Proposed Marine Protected Area	252.1	North-west
Monte Kuri	Protected Area	265.4	North-west
Lagoa BikanTidi	Protected Area	270.4	North-west
Parke Nasional Kay Rala Xanana Gusmão	National Park	270.7	North-west
Behau	Proposed Marine Protected Area	278.5	North-west
Area Mangal Metinaro	Protected Area	281.8	North-west
Monte Tatamailau	Protected Area	285.0	North-west
Area Mangal Hera	Protected Area	289.4	North-west
Cristo Rei Protected Area	Protected Area	294.7	North-west
Monte Lakus/Sabi	Protected Area	294.7	North-west
Suco de Vila	Marine Nature Reserve	314.9	North-west
Batugadé	Marine Nature Reserve	341.9	North-west

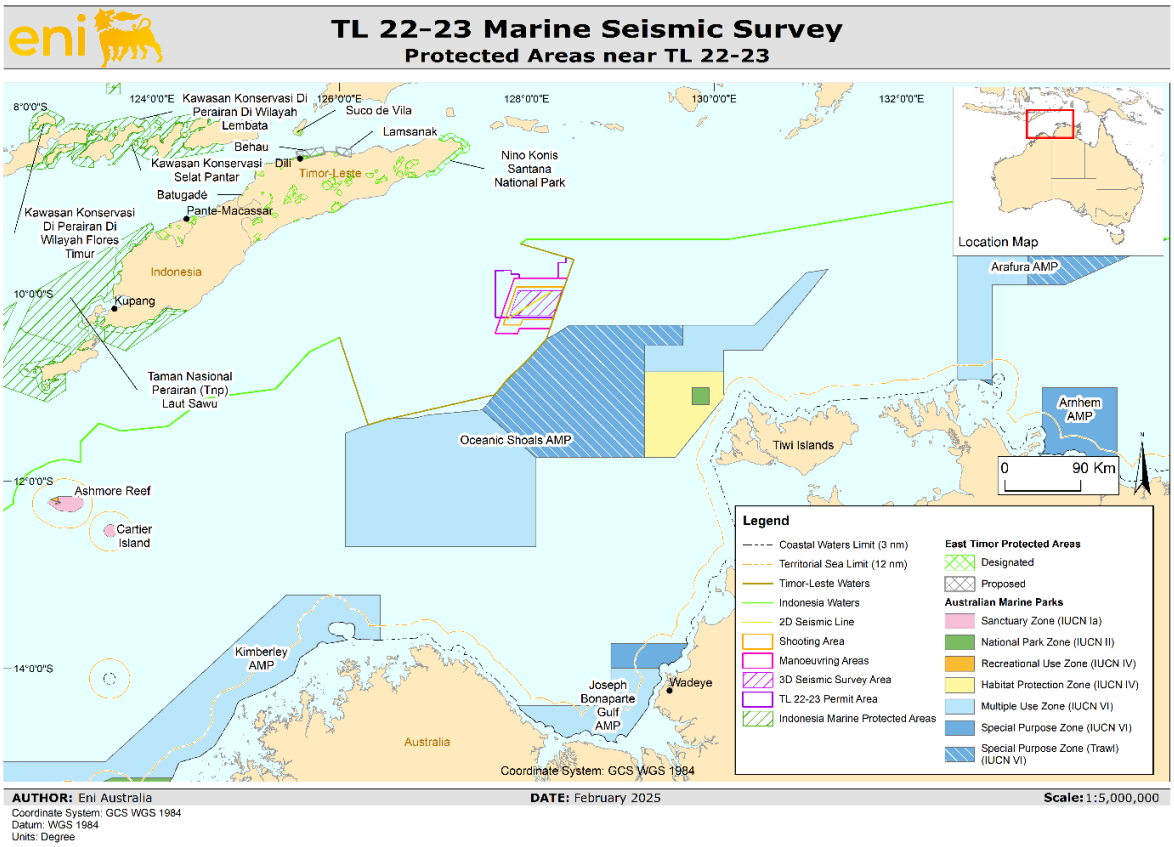


Figure 5-1: Protected areas near the survey area

5.2.6 Flora and Fauna

5.2.6.1 Regional Overview

The marine fauna of the Timor Sea is part of the Indo-West Pacific biogeographical province. Most species are widely distributed in this region. The waters of Timor-Leste host a variety of marine species, such as marine turtles, whale sharks and diverse fish communities (Erdman and Mohan, 2013). Coastal areas feature important mangroves and seagrass ecosystems, providing habitat for juvenile fish and other marine organism (Erdman and Mohan, 2013).

5.2.6.2 Continental Shelf

Across the northern continental shelf, the predominant animals living within seabed sediments (infauna) are polychaetes (burrowing worms) and crustaceans (such as prawns, shrimp and crabs). These two groups comprise 84% of the total species in sediment samples, with a high diversity of species but a low abundance of each individual species (Heyward et al., 1997). The remaining 16% of species include echinoderms (such as sea stars, sea urchins and feather stars), molluscs (as in, gastropods and bivalves), nemerteans (ribbon worms), sponges and fish.

Epibenthic communities (animals living on or near the seabed) in deeper waters are generally low in fauna abundance and diversity, probably due to the limited sea floor topography and hard substrate. The main taxa found in these areas include sponges

and gorgonians (sea whips and sea fans). While the abundance may be low, the diversity of Timor Sea shelf slope invertebrates may be high.

5.2.7 Marine Habitats

5.2.7.1 Shoals and Banks

Shoals and banks within the region are known to be inhabited by diverse biological communities. On shoals in less than 50m water depth (where adequate light may penetrate), epibenthic fauna can be abundant and diverse. These areas are of ecological significance due to their regional uniqueness and their patchy distribution in an otherwise broad area of featureless seafloor.

Shoals and banks do occur in the vicinity of the survey area (Figure 5-2). However, there are no shoals or banks located within the survey area itself. The nearest shoals and banks to the survey area include:

- Troubadour Shoals, approximately 21.9km to the northeast
- Sunrise Bank, approximately 24.6km to the north
- Margaret Harries Bank, approximately 26.1km to the southeast
- an unnamed Timor Sea shoal, approximately 32.3km to the west.

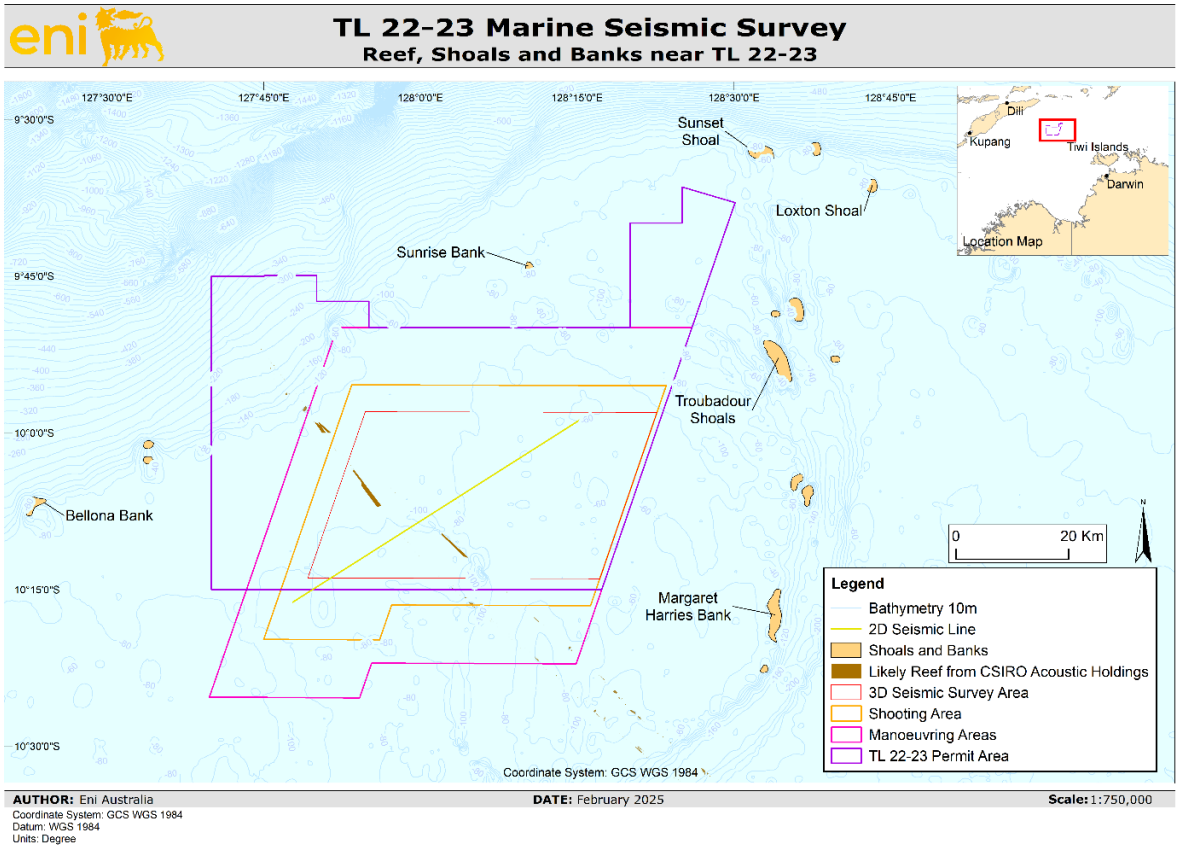


Figure 5-2: Reef, shoals and banks near the survey area

Characterisation of shoal environments in the Timor Sea is predominantly understood from surveys undertaken at the Big Bank Shoals by Heyward et al. (1997), which are

also located approximately 190km southwest of the survey area, in addition to surveys of several banks in the Greater Sunrise area 30 to 50km to the north.

Submerged banks of the region vary in their habitat and species composition but are generally characterised by mixed Halimeda algae, sponge and soft coral communities, with some hard corals on the more consolidated sediments. Shallower areas of shoals may also be used as foraging areas for turtles, including green turtles and hawksbill turtles (Sinclair Knight Merz, 2001).

Surveys undertaken at banks in the vicinity of the Greater Sunrise Field indicated the submerged banks contain extensive diverse and abundant benthic communities. Sunrise Bank (located 25km north of the survey area) was found to comprise a mixture of coral types (see Section 5.2.5) and the calcareous algae Halimeda.

5.2.7.2 Seamounts

Although no seamounts have been identified within the survey area itself, unnamed seamounts occur within the region of the survey area. The nearest seamounts are located approximately 260km to the north in Indonesian waters (Yesson et al., 2020).

5.2.7.3 Emergent Coral Reefs

Emergent coral reefs and associated islands have high species diversity both within and between the reefs. There are no emergent coral reefs in the survey area. The nearest of these emergent coral reef and associate island systems, Pulau Meatimiarang (Indonesia), is approximately 180km north of the survey area.

5.2.7.4 Rocky Reefs

The Institute of Marine and Antarctic Studies has compiled multiple benthic habitat datasets across the Australian continental shelf, which also includes the survey area. These datasets include both validated (by ground-truthing seafloor observations) and unvalidated (predicted, but not ground-truthed) habitat data. Within the survey area, several areas have been mapped as 'likely rocky reef'; however, this is an unvalidated output from a dataset based on regional data from Commonwealth Scientific and Industrial Research Organisation (CSIRO) acoustic modelling. Therefore, the presence of these reefs within the survey area has not been confirmed to date. Typically, rocky reefs occur at waters depths of between approximately 70 to 95m.

Species associated with rocky reefs in the region include green turtles, hawksbill turtles, reef manta rays, and fish species including common predators such as groupers, emperors, and snapper (Department of Sustainability, Environment, Water, Population and Communities, 2012).

5.2.8 Protected Species

The IUCN Red List of Threated Species is widely recognised as the most comprehensive objective global approach for evaluating the conservation status of animal species, including marine fauna. The IUCN Red List categorises threatened species as either:

- Critically Endangered – species facing a high risk of extinction in the wild

- Endangered – species likely to become extinct, or
- Vulnerable – species likely to become endangered unless circumstances threatening its survival and reproduction improve.

IUCN-listed species that may occur in the survey area, as per the available literature and data, are listed in Table 5-3. The IUCN-listed species shown in Table 5-3 have been assessed for likelihood (unlikely, possible, likely) based on each species' known distribution, their habitat preferences (as in, water depths and typical distance offshore), the occurrence of those habitats within the survey area, and known observations in Timor-Leste waters.

All these animals are widely distributed oceanic species. There are no oceanographic or topographic features in the survey area that could offer special breeding or feeding habitat for these species, although it is noted the Timor Trough may be used by whales as a migratory path.

Table 5-3: Protected species that could occur in the vicinity of the survey area

Species	Common Name	Status	Habitat Summary	Potential Presence Within Survey Area
Cetaceans				
Balaenoptera musculus	Blue whale	Endangered	Open ocean, worldwide distribution. Considered to be endangered. Occasional visitor to region.	Unlikely
Balaenoptera musculus brevicauda	Pygmy blue whale	Data Deficient	Present in Indonesian waters, with the waters around Sawu Island acting as nurseries and feeding grounds. The survey area is located within the migration corridor of this species.	Possible
Physeter macrocephalus	Sperm whale	Vulnerable	Global in deep waters in all oceans and confluent seas. However, known to occur close to coasts (in water depths exceeding 200m). Native to Australia, Indonesia and Timor-Leste.	Unlikely
Balaenoptera borealis	Sei whale	Endangered	Typically found in deep offshore waters, often in temperate and subtropical regions. Prefer areas with high concentrations of plankton. Unlikely to be present in the survey area due to their preference for deeper waters.	Unlikely

Species	Common Name	Status	Habitat Summary	Potential Presence Within Survey Area
Megaptera novaeangliae	Humpback whale	Least Concern	Widely distributed through the world's oceans and migrate between mating and calving grounds in tropical waters. Considered to be endangered. Known migration path not near survey area.	Unlikely
Balaenoptera edeni	Bryde's whale	Least Concern	Temperate to tropical waters, both oceanic and inshore. Occasional visitor to region.	Possible
Globicephala macrorhynchus	Short-finned pilot whale	Least Concern	Inhabit deep offshore waters, often in tropical and subtropical regions. Known to dive deep to feed on squid and other cephalopods (typically 200-1,000m). Possible presence in the survey area due to their wide distribution.	Possible
Feresa attenuata	Pygmy killer whale	Least Concern	Found in deep tropical and subtropical waters. Tend to form small, tight-knit groups. Likely to be present in the survey area due to their habitat preferences. Typically found in depths of 200-1,000m.	Likely
Peponocephala electra	Melon-headed whale	Least Concern	Inhabit deep tropical and subtropical waters and form large pods. Often found in areas with high ocean productivity. Possible presence in the survey area due to their habitat preferences. Typically found in depths of 200-1,000m.	Possible
Ziphius cavirostris	Cuvier's beaked whale	Least Concern	Found in deep offshore waters, known for deep diving capabilities. Prefer areas with steep underwater topography, such as continental slopes and canyons. Possible presence in the survey area due to suitable habitat.	Possible
Pseudorca crassidens	False killer whale	Near Threatened	Deep offshore waters, forming large pods. Known to feed on fish and squid. Typically found in depths of 200-1,000m.	Possible

Species	Common Name	Status	Habitat Summary	Potential Presence Within Survey Area
Grampus griseus	Risso's dolphin	Least Concern	Deep offshore waters, prefer areas with steep underwater topography. Known to form large pods. Typically found in depths of 200-1,000m.	Possible
Lagenodelphis hosei	Fraser's dolphin	Least Concern	Deep tropical and subtropical waters. Known to form large pods. Typically found in depths of 200-1,000m.	Possible
Tursiops truncatus	Common bottlenose dolphin	Least Concern	Tend to occur in open coastal waters of less than 200m depth. Occur in temperate and tropical waters around the world, in both coastal and offshore waters.	Possible
Steno bredanensis	Rough toothed dolphin	Least Concern	Deep tropical and subtropical waters, prefer areas with steep underwater topography. Known to form large pods. Typically found in depths of 200-1,000m.	Possible
Stenella longirostris	Spinner dolphin	Least Concern	Deep tropical and subtropical waters. Prefer areas with high ocean productivity. Typically found in depths of 0-200m.	Possible
Stenella attenuata	Pantropical spotted dolphin	Least Concern	Deep tropical and subtropical waters, prefer areas with high ocean productivity. Known to form large pods. Typically found in depths of 0-200m.	Possible
Orcinus orca	Killer whale	Data Deficient	Found in all oceans, highly social, forming large pods. Apex predators feeding on a variety of marine animals. Typically found in depths of 0-1,000m.	Possible
Tursiops aduncus	Indo-Pacific bottlenose dolphin	Near Threatened	Inhabit coastal and offshore waters in tropical and subtropical regions. Highly social, forming large pods. Often seen near coral reefs and seagrass beds. Typically found in depths of 0-200m.	Possible

Species	Common Name	Status	Habitat Summary	Potential Presence Within Survey Area
Delphinus delphis	Common dolphin	Least Concern	Found in temperate and tropical waters around the world. Likely presence in the survey area due to suitable habitat and frequent sightings in the region. Typically found in depths of 0-200m.	Possible
Manta Rays				
Mobula alfredi	Reef manta ray	Vulnerable	Found in tropical and subtropical waters, often near coral reefs. Unlikely due to preference for coral reefs.	Unlikely
Mobula birostris	Oceanic manta ray	Endangered	Inhabit open ocean waters and are known to migrate long distances. Occasionally seen in offshore waters.	Possible
Sharks				
Rhincodon typus	Whale sharks	Endangered	Found in tropical and warm temperate waters and known to migrate long distances.	Possible
Carcharhinus longimanus	Oceanic whitetip	Critically Endangered	Inhabit open ocean waters and known to be highly migratory.	Possible
Marine Turtles				
Dermochelys coriacea	Leatherback turtle	Vulnerable	Tropical to sub-polar oceans, inhabiting pelagic marine foraging areas throughout the water column. Nesting occurs on beaches with soft sands and shallow approach angles. Known to migrate through Timor Sea.	Possible
Caretta caretta	Loggerhead turtle	Vulnerable	Broad tropical and sub-tropical distribution, occurring in proximity to coral and rocky reefs, seagrass beds and muddy bays. Widespread throughout Timor Sea waters, although no breeding in Timor-Leste.	Possible
Lepidochelys olivacea	Olive ridley turtle	Vulnerable	A wide tropical and sub-tropical distribution and moderately abundant in the region, including the Timor Sea. Nests on beaches in Timor-Leste, Indonesia and Australia.	Possible

Species	Common Name	Status	Habitat Summary	Potential Presence Within Survey Area
Natator depressus	Flatback turtle	Data Deficient	Non-oceanic species nesting only in Australia, with some northern foraging areas. Found in shallow, soft-bottomed seabed habitats along the northern Australian continental shelf and away from reefs.	Possible
Chelonia mydas	Green turtle	Endangered	Tropical and subtropical waters throughout the world, including the Timor Sea. Feed in intertidal and subtidal habitats, including coral and rocky reefs, seagrass meadows, and algal turfs on sand or mud flats.	Possible
Eretmochelys imbricata	Hawksbill turtle	Critically Endangered	Found in tropical, subtropical and temperate waters in all oceans of the world. Nesting sites identified in Timor-Leste (Jaco Island and Tutuala Beach). Likely to be found foraging in habitats such as coral reef or hard bottom habitat.	Possible

Further discussion has been provided in the next subsections for all IUCN species identified above with a threatened categorisation of Vulnerable, Endangered and Critically Endangered in addition to several other IUCN-listed species of particular note in the region. These additions include the:

- Data Deficient pygmy blue whale, given the species' known migration corridor along the Timor Trough
- Data Deficient flatback turtle, given its possible occurrence due to habitat preferences and for completeness as the only marine turtle without a threatened IUCN listing
- Least Concern crocodile, given its cultural significance in Timor-Leste.

5.2.8.1 Whales and Dolphins

Twenty cetacean species on the IUCN Red List have been identified as potentially occurring within the survey area. Of these, the pygmy killer whale (*Feresa attenuata*), common dolphin (*Delphinus delphis*) and the bottlenose dolphin (*Tursiops truncatus*) are likely to occur near the survey area.

Blue Whales and Pygmy Blue Whales

The IUCN Red List status for blue whales is Endangered. There are two recognised subspecies of blue whale in the southern hemisphere, both recorded in the waters

surrounding Timor-Leste. These are the Antarctic (or 'true') blue whale (*Balaenoptera musculus*) and the pygmy blue whale (*Balaenoptera musculus brevicauda*). Antarctic blue whale numbers have been severely depleted by historic whaling, though numbers are slowly recovering; they are unlikely to be present in the survey area.

There is a lack of information about the number of pygmy blue whales before they were exploited, and the current total worldwide population is unknown (Commonwealth of Australia, 2015). The waters offshore of Timor-Leste are known to be a migration corridor for pygmy blue whales, with the mapped migration corridor boundary located approximately 32km northwest of the survey area. Furthermore, pygmy blue whales were observed in September and November (two and three, respectively), during the 2008 nearshore marine megafauna survey, along the north Timor-Leste coast (Dethmers et al., 2009). This confirms Timor-Leste is an important migratory corridor for pygmy blue whales in more coastal areas.

Blue whales generally migrate between warmer, lower latitude breeding grounds, where mating and calving take place during winter months, and colder, higher latitude feeding grounds in the summer months (Commonwealth of Australia, 2015). Feeding of blue whales is likely to occur in water depths of 500 to 1,000m (McCauley et al., 2004).

The waters of the survey area are outside the known pygmy blue whale migratory corridor, and the water depth of between 40 to 180m depth is shallower than the foraging water depth of 500 to 1,000m. However, given the proximity to the migration corridor and the known occurrence of pygmy blue whales in Timor-Leste waters, it is possible that pygmy blue whales will be encountered within the survey area.

Sperm Whales

Sperm whales (*Physeter macrocephalus*) are found worldwide and are the largest of all the toothed whale species. Their global distribution is comparable to the killer whale, with regular observations from both polar and equatorial waters (Whitehead, 2002). The IUCN Red List status for sperm whales is Vulnerable.

Sperm whales are sighted frequently in deeper waters and form large aggregations (100-1,000 animals) in foraging grounds of high oceanic productivity (Whitehead, 2002). Female sperm whales have restricted home ranges in water deeper than 1,000m and less than 40° latitudes (Whitehead, 2002). Male sperm whales will remain with their mothers for several years until early adulthood (4-21 years), at which time they will join larger male-only herds that migrate to polar waters to feed and return to tropical and temperate waters to breed (Whitehead, 2002). No global population estimates for sperm whales are available.

The marine megafauna survey undertaken in Timor-Leste in 2008 identified a single sperm whale in the south-eastern coast (Dethmers et al., 2009). Sperm whales are known to occur close to coasts in water depths exceeding 200m, and are native to Australia, Indonesia and Timor-Leste. Considering the mostly deep-water distribution of sperm whales and the relatively shallow depths of the survey area (between 40 and 180m), it is unlikely they will be encountered.

Sei Whales

The IUCN Red List status for sei whales is Endangered. The sei whale (*Balaenoptera borealis*) has a patchy and wide-ranging distribution, favouring deep, offshore habitat more than other large whale species. During the summer they are found between latitudes of 40° to 50° south, and lower winter latitudes are unknown. The marine megafauna survey undertaken in Timor-Leste in 2008 recorded one potential sighting of a sei whale but it was inconclusive (Dethmers et al., 2009). As they prefer higher latitudes and colder waters, it is considered unlikely that the species will be encountered in the survey area.

5.2.8.2 Marine Reptiles

The tropical Indo-Pacific region supports marine turtle species, six of which may be found using the waters within the survey area and surrounding shoals. Shallow shoal areas, such as the Troubadour Shoals or Sunrise Bank, can provide foraging areas, particularly for green (*Chelonia mydas*) and hawksbill (*Eretmochelys imbricata*) turtles. While these turtle species may occur, turtle numbers are unlikely to be high, given the absence of shoals within the survey area, and the distances from shorelines, internesting beaches and known foraging areas.

Leatherback Turtle

Leatherback turtles (*Dermochelys coriacea*) are listed as a Vulnerable under the IUCN Red List and are found in tropical to sub-polar oceans. Leatherback turtles inhabit pelagic marine foraging areas, throughout the water column, with nesting occurring on beaches with soft sands and shallow approach angles.

Loggerhead Turtle

Loggerhead turtles (*Caretta caretta*) are listed as Vulnerable under the IUCN Red List and are known to have a broad tropical and sub-tropical distribution, occurring near coral and rocky reefs, seagrass beds and muddy bays. Loggerhead turtles are carnivorous, feeding primarily on crustaceans and molluscs (Spotila, 2004) and are likely to be found foraging in areas that support high densities of these organisms.

Olive Ridley Turtle

Olive ridley turtles (*Lepidochelys olivacea*) are listed as Vulnerable under the IUCN Red List and are known to have a wide tropical and sub-tropical distribution. Olive ridley turtles feed on jellyfish, tunicates, sea urchins, bivalves and crabs.

Green Turtle

Green turtles (*Chelonia mydas*) are listed as Endangered under the IUCN Red List and are found in tropical and subtropical waters throughout the world. Green turtles feed in intertidal and subtidal habitats, including coral and rocky reefs, seagrass meadows, and algal turfs on sand or mud flats (Limpus, 2009).

Hawksbill Turtle

Hawksbill turtles (*Eretmochelys imbricata*) are listed as Critically Endangered under the IUCN Red List and are found in tropical, subtropical and temperate waters in all oceans of the world. Hawksbill turtles feed primarily on sponges, but also forage on cephalopods, gastropods, cnidarians, seagrass and seaweed (Carr and Stancyk, 1975; Witzell, 1983; Limpus et al., 1992; Spotila, 2004) and are likely to be found foraging in habitats that support these organisms; as in, coral reef or hard bottom habitat.

Flatback Turtle

Flatback turtles (*Natator depressus*) are listed as Data Deficient under the IUCN Red List and are found in shallow, soft-bottomed seabed habitats along the northern Australian continental shelf and away from reefs. Flatback turtles mostly feed on soft-bodied prey, including jellyfish, soft corals and sea cucumbers, feeding in predominantly subtidal, soft-bottomed habitats.

Sea Snakes

In addition to the IUCN-listed marine turtles, sea snake species may also occur in the vicinity of the survey area; however, these are most likely to be associated with the various submerged banks and shoals outside the survey area. These include the Troubadour Shoals, the Sunrise Bank, and Margaret Harries Bank and various unnamed Timor Sea shoals.

5.2.8.3 Sharks and Rays

The survey area may host various elasmobranch species, including rays and sharks. Key species expected in this region include the giant manta ray, whale shark and oceanic whitetip shark. These species are commonly found in tropical and subtropical waters and are discussed below.

Manta Rays

Manta rays consist of two individual species: the oceanic, or giant, manta ray (*Manta birostris*) and the reef, or coastal, manta ray (*Manta alfredi*). The IUCN Red List status for reef manta rays is Vulnerable, and for oceanic manta rays, Endangered.

The oceanic manta ray is the largest ray species in the world and is found in tropical marine waters worldwide and only on occasion in temperate regions. The oceanic manta ray spends time on the surface, sometimes even jumping out of the water, and has also been observed diving to depths of over 1,000m (Arkive, 2016). The species is a seasonal visitor to coastal and offshore sites and is commonly recorded on productive coastlines with regular upwellings, oceanic islands, and offshore pinnacles and seamounts (Marshall et al., 2009). Oceanic manta rays also visit shallow reefs to be cleaned by 'cleaner fishes' and to feed (Arkive, 2016).

The marine megafauna survey undertaken in 2008 sighted several groups of five or more oceanic manta rays in Timor coastal waters during the month of November (Dethmers et al., 2009).

Given the partly oceanic pelagic nature of the oceanic manta ray, its known distribution in tropical marine waters and observations in Timor-Leste coastal waters, it is possible the species will be encountered in the survey area.

Reef manta rays are also an oceanic pelagic species; however, typically occur in productive nearshore environments more characteristic of the coastal waters of Timor-Leste than the survey area. They typically reside near coral and rocky reefs, islands, atolls and continental coastlines (Marshall et al., 2009). As such, they are unlikely to be encountered in the survey area.

Whale Sharks

The whale shark (*Rhincodon typus*) has a broad distribution in tropical and warm temperate seas, usually between latitudes 30° north and 35° south (Wilson et al., 2001; Wilson et al., 2006). The IUCN Red List status for whale sharks is Endangered. Whale sharks are highly migratory, and the species' movements are closely associated with productivity pulses, ocean circulation and water temperatures, although this is little understood. Whale shark presence coincides with the coral mass spawning period, when there is an abundance of food (krill, planktonic larvae, and schools of small fish) in the waters adjacent to the reef. Whale sharks inhabit both coastal and oceanic habitats, mostly in the epipelagic zone (Tyminski et al., 2015) (between 0 to 200m depth).

Frequent sightings of whale sharks have been recorded in Timor-Leste during the east monsoon period from August until the beginning of the west monsoon in November (Stacey et al., 2012). According to fishers in the area, whale sharks occur regularly in the Timor Passage south of Roti Island, and also offshore Suai (south-western Timor-Leste) and in the Savu Sea between Timor and the island of Flores (Dethmers et al., 2009).

A marine megafauna survey undertaken in 2008 in Timor-Leste waters (Dethmers et al., 2009) sighted only three whale sharks in May, June and November; all sightings were recorded in the northwest near Dili. Given the known occurrence of whale sharks in Timor-Leste waters, and the depths of the survey area, it is possible whale sharks will be encountered within the survey area.

Oceanic Whitetip Shark

The oceanic whitetip (*Carcharhinus longimanus*) has a widespread distribution in tropical and subtropical oceans, usually far offshore in epipelagic waters (0 to 200m) and most typically in surface waters. The oceanic whitetip has also been recorded at depths of 1,082m (Bonfil et al., 2008; Tolotti et al., 2015; Weigmann, 2016).

The IUCN Red List status for oceanic whitetip sharks is Critically Endangered. Given the widespread distribution of the oceanic whitetip, the oceanic environment and water depths of the survey area, it is likely the species will be encountered.

5.2.8.4 Fish

Fish densities are likely to be low in the open oceanic waters in which the survey area is situated. The broader area of the Timor Sea region supports pelagic fish species that are used in traditional and commercial fisheries. The region supports large populations

of cartilaginous fishes such as sharks and rays. The most prolific of the sharks are the whalers, represented by at least 12 species in the region. They are common in all environments.

5.2.8.5 Birds

Bird life in the vicinity of the survey area is limited, given the oceanic environment. A large variety of seabird species is expected to migrate across the region or forage within the coastal waters of the Timor Sea, including numerous species migrating between Australia and the northern hemisphere. Shoreline species may pass through these areas during migrations or enter for short periods during foraging.

Migratory shorebird species found at the Nino Konis Santana National Park (167km northwest of the survey area) may migrate through the survey area. These may include species listed as Threatened under the IUCN Red List, including the Endangered far eastern curlew (*Numenius madagascariensis*), the Endangered great knot (*Calidris tenuirostris*) and the Vulnerable sharp-tailed sandpiper (*Calidris acuminata*) (Avibase, 2024).

5.2.8.6 Benthic Fauna

Benthic fauna in the survey area is expected to be widely represented in the region. Epibenthic communities (animals living on or near the seabed) in deeper waters are generally low in fauna abundance and diversity, probably due to the limited sea floor topography and hard substrate. The main taxa found in these areas include sponges and gorgonians (sea whips and sea fans). While the abundance may be low, the diversity of Timor Sea shelf slope invertebrates may be high.

5.3 Economic Components

5.3.1 Employment Sectors

The survey activity is expected to provide positive economic benefits to Timor-Leste through employment opportunities included within the local content plan of the seismic contractor.

5.3.2 Infrastructure Installations

There are no infrastructure installations within the survey area. Key infrastructure in the region is shown in Figure 5-3.

The nearest infrastructure installations include offshore oil and gas pipelines, including the Bayu-Undan to Darwin pipeline (approximately 150km south) and the Barossa export pipeline (approximately 205km east). Santos's Bayu-Undan Development (about 150km to the southwest) is currently the only producing facility in the region. The closest oil and gas well to the survey area is Sikatan-1/ST1 exploration well, immediately south of the permit boundary (Figure 5-3). The nearest fibre optics cable was installed in 2024 and is located 55km west of the survey area (Figure 5-4).

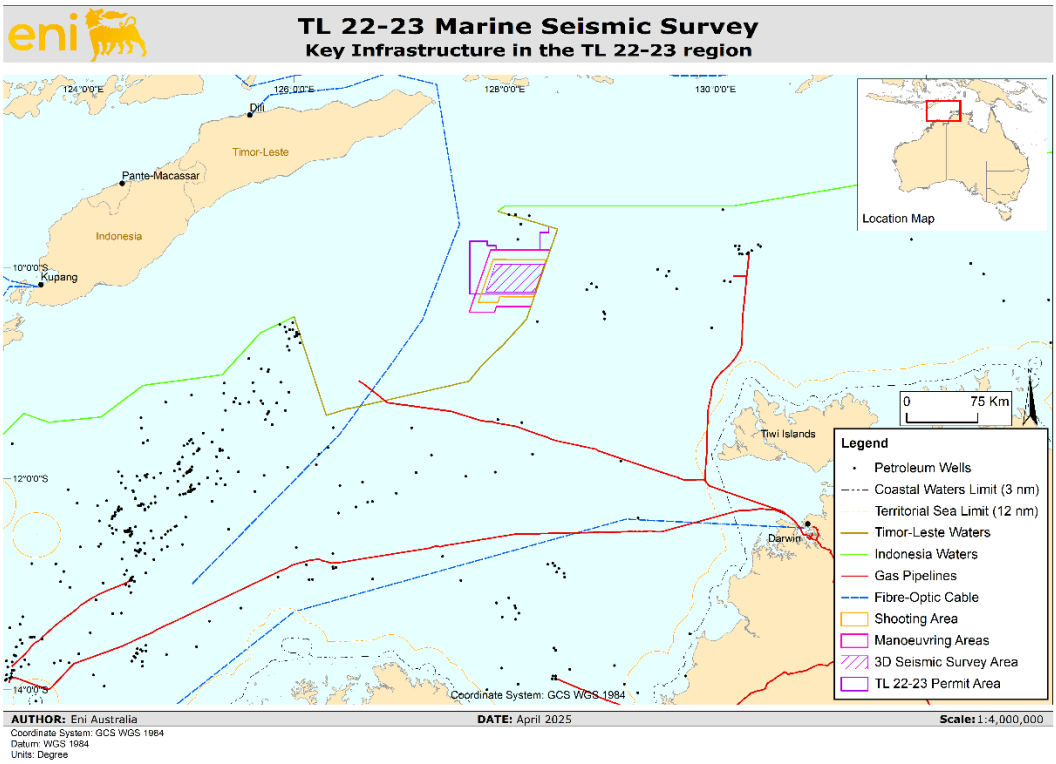
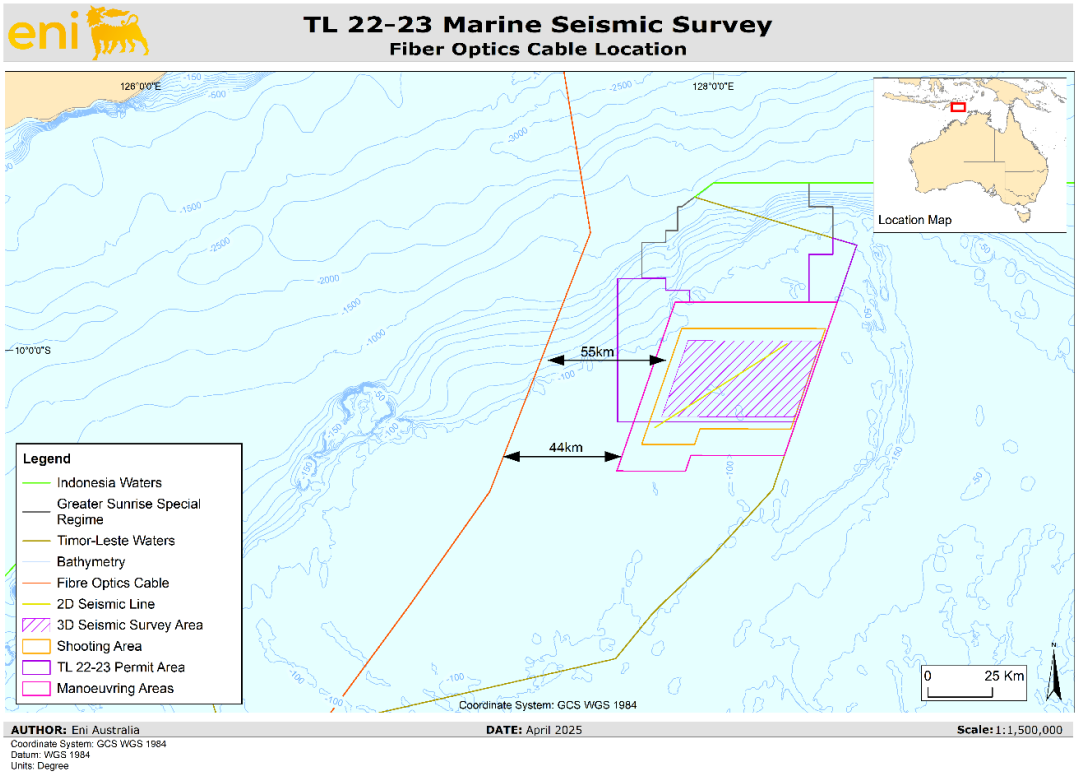


Figure 5-3: Key infrastructure in relation to the survey area



Source: submarine cable map, 2024

Figure 5-4: Fibre optics in relation to the survey area

5.3.3 Land Use

There is no land surface within the survey area. The use of the marine environment for the purposes of fishing is described in Section 5.3.6.

5.3.4 Use of Forests and Other Natural Resources

The survey area is located offshore in marine waters; therefore, forests are not relevant for the survey activity.

The petroleum exploration and production industry is present in the region surrounding the survey area, although operating developments currently remain at low levels. The Bayu-Undan Development is located 150km southwest of the survey area and is the only producing facility in the region. Approximately 30km to the north is the Greater Sunrise Field, which is yet to be developed. Immediately south of the PSC TL-SO 22-23 is TL 19-16, operated by SundGas, containing the undeveloped Chuditch Gas Field.

5.3.5 Agriculture

The survey area is located offshore in marine waters. Agriculture is therefore not relevant to this survey activity.

5.3.6 Fisheries

Local (Indonesian and Timorese) fishers traditionally fish in the Timor Sea. Fishing occurs from April to December, with most activity in September and October. Fishing is typically concentrated in the vicinity of Hibernia Reef, approximately 520km southwest of the survey area in Australian waters. The nearest reef at which local fishing may occur is Pulau Meatimiarang (Indonesia), located 180km north of the survey area.

Fishing vessel activity from 2020 (Office for Coastal Management, 2024) indicates fishing vessels may occur within the survey area (Figure 5-5). However, substantial activity is not expected, given the offshore location of the survey area and lack of suitable fishing grounds.

Illegal fishing activities have been reported in Timor-Leste waters. These activities may involve destructive methods such as fish aggregating devices, explosives or poisons, which pose significant threats to marine ecosystems. Given the offshore location and lack of suitable fishing grounds, substantial activity is not expected in the survey area.

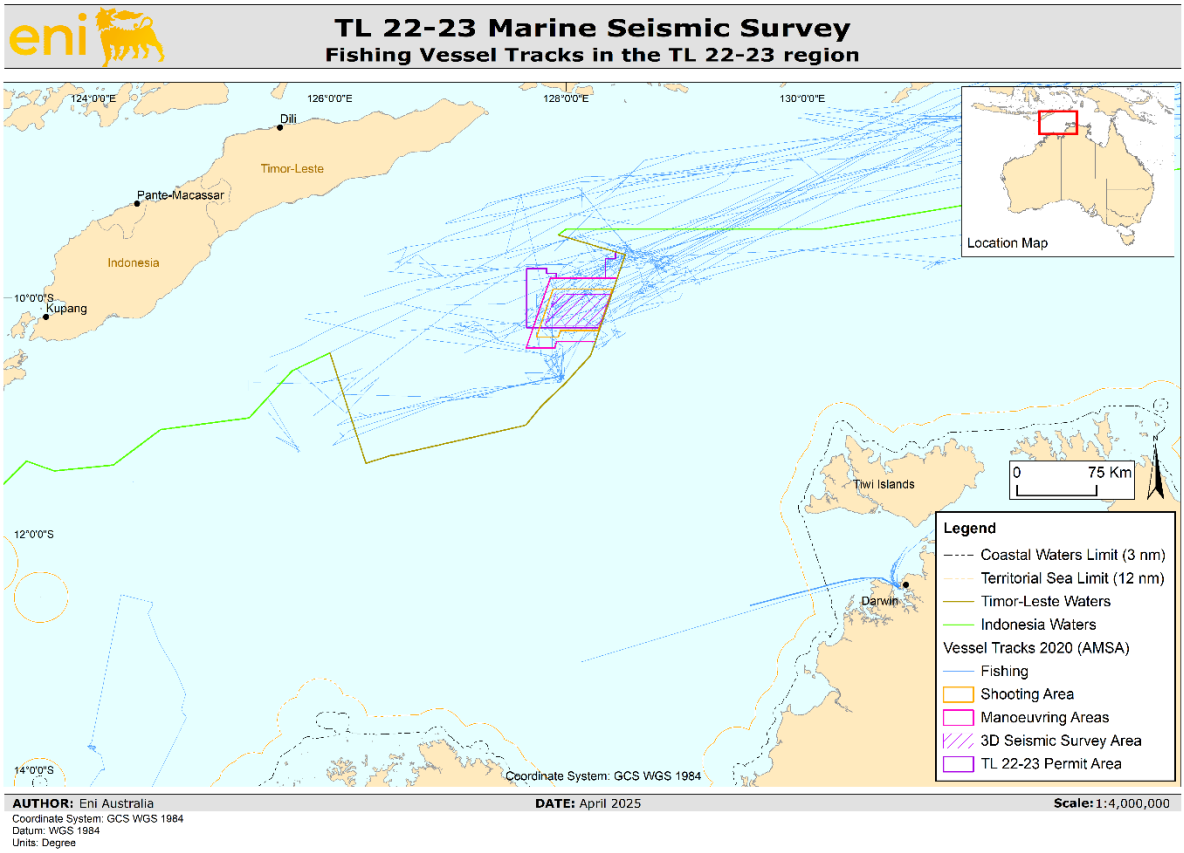


Figure 5-5: Fishing vessel tracks in relation to the survey area

5.3.7 Tourism

The survey area is in offshore waters that are not accessed for tourism activities (recreational fishing and boating and charter boat operations). These tend to be focused on islands, nearshore waters and coastal areas.

5.3.8 Ports and Commercial Shipping

Shipping traffic close to the survey area is anticipated to be infrequent. The main shipping routes relevant to the survey area are predominantly northwest to southeast routes linking Darwin and Wyndham in Australia with ports in Southeast Asia (Figure 5-6). The routes accommodate various vessels, including vessels supporting offshore oil and gas operations situated to the west and east of the survey area.

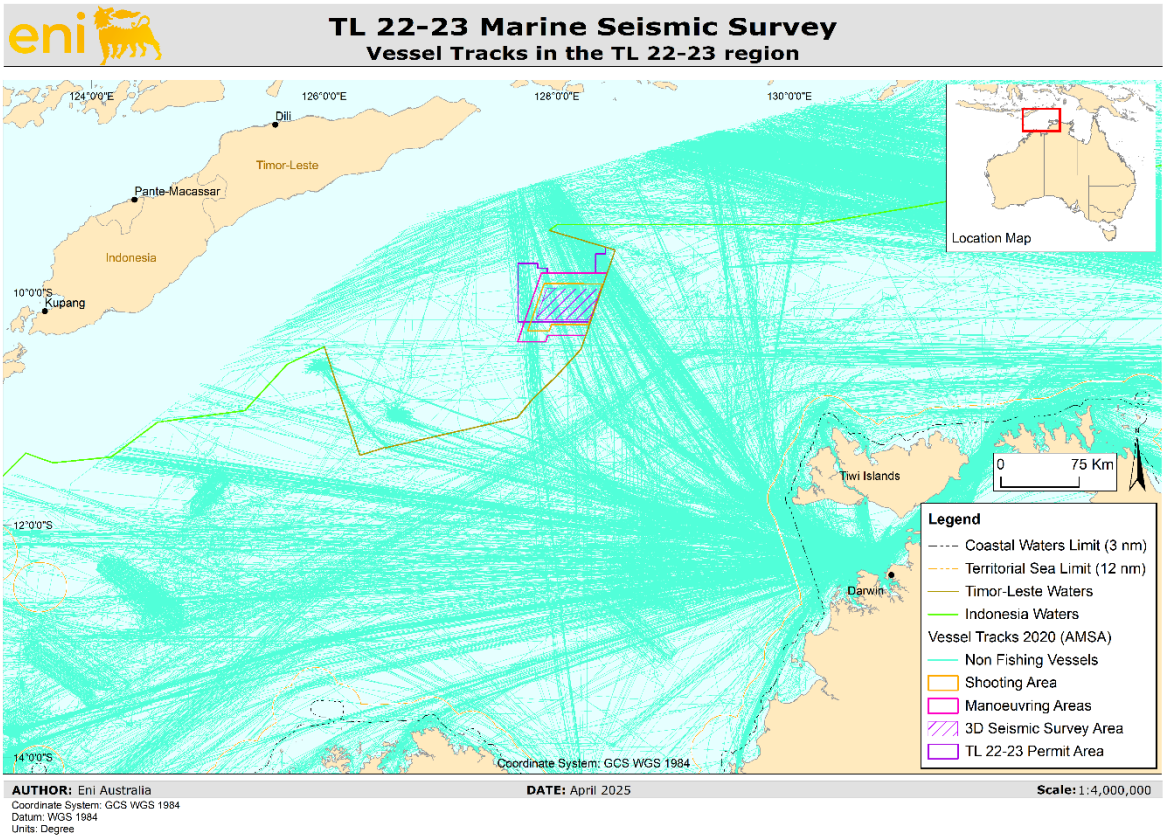


Figure 5-6: Vessel tracks in relation to the survey area

5.3.9 Hydrocarbon Exploration and Operations

The undeveloped Sunrise-Troubadour Gas Field is located to the north of the survey area within blocks JPDA 03-19 (operator TIMOR GAP Greater Sunrise 03-19 Unipessoal Lda, 62.33%) and NT/RL2 (operator Woodside Energy Ltd, 35%), which are directly adjacent to PSC TL-SO 22-23. Eight exploration and appraisal wells were drilled on the Sunrise-Troubadour Field between 1974 to 2008. The closest offset wells to the north are Troubadour-1 and Bard-1, which are located approximately 10km from the boundary of PSC TL-SO 22-23. The closest exploration well in the south is Sikatan-1/ST1, which is positioned approximately 75m south of the PSC boundary in TL 19-16. Exploration well Jura-1 is 4km from the western boundary of PSC TL-SO 22-23 in open acreage; the Eni-operated Blackwood Gas Discovery in NT/RL8 is 30km to the east of the survey area in Australian waters. The seismic survey vessel will not be required to enter JPDA 03/19 or NT/RL2 for vessel manoeuvring when acquiring seismic data.

There is currently no production close to the survey area in either Timor-Leste or Australian waters. The Santos-operated Bayu-Undan Development (about 150km to the southwest) is currently the only producing facility in the region. Immediately south of PSC TL 22-23 is TL 19-16, operated by SundaGas. TL 19-16 contains the undeveloped Chuditch Gas Discovery. The seismic vessel will be required to enter TL 19-16 as part of vessel manoeuvring. Approximately 4km of 2D seismic data will also be acquired within TL 19-16 to fully image the Sikatan-1ST well location. There is also a contingent option for acquiring an extra ~35km² of 3D seismic data over the Sikatan-1/ST1 well location, in addition to the firm 2D seismic line.

Eni will obtain the necessary approvals to enter and carry out manoeuvring and acquisition operations within TL 19-16. Eni is in direct contact with SundaGas with regards to 2025 operational activity for both companies, and will maintain dialogue to ensure there are no adverse impacts to operations in the survey area.

5.4 Social Components

5.4.1 Population and Communities

There are no local populations or communities within proximity to the survey area, with the nearest populations located on the south coast of Timor-Leste, approximately 175km to the northwest.

Timor-Leste's total population at the 2022 Census (Timor-Leste National Institute of Statistics, 2023), was 1,340,434 people. According to the census data, there has been an increase in Timor-Leste's population of some 31%, or 417,326 people since 2010 (Government of Timor-Leste, 2010). Districts that are situated on the southern Timor-Leste coastline have seen a similar trend, as shown in Table 5-4.

The nearest district to the survey area is Lautém, and the coastal community of Loré in Lautém is the nearest population centre, situated approximately 168km from the survey area. Given the remote offshore location of the survey area, the survey activity is unlikely to have an impact on any district, including those along the southern coast. Due to the absence of nearby communities, this SEIS does not include discussions on community health profiles, schools and health services.

Table 5-4: Southern coastline district population sizes

Municipality	2022	2015	2010
Lautém	70,022	65,240	60,218
Viqueque	80,176	76,033	70,177
Manatuto	50,859	46,619	43,246
Manufahi	60,665	53,691	48,894
Ainaro	73,115	63,136	59,382
Covalima	73,933	65,301	60,063

Source: Timor-Leste National Institute of Statistics, 2023; Government of Timor-Leste, 2010.

5.5 Cultural Components

5.5.1 Cultural Heritage

Due to the remote offshore location of the survey area, there are no known cultural heritage sites within its immediate vicinity. Any unknown cultural heritage sites or artefacts of significance are considered unlikely.

5.5.2 Archaeological Sites

There are no known archaeological sites within the survey area. The presence of undocumented archaeological sites is considered unlikely.

5.5.3 Historic Sites

There are no known historic sites, including shipwrecks, within the survey area. The presence of undocumented historic sites of significance is considered unlikely.

5.5.4 Sacred Sites

There are no known sacred sites within the survey area and the presence of undocumented sacred sites is considered unlikely.

5.5.5 Unique Landscape

The survey area is located within a relatively shallow and largely flat and featureless area of the Sahul Shelf. This marine landscape is considered to be widely represented within the region. There are no protected areas or key biodiversity areas within the survey area. Marine habitats that are considered to be more unique, including seamounts and submerged shoals and banks, are not present within the survey area. The survey area is therefore not considered to be a unique landscape.

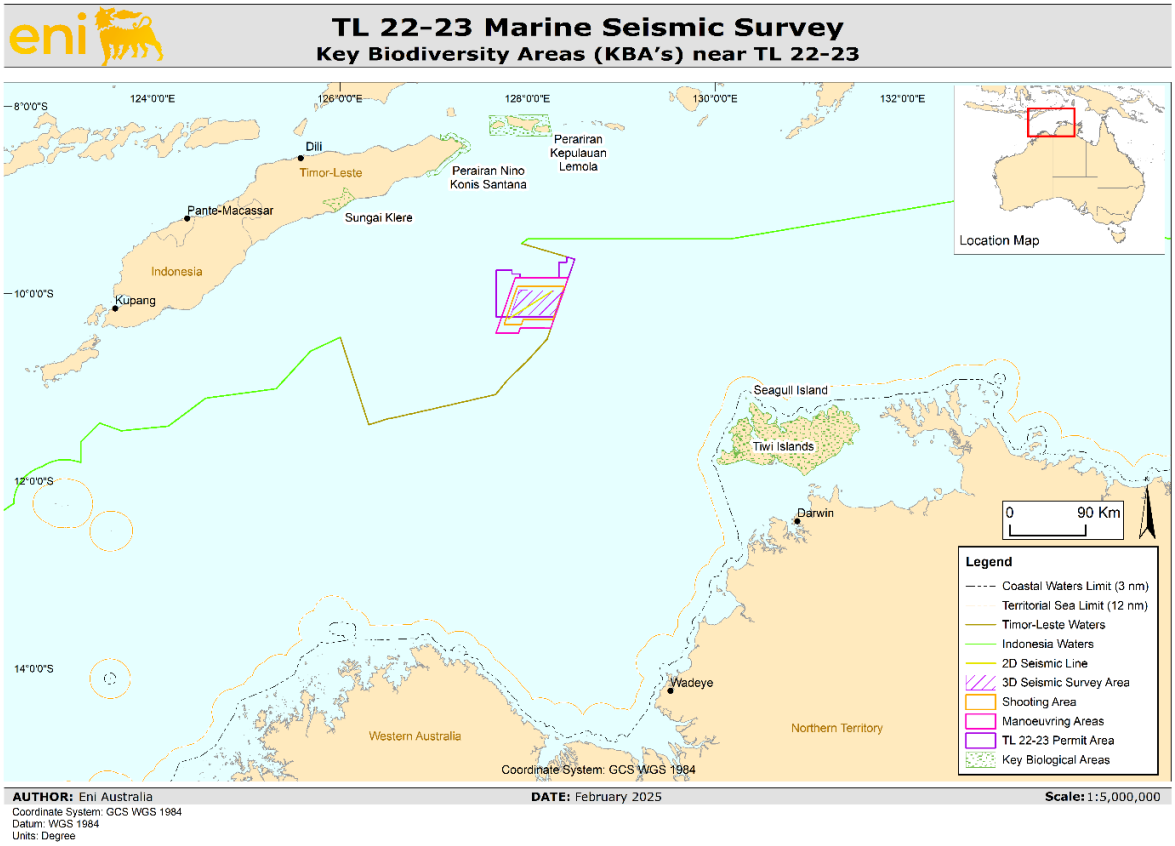


Figure 5-7: Key biodiversity areas near the survey area

6 ALTERNATIVES

6.1 Alternative Location

The position and shape of the proposed 3D seismic survey was selected to fully image the most prospective geological feature in the PSC without crossing the international maritime boundary between Australia and Timor-Leste. Any seismic acquisition over the maritime border in Australian waters would require approval from the Australian National Offshore Petroleum Safety and Environmental Management Authority. This would add significant complexity and time to the planning and approval process. There is also no technical value in extending the survey across the border, as synthetic modelling shows the prospective feature can be fully imaged within Timor-Leste waters.

If the survey area was moved north or west of its current location, the primary geological feature within the PSC would not be fully imaged. Hence, the selected location for the seismic survey is considered to be in the optimal position. No other survey location fulfills the two key requirements outlined above.

A no action alternative would be to not acquire the 3D seismic survey and select a well location based on existing 2D seismic data. The PSC area is covered by several vintages of 2D seismic data, which were acquired during the 1990s and early 2000s. One of the benefits of a new 3D seismic dataset compared with the existing 2D data is that the 3D survey will provide a continuous image of the subsurface, so structures and features can be clearly defined without extrapolation between lines. Furthermore, there have been considerable advances in seismic acquisition technology since the early 2000s, and the new survey data will have much better imaging and quality compared with the old datasets.

If the no alternative approach were taken, it may result in a future exploration well not being placed in the optimal location and the opportunity to make a hydrocarbon discovery could be missed.

The location for the 2D seismic line has been selected to cover both the Sikatan-1/ST1 well location in TL 19-16 and intersect with regional 2D seismic line PGS_NMAA 10-106, which is the only broadband line that intersects the primary geological feature within the survey area. Both Sikatan-1/ST1 and the Petroleum Geo-Services broadband seismic line are important control points for characterising subsurface properties within the PSC. An alternative north-south orientation for the new 2D seismic line was considered, but in this orientation, the line would not be able to intersect both the key well and the key broadband seismic line. The proposed location and orientation of the new 2D seismic line is therefore considered to be optimal.

6.2 Different Survey Activity Sizes or Design

A seismic feasibility study was carried out by Eni to evaluate the best possible acquisition parameters and design for the survey activity, using synthetic modelling with existing data, including vintage 2D seismic, bathymetry, well data, maritime boundaries, faults and horizons.

The study results concluded that to fully image the investigated area, seismic acquisition in Australian waters was not needed and an acquisition direction ranging from

north-south to azimuth 20° north did not have any impact on the quality of the final imaging. Since azimuth 20° north provides a logistical improvement to survey design, by keeping the survey activity within Timor-Leste administrative borders, this acquisition direction has been chosen for the actual survey activity. Synthetic modelling was also used to test different spread configurations for satisfactory near offset and near angle coverage, and to select the recommended acquisition parameters.

There is also a contingent option for acquiring an extra ~35km² of 3D seismic data over the Sikatan-1/ST1 well location. This would be achieved by continuing the sail lines in the south-west corner of the full fold area approximately 6km further south. The benefit of additional 3D seismic data would be to provide seamless imaging of the key offset well and the prospective geological feature in the survey area.

6.3 Alternative Technologies or Methods

A triple source has been selected for the seismic data acquisition. Dual source was also modelled in the seismic feasibility study to evaluate if this produced better imaging results. While the synthetic modelling indicates good imaging would be achieved using dual source, the imaging would be no better than using a triple source.

The dual source approach has been rejected during the environmental planning stage as it would require a larger source volume. Using a large volume would increase the risks to marine mammals and other sea creatures and result in a larger area impacted by the noise, whereas the triple source acquisition would use lower source volumes which would have a lesser impact on the environment.

6.4 Basis for Selected Alternative

The final concept for the survey activity was selected for the following reasons:

- Synthetic modelling determined the best location and orientation of the 3D survey to fully image the most prospective geological feature in the PSC without crossing international boundaries.
- The 2D seismic line is in an optimal location and orientation to intersect key existing well and seismic data
- A triple source was chosen because it uses a smaller volume, leading to a smaller acoustic impact on marine mammals and other sea creatures.

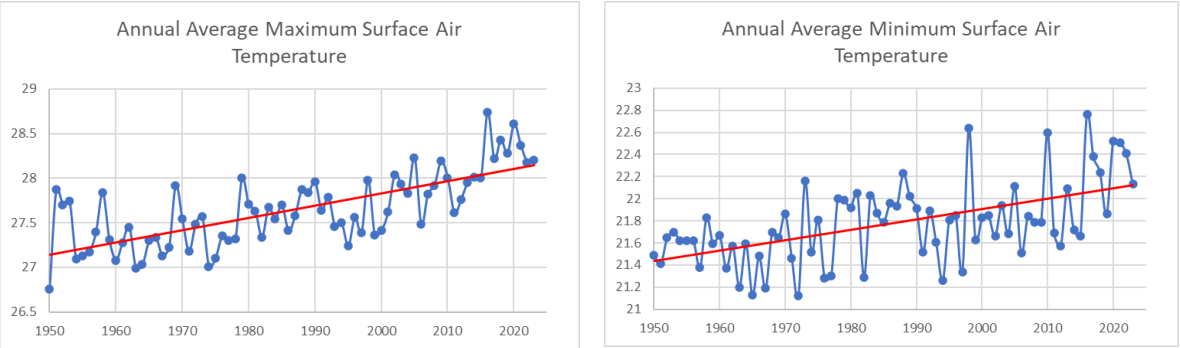
7 CLIMATE CHANGE

7.1 Historical Climate

Timor-Leste's climate is significantly influenced by the West Pacific monsoon, resulting in a distinct wet season from December to May and a dry season from June to November (Section 5.1.1). Over recent decades, the country has experienced notable changes in its climate patterns, largely driven by global climate change. One of the most significant trends observed is the increase in average temperatures. Both maximum and minimum temperatures have shown a rising trend, contributing to overall warming in the region (Figure 7-1).

Sea level rise is another critical concern for Timor-Leste, particularly for its coastal communities. Historical data indicates the global mean sea level has risen approximately 210–240mm since 1880, with about a third of this rise occurring in the last two and a half decades (United Nations Development Programme (UNDP), 2018). Specifically for Timor-Leste, reports suggest the sea level is currently rising at a rate of 9mm per year, which is higher than the global average of 3mm per year (UNDP, 2018). This accelerated rise is attributed to both the melting of mountain glaciers and polar ice sheets, and the thermal expansion of seawater as it warms. Rising sea levels contribute to coastal erosion, saltwater intrusion, and increased vulnerability to storm surges. These changes threaten livelihoods, especially in low-lying areas, and necessitate adaptive measures to mitigate their impacts.

Additionally, extreme weather events have become more frequent and severe in Timor-Leste due to climate change (UNDP, 2018). The country experiences a range of extreme weather conditions, including heavy rainfall, floods, cyclones and droughts. In 2021, the country experienced its worst floods in over 50 years, resulting in significant fatalities and destruction. The frequency and intensity of cyclones and storms have also increased, causing widespread damage to infrastructure and agriculture. Additionally, droughts have become more common, affecting water availability and food security. Forecasted projections indicate climate change will exacerbate these extreme weather events, leading to heavier precipitation and more intense floods. To address these challenges, Timor-Leste is implementing an early warning system for climate-related disasters, supported by the United Nations Environment Programme and financed by the Green Climate Fund, to improve forecasting and protect communities.



World Bank Group (2021).

Figure 7-1: Average maximum and minimum surface air temperature annual trends per decade: 1951 to 2023 Timor-Leste

7.2 Climate Change Projections

Climate change projections indicated alterations in weather patterns and climatic conditions, driven by global emissions largely from industrial processes in industrialised countries. In Timor-Leste, this is likely to lead to changes in the:

- length and intensity of the rainy seasons
- number and intensity of storms and other climatic events, such as floods and fires)
- maximum and minimum temperatures
- sea level rise.

These climatic changes are likely to affect all economic sectors, most notably agriculture, forestry and health.

7.3 Implications for the Survey Activity

Hydrocarbons combusting during the survey activity to move vessels and generate power will result in the release of very low levels of GHG emissions (Section 8.2.4). The key impact of GHG emissions will be their propensity to accumulate in the atmosphere over varying time scales, where their increasing concentration leads to a warming or 'greenhouse' effect, resulting in climate change impacts. Given the very low levels of atmospheric emissions expected to result from the survey activity, the contribution of GHG emissions from the survey activity compared to Timor-Leste's and global GHG emissions will be negligible. Section 8.2.4 contains a detailed assessment of GHG emissions related to the survey activity.

7.4 Adaptation Measures Required

The survey activity will generate very low levels of atmospheric emissions as a result of hydrocarbon combustion to generate power and move the vessels (Section 8.2.4). This may result in minor, temporary and localised changes in air quality in the immediate vicinity of the survey activity. Impacts to air quality will be further reduced through operation of the seismic, chase and support vessels in accordance with MARPOL 73/78 Annex VI. The fuel type (MDO) used to operate incinerators onboard the seismic, chase and support vessels will be MARPOL 73/78 compliant. Given the very low levels of anticipated atmospheric emissions, compliance with MARPOL 73/78 Annex VI and the distance of the survey area offshore, impacts to local communities, habitats and protected areas as a result of reduced air quality are not expected.

Given the short-term duration of the survey activity (up to eight weeks) impact to survey activity from climate change is not expected; therefore, it is not considered necessary to assess predictions or adaptation measures regarding future climate change.

8 IMPACT ASSESSMENT AND MITIGATION MEASURES

8.1 Environmental Risk Assessment Methodology

8.1.1 Risk Assessment

Eni has implemented its Health, Safety and Environment (HSE) Risk Management and Hazard Identification Procedure (ENI-HSE-PR-001). The purpose of the procedure is to ensure the HSE, asset and reputational hazards are identified, risk-assessed and managed in a systematic and consistent way. In this way, risks associated with projects and operational changes are effectively managed and addressed in compliance with company and legislative requirements.

The procedure is based on Eni's philosophy that to manage environmental risks is to eliminate or mitigate the risk during the planning phase. Managing risks through design is contingent upon identifying, at an early stage in the survey activity, the sources, and pathways by which environmental impacts can occur and the sensitivities of the receiving environment in which the survey activity is situated. Where risks and impacts are unable to be eliminated at the planning phase, the HSE Risk Management and Hazard Identification Procedure provides a robust framework that must be applied to understand the residual risk and impact from the key survey activity covered in this SEIS document.

The procedure is consistent with the Australian Standard for Risk Management: ISO 31000:2018 Risk Management – Principles and Guidelines and ISO 14001:2015 Environmental Management Systems. A general outline of the formal risk management process is provided in Figure 8-1.

Under Article 134(1) of Decree Law No. 32/2016 of Offshore Petroleum Operations, environmental risks must be managed in accordance with applicable law and to as low as reasonably practicable (ALARP).

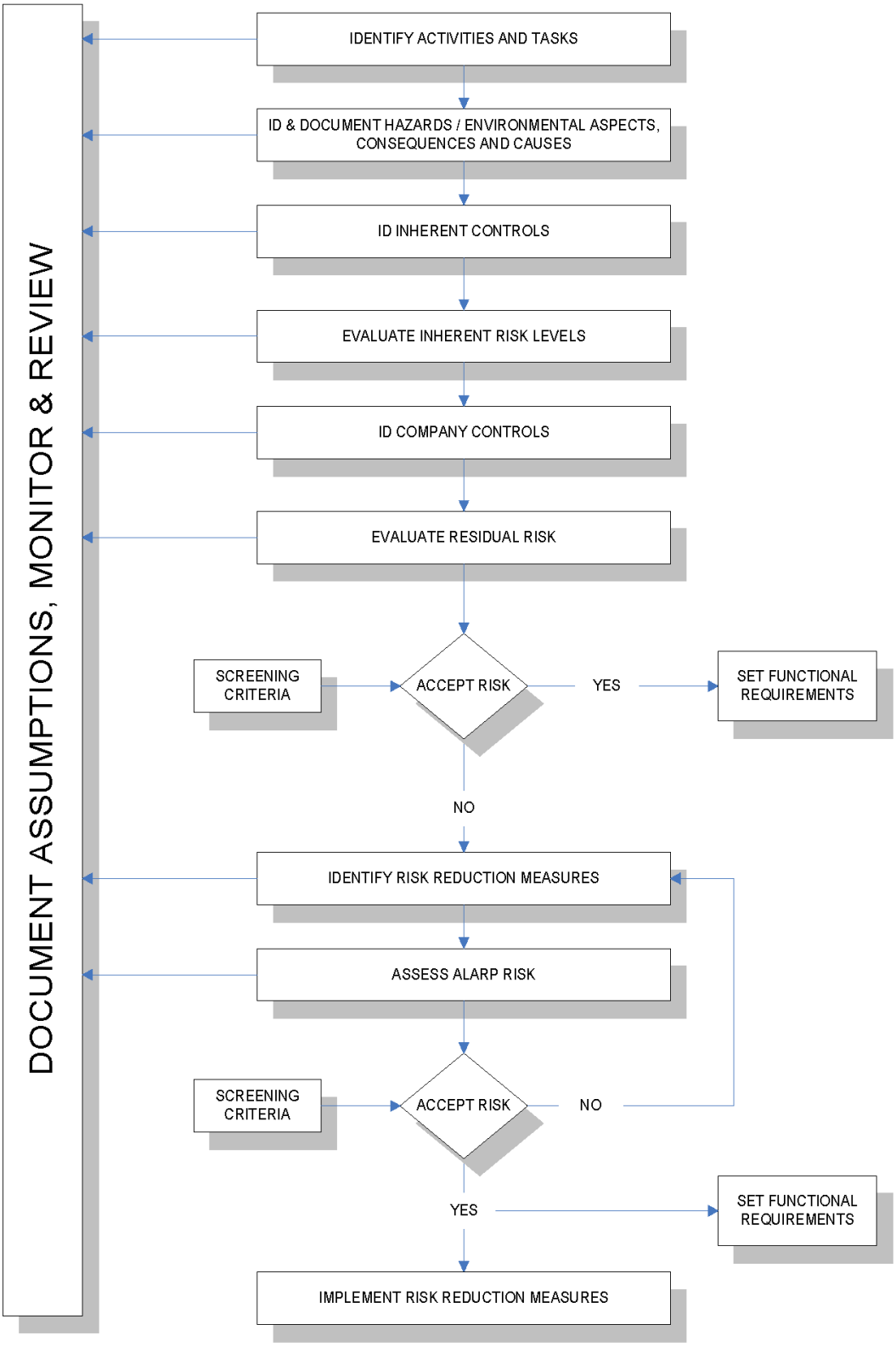


Figure 8-1: Overview of the risk management process

Before starting a systematic risk assessment process, it is essential to ensure the context of the risk assessment (why, when, who, what, where) is fully understood. This is achieved by:

1. identifying activities and tasks for the survey activity, the sources of impact and risk, and the associated environmental aspects
2. identifying environmental values and sensitivities within and adjacent to the survey area and the environment that may be affected.

Using that information, the process continues by:

3. defining the potential environmental effects (impacts and risks) the aspects identified in Step 1 may have on the values identified
4. identifying the potential environmental consequences and severity of the impact (Table 8-1)
5. identifying the likelihood of occurrence of the consequence, according to a six-level scale (Table 8-2)
6. evaluating overall environmental risk levels using the Eni environmental risk matrix (Figure 8-2)
7. identifying mitigation measures, assigning management actions, and further recommending risk reduction measures according to the hierarchy of controls (Table 8-3), with consideration of the risk management actions (Table 8-4), to reduce the risk to an acceptable level.

Inherent risk levels assume inherent controls are in place. Residual risk levels are based on the inherent controls and the application of additional risk reduction measures.

Table 8-1: Environmental consequence descriptors

Descriptor	Description
(1) Slight	No stakeholder impact **OR** temporary impact on the area. Involved area is less than 0.1 square mile. Spill is less than 1m³ – no sensitive impact on ground. Small discharges with confined and temporary impact on the area. No noticeable impact on water, air, soil and biodiversity. Negligible impact due to GHG emissions. Good materials, energy and water selection and use. Negligible financial consequences.
(2) Minor	Some local stakeholder concern or less than one week for clean-up **OR** one year for natural recovery **OR** impact on a small number of uncompromised species. Involved area is less than 1 square mile. Spill is less than 10m³ – impact on localised ground. Sufficiently large discharges to impact the environment, but no long-lasting effect. Short term, localised impact on water, air, soil and biodiversity (on a limited number of non-threatened species). Slight impact due to GHG emissions. Adequate materials, energy and water selection and use. Single breach of statutory or prescribed limit, or single complaint.

Descriptor	Description
(3) Local	Regional stakeholder concern **OR** one to two years for natural recovery **OR** one week for clean-up **OR** threatening to some species or impact on protected natural areas. Involved area less than 10 square miles. Spill is less than 100m³. Limited discharges affecting the neighbourhood and damaging the environment with longer effects. Short-term, more widespread impact on water, air, soil and biodiversity (on a higher number of non-threatened species). Limited impact due to GHG emissions. Inadequate materials, energy and water selection and use. Repeated breaches of statutory or prescribed limit, or many complaints.
(4) Major	National stakeholder concern **OR** impact on licences **OR** two to five years for natural recovery **OR** up to five months for clean-up **OR** threatening to biodiversity or impact on internesting areas for science. Involved area is less than 100 square miles. Spill is less than 1,000m³. Large discharges with severe and long-lasting environmental damage. Medium-term, widespread impact on water, air, soil and biodiversity (on some threatened species or one ecosystem function). Extensive measures (financially significant) required to restore the impacted area. Significant impact due to GHG emissions. Poor materials, energy and water selection and use. Extended breaches of statutory or prescribed limits, or widespread nuisance.
(5) Extensive	International stakeholder concern **OR** impact on licences and acquisitions **OR** more than five years for natural recovery **OR** less than five months for clean-up **OR** reduction of biodiversity **OR** impact on special conservation areas. Involved area is greater than 100 square miles. Spill is greater than 1,000m³. Large discharges with severe and persistent environmental damage. Long-term, broad-scale impact on water, air, soil and biodiversity (likely permanent species loss and impact on ecosystem function). Very poor materials, energy and water selection and use. Extensive impact due to GHG emissions. Major financial consequences for the company. Ongoing breaches well above statutory or prescribed limits.

Table 8-2: Likelihood scale

ID	Likelihood	Frequency (occurrence per year)	Description
0	Non-credible	<10-6 occ/y	Theoretically possible but not known or reasonably expected to have occurred in the exploration and production industry
A	Rare	10-6 ≤ occ/y < 10-4	Known or reasonably expected to have occurred in the exploration and production industry under similar circumstances
B	Unlikely	10-4 ≤ occ/y < 10-3	Known or reasonably expected to have occurred in company under similar circumstances
C	Possible	10-3 ≤ occ/y < 10-1	Known or reasonably expected to have occurred in the company more than once under similar circumstances
D	Likely	10-1 ≤ occ/y < 1	Known or reasonably expected to have occurred in the company more than once a year under similar circumstances
E	Almost certain	≥1 occ/y	Known or reasonably expected to have occurred at the considered location, more than once a year under similar circumstances

Table 8-3: Hierarchy of controls

Control Category	Description
Elimination	The causes of the hazardous event are removed such that it is no longer credible it will occur
Substitution (alternatives)	Replace with a less hazardous substance or method; for example, use a wet method instead of dry and introduce a non-dusting powder for one that is friable
Engineering (plant and equipment)	Physical controls; for example, containment, exhaust ventilation, mechanical aids
Procedural (signage, warnings or administrative)	Human controls; for example, supervision, work methods, housekeeping, personal hygiene, information, instruction and training
Personal protective equipment	In all cases, use of personal protective equipment should be considered as the only barrier **only** when control measures within the above categories are not practicable

Table 8-4: Risk management actions

Risk Rating	Significance	Risk Management Actions
Low (green)	Continuous improvement	The level of risk is broadly acceptable and generic control measures are required, aimed at avoiding deterioration[1].
Medium (yellow)	Risk reduction measure	The level of risk can be tolerable only once a structured review of the risk reduction measures has been performed; where necessary, the relevant guidance from the local authorities should be adopted for application of ALARP. ALARP is a concept that applies well to personnel and environmental risk. Asset risk is often most easily judged on a basis of costs and benefits alone.
Medium-High (orange)	Risk reduction measure	The level of risk can be tolerable only once a structured review of the risk reduction measures has been performed; where necessary, the relevant guidance from the local authorities should be adopted for application of ALARP. ALARP is a concept that applies well to personnel and environmental risk. Asset risk is often most easily judged on a basis of costs and benefits alone[2].
High (red)	Intolerable risk	The level of risk is not acceptable and risk control measures are required to lower the risk to another level of significance.

Note 1: The exception to the appropriate risk management actions for the Low risks are where a low risk to people is identified on the matrix position A3, then risk reduction measures are required.

Note 2: The exception to the appropriate risk management actions for Medium-High risk is the case of a 4B risk where the impact is on third parties onshore and is considered intolerable.

Consequence					Likelihood or Annual Frequency					
Severity	Company Reputation	People (Health & Safety)	Environment	Assets / Project	0 - Non credible / Could happen in E&P industry (Freq <10-6 /y)	A - Rare / Reported for E&P industry (Freq 10-6 to 10-4 /y)	B - Unlikely / Has occurred at least once in Company (Freq 10-4 to 10-3 /y)	C - Credible / Has occurred several times in Company (Freq 10-3 to 10-1 /y)	D - Probable / Happens several times per year in Company (Freq 10-1 to 1 /y)	E - Frequent / Several times per year at one location (Freq >1 /y)
1	1-Slight impact	1-Slight health effect / injury	1-Slight effect	1-Slight damage	Low	Low	Low	Low	Low	Low
2	2-Minor impact	2-Minor health effect / injury	2-Minor effect	2-Minor damage	Low	Low	Low	Medium	Medium	Medium
3	3-Local impact	3-Major health effect / injury	3-Local effect	3-Local damage	Low	Low	Medium	Medium - High	High	High
4	4-National impact	4-PTD or single fatality	4-Major effect	4-Major damage	Low	Medium	Medium - High	High	High	High
5	5-International impact	5-Multiple fatalities	5-Extensive effect	5-Extensive damage	Medium	Medium - High	High	High	High	High

Figure 8-2: Eni environmental risk matrix

8.1.2 Risk Reduction

Impacts or risks identified as requiring additional controls – the application of mitigation and management measures beyond what is standard practice for offshore petroleum activities – are subject to further review to identify the controls that must be provided or modified to reduce the residual risk.

Risk assessment is an iterative process of:

- identifying a risk
- assessing a risk
- deciding whether residual risk is tolerable
- if not tolerable, generating a new risk or mitigation measures
- assessing the effectiveness of the mitigation measures.

The acceptability of a risk, after controls and mitigation measures have been applied, is determined in accordance with ratings and associated management actions outlined in Table 8-4.

8.1.3 Risk Identification Workshops

An environmental hazard identification (ENVID) workshop was held on 19 September 2024 by Eni to identify and manage the environmental impacts and risks that may credibly arise from the survey activity. The ENVID workshop was attended by representatives from Eni's exploration and environment teams along with environmental consultants from Worley Consulting.

The environmental impacts and risks were assessed during the ENVID workshop using the methodology within the Eni HSE Risk Management and Hazard Identification Procedure (ENI-HSE-PR-001).

8.2 Planned Impacts

8.2.1 Interaction with Other Marine Users (Risk ID P1)

8.2.1.1 Summary of Environmental Risk

Hazard	Interaction with Other Marine Users		
	Frequency	Severity	Risk
Inherent Risk	E	1	L
Residual Risk	B	1	L

8.2.1.2 Description of Hazard

The presence of the seismic, chase and support vessels ('survey vessels') and the streamers and associated seismic equipment have the potential to interact with fishers and, to a lesser extent, commercial shipping.

High levels of fishing are not expected within the survey area; however, local Timorese and Indonesian fishers, including traditional fishing vessels and equipment, may be encountered within or pass through the survey area (Section 5.3.6). Commercial shipping traffic may infrequently pass through the survey area (Section 5.3.8).

Illegal fishing activities have been reported in Timor-Leste waters. These activities may involve destructive methods such as fish aggregating devices, explosives or poisons, which pose significant threats to marine ecosystems. Given the offshore location and lack of suitable fishing grounds, substantial activity is not expected in the survey area.

The survey vessels will be required to enter the northern part of TL 19-16 (operated by SundaGas) as part of the 2D seismic data acquisition and during vessel manoeuvring and line turns. Eni will obtain the necessary approvals to enter and carry out manoeuvring and acquisition operations within TL 19-16. Eni is in direct contact with SundaGas with regards to 2025 operational activity for both companies, and will maintain dialogue to ensure there are no adverse impacts to operations in the survey area.

8.2.1.3 Potential Environmental Impact

Low levels of traditional and subsistence fishing from Timor-Leste and Indonesia may occur within the survey area, resulting in potential impacts to traditional fishers. The presence of the survey vessels and the seismic streamer array may result in the temporary displacement of traditional fishing vessels and the need to alter fishing operations. The presence of the seismic streamer equipment may also result in the entanglement of fishing equipment, such as nets, lines and fish aggregating devices. Entanglement in the seismic streamers may result in damage to fishing and seismic equipment, inconvenience, and delay due to the need to disentangle equipment. Temporary displacement, damage or entanglement of equipment and delays to fishing activities may result in reduced income for fishers.

The seismic vessel will typically move along planned seismic lines at a consistent speed of approximately 4.5 knots, and will proactively manage operational information with

other operators and fishers active in the survey area. In addition, due to the nature of the survey activity, the vessels will only occupy a portion of the survey area at any time.

The limited manoeuvrability of the seismic vessel means fishers may be asked to take measures to avoid the seismic vessel and towed equipment. Some commercial shipping vessels may also be asked to deviate from their intended route to avoid interaction.

Fishing vessels are expected to easily and actively avoid the survey vessels. Streamers and vessels will be marked with visual aids and Fishery Liaison Officers (FLOs) will be onboard the support and chase vessels to communicate with fishers as required. As such, the impact of the survey activity on fishers is considered to be minimal, temporary, and localised to the immediate vicinity of the survey vessels and streamers.

Eni will obtain necessary approvals to enter and carry out manoeuvring and acquisition operations within TL 19-16. No adverse impacts to the operations of SundaGas are expected and planned operational activity will not overlap spatially.

Illegal fishing activities have been reported in Timor-Leste waters. These activities may involve destructive methods such as fish aggregating devices, explosives or poisons, which pose significant threats to marine ecosystems. Given the offshore location and lack of suitable fishing grounds, substantial activity is not expected in the survey area. Support/chase vessels may be used to deter non-survey activity vessels from the survey area, as well as identify debris and fish aggregating devices.

Given the low levels of shipping traffic and the use of navigation lighting and aids, minimal impacts to commercial shipping are expected.

Transboundary impacts are not anticipated as the survey activity will be confined to within Timor-Leste waters. The likelihood of impacts to other marine users, including vessels crossing into or out of Australian waters, is considered low. Consequently, no cumulative impacts are expected.

8.2.1.4 Management Control Measures

Control measures relating to this risk comprise:

- Navigation lighting and aids in accordance with the COLREGS and Chapter V of SOLAS.
- Support/chase vessels used to deter non-survey activity vessels from the survey area, as well as identify debris and fish aggregating devices.
- Support and chase vessels will have FLOs onboard who are Bahasa and Tetum speakers.
- Support and chase vessels will have a communication sheet in Bahasa and Tetum, with key survey information to be provided to fishers encountered during the survey activity.
- Stakeholder engagement.
- Streamers marked with tail buoys.

- Support/chase vessels used to deter non-survey activity vessels from the survey area, as well as identify debris and fish aggregating devices.
- Support/chase vessels will be able to identify, tow and recover fishing equipment and debris.

8.2.2 Noise Emissions – Seismic Source (Risk ID P2)

8.2.2.1 Summary of Environmental Risk

Hazard	Underwater Noise – Seismic Source		
	Frequency	Severity	Risk
Inherent Risk	E	3	H
Residual Risk	B	3	M

8.2.2.2 Description of Hazard

The survey activity will use a seismic source, consisting of an airgun array with a maximum capacity of 3,500in³, towed at a water depth of 8m. The source will be used to generate acoustic pulses by periodically discharging compressed air into the water column at an interval of approximately eight seconds, as the vessel transits along planned survey lines within the survey area.

A 3,480in³ seismic source is expected to produce far-field horizontal source levels of up to a maximum of 248.8dB re 1µPa m (peak, or 'PK') and per-pulse sound exposure level (SEL) of 199.6 (JASCO, 2024).

8.2.2.3 Underwater Noise Modelling Methodology

Modelling Scenarios

To assess the potential magnitude and extent of impacts from underwater noise produced by the survey activity, Eni commissioned JASCO Applied Sciences (JASCO) to model sound propagation within the survey area. The objective of this acoustic modelling study was to evaluate the potential effects of sound (potential injury and behavioural disruption) to marine fauna, including cetaceans, marine reptiles, fishes, and zooplankton from the seismic array.

The modelling study considered a 3,480in³ seismic source in a triple array with 96m cross-line separation. JASCO's specialised Airgun Array Source Model was used to predict the acoustic signature and spectra for the seismic source. The Airgun Array Source Model accounts for individual airgun volumes, airgun bubble interactions and array geometry to yield accurate source predictions.

Two scenarios were considered (Figure 8-3):

- Scenario 1 accounted for 1,566 impulses during the approximately 18.6-hour period of acquisition within the 24-hour scenario, inclusive of run-ins and run-outs.
- Scenario 2 accounted for 1,641 impulses during the approximately 19.2-hour period of acquisition within the 24-hour scenario, inclusive of run-ins and run-outs.

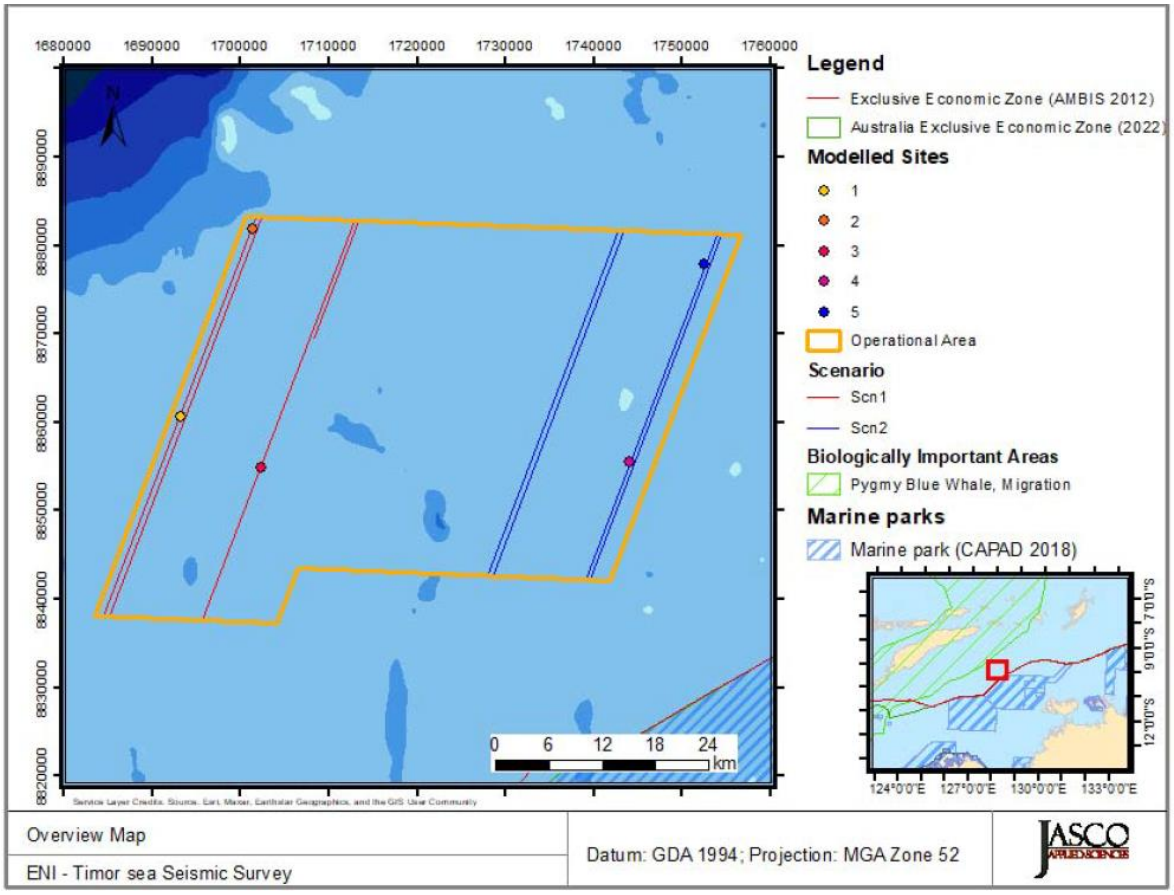


Figure 8-3: Overview map of considered seismic shooting area for the SEL_{24h} Scenario 1 and 2

Complementary underwater acoustic propagation models were used in conjunction with the array signature to estimate sound levels, considering site-specific environmental influences. Single-impulse sound fields were predicted at five sites within the proposed survey area (Table 8-5), and accumulated sound exposure fields were predicted for two representative scenarios for likely survey operations over 24 hours. A conservative sound speed profile, one that would be most supportive of sound propagation conditions for the potential survey period, was defined and applied throughout.

The modelling methodology considered source directivity and range-dependent environmental properties. Estimated underwater acoustic levels are presented as sound pressure levels (SPL, L_p), zero-to-peak pressure levels (PK, L_{pk}), and either single-impulse (as in, per-pulse) or accumulated sound exposure levels (SEL, L_E) as appropriate for different noise effect criteria. The duration period for cumulative SEL is defined as a 24-hour period over which sound energy is integrated; the level is specified with the abbreviation SEL_{24h}.

It should be noted that due to the cumulative 24-hour exposure level of the SEL_{24h} metric, there is an assumption that the receiver, such as a marine animal, remains in a fixed position throughout this timeframe. However, in reality, marine mammals, fish and sea turtles are unlikely to stay in one location for an entire 24-hour period, especially if the habitat is not location-specific. Their movement patterns, influenced by behaviour and the proximity and movement of the noise source, mean they would

typically be exposed to these noise levels for shorter durations. Consequently, the reported radius for SEL_{24h} criteria does not imply that marine fauna within this radius will necessarily experience impairment. Instead, it indicates an animal could be exposed to sound levels that might cause permanent or temporary threshold shifts if it were to remain in that location for 24 hours. This understanding helps in more accurately assessing the potential impact of noise on marine fauna.

Table 8-5: Location details for the single impulse modelled sites

Site	Latitude	Longitude	MGA[1] Zone 52		Water Depth (m)
			X (m)	Y (m)	
1	-10.12615	127.83066	371887	8880410	87
2	-9.9348202	127.89688	379072	8901593	96
3	-10.174505	127.91383	381018	8875094	75
4	-10.155547	128.28654	421843	8877304	78
5	-9.9556026	128.35561	429366	8899428	76

[1] *Map Grid of Australia (MGA).*

8.2.2.4 Thresholds

To evaluate the potential effects of underwater noise, it is essential to establish exposure criteria that determine the levels of sound that may negatively impact animals. Permanent threshold shift (PTS) occurs when an animal experiences lasting injury to its hearing organs. This type of hearing loss is irreversible and can result in prolonged exposure to loud noise or sudden intense sound. Temporary threshold shift (TTS) occurs when the receptor hair cells in the cochlea become fatigued due to exposure to loud sounds. This causes a temporary reduction in hearing sensitivity that usually returns after a period of rest. Without proper mitigation measures, the impulsive sound from seismic sources has the potential to cause permanent (PTS) or temporary (TSS) threshold shifts in hearing, as well as behavioural disturbances in marine fauna.

Mammals

To better understand these impacts to marine mammals, the U.S. National Oceanic and Atmospheric Administration (NOAA, 2019) and U.S. National Marine Fisheries Service (NMFS, 2024) established specific thresholds to determine the distances within which various sound levels can affect marine mammals of different hearing groups (Table 8-6).

Table 8-6: Acoustic effects of impulsive noise on marine mammals; unweighted sound pressure level, SEL_{24h} and peak thresholds

Hearing Group	NOAA (2019)	NMFS (2024)			
	Behaviour	PTS Onset Thresholds*		TTS Onset Thresholds*	
	SPL (L_p; dB re 1µPa)	Weighted SEL_{24h} ($L_{E,24h}$; dB re 1µPa²·s)	PK (L_{pk}; dB re 1µPa)	Weighted SEL_{24h} ($L_{E,24h}$; dB re 1µPa²·s)	PK (L_{pk}; dB re 1µPa)
Low frequency	160	183	222	168	216
High frequency		193	230	178	224
Very high frequency		159	202	144	196
Otariid seals		185	230	170	224
Phocid seals		183	223	168	217

$L_{E,24h}$ denotes cumulative sound exposure over a 24-hr period and has a reference value of 1µPa2s.

L_{pk} denotes peak sound pressure is flat weighted or unweighted and has a reference value of 1µPa.

L_p denotes sound pressure level and has a reference value of 1µPa.

* *Dual metric acoustic thresholds for impulsive sounds: Use whichever results in the largest isopleth for calculating PTS and TTS onset.*

Sea Turtles

Due to limited data about sea turtles' responses to acoustic exposure and the absence of studies on hearing loss from loud sounds, Popper et al. (2014) suggested using thresholds for fish with poor hearing as a conservative estimate for sea turtles. Finneran et al. (2017) revised these thresholds, noting that sea turtles, with their best sensitivity at low frequencies and poor auditory sensitivity, likely have TTS and PTS thresholds similar to fish rather than marine mammals. McCauley et al. (2000) observed that caged green and loggerhead sea turtles exhibited increased swimming activity at received levels above 166dB re 1µPa (SPL) and erratic behaviour above 175dB re 1µPa, indicating agitation. The Recovery Plan for Marine Turtles in Australia (2017) acknowledges the 166dB re 1µPa SPL as a level that may elicit a behavioural response, with 175dB re 1µPa recommended as a criterion for behavioural disturbance. These thresholds are shown in Table 8-7.

Table 8-7: Acoustic effects of impulsive noise on sea turtles: unweighted sound pressure level, 24-hour sound exposure level, and peak pressure thresholds

Effect Type	Criterion	SPL (L_p; dB re 1µPa)	Weighted SEL_{24h} ($L_{E,24h}$; dB re 1µPa²·s)	PK (L_{pk}; dB re 1µPa)
Behavioural response	McCauley et al. (2000)	166	NA	
Behavioural disturbance		175		
PTS onset[1]	Finneran et al. (2017)	NA	204	232
TTS onset[1]			189	226

[1] *Dual metric acoustic threshold for impulsive sounds: Use whichever results in the largest isopleth for calculating PTS and TTS onset.*

L_p denotes sound pressure level and has a reference value of 1µPa.

L_{pk} denotes peak sound pressure is flat weighted or unweighted and has a reference value of 1µPa.

$L_{E,24h}$ denotes cumulative sound exposure over a 24-hr period and has a reference value of 1µPa2s.

Sharks, Fish and Plankton

Susceptibility to injury from noise exposure in fish varies significantly based on the presence and role of the swim bladder in hearing. Different thresholds have been proposed for fish without a swim bladder (such as sharks and rays), fish with a swim bladder not used for hearing, fish that use their swim bladders for hearing, and fish eggs and fish larvae generally accepted to represent plankton (Popper et al., 2014). Table 8-8 presents the relative accepted thresholds from Popper et al. (2014).

Table 8-8: Criteria for seismic noise exposure for fish, adapted from Popper et al. (2014)

Type of Animal	Mortality and Potential Mortal Injury	Impairment			Behaviour
		Recoverable Injury	TTS	Masking	
Fish: No swim bladder (particle motion detection)	>219dB SEL_{24h} or >213dB PK	>216dB SEL_{24h} or >213dB PK	>>186dB SEL_{24h}	(N) Low (I) Low (F) Low	(N) High (I) Moderate (F) Low
Fish: Swim bladder not involved in hearing particle motion detection)	210dB SEL_{24h} or >207dB PK	203dB SEL_{24h} or >207dB PK	>>186dB SEL_{24h}	(N) Low (I) Low (F) Low	(N) High (I) Moderate (F) Low
Fish: Swim bladder involved in hearing (primarily pressure detection)	207dB SEL_{24h} or >207dB PK	203dB SEL_{24h} or >207dB PK	186dB SEL_{24h}	(N) Low (I) Low (F) Moderate	(N) High (I) High (F) Moderate
Fish eggs and fish larvae (relevant to plankton)	>210dB SEL_{24h} or >207dB PK	(N) Moderate (I) Low (F) Low	(N) Moderate (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Moderate (I) Low (F) Low

Peak sound pressure level: dB re 1µPa; SEL_{24h} dB re 1µPa^2·s.

All criteria are presented as sound pressure even for fish without swim bladders since no data for particle motion exist.

Relative risk (high, moderate, low) is given for animals at three distances from the source defined in relative terms as near (N), intermediate (I), and far (F)

8.2.2.5 Modelling Results

This section presents the modelling results for sound fields in terms of SEL accumulated over 24 hrs of survey activity, for the two modelled scenarios (Section 8.2.2.3). Frequency-weighted SEL_{24h} sound fields were used to estimate the maximum distances (R_{max}) to marine mammal (cetacean) and turtle PTS and TTS thresholds (listed in Table 8-9) and to estimate maximum distance and the area to injury and TTS guidelines for fish (Table 8-10).

The SEL_{24h} sound fields are presented as contour maps for the two modelled scenarios for cetaceans and turtles (Figure 8-4 and Figure 8-5) and fish (Figure 8-6 and Figure 8-7). For the modelling and impact assessment, fish eggs and larvae are used to represent plankton. Figure 8-4 to Figure 8-7 present the unweighted SEL_{24h} in 10dB steps, as well as the isopleths corresponding to thresholds or guidelines for which R_{max} was greater than 20m.

Table 8-9: Maximum-over-depth distance (km) to frequency-weighted 24-hour sound exposure thresholds for permanent and temporary threshold shift for marine mammals and sea turtles for the 3,480in³ array

Hearing Group	Threshold for SEL_{24h}	Scenario 1		Scenario 2	
		R_{max} (km)	Area (km²)	R_{max} (km)	Area (km²)
PTS					
Low-frequency cetaceans	183	2.82	425.65	3.08	469.44
High-frequency cetaceans	193	-	-	-	-
Very high-frequency cetaceans	159	0.16	1.44	0.16	2.07
Sea turtles	204	0.16	1.44	0.16	2.07
TTS					
Low frequency cetaceans	168	42.12	5,462.88	44.99	4,770.23
High-frequency cetaceans	178	0.16	1.44	0.16	2.07
Very high-frequency cetaceans	144	0.58	122.68	0.58	133.88
Sea turtles	189	1.22	226.45	1.23	233.16

Dash indicates the threshold was not reached within the limits of the modelling resolution (20m).

Table 8-10: Distances to 24-hour sound exposure level based fish criteria in the water column for 3,480in³ array

Hearing Group	Threshold for SEL_{24h}	Scenario 1		Scenario 2	
		R_{max} (km)	Area (km²)	R_{max} (km)	Area (km²)
Mortality and Potential Mortal Injury					
Fish: no swim bladder	219	0.15	1.3	0.15	1.41
Fish with swim bladder not involved in hearing, fish eggs and fish larvae	210	0.16	1.44	0.16	2.07
Fish with swim bladder involved in hearing	207	0.15	1.44	0.16	2.07
Fish Recoverable Injury					
Fish: no swim bladder	216	0.15	1.3	0.16	1.58
Fish with swim bladder involved and not involved with hearing	203	0.17	1.31	0.18	6.56
Fish TTS					
All fish	186	4.96	921.21	4.98	851.05

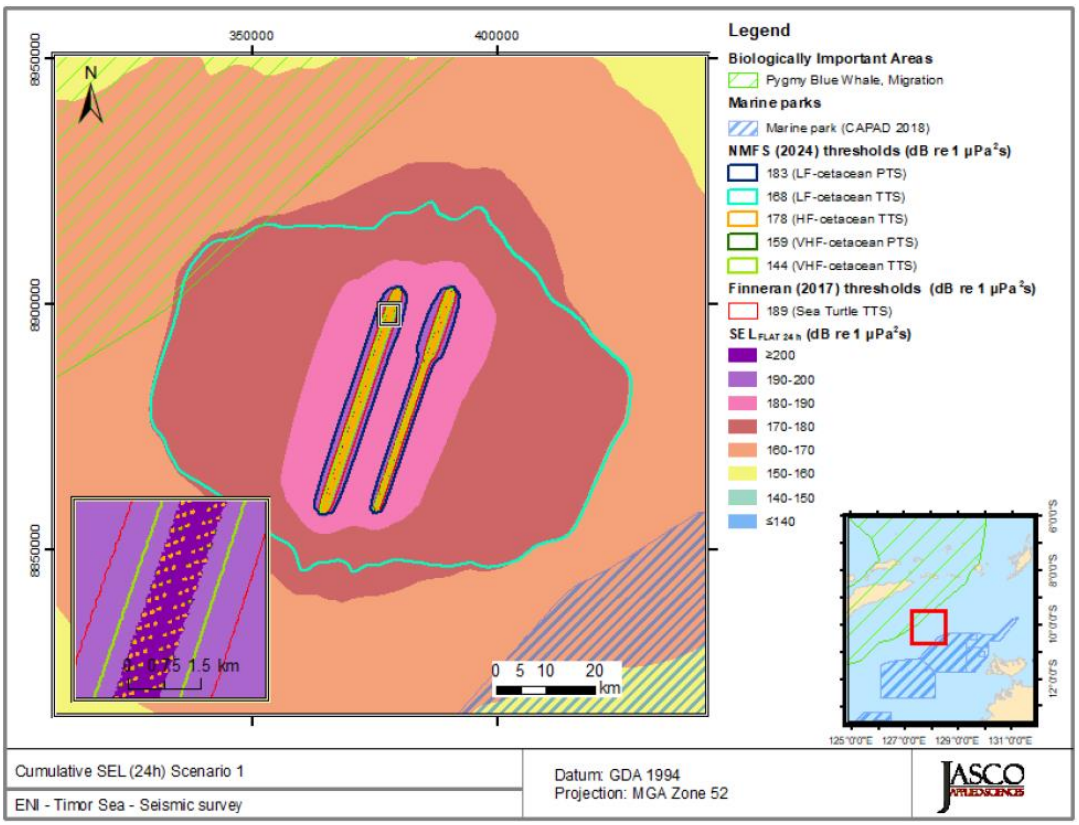


Figure 8-4: Scenario 1, SEL_{24h} sound contour map for cetaceans and turtles

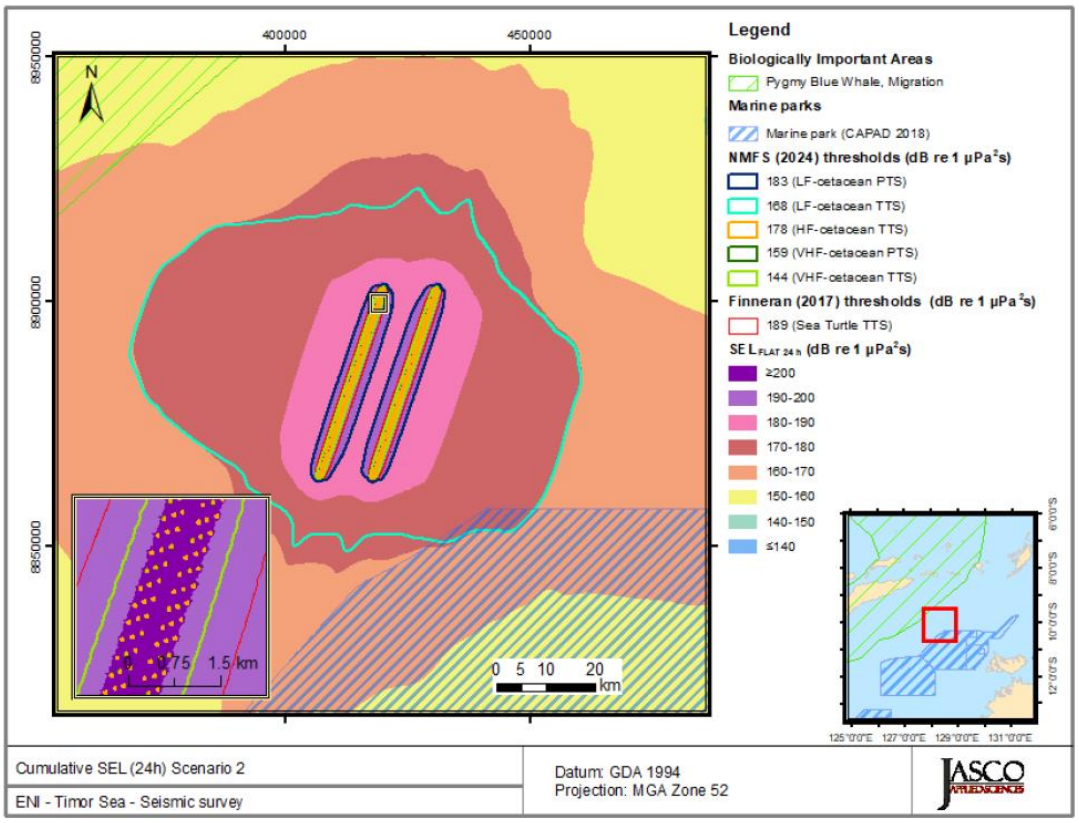


Figure 8-5: Scenario 2 SEL_{24h} sound contour map for cetaceans and turtles

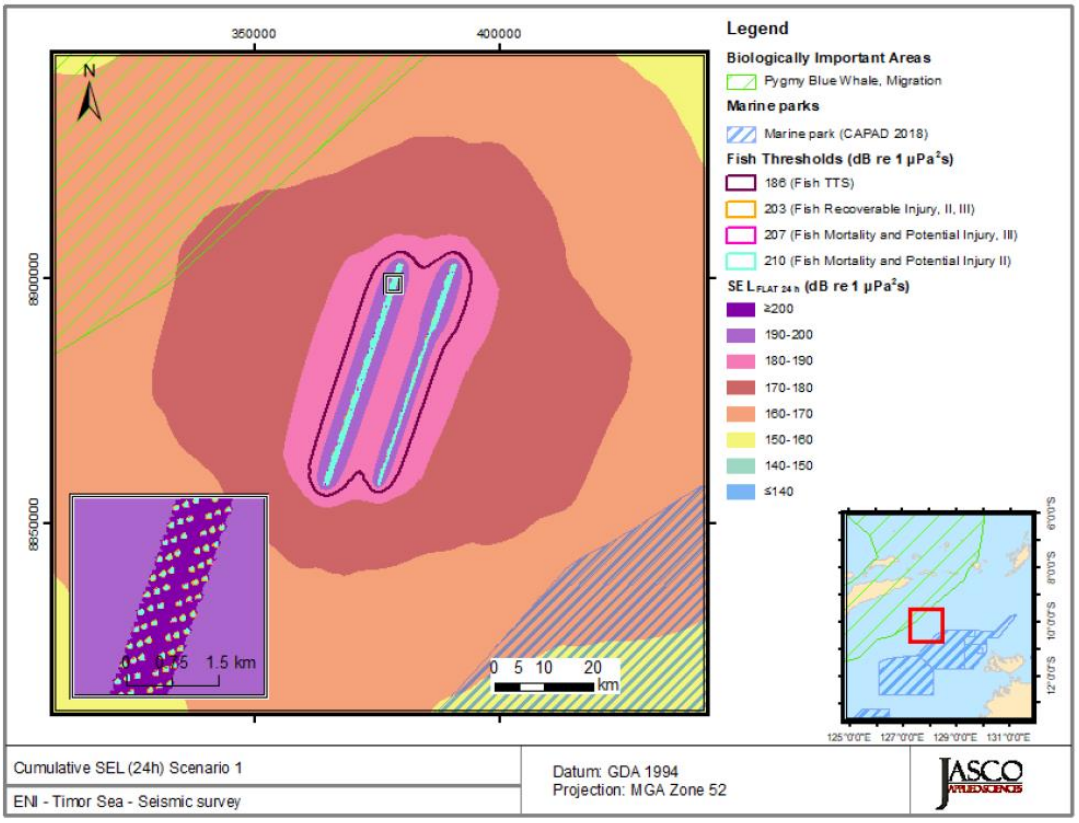


Figure 8-6: Scenario 1, SEL_{24h} sound contour map for fish

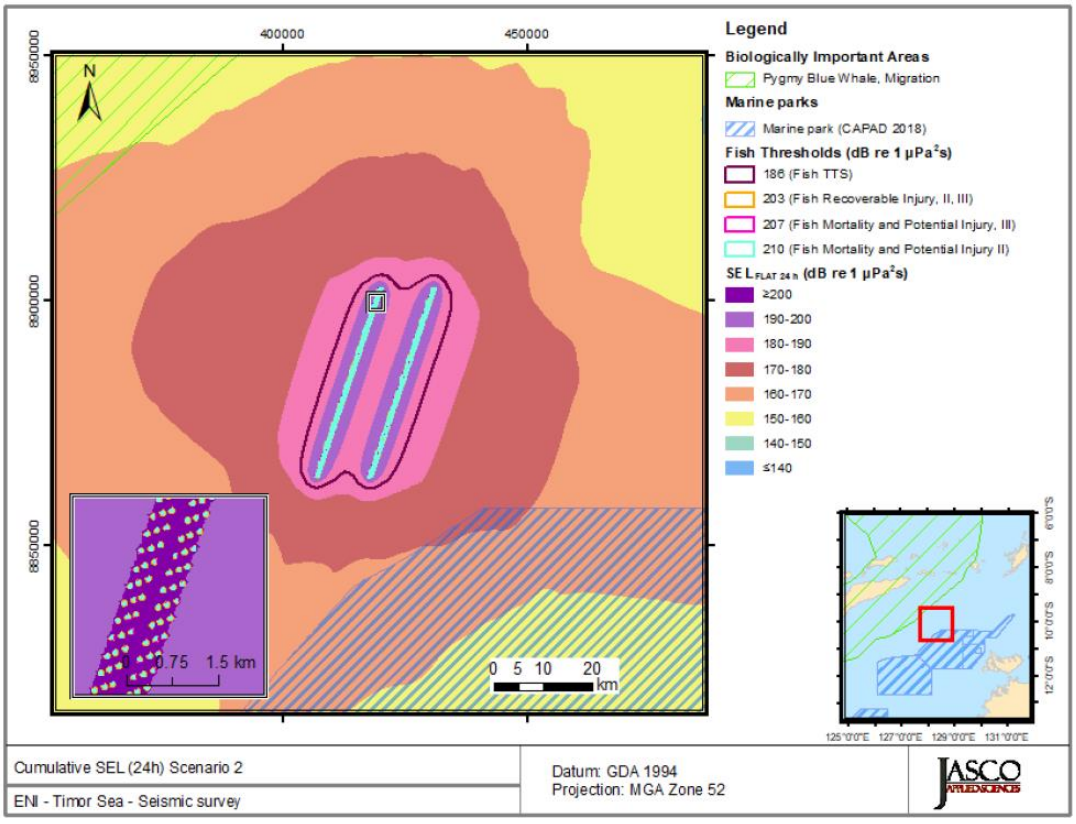


Figure 8-7: Scenario 2 SEL_{24h} sound contour map for fish

8.2.2.6 Potential Environmental Impact

The potential impacts and risks of seismic noise have been assessed, with controls proposed to reduce the impacts and risks, for the receptor categories of:

- marine mammals
- marine turtles
- sharks, rays, and fish
- plankton, fish eggs and larvae
- benthic invertebrates
- cross-border impacts
- potential cumulative impacts.

Marine Mammals

Marine mammals, particularly cetaceans, rely heavily on sound for essential life functions such as individual recognition, socialising, detecting predators and prey, navigation, and reproduction (Weilgart, 2007; Erbe et al., 2015; Erbe et al., 2018). Underwater noise from seismic surveys can significantly impact these animals by interfering with their communication (masking), causing behavioural changes, shifting hearing thresholds, and inducing physical damage and stress (Erbe, 2012; Rolland et al., 2012). Exposure to high-intensity underwater noise at close range can lead to both lethal and sublethal physiological effects, including tissue damage similar to decompression sickness, hearing impairment and chronic stress (Gordon et al., 2003).

Thirteen cetaceans were identified as potentially occurring within the survey area, as presented in Table 5-3. Among these species, the pygmy killer whale (*Feresa attenuata*), common dolphin (*Delphinus delphis*) and the bottlenose dolphin (*Tursiops truncatus*) were identified as likely to occur near the survey area. These species fall within the high-frequency hearing group (Southall et al., 2019). The maximum horizontal distance (R_{max}), the distance to which the TTS or PTS thresholds could be met for each cetacean hearing group, are summarised within Table 8-11.

Table 8-11: Summary of maximum horizontal distance (R_{max}) for behavioural response thresholds, and thresholds for permanent and temporary threshold shift for marine mammals

Hearing Group	Maximum Modelled Distance to Effect Threshold (R_{max})		
	Behavioural Response (km)[1]	Impairment (km): PTS	Impairment (km): TTS
Low frequency cetaceans	10.60	3.08 (SEL_{24h})	44.99 (SEL_{24h})
High frequency cetaceans		-	0.16 (SEL_{24h})
Very high frequency cetaceans		0.54 (SEL_{24h})	0.90 (SEL_{24h})
Pinnipeds		0.18 (SEL_{24h})	3.07 (SEL_{24h})
Otariids		0.15 (SEL_{24h})	0.18 (SEL_{24h})

Noise exposure criteria: [1] NMFS (2024).

Dash (-) indicates the sound threshold was not reached within the limits of the modelling resolution (20m).

For high-frequency cetaceans, the modelling results indicate that while TTS may occur within 0.16km of the seismic source, the risk of PTS is minimal due to the noise levels not exceeding the PTS threshold within the modelled area (Table 8-9). This suggests high-frequency cetaceans are unlikely to suffer permanent hearing damage from the survey activity. However, the predicted behavioural impacts at distances up to 10.6km highlight the potential for disturbance to these species, which could affect their foraging, communication and other critical behaviours.

Low-frequency cetaceans, such as blue whales and other baleen whales, are at risk of PTS within 3.08km of the seismic noise source, and TTS could occur within 44.99km (Table 8-9 and Table 8-11). Pygmy blue whales, which are known to migrate within 32km of the survey area, are therefore at risk of TTS and PTS (Figure 8-4 and Figure 8-5).

Seismic noise could cause disruptions to their migration routes, feeding and communication behaviours. Exposure to high levels of noise can impair their hearing, affecting their ability to communicate and navigate. However, low-frequency cetaceans are highly mobile and capable of moving away from the noise source, reducing the likelihood of prolonged exposure and significant impacts.

Given the proposed controls, including observation, soft-start and shutdown procedures implemented in accordance with JNCC Guidelines (Section 8.2.2.7), the risk of TTS and PTS is reduced. Additional mitigation and management control measures to further reduce potential impacts are presented in Section 8.2.2.7. These strategies significantly reduce the likelihood of use of the seismic source close to marine mammals.

Based on the absence of critical habitats for any species of cetacean (as in, feeding, breeding, calving) or a constricted migratory pathway within the survey area, and the control measures in place, predicted noise levels from seismic acquisition are not considered likely to cause injury (PTS/TTS) effects to cetaceans that may be transiting through the survey area. The potential impacts of noise emissions from the seismic source on cetaceans during acquisition of survey data are considered to be unlikely and most likely limited to temporary behavioural changes (avoidance) in individuals, therefore residual risk has been rated as Medium.

Marine Turtles

High-intensity impulsive sounds emitted from seismic sources have the potential to impact marine turtles in several ways. These impacts include mortal or potential mortal injury to marine turtles at very close range to the seismic source, permanent or temporary hearing impairment (recoverable injury, TTS, or masking) at close range, and behavioural disturbances. Marine turtles, while less sensitive to noise than marine mammals due to the absence of an external hearing organ, can detect sound through bone-conducted vibrations in the skull, with their shell acting as a receiving surface (Lenhardt et al., 1985). The threshold criteria for assessing the impact of noise on sea turtles has been derived from the widely accepted studies conducted by McCauley et al. (2000) and Finneran et al. (2017).

Six sea turtle species or species habitat were identified as potentially occurring within the survey area (Table 5-3). However, no biologically important areas or nearby island nesting sites have been identified. Five of these species generally inhabit shallower coastal waters, making their presence in the deeper offshore waters of the survey area improbable (Whiting et al., 2008; Limpus et al., 2008). The leatherback turtle, which is adapted to deeper pelagic environments, may occasionally be encountered due to its ability to dive to significant depths. However, a recent study by Hazel et al. (2024) reported few observations of leatherbacks in the Timor Sea, indicating their presence in the survey area is infrequent.

Modelling results indicate the high-intensity impulsive noise from the seismic airgun array may have significant impact to marine turtles. Behaviour responses, such as changing swimming patterns or avoidance behaviours, can occur up to 5.01km from the seismic source (Table 8-12). More pronounced behaviours are expected within 1.99km at an SPL of 175dB re 1uPa. These disturbances can disrupt normal activities, such as foraging and migration, potentially affecting the turtles' overall health and survival.

Modelling predicts that turtles could experience TTS within 1.23km SEL_{24h}. This temporary impairment may hinder the turtles' ability to detect predators, prey, and navigate their environment. The potential for PTS, a lasting injury to hearing, is predicted within 0.16km based on SEL_{24h} (Table 8-12). This irreversible damage can have long-term consequences on the turtles' ability to survive. Despite these risks, turtles are highly mobile and likely to move away from the noise source, which would reduce their exposure and the severity of these impacts. Therefore, while the potential for hearing impairment exists, the actual impact on turtles is expected to be less severe due to their natural avoidance behaviour and mobility.

Table 8-12: Summary of maximum horizontal distance (R_{max}) for behavioural response thresholds, and thresholds for permanent and temporary shift for sea turtles

Hearing Group	Maximum Modelled Distance to Effect Threshold (R_{max})			
	Behavioural Response[1]	Behavioural Disturbance[1]	Impairment (km): TTS[2]	Impairment (km): PTS[2]
Sea turtles	5.01 (166dB re 1µPa - SPL)	1.99 (175dB re 1µPa - SPL)	1.23 (SEL_{24h})	0.16 (SEL_{24h})

Noise exposure criteria: [1] McCauley et al. (2000) and [2] Finneran et al. (2017).

Significant aggregations of marine turtles are not anticipated within the survey area, and their presence is expected to be transient. Therefore, significant impacts to marine turtles are not expected. Consequently, the residual risk to marine turtles from the survey activity is considered to be low, with any potential impacts likely to be temporary.

Sharks, Rays and Fish

Given the survey area is situated in oceanic waters, with the nearest shoal located approximately 26km away, key pelagic fish species in the survey area may include tuna, mackerel and billfish. Additionally, there are three listed Threatened or Migratory shark and ray species that may be present within the survey area, including the oceanic manta ray, oceanic whitetip and whale shark (Table 5-3).

These species either do not possess a swim bladder or it is poorly developed and not directly connected to hearing (Popper et al., 2014), indicating they are sensitive only to the particle motion component of sound at close range to a sound source. These species are also generally free roaming, with naturally large ranges spanning hundreds to thousands of kilometres. Whale sharks, for instance, are known to travel thousands of kilometres in search of food and suitable breeding grounds (Hueter et al., 2013). Tuna, including bluefin, undertake impressive migrations across entire oceans, often covering distances of over 5,000km (Aranda et al., 2013). Similarly, many shark species migrate for feeding, mating and birthing, often traveling vast distances to find optimal conditions.

Modelling results predict sharks, rays and pelagic fish are at risk of TTS at 4.98km SEL_{24h}. Expected impacts are likely to include temporary behavioural changes such as changes in orientation, swim speed, tightening of school structure, and changes in position within the water column several kilometres from the source (Pearson et al., 1992; Santulli et al., 1999; McCauley et al., 2000; Simmonds and MacLennan, 2005; Fewtrell and McCauley, 2012; Peña et al., 2013; Popper et al., 2014). Fish may exhibit stronger startle and flee responses, with normal behaviours resuming shortly after the seismic source has passed, typically within an hour (Pearson et al., 1992; Santulli et al., 1999; McCauley et al., 2000; Simmonds and MacLennan, 2005; Fewtrell and McCauley, 2012; Peña et al., 2013; Popper et al., 2014). These temporary behavioural changes are not expected to have long-term impacts on fish populations.

At close range, predicted from modelling at 0.15 to 0.16km, fish may experience lasting impacts, such as swim bladder rupture, internal organ damage, and increased vulnerability to predation (Table 8-13). The rapid pressure changes from seismic blasts can cause the swim bladder to rupture, leading to internal injuries and potentially fatal consequences. Additionally, the shock waves can damage other internal organs, such as the kidneys and liver, due to their proximity to the swim bladder. These injuries can result in altered swimming behaviours, reduced ability to maintain buoyancy, and increased vulnerability to predators. However, these impacts are unlikely as fish are expected to move away from the noise source, reducing their exposure duration.

Localised and temporary disruptions to fishing activities from the survey activity are anticipated. However, the behavioural impacts on target fish species are expected to be confined to a few hundred metres from the seismic source, with normal behaviours and distributions resuming within minutes to hours, or at most, days. Consequently, the acoustic disturbance to commercial or subsistence fisheries and their target species is

unlikely to be significant, with fish behaviours and distributions expected to normalise within hours to days after completing the survey activity.

Additionally, the waters of the survey area are not expected to support significant fish assemblages, as they are distant from reefs, shoals or banks that typically attract fish aggregations. Therefore, the impact on commercial or subsistence fisheries is expected to be minimal, and the overall assessment indicates the survey activity is unlikely to substantially affect fishing operations in the survey area.

Table 8-13: Summary of maximum onset distance for single impulse and 24-hour sound exposure for fish with and without swim bladders

Hearing Group	Effect Criteria	R_{max} (km)
No swim bladder	Mortality/potential mortal injury	0.15 SEL_{24h}
	Recoverable injury	0.16 SEL_{24h}
	TTS	4.98 SEL_{24h}
Swim bladder (involved and not involved in hearing)	Mortality/potential mortal injury	0.16 SEL_{24h}
	Recoverable injury	0.23 PK
	TTS	4.98 SEL_{24h}

Plankton, Fish Eggs and Larvae

Plankton is a collective term for all marine organisms that cannot swim against a current. This group is diverse and includes phytoplankton (plants) and zooplankton (animals), as well as fish eggs and larvae, invertebrate eggs and larvae, and coral spawn.

Modelling results indicated mortality to plankton could occur up to 0.23km from the seismic source (RPS, 2024). Despite this, the constant movement of the vessel and replenishment of zooplankton populations by currents suggest mortality rates are detectable only close to the survey area and not at a regional scale (Richardson et al., 2017). Zooplankton biomass has been shown to recover within a few days, reflecting the natural movement and replenishment of populations (Richardson et al., 2017). Consequently, the overall risk to plankton is considered low, with impacts being localised and temporary.

Table 8-14: Summary of maximum onset distance for single impulse sound exposure to plankton, fish eggs and larvae

Hearing Group	Effect Criteria	R_{max} (km)
Fish eggs and larvae (relevant to plankton)	Mortality/potential mortal injury	0.23 PK

Benthic Invertebrates

The survey activity may impact benthic invertebrates within the survey area. In deeper waters, benthic invertebrates are not expected to be abundant, but may include polychaetes (burrowing worms) and crustaceans (such as prawns, shrimp, and crabs), echinoderms, molluscs, nemerteans and sponges.

Research indicates benthic invertebrates detect sound through particle motion, using structures like sensory hairs and statocysts (Parry and Gason, 2006; Carroll et al., 2017; McCauley, 1994' André et al., 2016; Roberts et al., 2016; Edmonds et al., 2016; Popper and Hawkins, 2018). These organisms are generally less sensitive to sound than fish, lacking gas-filled bladders. Impacts are often sublethal, such as statocyst impairment in crustaceans and impaired reflexes in sessile molluscs, with no long-term ecological implications expected.

Mobile invertebrates like cephalopods may exhibit increased movement and avoidance behaviour. Some macro-invertebrates may experience sublethal effects or a slight increase in mortality rates due to chronic exposure at close range. However, given benthic communities are relatively sparse across most of the survey area, the localised extent of potentially significant impacts, and the potential for subsequent recruitment and recovery (over weeks or months at most), no long-term population and community level impacts are expected.

Cross-border Impacts

Cross-border impacts may occur as a result of underwater noise generated from the operation of the seismic source. Underwater noise may travel from the survey area within Timor-Leste waters across the Timor-Leste/Australian border. Cross-border impacts and receptors are expected to be the same as those in Timor-Leste waters. No impacts to habitats from underwater noise in Australian waters are anticipated, with potential impacts expected to be limited to behavioural responses from marine fauna species as detailed in the previous sections.

Potential Cumulative Impacts

Potential cumulative impacts may occur if the survey activity is undertaken:

- at the same time as another seismic survey within the survey area and there is an overlap in the areas impacted by each survey and there are noise-sensitive receptors in the overlap zone (concurrent surveys)
- within an area where previous seismic surveys have occurred, the affected marine biota are still in the same area and have not fully recovered (sequential surveys).

<u>Concurrent Surveys</u>

Eni is not aware of any planned concurrent seismic surveys by other operators in the vicinity of the survey area at the time of writing this SEIS.

In the event of a survey planned at the same time as the survey activity by another operator, the industry best practice and conservative 40km buffer between seismic vessels will keep sound levels below the level at which physiological impacts could occur. The survey area is remote, with the only operating oil and gas facility in the region being Bayu-Undan, approximately 130km to the southwest; therefore, cumulative noise impacts from concurrent activities are not expected.

Given the very low probability of two seismic surveys occurring simultaneously and the controls that will be implemented to establish and maintain communications before and during the survey activity to ensure such simultaneous activities would maintain an

adequate separation distance (40km), there is very little risk of cumulative impacts to marine receptors. No cumulative impacts are predicted from concurrent surveys.

Sequential Surveys

Sequential seismic surveys in the survey area of Timor-Leste waters can lead to cumulative impacts if the interval between activities is shorter than the recovery rate of affected receptors.

NMFS suggests a 'resetting' of cumulative sound exposure levels (SEL_{cum}) after 12 hours of non-exposure, which can mitigate some impacts (Stadler and Woodbury, 2009). Whereby, if there is a 12-hour period between the end of one pile driving operation and the start of the next, the SEL_{cum} for a fish during the pile driving operation is reset to zero for the next set of exposures. Fish have been seen to recover from startle response within minutes, and repeated exposure can lead to habituation within weeks (Bruintjes et al., 2016; Nedelec et al., 2016). Given the lower number of sound pulses in seismic surveys compared to pile driving, and the mobility of most fish, populations are expected to be resilient due to immigration and recruitment of unaffected individuals. Recovery in fish is anticipated within 24 hours after the seismic vessel passes (Popper, 2018).

Zooplankton abundance is expected to return to natural levels within hours to a few days after exposure (McCauley et al., 2017; Richardson et al., 2017). While some benthic invertebrates may experience sublethal and chronic lethal effects for weeks or months, overall changes in benthic community composition are likely negligible. Behavioural changes in marine fauna, such as cetaceans and sea turtles, are expected to normalise within hours or days after the survey activity concludes.

There have been no seismic activities undertaken in the region in recent times; therefore, no cumulative impacts from sequential seismic surveys are predicted for the survey activity.

8.2.2.7 Management Control Measures

Control measures relating to this risk comprise:

- Vessels will adhere to JNCC Guidelines for Minimising the Risk of Injury to Marine Mammals from Geophysical Surveys (2017).
- Vessels will adhere to Eni Minimum HSE requirements in Geophysical Operations, including requirements for offshore seismic surveys.
- Use of sufficient MMO and PAM operatives on vessels.
- Marine megafauna interaction requirements included in survey activity inductions.
- No equipment testing outside of the survey area.
- Airgun firing (including testing) must not exceed the planned maximum production volumes outlined in the environmental licence application.
- Pre-shooting survey searches and soft starts incorporated into the survey activity.
- Cetacean sighting and compliance reports to be submitted to ANP (End of Activity Report).

- Incorporate JNCC mitigations for night-time and poor visibility conditions, including use of PAM operatives in addition to MMO visual mitigation.
- If an unplanned break in operations occurs during night-time or poor visibility conditions, mitigation zone is to be monitored using PAM procedures.
- If PAM operatives are not available, the survey activity will be delayed until conditions are suitable for visual assessment of the mitigation zone.

8.2.3 Noise Emissions – Vessels, Mechanical Equipment and Helicopters (Risk ID P3)

8.2.3.1 Summary of Environmental Risk

Hazard	Noise Emissions – Vessels, Mechanical Equipment and Helicopters		
	Frequency	Severity	Risk
Inherent Risk	E	1	L
Residual Risk	B	1	L

8.2.3.2 Description of Hazard

Noise will be generated by the operation of the seismic vessel, support vessel, helicopter and chase vessels during the survey activity. Vessel noise will comprise noise from the vessel engines and machinery, including equipment used to deploy and retrieve the seismic streamers.

Noises emitted from vessel operations will be continuous during the survey activity, with noise emitted from mechanical equipment associated with streamer deployment and retrieval to be short-term (hours). Typically, vessels are the noisiest during dynamic positioning, when the vessel maintains position and heading by using its own propellers and thrusters. Vessels in the 50-100m size class typically have broadband source levels in the 165-180dB re 1µPa SPL range (Gotz et al., 2009). McCauley (1998) measured underwater broadband noise equivalent to approximately 182dB re 1µPa SPL @ 1m with a frequency range of 20Hz to 10kHz from a vessel using dynamic positioning in the Timor Sea. It is expected that similar noise levels will be generated by support vessels used during the activities. The thruster noise dropped below 120dB re 1µPa within 3 to 4km and was audible above ambient noise up to 20km away (McCauley, 1998). This has been taken as the greatest noise-generating activity for assessment purposes, as other vessel activities will require the vessel to be idle or moving.

Noise from helicopters will be limited to crew transfer during operations or medical evacuations. The level of noise received underwater from helicopter engines depends largely on the source's altitude and lateral distance, receiver depth in the water column, and other variables such as wind and wave speed. Sound pressure in the water directly below a helicopter is greatest at the surface and diminishes with increasing receiver depth. Noise also reduces with increasing helicopter altitude. Noise levels for typical helicopters used in offshore operations (Eurocopter Super Puma AS332) at 150m separation distance have been measured at up to a maximum of 90.6dB (BMT Asia Pacific, 2005). Noise levels reported for a Bell 212 helicopter during fly-over was reported at 162dB re 1µPa and for Sikorsky-61 is 108dB re 1µPa at 305m (Simmonds et al., 2004).

8.2.3.3 Potential Environmental Impact

Potential receptors associated with underwater sound emissions from mechanical and vessel noise include:

- cetaceans
- marine turtles
- sharks, rays, and fish
- seabirds.

Elevated non-impulsive underwater noise can affect marine fauna in three main ways:

- by direct physical effects on hearing or other organs
- by masking or interfering with biologically important sounds/vocalisations
- through disturbance leading to behavioural changes or displacement from important areas.

Noise from vessels (as in, machinery and propellers) is the dominant anthropogenic sound in marine environments that influences ambient noise levels. Commercial vessels produce relatively loud, low-frequency sounds. However, the underwater noise generated by their movement lacks the intensity and characteristics necessary to cause physiological damage to marine fauna (Nedwell and Edwards, 2004; Hatch and Southall, 2009).

In the survey area, marine fauna most at risk from acoustic disturbance are cetaceans, particularly baleen whales, as the auditory bandwidth of these large whales overlaps with the low-frequency broadband noise produced by thrusters during vessel positioning and movement. Given there are no high-energy impulsive sound sources associated with the routine operation of vessels, there may be some localised behavioural disturbance of marine fauna in the immediate vicinity of vessels during the survey activity, but physiological effects on fauna are not anticipated. Permanent injury would be expected to occur at 230dB re 1uPa (peak) for cetaceans (Southall et al., 2007). Noise from vessels is unlikely to exceed that level; therefore, PTS or TTS is not anticipated.

Additionally, noise emissions from the vessels are expected to be similar in level, frequency range, and character to those from general shipping traffic already present in the survey area. Therefore, they are not considered to represent a significant additional environmental impact beyond the noise from normal shipping activities.

In general, exposure to helicopter sound emissions is of short duration, peaking as the helicopter passes directly overhead. Received levels are expected to be low during transit, when helicopter altitude is greatest and disturbance to marine fauna is not expected. The highest received levels will occur at lower altitudes on approach to landing. Some minor behavioural disturbance may occur for short periods if marine fauna are present near the surface in the vicinity of landing helicopters. This would be limited to temporary behavioural changes (avoidance) but are not expected to have any long-term impacts. Seabirds are expected to avoid the immediate vicinity of a helicopter, but again no long-term impacts are anticipated.

Cumulative impact from the use of multiple support vessels, the seismic vessel and helicopter operations are not considered to present significant impacts to marine fauna, given their mobility and ability to avoid the sound source. Impacts are anticipated to comprise behavioural disturbance and avoidance only. The survey area is within a remote offshore environment with low levels of shipping and fishing activities. Therefore, should avoidance behaviour occur, it is anticipated the marine fauna would be able to move freely to an area below the behavioural threshold. Noise levels from vessels operating on dynamic positioning, the noisiest activity in the survey activity, are expected to be below 120dB re 1µPa (as in, the behavioural response thresholds for cetaceans) within 3 to 4km (McCauley, 1998). Potential impacts would be expected to be limited to behavioural response from transitory and mobile marine fauna such as cetaceans, as described above.

Based on the assessment presented above and the implementation of controls and mitigations presented within Section 8.2.3.4, the consequence of occasional short-term and localised disturbance to marine fauna is low and no long-term impacts are anticipated.

8.2.3.4 Management Control Measures

Control measures relating to this risk comprise:

- Vessels to be maintained in accordance with the applicable PMS.
- Marine megafauna interaction requirements included in survey activity inductions.

8.2.4 Atmospheric Emissions (Risk ID P4)

8.2.4.1 Summary of Environmental Risk

Hazard	Atmospheric Emissions		
	Frequency	Severity	Risk
Inherent Risk	E	1	L
Residual Risk	E	1	L

8.2.4.2 Description of Hazard

Exhaust gases are produced from combustion hydrocarbons for power generation on board the seismic, support and chase vessels and are ultimately released into the atmosphere.

Products of hydrocarbon combustion emitted to the atmosphere include emissions of GHG, such as carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O), along with non-GHG emissions such as sulphur oxides and nitrogen oxides. There may also be emissions of particulate matter and hydrocarbons, including benzene, ethylbenzene, toluene and xylene.

The forecast volumes of GHG emissions from the survey activity are provided in Table 8-15. The forecast GHG emissions have been calculated based on conservative assumptions regarding vessel allocation and activity duration for the survey activity. Consequently, the forecast GHG emissions are conservative in nature and the actual GHG emissions arising from the survey activity may be lower.

The assumptions used to forecast the GHG emissions include the mobilisation of the seismic vessel and support vessel from locations outside of Timor-Leste waters. These vessels will require up to 38 days to mobilise to the survey area. The chase vessels are expected to require significantly less time to mobilise to the survey area, as they are expected to mobilise from Timor-Leste or Indonesia.

Before starting the survey activity, two chase vessels will complete a reconnaissance campaign to ensure the survey area's conditions are suitable to undertake the survey activity. The GHG emissions forecast is based on all vessels completing the survey activity with a duration of ten weeks.

While no crew changes or medical evacuations are expected to be necessary during the survey activity, the GHG emissions forecast includes five helicopter flights as a contingency to account for these potential helicopter movements.

The survey activity is expected to result in up to 17,607t CO_2-e (tonnes of carbon dioxide equivalent) of GHG emissions (Table 8-15). As shown in Figure 8-8, most of these emissions arise from operating the seismic and support vessels, with operation of the chase vessels contributing less than 10% of the forecast GHG emissions. As shown within Figure 8-8, the helicopter movements represent an insignificant contribution to the forecast GHG emissions.

The GHG emissions forecast was developed using methods and emission factors contained within the latest update to the National Greenhouse and Energy Reporting (Measurement) Determination 2008, published by the Commonwealth of Australia on 31 August 2024.

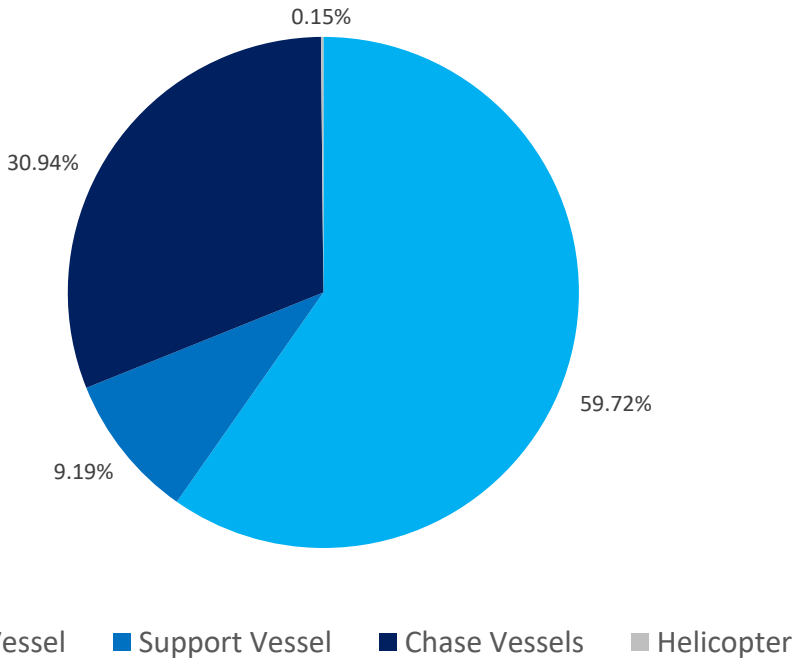


Figure 8-8: Forecast contribution of greenhouse gas emissions by vessel type

Table 8-15: Forecast greenhouse gas emissions from the survey activity

Vessel	Daily Fuel Consumption (kilolitres)	Mobilisation (days)	Pre-campaign Reconnaissance (days)	Survey Activity (days)	Total Fuel Consumption (kilolitres)	CO_2 Emissions (t CO_2-e)	CH_4 Emissions (t CO_2-e)	N_2O Emissions (t CO2-e)	Total GHG Emissions (t CO_2-e)
Seismic vessel	41.17	38	0	56	3,869.61	10,440.75	14.94	59.75	10,515.43
Support vessel	6.33	38	0	56	595.32	1,606.27	2.30	9.19	1,617.76
Chase vessel 1	9.50	5	14	56	712.49	1,922.40	2.75	11.00	1,936.15
Chase vessel 2	9.50	5	14	56	712.49	1,922.40	2.75	11.00	1,936.15
Chase vessel 3	9.50	5	0	56	579.49	1,563.55	2.24	8.95	1,574.73
Helicopter	2.07	0	0	5	10.34	26.48	0.00	0.23	26.71
Total		**91.00**	**28.00**	**285.00**	**6,479.74**	**17,481.84**	**24.98**	**100.12**	**17,606.93**

8.2.4.3 Potential Environmental Impact

Hydrocarbon combustion to power the survey vessels may result in a temporary, localised reduction of air quality immediately surrounding the discharge point, due to the release of both non-GHG emissions (such as nitrogen oxides and sulphur oxides) and GHG emissions. Given the quantities of emissions released and the remote location of the survey area, these emissions will quickly dissipate into the surrounding atmosphere.

Reductions in air quality have the potential to result in health impacts to humans and marine fauna within the survey area. Non-GHG emissions could particularly impact sensitive receptors, including humans and communities, as well as seabirds located in the immediate vicinity of discharges. The key impact of GHG emissions is their propensity to accumulate in the atmosphere over varying time scales, where their increasing concentration leads to a warming or 'greenhouse' effect.

Local impacts typically associated with the emissions are mitigated by the dispersive nature of the offshore environment. Any potential local elevated concentrations of emissions will be short lived and unlikely to be detectable except in the near vicinity of the release.

The survey area is remote from any land mass and far from sensitive receptors. Atmospheric emissions will not impact on air quality for any social receptors, with the nearest community approximately 170km northwest on the southern Timor-Leste coast.

Due to the dispersive nature of the offshore environment, atmospheric emissions from the survey activity are not anticipated to contribute to cumulative impacts on local air quality from existing emissions from vessels in the Timor Sea. Transboundary impacts to air quality may occur while the survey vessels are immediately adjacent to the border of Timor-Leste and Australian waters. However, emissions will be quickly dispersed and highly localised and any transboundary impacts are expected to be negligible. The survey activity's contribution of GHG emissions to global GHG levels and the associated global warming effects to the other nations will be indiscernible.

8.2.4.4 Management Control Measures

Control measures relating to this risk comprise:

- International Air Pollution Prevention Certificate – in accordance with MARPOL 73/78 Annex VI.
- Fuel type used (marine diesel) – in accordance with MARPOL 73/78 Annex VI.
- Equipment (engines, thrusters, generators, etc) is maintained in accordance with the applicable PMS.
- Vessel incinerators will be maintained to manufacturer's specification and in accordance with MARPOL 73/78 Annex VI.
- Ozone-depleting substances shall not be deliberately released – in accordance with MARPOL 73/78 Annex VI.

- Fuel consumption will be recorded and monitored for abnormal consumption, with corrective action taken if necessary.

8.2.5 Light Emissions (Risk ID P5)

8.2.5.1 Summary of Environmental Risk

Hazard	Light Emissions		
	Frequency	Severity	Risk
Inherent Risk	E	1	L
Residual Risk	B	1	L

8.2.5.2 Description of Hazard

Artificial lighting is required on the survey vessels for the health and safety of crew onboard (for example, deck lighting for night operations) and for safe navigation of vessels underway at sea. This is in accordance with the requirements of the COLREGS and Chapter V of SOLAS. The primary source of artificial lighting will result from deck and navigational lights onboard the survey, chase and support vessels.

External deck lighting will predominantly be directed towards working areas, limiting the light spill area to sea. The distance at which direct light and sky glow may be visible from the source depends on the vessel lighting and environmental conditions. The light glow from vessel lights will be transitory throughout the survey area due to the constant movement of this vessel.

8.2.5.3 Potential Environmental Impact

Artificial lighting can cause a change in the behaviour of fauna. Potential impacts to marine fauna from artificial lighting may include:

- disorientation, attraction or repulsion to the light
- disruption to natural behaviour patterns and cycles
- indirect impacts such as increased predation risks through attraction of predators.

Artificially lit installations, vessels or structures attract seabirds, especially in dark areas and during nighttime migrations (Marquenie et al., 2008). Both seabirds and migratory shorebirds may be drawn to artificial lighting that coincides with their migratory paths. Seabirds are expected to occasionally migrate across and forage within the survey area, while migratory shorebirds may also be encountered. Artificial light can negatively impact seabirds, causing collisions, entrapment, stranding, grounding, disorientation, navigation interference and altered foraging behaviour. Migrating shorebirds may be attracted to foraging areas with increased artificial lighting (Poot et al., 2008). Observations at the Tristan da Cunha Islands show the commercial rock-lobster fishery significantly impacts seabird populations, with thousands of birds from eight or more species killed annually due to night-strikes caused by ships' lights, especially on vessels with exposed rigging and lines (Ryan, 1991). Offshore artificial lights have been confirmed to attract birds to offshore infrastructure (Marquenie et al., 2008), potentially disorienting migratory birds, affecting stopover selection, and disrupting feeding (McLaren et al., 2018).

Internationally protected marine turtles may occur within the survey area (Table 5-3). Marine turtle behavioural responses to artificial light depend on the life stage or behaviours being undertaken at the time and the artificial light characteristics. Potential impacts include attraction of prey species attracted to light, hatchling disorientation and misorientation, and disruption to nesting. Given the offshore location and the distance to the nearest beach (approximately 175km), potential impacts to turtles are expected to be limited to foraging adult turtles. If impacts were to occur, these would be temporary and slight, and limited to local attraction to prey species attracted to light (Kebodeaux, 1994).

Certain pelagic species, such as fish and plankton, may be attracted to vessel lighting. Experiments that use light traps have found that some fish species and zooplankton species are attracted to artificial light sources (Meekan et al., 2001). Although this effect is expected to be greater for stationary vessels, plankton and fish can aggregate directly under downward-facing lights on the water, which can in turn attract predatory fauna. However, the constant movement of survey vessels ensures disruption of light patterns and light intensity, thereby significantly reducing the potential attraction of plankton and fish species, and minimising the impacts of increased predation.

IUCN-listed cetacean species could occur within the survey area. Potential behavioural impacts to cetaceans may include increased foraging in response to the increased prey abundance (as in, fish and plankton) around artificial light sources.

Overall, impacts from light generated by seismic survey vessels will be temporary and short-term in nature. Light glow will be transitory as the survey vessels acquire data and because marine fauna are also transitory and highly mobile. Given the limited area over which light emissions are likely to extend, impacts to marine fauna are unlikely.

The nearest social receptor is the coastal community of Loré in Lautém district, located on the south coast of Timor-Leste, approximately 168km to the northwest. Given the distance offshore from any human receptors, no communities or populations will be impacted by light emissions from the survey activity.

The survey area is remote from other existing light sources, with the only operating oil and gas facility in the region being Bayu-Undan, approximately 150km to the southwest. As such, cumulative impacts from light emissions are not expected. Transboundary impacts from light to transitory marine fauna may occur as the survey area is immediately adjacent to the Australian/Timor-Leste border. However, given light emissions are expected to be slight, temporary and localised, and marine fauna are transitory and mobile, transboundary impacts from light will be inconsequential.

8.2.5.4 Management Control Measures

Control measures relating to this risk comprise:

- Management of lighting in accordance with the COLREGS and Chapter V of SOLAS.

8.2.6 Planned Vessel Discharges (Risk ID P6)

8.2.6.1 Summary of Environmental Risk

Hazard	Planned Vessel Discharges		
	Frequency	Severity	Risk
Inherent Risk	E	1	L
Residual Risk	B	1	L

8.2.6.2 Description of Hazard

The seismic, support and chase vessels will produce planned vessel discharges, including putrescible wastes such as greywater, sewage and food scraps, and contaminated water such as deck drainage, bilge water, cooling water and brine.

Sewage, Greywater and Food Wastes

Combined sewage and grey water from the survey vessels will be treated by onboard sewage treatment facilities, certified to meet MARPOL 73/78 Annex IV requirements.

Contaminated Water

On the vessels, under normal operating conditions, scupper plugs are fitted at open deck drainage points, to direct drainage to the bilge water tank for processing. However, if clean water builds up after, for example, after heavy rain, these plugs are manually removed, allowing the clean water to drain to sea. Bilge water is generated on the vessels and consists of deck drainage and machinery space water that has been directed to a bilge water tank. Sources of contamination include chemical spills on deck. Bilge water shall be diverted to a holding tank either for onshore disposal at an appropriately licenced facility, or for discharge with an oil content of less than 15ppm in accordance with MARPOL 73/78 Annex I.

Cooling Water and Brine

Cooling water is used as a heat exchange medium for cooling the machinery and engines on the vessels. Seawater is drawn from the ocean and flows counter-current through closed-circuit heat exchangers, transferring heat from engines and machinery to the seawater. The seawater is then discharged to the ocean. Cooling water temperatures vary depending upon the vessel engine's workload and activity; however, may be in the vicinity of 32°C.

The survey vessels may be required to produce potable water through reverse osmosis, with the process producing hypersaline brine as a byproduct. On average, seawater has a salt concentration of 35,000ppm. Brine will be discharged to the ocean at a salinity of approximately 10% higher than seawater. Brine may also contain scale inhibitors used in the reverse osmosis process to control inorganic scale formation in water supply systems. The volume of brine discharge will depend on the requirements for potable water and will vary between the vessels and the number of people on board. Brine discharges will be intermittent and as required.

8.2.6.3 Potential Environmental Impact

Sewage, Greywater and Food Waste

Sewage, greywater and food waste discharge has the potential to increase nutrient availability and biological oxygen demand in the marine environment. However, in the open oceanic environment, the impact of biological oxygen demand on seawater oxygen concentrations is expected to be negligible (Black et al., 1994).

Some fish and marine seabirds may be attracted to the vessels by the discharge of food waste. However, given the small quantities, intermittent nature of discharge and movement of currents, any attraction is likely to be slight and is not anticipated to result in adverse impacts at an ecosystem or population level.

Given the temporary and highly localised nature of the potential impacts to water quality from these discharges, as well as the transient nature of marine fauna, impacts are not expected, but at worst, would be limited to behavioural change to a small number of individuals. Overall, the discharge of sewage, grey water and putrescible wastes is not expected to have any significant negative effects on the marine environment.

Contaminated Water

Discharges of contaminated water can result in injury or mortality to marine fauna as a result of toxicity or changes in water quality. Marine fauna with the most potential to be impacted by contaminated water include plankton and fish, in particular fish at earlier life stages.

Oil-contaminated water on the survey vessels shall be diverted to a holding tank either for onshore disposal at an appropriately licenced facility, or for discharge with an oil content of less than 15ppm (MARPOL 73/78 Annex I). The environmental impacts associated with a discharge are likely to be highly localised and temporary, due to the low volumes and the high dilution rates expected at the open ocean environment.

When discharged into the marine environment, the small volumes of contaminated water from deck drainage are anticipated to quickly disperse in the offshore waters. These discharges will occur intermittently and may cause a localised and temporary (lasting a few hours) reduction in water quality near the release point. The strong ocean currents in the survey area are expected to further dilute the deck drainage, minimising the duration of chemical exposure to marine fauna. Additionally, deck cleaning products will comply with MARPOL Annex III (harmful substances) standards, ensuring they are not harmful to the marine environment. Consequently, the release of chemicals in contaminated water is not expected to have toxic effects on marine fauna.

Cooling water will remain in the surface layer, where turbulent mixing and heat transfer with surrounding waters will occur. This will cause localised increases in water temperature. The potential impacts of increased seawater temperatures downstream of the cooling water discharge are localised changes to the physiological processes of marine organisms (particularly plankton), including attraction or avoidance behaviour. It is expected that most pelagic species could tolerate short-term exposure to small increases in temperature resulting from discharge. Given the temperature of the discharge is only marginally higher than that of the receiving waters and the receiving

environment is subject to strong currents, the impacts of cooling water discharges are considered minor and will be temporary and localised.

Brine Impacts

Brine generated from onboard reverse osmosis systems will be discharged directly to the open ocean intermittently in small quantities. Elevated salinity from brine discharges can impact plankton, with early life stages of fish and other plankton being most vulnerable to the toxicity of residual chemicals in brine. However, most marine species can tolerate short-term salinity fluctuations of 20% to 30% (Walker and McComb, 1990). Therefore, it is expected that most pelagic species can endure brief exposure to slight increases in salinity resulting from the discharge. The brine will be rapidly mixed and diluted in the open offshore waters and dispersed by the strong currents in the region. As a result, potential impacts are expected to be minor, localised to the discharge point, and temporary in duration.

Chemicals used in the production of potable water will be significantly diluted before being discharged and low in toxicity. Upon the brine discharge, these chemicals will dilute further in the marine environment.

No transboundary impacts are expected from contaminated water, as discharges are anticipated to be localised to discharge points and rapidly dispersed.

8.2.6.4 Control Measures

Control measures relating to this risk comprise:

- Sewage treatment system in accordance with MARPOL 73/78 Annex IV.
- Waste management procedure in accordance with MARPOL 73/78 Annex V.
- Oily water treatment system in accordance with MARPOL 73/78 Annex I.
- Oily water prevention in accordance with MARPOL 73/78 Annex I.
- Valid International Oil Pollution Prevention Certificate, which confirms that required measures to reduce impacts of planned oil discharges are in place on vessels.
- Vessels will have and be compliant with a Garbage Management Plan in accordance with MARPOL 73/78 Annex V, as appropriate to vessel class.
- Equipment/machinery involved in the treatment of wastes will be routinely maintained.
- All crew will participate in the vessel and environmental induction prior to the commencement of the survey activity.
- Chemical selection process in Eni is followed and all chemicals to be used must be submitted for approval to ANP before use.

8.3 Unplanned Events

8.3.1 Vessel Collision or Entanglement with Marine Fauna (Risk ID U1)

8.3.1.1 Summary of Environmental Risk

Hazard	Vessel Collision or Entanglement with Marine Fauna		
	Frequency	Severity	Risk
Inherent Risk	B	2	L
Residual Risk	A	2	L

8.3.1.2 Description of Hazard

There is the potential for the vessels to collide with marine fauna, including whale sharks, migratory pygmy blue whales, and marine turtles, during the survey activity. The main collision risk is vessel collision with large, slow-moving cetaceans, potentially resulting in severe injury or mortality.

There is also the potential for marine fauna to become entangled in the seismic streamers and the associated equipment, particularly marine turtles and cetaceans, also resulting in injury or mortality.

8.3.1.3 Potential Environmental Impact

Vessel collision with marine fauna, or marine fauna entanglement with seismic survey equipment, may result in injury or death of marine fauna. Marine fauna that are present in surface waters, such as turtles and cetaceans, are most susceptible to vessel strikes and entanglement due to their proximity to the vessels (hull, propeller or equipment) and deployed seismic equipment (streamers, cables and attached equipment).

The survey area is not within any known aggregation, foraging or biologically important areas. Therefore, their presence is limited to individuals traversing through the survey area. Vessels supporting the survey activity will also generally travel at speeds of less than five knots. Cetaceans, marine turtles and other marine fauna are expected to exhibit avoidance behaviour, due to the noise of the seismic airguns; therefore, close-range encounters are expected to be infrequent and limited to isolated individuals in the immediate vicinity of the survey vessels and survey array. Additionally, management control measures presented in Section 8.3.1.4, including MMO and PAM operatives on vessels, will further reduce the potential for collision or entanglement. As a result, marine fauna injury or mortality as a result of collision or entanglement is highly unlikely and there is no risk of population-level impacts or threats of serious or irreversible environmental damage.

8.3.1.4 Management Control Measures

Control measures for this risk comprise:

- Vessels will adhere to the JNCC Guidelines for Minimising the Risk of Injury to Marine Mammals from Geophysical Surveys (2017).
- Vessels will adhere to Eni Minimum HSE requirements in Geophysical Operations, including requirements for offshore seismic surveys.
- Use of sufficient MMOs and PAM operatives on vessels.
- Marine megafauna interaction requirements included in survey activity inductions.
- Any vessel strike incident to marine mammals shall be reported to ANP as soon as possible.
- Turtle guards on seismic tail-buoys

8.3.2 Loss of Equipment and Dropped Objects (Risk ID U2)

8.3.2.1 Summary of Environmental Risk

Hazard	Loss of Equipment and Dropped Objects		
	Frequency	Severity	Risk
Inherent Risk	B	1	L
Residual Risk	A	1	L

8.3.2.2 Description of Hazard

During the survey activity, there is the potential for dropped objects (such as personal protective equipment, small tools or domestic waste) to occur as a result of human error or incorrect storage, equipment failure and accidental loss during transfer of materials.

In addition to accidental dropped objects, there is potential for loss of seismic streamers to occur due to snagging with floating debris, rupture from abrasions or shark bites, or loss from severance during a collision (for example, if another vessel were to accidentally cross the streamer). Solid streamers, such as those proposed to be used during the survey activity, are negatively buoyant and sink quickly if severed.

8.3.2.3 Potential Environmental Impact

If equipment is lost, other users of the survey area may be required to make minor diversions to avoid the equipment, until it can be retrieved. The potential for such interactions will be limited to a short period of time while equipment is retrieved. Should disruption occur, it is only expected to affect individual users and cause temporary disruption through avoidance of a highly localised area. Given the nature and size of the equipment to be used during the survey activity, lost equipment is not expected to result in a navigational hazard.

If a streamer or dropped object is irretrievably lost, it will make direct contact with the seabed, causing physical damage to the benthic habitat and any sensitive communities in the survey area. The seabed within the survey area likely consists of soft sediments with varying amounts of silt and sand, and sparse hard substrates inhabited by sponges,

soft corals and filter feeders. These habitats are well represented through the region. A lost object may disturb the seabed upon landing, causing local physical damage or resuspension of fine sediments. This could affect benthic faunal communities in the immediate area. Over time, natural sediment settling and redistribution would aid recovery. These impacts, both direct and indirect, would be limited in scope and relative to the size of the streamer(s) or object. Consequently, no long-term impacts are anticipated.

Additionally, dropped objects could contaminate or impact local water quality; see Sections 8.3.3 and 8.3.4 for further details.

8.3.2.4 Management Control Measures

Control measures for this risk comprise:

- Hazardous and non-hazardous waste management process will be in place in accordance with MARPOL 73/78 Annex V:
  - All wastes will be collected and segregated into clearly marked containers before onshore disposal by a licenced waste management contractor.
  - All bins on deck will be covered to prevent rubbish blowing overboard.
  - Records will be maintained of solid and hazardous waste volumes generated and transferred for onshore recycling or disposal.
  - Waste management procedure will be implemented, including safe handling, treatment, transportation and appropriate segregation and storage of all waste generated.
  - Lost waste will be recovered when safe and practicable to do so.
- Streamer related controls:
  - Approved procedures for streamer deployment.
  - Routine maintenance and inspection of streamer equipment.
  - Streamers will be fitted with:
    - streamer recovery devices (self-inflating)
    - surface marker buoys
    - secondary retaining devices
    - tail buoys.
  - Support and chase vessels will search for and recover lost in-water equipment where possible and safe to do so.
  - Relevant persons will be notified via radio in the event of a loss of in-water equipment.

8.3.3 Non-hazardous and Hazardous Waste Loss to Marine Environment (Risk ID U3)

8.3.3.1 Summary of Environmental Risk

Hazard	Non-hazardous and Hazardous Waste Loss to Marine Environment		
	Frequency	Severity	Risk
Inherent Risk	B	1	L
Residual Risk	A	1	L

8.3.3.2 Description of Hazard

The survey activity will generate various solid and liquid wastes, including packaging, domestic wastes such as paper, plastic, bottles and scrap materials, and industrial wastes such as chemicals, waste oil and consumables.

Non-hazardous solid waste, such as scrap metal, packaging and paper, will be stored on board in suitable containers (segregated from hazardous waste materials) for transport back to shore for disposal/recycling in accordance with local regulations.

All hazardous waste generated will be documented and tracked, segregated from other waste streams, and stored in suitable containers. Recyclable hazardous wastes, such as oils and batteries, will be stored separately from non-recyclable materials. All hazardous waste materials will be transported to shore for disposal or recycled at an approved facility in accordance with local requirements.

Chemicals and other hazardous materials that will be stored on the vessels include:

- lubricating oils, cleaning and cooling agents
- oil filters and batteries
- oily rags
- paint, aerosol cans
- acids/caustics and solvents.

No discharge of non-hazardous or hazardous solid waste to sea is expected during the survey activity. All waste generated will be transported to licenced onshore facilities and managed appropriately by third parties.

8.3.3.3 Potential Environmental Impact

Potential impacts from the loss of hazardous and non-hazardous waste to the marine environment include:

- localised and temporary reduction in water quality
- pollution or contamination of the marine environment
- injury or mortality to marine fauna through ingestion or entanglement.

Potential impacts of accidental non-hazardous and hazardous waste discharge to sea may result in physical harm to marine fauna resulting from ingestion or entanglement with waste.

It is considered highly unlikely that any unplanned discharges of waste will result in significant impacts to the marine environment. The survey area does not contain any significant feeding, breeding or aggregation areas for marine fauna. Any potential impacts from unplanned discharges of waste are expected to be limited to a small number of individuals that may be transiting the survey area. The potential impacts to water quality from unplanned liquid waste discharges are likely to be for a short duration only, due to the rapid dispersion of the fluids as a result of ocean currents.

8.3.3.4 Management Control Measures

Control measures for this risk comprise:

- Hazardous and non-hazardous waste management process in place in accordance with MARPOL 73/78 Annex V:
  - All wastes will be collected and segregated into clearly marked containers before onshore disposal by a licenced waste management contractor.
  - All bins on deck will be covered to prevent rubbish blowing overboard.
  - Records will be maintained of solid and hazardous waste volumes generated and transferred for onshore recycling or disposal.
  - Waste management procedure will be implemented, including safe handling, treatment, transportation and appropriate segregation and storage of all waste generated.
  - Lost waste will be recovered when safe and practicable to do so.
- All crew will participate in the vessel and environmental induction before the survey activity begins.

8.3.4 Minor Hydrocarbon or Chemical Leaks (Risk ID U4)

8.3.4.1 Summary of Environmental Risk

Hazard	Minor Hydrocarbon or Chemical Leaks		
	Frequency	Severity	Risk
Inherent Risk	B	2	L
Residual Risk	B	1	L

8.3.4.2 Description of Hazard

The fluids stored on the seismic vessel, support vessels and chase vessels range from lubricating fluids to hydraulic fluids, which are used in fittings and connections including those used to operate streamer deployment and retrieval machinery.

Small leaks of these fluids could occur due to a mechanical failure, improper storage or incorrect handling, with the largest release typically being less than 1m³.

8.3.4.3 Potential Environmental Impact

The accidental release of up to 1m³ of hydraulic fluids or chemicals to the marine environment may result in a localised reduction in water quality. Hydraulic fluids spilt overboard have the potential to result in toxicity effects to marine fauna and fish in the immediate vicinity of the spill release location, through either direct contact or accidental ingestion. Given the open water dispersive location of the survey area and the extent and duration of potential exposures, impacts to marine fauna and fish are expected to be highly localised and short term, and limited to the vicinity of the point of discharge. Therefore, impacts are considered to result in a minor consequence and the residual risk has been determined to be Low with the proposed preventative controls in place.

8.3.4.4 Management Control Measures

Control measures for this risk comprise:

- Spill response plan in place for vessels.
- Spill response kits located in proximity to hydrocarbon storage/bunkering areas and appropriately stocked and replenished as required.
- Chemical selection process in Eni is followed and all chemicals to be used must be submitted for approval to ANP before use.
- Hydrocarbon or chemical storage containers will be properly stored with lids that are tight and secured to prevent spillage during vessel movement or rough weather.
- Storage containers will be managed in a manner that provides for secondary containment in the event of a spill or leak.
- Storage containers will be labelled with the technical product name as per the Safety Data Sheet.
- Hazardous substances will be stored, segregated, handled and used in accordance with the product's Safety Data Sheet.

- Vessels to be maintained in accordance with the applicable PMS.
- Refuelling transfer procedures to prevent bunkering spills.
- Vessels are equipped with oily water prevention system in accordance with MARPOL 73/78 Annex I.

8.3.5 Introduction of Invasive Marine Species (Risk ID U5)

8.3.5.1 Summary of Environmental Risk

Hazard	Introduction of Invasive Marine Species		
	Frequency	Severity	Risk
Inherent Risk	B	3	M
Residual Risk	A	3	L

8.3.5.2 Description of Hazard

Invasive marine species (IMS) are non-native flora or fauna that establish new populations outside their natural habitats. They are often transported as larvae or juveniles on international vessels, either on hulls or in ballast and bilge water. IMS, once introduced, are often unable to be eradicated and can have significant impacts on the marine ecosystem as they are likely to have little or no natural competition or predation, resulting in IMS outcompeting native species for food or space, preying on native species, or changing the nature of the environment.

The survey activity has the potential to translocate or introduce IMS to the survey area due to the international movements of survey vessels.

8.3.5.3 Potential Environmental Impact

Potential impacts caused by IMS include:

- out-competing and displacing native species
- increasing predation or possibly depleting native flora and fauna
- altering the abundance and diversity of native species, resulting in changes to ecosystem function.

If left unmanaged, IMS can often result in irreversible impacts to the marine environment. Bax et al. (2003) state IMS often significantly change the environment in which they are introduced. This change may include applying predation pressure on native organisms, smothering habitats, or providing new structural habitat (Bax et al., 2003).

Receptors within the survey area most likely to be impacted by the introduction of IMS include benthic habitats and communities and fish species and populations. The establishment of IMS can also impact on marine users, particularly fishers.

The risk of IMS establishing in the survey area as a result of the survey activity is considered low, due to the location of the survey activity in relatively deep waters (40-180m) and general lack of key biological features such as shoals or reefs. IMS are

generally unable to successfully establish in deep water environments due to the lack of suitable light and habitat (Geiling, 2014).

8.3.5.4 Management Control Measures

Control measures for this risk comprise:

- All vessels will comply with Timor-Leste entry requirements and IMO International Convention for the Control and Management of Ships Ballast Water and Sediments 2004-MARPOL 73/78 (as appropriate to vessel class), including:
  - Ballast water exchanges conducted more than 50NM from land and in more than 200m water depth.
- International Convention on the Control of Harmful Anti-fouling Systems on Ships, which requires vessels (applicable to vessels only, of appropriate class) have a valid International Anti-fouling Systems Certificate.
- Implementation of IMS risk assessment tool (by Eni Logistics).
- Survey equipment to be cleaned and dried before use in the survey area.

8.3.6 Marine Diesel Oil Spills to Sea (Risk ID U6)

8.3.6.1 Summary of Environmental Risk

Hazard	Marine Diesel Oil Spills to Sea		
	Frequency	Severity	Risk
Inherent Risk	B	3	M
Residual Risk	A	3	L

8.3.6.2 Description of Hazard

MDO used by the seismic and support vessels can be lost due to refuelling/bunkering incidents or collisions with other vessels. During operational activities, spills can occur from damaged hoses, coupling failures, loss of connection, vessel collisions, or loss of vessel position. Overfilling spills are contained within the vessel's drainage system. If a refuelling pipe ruptures, the activity stops, but some fuel may still escape.

The worst-case spill during refuelling for this operation is estimated at 37.5m³. A vessel collision could rupture a fuel tank, potentially releasing up to 1,200m³ of MDO to the sea surface, although measures like pumping between tanks and ballasting can limit the discharge.

MDO properties are summarised in Table 8-16. Figure 8-9 and Figure 8-10 display the MDO weathering results under various environmental conditions from the hydrocarbon spill assessment completed by RPS (2024).

Table 8-16: Properties of marine diesel oil use in modelling

Name	Volatiles (%)	Semi-volatiles (%)	Low Volatiles (%)	Residual (%)
Boiling point (°C)	< 180	180 to 265	261 to 380	>380
	Non-persistent			**Persistent**
MDO	4.0	32.0	54.0	10.0

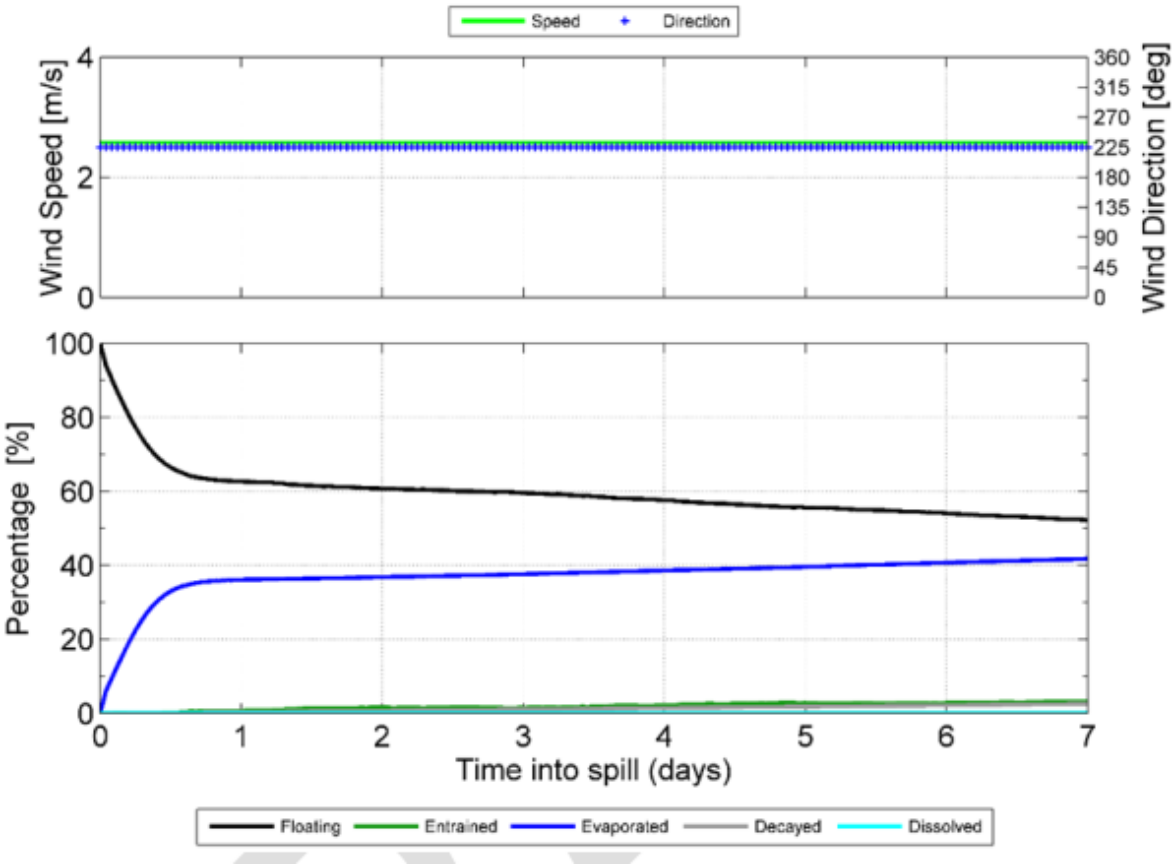


Figure 8-9: Predicted weathering of 50m³ of marine diesel oil tracked over seven days, subjected to constant 5-knot (2.6m/s) wind, currents and 27º water temperature

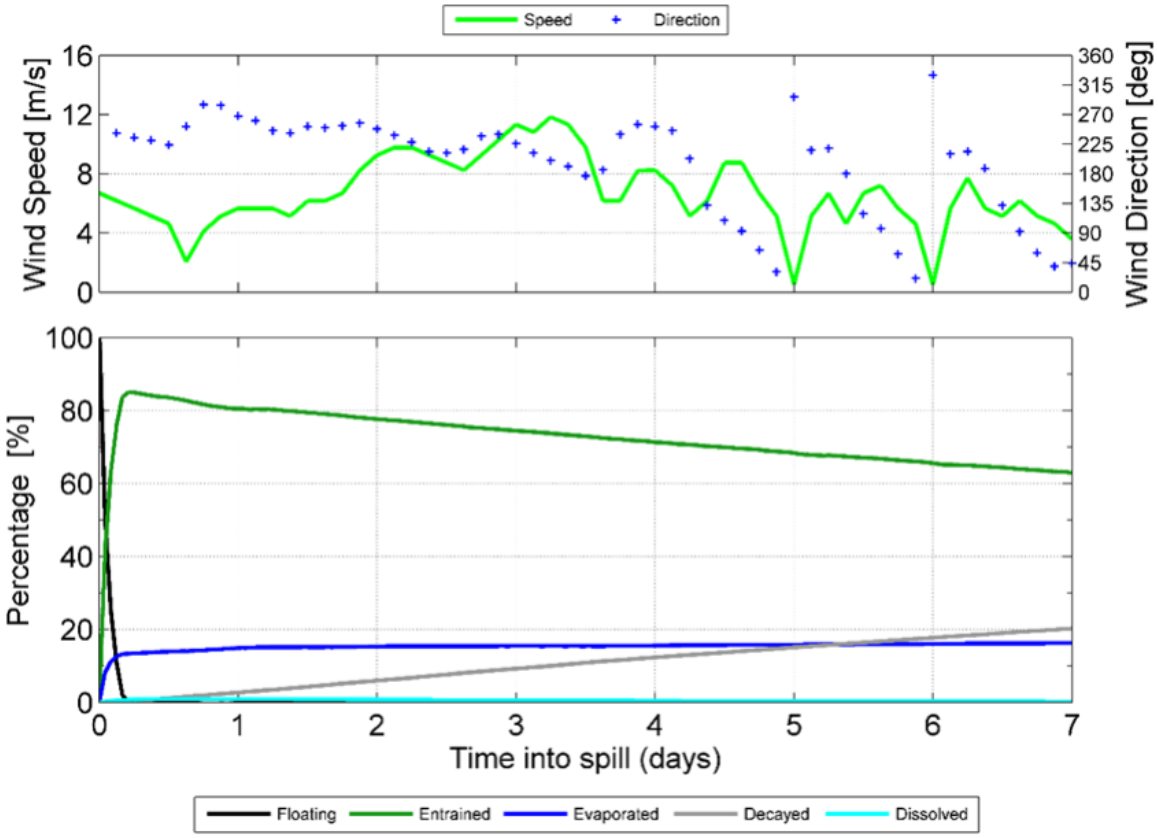


Figure 8-10: Predicted weathering of 50m³ of marine diesel oil tracked over seven days, subjected to variable wind speeds 2 to 23 knots (1 to 12m/s), currents and 27° water temperature

8.3.6.3 Spill Risk Methodology

Spill modelling was performed by RPS (RPS, 2024) on behalf of Eni to inform the risk assessment. The spill scenario involved a 1,200m³ surface spill of MDO over one hour from the seismic vessel resulting from a vessel collision. This spill scenario was selected as it represents the worst-case hydrocarbon spill event that could result during the survey activity. The modelled hydrocarbon spill scenario release location is shown in Table 8-17.

Table 8-17: Coordinates of the hydrocarbon spill modelling release location

Release Location	Longitude	Latitude	Easting	Northing
Closest location in the seismic survey area to the Timor-Leste shoreline	127° 53' 24.72" E	9° 55' 25.17" S	378335	8902825

Modelling Software

The spill modelling was performed using the Spill Impact Model Application Package (SIMAP), an advanced 3D trajectory and fates model. The model calculates the transport, spreading, entrainment and evaporation of spilled hydrocarbons over time, based on the prevailing wind and current conditions and the physical and chemical

properties of the hydrocarbon itself. The modelling does not take into consideration any of the spill prevention, mitigation and response capabilities that would be implemented in response to a hydrocarbon spill.

Modelling was conducted using a stochastic or probabilistic approach to simulate the defined credible scenarios using the same spill information – location, spill volume, duration, and composition of hydrocarbons – but randomly selected start times to ensure a range of seasonal wind and current conditions were assessed.

Once all the simulations were run, the results were combined and statistically analysed to determine the potential areas of hydrocarbon exposure in the surrounding waters, shorelines and sensitive receptors based on the thresholds. The stochastic approach captures a wide range of potential weathering outcomes under different environmental conditions, which is reflected in the aggregated spatial outcomes showing the areas that might be affected by hydrocarbons in a spill event.

The modelling outcomes demonstrate a worst-case hydrocarbon release extent by incorporating the maximum distances the hydrocarbon spill could travel under varying conditions. This worst-case hydrocarbon release extent captures the extent of every modelled hydrocarbon spill scenario; an actual hydrocarbon spill event may comprise a significantly smaller area than that shown by the modelling outcomes.

Thresholds

Hydrocarbons in the marine environment can be categorised into four separate phases, each with varying fates and impact mechanisms, being:

- floating: hydrocarbons on the surface of the water
- shoreline: accumulated hydrocarbon stranded onshore
- entrained: oil droplets that are suspended in the water column and insoluble
- dissolved: dissolved into the water, becoming evenly distributed throughout the water column.

Impact exposure thresholds were applied to the hydrocarbon spill modelling and used to inform the assessment of potential impacts and risks from a hydrocarbon release. Thresholds used in the modelling are shown in Table 8-18.

Table 8-18: Summary of the thresholds applied

Floating Oil Concentration (g/m²)	Shoreline Oil Accumulation (g/m²)	Entrained Hydrocarbons Concentration (ppb)	Instantaneous Dissolved Hydrocarbons (ppb)
1	10	10	10
10	100	100	50
50	1,000	-	400

8.3.6.4 Potential Environmental Impact

Results from the hydrocarbon spill modelling by RPS (2024) were extrapolated and used to assess the credible spill scenario. This scenario investigated a potential exposure from

the surface release of 1,200m³ of MDO over one hour from a vessel spill. The MDO was tracked for 30 days to allow the concentrations to decrease below the lowest threshold (1g/m²).

An MDO spill may temporarily impact water quality for a short period while the release is dispersed and evaporates. When released to the marine environment, the MDO will spread quickly and thin out to low thickness levels, thereby increasing the rate of evaporation. Due to its chemical composition, up to 4% of the MDO mass should evaporate within the first 12 hours (boiling point (BP) < 180°C); a further 32.0% should evaporate within the first 24 hours (180°C < BP < 265°C); and an additional 54.0% should evaporate over several days (265°C < BP < 380°C), depending on prevailing wind conditions (RPS, 2024).

MDO also has low volatility and low aromatics, limiting the toxicity effects of entrained hydrocarbons. However, despite these properties, the potential impacts on the marine environment can still be significant, particularly in the short term. Recovery is expected to be relatively quick once the MDO disperses, but localised effects on marine fauna and water quality may still occur, requiring careful monitoring and mitigation.

Table 8-19: Maximum distances from the release location to floating oil exposure thresholds from a surface vessel spill for each season

Season	Distance and Direction Travelled	Floating Oil Exposure Thresholds		
		1g/m²	10g/m²	50g/m²
Summer	Maximum distance (km) from release location	187	105	67
	Direction	Northwest	Southwest	Southwest
Transitional	Maximum distance (km) from release location	265	216	86
	Direction	Southwest	West	West
Winter	Maximum distance (km) from release location	96	65	44
	Direction	Northwest	West	West

As shown in Table 8-19, floating oil concentrations exceeding 1g/m² could extend up to 265km from the release location. This distance is reduced to 216km and 86km as the threshold increases to 10g/m² and 50g/m², respectively.

The highest probability of exposure to floating oil at concentrations at or above 1g/m² is Oceanic Shoals Australian Marine Park at 4%, occurring during transitional conditions. Bellona Bank recorded the fastest time until exposure to floating oil at or above 1g/m², at 65 hours for a spill commencing during transitional conditions (Table 8-20). No receptors were forecast to be exposed by floating oil during winter conditions.

Additionally, Bellona Bank showed the highest probability of exposure to entrained hydrocarbons (40%) and dissolved hydrocarbons (3%) at or above the 10ppb threshold, with the highest concentration predicted at 1,145ppb and 35ppb, respectively (RPS, 2024). Sunrise Bank (located 25km north of the survey area) had the quickest time to

exposure for entrained hydrocarbons, at 29 hours, experiencing a worst-case exposure of 245ppb during transitional conditions.

The highest probability of shoreline accumulation of MDO at or above 10g/m² occurred during summer conditions, reaching 22%, reducing to 2% for the transitional season and no contact for winter (Table 8-21). The maximum accumulated volume along any shoreline with concentrations ≥10g/m² was predicted for Timor-Leste and Lautem (Timor-Leste province) at 3m³ during summer, impacting 5km of shoreline for each location. The maximum volume accumulated on any shoreline during the transitional season was less than 1m³, impacting 1km of shoreline at Timor-Leste and Lautem; however, no shoreline accumulation was predicted for the winter season.

Table 8-20: Receptors predicted to be exposed to hydrocarbons after a vessel collision for each modelled season

Category	Name	Probability (%) of Floating Hydrocarbon			Maximum Time Before Exposure (hours)		
		≥1g/m²	≥10g/m²	≥50g/m²	≥1g/m²	≥10g/m²	≥50g/m²
Summer Conditions							
Reefs/Shoals/Banks	Bellona Bank	1	NC	NC	187	NC	NC
	Echo Shoals	2	NC	NC	187	NC	NC
	Sunset Shoal	1	NC	NC	66	NC	NC
Transitional Conditions							
Australian Marine Park	Oceanic Shoals	4	1	NC	149	168	NC
KEF	Carbonate bank and terrace system of the Sahul Shelf	2	NC	NC	434	NC	NC
	Carbonate bank and terrace system of the Van Diemen Rise	3	1	NC	163	168	NC
	Pinnacles of the Bonaparte Basin	3	NC	NC	254	NC	NC
Reefs/Shoals/Banks	Bellona Bank	3	3	NC	65	67	NC
	Echo Shoals	1	NC	NC	121	NC	NC
	Karmt Shoal	1	NC	NC	261	NC	NC
	Sunset Shoal	1	NC	NC	142	NC	NC
Winter Conditions – no floating oil contact with any receptor							

Table 8-21: Summary of oil accumulation on shorelines after a vessel collision for each modelled season

Shorelines	Probability (%) of Shoreline Oil			Minimum Time to Receptor (hours)			Maximum Local Accumulated Concentration (g/m²)		Maximum Accumulated Volume (m³) ≥10g/m²		Maximum Accumulated Volume (m³) ≥100g/m²		Maximum Accumulated Volume (m³) ≥1,000g/m²	
	≥10 g/m²	≥100 g/m²	≥1,000 g/m²	≥10 g/m²	≥100 g/m²	≥1,000 g/m²	Average	Worst-case	Average	Worst-case	Average	Worst-case	Average	Worst-case
Summer Conditions														
Indonesia	4	1	NC	234	425	NC	1.8	108	<1	2	<1	2	NC	NC
Timor-Leste	6	NC	NC	254	NC	NC	2	62	<1	3	NC	NC	NC	NC
Lautem (Timor-Leste province)	6	NC	NC	254	NC	NC	2	62	<1	3	NC	NC	NC	NC
Viqueque (Timor-Leste province)	1	NC	NC	445	NC	NC	0.2	14	<1	<1	NC	NC	NC	NC
Transitional Conditions														
Timor-Leste	2	NC	NC	382	NC	NC	0.4	19	<1	<1	NC	NC	NC	NC
Lautem (Timor-Leste province)	2	NC	NC	382	NC	NC	0.4	19	<1	<1	NC	NC	NC	NC
Winter Conditions – no shoreline accumulation predicted for any shoreline receptor														

**NC: No contact to receptor predicted for specified threshold.*

8.3.6.5 Potential Impacts to Sensitive Receptors

Sensitive receptors that have the potential to be impacted as a result of an unplanned spill include:

- marine mammals
- marine reptiles
- seabirds and migratory shorebirds
- plankton
- fish, rays and sharks
- coral reefs
- submerged reefs and shoals
- coastal marine environments.

An MDO spill is considered unlikely. However, sensitive receptors such as marine fauna, particularly mobile species, can generally move away from the affected area to avoid significant impacts. While marine fauna may transit through the release area, contact is unlikely to result in impacts greater than minor short-term behavioural changes, limited to one or a few individual species. No significant impact on overall population viability or ecosystems is anticipated.

Sensitive receptors that have the potential to be impacted as a result of an unplanned spill are discussed further in subsequent sections.

Marine Mammals

Marine mammals are likely to be exposed primarily through inhalation of volatiles during surfacing and from feeding. Impacts may include changes in behaviour, reduced activity, inflammation of the mucous membranes, lung congestion, pneumonia, liver disorders and neurological damage.

Cetaceans have smooth skin, which means hydrocarbons are unlikely to stick to their bodies. Observational evidence suggests cetaceans may detect and avoid areas affected by spills (International Petroleum Industry Environmental Conservation Association (IPIECA), 1995). Bottlenose dolphins, for example, have been found to actively avoid surface slicks after few brief contacts with no adverse impacts (Smith et al., 1983). It is unclear whether other marine mammals in the survey area have the same ability to detect and avoid hydrocarbon slicks. However, it is possible that even if whales and dolphins can detect hydrocarbon slicks, their attraction to specific breeding, feeding or resting areas may override their tendency to avoid the presence of hydrocarbons. Therefore, any physical contact with surface hydrocarbons would likely cause irritation and sublethal stress, given their physical characteristics and potential ability to avoid slicks.

The potential impact to cetaceans due to ingestion of hydrocarbon is limited, since only low numbers of cetaceans are expected to pass through the affected area in the event of a hydrocarbon spill. Additionally, the characteristics of the MDO suggest any oil on the sea surface would disperse and evaporate over time, leaving behind less toxic

residues. These residues would become weathered and may form waxy flakes due to wave and wind actions. Therefore, significant impacts to cetacean populations are not expected to result from the hydrocarbon spill.

Marine Reptiles

Marine reptiles, such as turtles, are not known to exhibit avoidance behaviour towards oil spills. Therefore, turtles may be exposed through inhalation, ingestion and physical contact, causing negative impacts to the skin, blood, digestive and immune systems, and salt glands. Inhaling oil vapours can lead to internal damage, including neurological impairment (IPIECA, 1995). Ingesting tarballs can result in blockage and injury to the digestive tract and buoyancy problems due to the build-up of fermentation gases (NOAA, 2010a).

The hydrocarbons that pose the most aquatic toxicity in a spill are usually the more volatile aromatic and soluble components, such as polycyclic aromatic hydrocarbons. However, weathered residues of MDO would not contain high levels of aromatic hydrocarbons that could cause significant aquatic toxicity. Therefore, in the unlikely event of an MDO fuel spill, marine turtles may be exposed to low levels of hydrocarbons.

Fish, Rays and Sharks

Fish, rays and sharks may be affected by dissolved and entrained hydrocarbons through ingestion or gill contamination. Smothering through coating of gills can lead to the lethal and sublethal effects of reduced oxygen exchange, and coating of body surfaces may lead to increased incidence of irritation and infection.

However, due to their high mobility, pelagic fish possess the ability to evade surface waters beneath oil spills by swimming into deeper waters or moving away from the affected areas (International Tanker Owners Pollution Federation Limited (ITOPF), 2011). However, indirect exposure may still occur through consumption of contaminated prey; fishes that are exposed to sublethal dissolved aromatics are likely to recover due to their ability to metabolise hydrocarbon toxicants (Johnson et.al., 2002).

Fish populations in open waters and diverse fish groups in shallow waters around islands may be exposed to dissolved aromatics and entrained hydrocarbon phases. However, fish have natural instincts to avoid many aromatic hydrocarbons (Iwama and Nakanishi, 1996) and are therefore not likely to come into contact with high concentrations of dissolved aromatics or entrained hydrocarbons.

Plankton

Exposure to hydrocarbons within the water column can result in alterations in species composition, encompassing declines or increases in one or more species or taxonomic assemblages (Batten et al., 1998). This exposure can induce diminished rates of photosynthesis in phytoplankton, leading to suffocation, as well as provoke behavioural or environmental modifications that render them more vulnerable to predation (Tomajka, 1985). Given their high turnover rate, planktonic communities are expected to swiftly recuperate, typically within a timeframe of weeks to months (ITOPF, 2011).

Seabirds and Migratory Shorebirds

Seabirds and shorebirds can be exposed to hydrocarbons through direct contact and ingestion. Direct contact can compromise the insulation properties of their plumage, adversely affecting birds' ability to thermoregulate, resulting in hypothermia and pneumonia. Oiled feathers can also lead to a loss of buoyancy, resulting in drowning.

Seabirds typically do not exhibit avoidance behaviour towards oil spills, and may come into contact with oil slicks while foraging or resting on the water surface, which can lead to their feathers becoming matted and causing hypothermia, starvation and drowning. Soiled birds can also ingest hydrocarbons directly through preening or indirectly by consuming contaminated prey. Ingestion and oiling can cause internal harm to sensitive membranes and organs. Long-term exposure to oil can also result in a decrease in reproductive success due to the loss of breeding adults and the deformity of eggs or chicks (Australian Maritime Safety Authority, 2012).

Submerged Shoals and Reefs

The potential impacts of a worst-case scenario spill on submerged reefs, banks and shoals in the survey area are potentially significant. If a large amount of hydrocarbons was to be spilled, these features would be exposed to dissolved aromatic compounds and concentrations of hydrocarbons in the water, which could have detrimental effects. Submerged shoals and reefs that have the potential for hydrocarbon expose include Echo Shoals, Sunrise Bank, Bellona Bank and Oceanic Shoals.

Filter feeders that inhabit these submerged reefs and shoals are particularly vulnerable to the ingestion of hydrocarbons and absorption of aromatic compounds. This can lead to a range of harmful effects, including changes in respiration rates, decreased filter feeding activity, reduced growth rates, biochemical effects, increased predation, reproductive failure, and mechanical damage by waves due to inability to maintain a hold on substrate (Connell and Miller, 1981).

Diverse fish assemblages are also associated with the shallow water around submerged reefs and shoals and may be impacted in case of a worst-case scenario spill during the survey activity.

Coral Reefs

Direct contact between hydrocarbon droplets and sensitive coral species, such as branching corals, can result in coral mortality. However, the toxicity effects of direct contact with entrained hydrocarbons are likely to be reduced by weathering processes, which decrease the content of soluble aromatic components before contact occurs. It is the water-soluble fractions that are believed to cause the most harm to coral reefs (Shigenaka, 2001). Impacts on corals and other sessile benthos from exposure to entrained oil at levels higher than 200ppb are expected to primarily be sublethal in nature. However, it is possible for some coral species and sessile benthos to experience mortality in highly affected areas of a reef. Sublethal effects on corals may include polyp retraction, changes in feeding behaviour, bleaching (loss of symbiotic algae), increased mucus production leading to impaired growth rates and reproduction. Lethal effects would result in a reduction in coral coverage and a change in the composition of coral

communities. The recovery of impacted reef areas will rely on coral larvae from neighbouring unaffected or partially impacted coral communities.

In the unlikely event of a worst-case scenario spill occurring during coral spawning seasons (March/April and October/November), direct contact with entrained hydrocarbons may decrease successful fertilisation and survival of coral larvae. Consequently, there is the potential for a reduction in recruitment and settlement of new coral populations. Additionally, the early life stages of reef-associated organisms, such as reef fish and invertebrates, may be negatively affected, resulting in sublethal impacts and, in some cases, mortality. The precise impact on resident coral communities will depend on the concentration and inherent toxicity of the hydrocarbons, as well as the duration of exposure and the water depth of the affected communities.

Coastal Marine Environments

There are many different types of shorelines, ranging from cliffs, rocky beaches, sandy beaches, mud flats and mangroves, and each of these influences the volume of oil that can remain stranded ashore and its thickness before the shoreline saturation point occurs.

Modelling predicted that in a worst-case scenario, up to 3m² of MDO could accumulate on the shorelines of Timor-Leste and Lautem after at least 254 hours (Table 8-21). This extended period allows for the natural dispersion and evaporation of the MDO due to its low density and viscosity. Once on the shoreline, the MDO undergoes natural weathering and biodegradation processes. Coastal processes, such as high wave energy, help break down the hydrocarbons, reducing their toxicity and environmental impact. Therefore, the predicted level of impact from an MDO spill on coastal environments is considered low.

8.3.6.6 Management Control Measures

Control measures for this risk comprise:

- Navigation equipment and procedures on vessels will be compliant with the COLREGS and Chapter V of SOLAS.
- Fuel type used (marine diesel) – in accordance with MARPOL 73/78 Annex VI.
- Refuelling transfer procedures to prevent bunkering spills.
- Vessel spill response plan in place for vessels.
- Oil spill contingency plan in place for survey activity.
- Support and chase vessels used to deter non-survey activity vessels from the survey area.
- Support and chase vessels will have a communication sheet in Bahasa and Tetum with key survey information to be provided to fishers encountered during the survey activity.
- Support and chase vessels will have FLOs onboard who are Bahasa and Tetum speakers.
- Automated Identification System transponders fitted to survey vessels and tail buoy.

- Radio communication watch kept at all times.

9 SUMMARY OF THE ENVIRONMENTAL MANAGEMENT PLAN

The PSC TL-SO 22-23 Seismic Survey EMP (Eni-AH08-EXP-1000282) is a separate document that has been prepared for submission to and acceptance by ANP. It has been designed to address and mitigate potential environmental impacts described and assessed in this SEIS. The EMP outlines environmental standards for the survey activity and the process for their implementation and is structured as per Table 9-1.

Table 9-1: Environmental Management Plan structure

Section	Contents
Introduction	An introduction to the EMP and the survey activity
Environmental Legislation	A description of the environmental legislation and requirements as relevant to the survey activity
Description of the Survey Activity	A description of the survey activity
Existing Environment	A description of the environment in the survey area and surrounding region
Environmental Risk Assessment	Description of environmental risk assessment and ALARP processes
Routine Activities	Identification and assessment of risks associated with routine activities Identification of controls to manage risks An assessment of the risk to ALARP and acceptable levels
Non-routine Activities	Identification and assessment of risks associated with non-routine and unplanned events Identification of controls to manage risks An assessment of the risk to ALARP and acceptable levels
Environmental Objectives, Standards and Measurement Criteria	The environmental objectives and standards that will be applied to the survey activity and the measurement criteria that will be used to measure the performance
Implementation Strategy	A description of the processes and strategies that Eni will use to implement the survey activity and standards
References	A list of literature referenced within the EMP

10 DISCLOSURE OF INFORMATION AND PUBLIC CONSULTATION

10.1 Overview

Eni believes in the value of long-term partnerships and sustainable relationships with the countries and communities where we operate. Retaining a social licence to operate depends on maintaining positive relationships with stakeholders across communities, government, non-government and the business sector.

Eni believes in engaging proactively with our many stakeholders and is committed to building relationships based on dialogue, fairness and transparency. We believe in the effectiveness of a participatory approach that involves our stakeholders at the early stages in a project.

Eni's management system guideline, Responsible and Sustainable Enterprise [MSG-SSC-ENI SPA-ENG-R03], defines the rules of conduct and principles to be observed in carrying out activities and serves as the overarching corporate guide for stakeholder engagement. The management system guideline's associated Annex E, Sustainability Stakeholder Engagement provides a methodology for:

- identifying stakeholders
- preparing and planning for consultation
- assessing and monitoring engagement
- assessing stakeholders' feedback.

Further, Eni's internal policy outlines a clear process for identifying, analysing and risk-assessing stakeholders.

This section summarises the process Eni follows across all assets, towards authentic engagement of stakeholders that have an interest in any associated activities. This model has also been implemented for the purposes of consultation for preparation of the survey activity to be undertaken within the survey area.

Figure 10-1: Eni's process for stakeholder engagement and consultation

Eni's activities in Timor-Leste commenced in early 2005 with the award of five exploration blocks within the Timor-Leste Exclusive Area. An office was established in Dili in 2007. In addition to the exploration blocks in the Timor-Leste Exclusive Area, Eni developed the Kitan Field, which was in production from 2011 until 2015.

Eni maintains a presence in country and demonstrated an intention to continue investing through the bid for an offshore block offered during the last acreage release. Eni was awarded PSC TL 22-23 in December 2023, which became effective on 22 April 2024. Within the first three years of PSC TL 22-23, Eni plans to undertake a marine seismic survey and drill one well.

Building on Eni's long-term presence in the country and existing constructive relationships with stakeholders, Eni intends to ensure stakeholders are consulted effectively in relation to preparing for the survey activity as well as future projects within PSC TL-SO 22-23. Eni plans to undertake a phased approach to stakeholder consultation throughout the project lifecycle:

- **Stage 1: Consultation during preparation of the SEIS and EMP** – with key stakeholders identified for specific activities within the PSC area, including seismic, drilling, operation and decommissioning/abandonment.
- **Stage 2: Public consultation during submission of draft SEIS, EMP, Environmental Impact Statement and other relevant documents** – Draft SEIS will be made available on ANP's website and the public will be notified.
- **Stage 3: Ongoing engagements with relevant stakeholders** – Maintaining engagements with stakeholders during the survey activity duration will support Eni's effort to maintain positive relationships with all relevant stakeholders.

In accordance with Eni Australia's Local Stakeholder Operating Instruction, Eni's stakeholder management process identifies, analyses and prioritises stakeholders to ensure appropriate engagement and consultation. In addition, Eni assesses and monitors the effectiveness of such engagement and consultation, and identifies and responds to stakeholder interests and concerns as needed.

10.2 Stakeholder Identification

Eni's objective for stakeholder engagement is to develop and maintain long-term relationships with stakeholders in and around its general areas of operations. Identifying and understanding stakeholders, with particular attention to those affected directly and indirectly, is key in understanding the potential or perceived impacts Eni's operations can have on them.

Leveraging previous operations or activities in Timor-Leste, Eni was able to identify stakeholders with interest in the PSC and stakeholders potentially affected by the survey activity.

10.3 Stakeholder Analysis and Mapping

A sound consultation strategy involves engagement linked to analysing and mapping the prioritisation of stakeholders based on an assessment of their roles, responsibilities, and consideration of issues of interest or relevance to them. So, after identifying them, Eni's detailed analysis process allowed for considering the most effective methods for involving stakeholders.

The various criteria considered were:

- the role of the entities within regulatory context in the country
- the nature of the current relationship with a given stakeholder
- the awareness of Eni's activities.

As a part of the analysis, every stakeholder was qualitatively assessed by:

- rating their attitude (disposition), towards Eni's activities – whether it be positive, neutral or negative
- rating the level of power/influence – whether it be high, medium or low – that they may have towards influencing the survey activity.

The assessment of stakeholders' disposition and power/influence were conducted based on the matrix in Figure 10-2.

		Disposition towards Survey Activity		
		Positive	**Neutral**	**Negative**
Power/ Influence	High	3	2	1
	Medium	4	3	2
	Low	4	4	3

Figure 10-2: Stakeholder assessment matrix using a disposition/power diagram

10.4 Stakeholder Consultation Methodology

Eni adopted a phased or staged consultation approach for preparing the survey activity, which consisted of:

- Stage 1: initial consultation during preparation of the draft SEIS and draft EMP
- Stage 2: public consultation after submission of draft SEIS and draft EMP (14 days of the public comment period)
- Stage 3: regular or continuous engagements (after the public comment period and after ANP approval).

10.5 Potentially Interested Stakeholders

The aim of Eni's stakeholder consultation process for preparing the draft SEIS and draft EMP is to inform stakeholders about Eni's survey activity and to encourage dialogue with the identified stakeholders.

Based on the survey area, which is approximately 300km from the capital city of Dili and more than 170km from the south coast of Timor-Leste, there were limited stakeholders identified within proximity of the survey area.

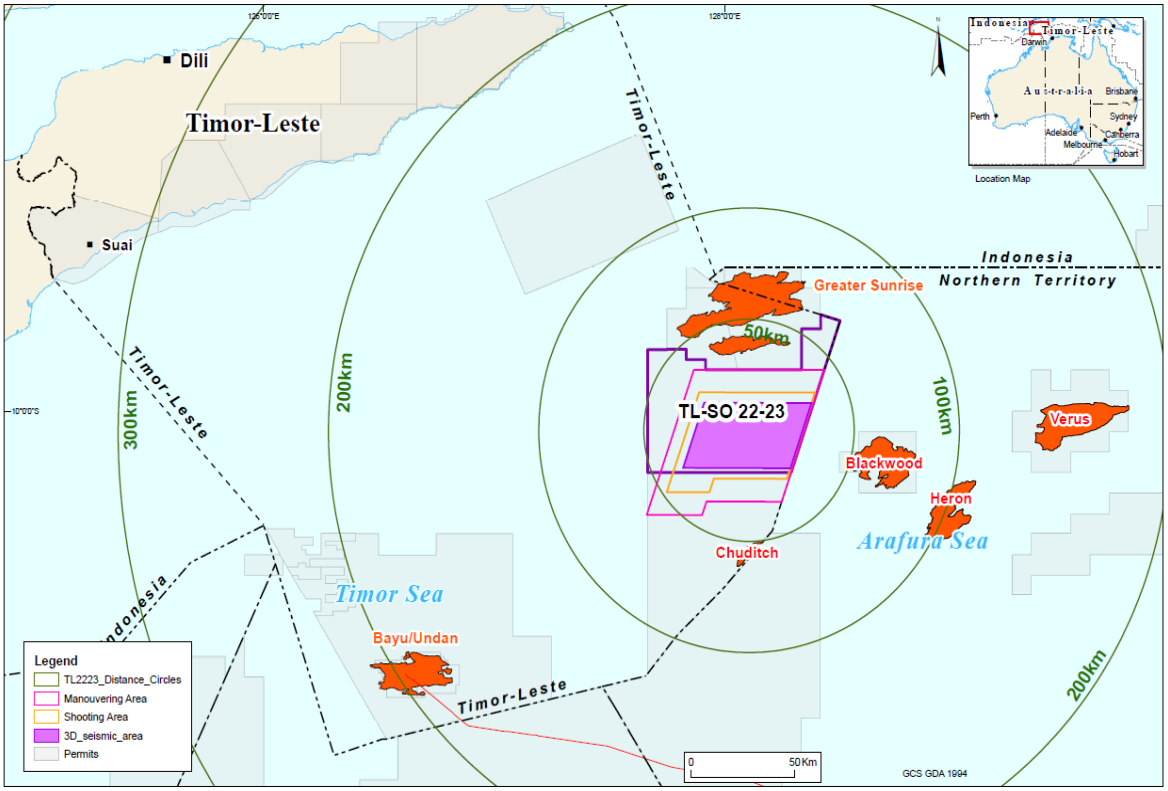


Figure 10-3: Survey location and distance from Timor-Leste

Despite the distance of the survey area, Eni's preparation for the consultation included a review of existing stakeholders to identify stakeholders with potential interest in the survey activity.

Interested stakeholders identified for the survey activity included national government, regulatory authorities, business associations, civil societies or Non-Government Organisations (NGOs), and operators within the industry.

The stakeholder list will be assessed and reviewed regularly to capture possible changes in the country. During consultation, Eni will also take into consideration, advice or suggestions to incorporate additional stakeholders.

Table 10-1: Potentially interested stakeholders

Category	Function/Interest/Activities	Stakeholders
National Government	Within the Ministry of Tourism and Environment, the National Department of Biodiversity is responsible for designing, implementing and evaluating environment policies, as well as supporting the implementation of the 'Blue Economy' development strategy.	National Department of Biodiversity
	As part of the Ministry of Agriculture and Fisheries, the National Director for Fisheries, Aquaculture & Aquatic Resources Management is responsible for developing and managing aquaculture in the country, and will take the lead role in implementing and formally monitoring the National Aquaculture Strategy.	National Director for Fisheries, Aquaculture & Aquatic Resources Management
	Established within Ministry for Transportation and Communication, the National Directorate of Maritime Transport is the maritime regulatory body for Timor-Leste, responsible for regulating the maritime sector and working with the Timor-Leste Port Authority to manage and develop the maritime sector.	National Directorate of Maritime Transportation (Portuguese abbreviation DNTM)
	Quarantine is one of the departments under the Ministry of Agriculture and Fisheries, responsible for controlling goods entering the country. This department is responsible for safeguarding agricultural resources and plays a critical role in protecting the country's agricultural sector and the environment from invasive plant and animal pests and diseases. It also seeks to prevent harmful human and animal food stuffs from entering the supply chain.	Quarantine Services
	As a department within the Ministry of Transportation and Communication, the National Directorate for Communication Infrastructure is responsible for overseeing and managing the development and maintenance of the country's telecommunications and infrastructure projects. This position is part of the broader efforts to improve the nation's communication systems and ensure the effective implementation of infrastructure projects, particularly in the fields of transport, communication and technology. Specifically, to ensure successful installation of fibre optic cables for the country.	National Directorate for Communication Infrastructure
	The National Maritime Authority, under the responsibility of the Minister of Defence, is responsible for carrying out the duties defined for it within the framework of the Maritime Authority System, in the areas of national jurisdiction, in accordance with the guidelines defined by the Minister of Defence.	National Maritime Authority (Portuguese abbreviation AMN)

Category	Function/Interest/Activities	Stakeholders
Regulatory Authority	ANP is a Timor-Leste public institution, created as part of the Ministry of Petroleum and Mineral Resources. ANP is responsible for managing and regulating petroleum activities in Timor-Leste, both offshore and onshore and in the Greater Sunrise Special Regime.	Autoridade Nacional do Petroleo (Portuguese abbreviation ANP)
	As part of Ministry of Tourism and Environment, the National Authority for Environmental Licensing's (ANLA) mission is to ensure the implementation of legislation on environmental licencing, being responsible for evaluating projects, classifying and issuing environmental licences, and monitoring the activities of public and private entities in general, proponents and holders of environmental licences, in accordance with national and international legislation relating to the environment. (For the purpose of environmental licencing for oil & gas activities, ANP is authorised to implement this responsibility.)	National Authority for Environmental Licensing (Portuguese abbreviation ANLA)
	Within the Ministry of Finance, Customs Authority was established with the responsibilities of controlling the movement of goods, people and vehicles entering and leaving the country, primarily by collecting import and export duties, securing the borders from illegal goods, and facilitating legitimate trade while acting as a key source of national revenue for the government; essentially safeguarding Timor-Leste's borders and regulating what comes in and out of the country.	Customs Authority
Business Association	As an association that represents the private sector in Timor-Leste, CCI-TL aims to create a dynamic, innovative, competitive, inclusive and sustainable private sector in Timor-Leste. It has been involved in promoting local enterprises through national and international forums, as well as organising workshops and training sessions to continue improving capacities of local enterprises.	Chambers of Commerce and Industry, Timor-Leste (CCI-TL)
	Asociacao Empresaria Mulher Timor-Leste (AEMTL) aims to support Timorese entrepreneurs in facing challenges and competing in Timor-Leste's business landscape, with the aspiration to contribute to the economic development of the country.	Association of Women Enterprises

Category	Function/Interest/Activities	Stakeholders
Civil Society/ Non-Government Organisation	Forum ONG Timor-Leste (FONGTIL) is an organisation established as an umbrella for local, national and international non-government organisations in Timor-Leste. It is a non-profit, non-partisan and non-sectarian organisation. As well as acting as a partner for state institutions in the process of nation building, it maintains a position as an independent organisation that monitors government and aims to help strengthen civil society to participate in the national development process.	FONGTIL
	La'o Hamutuk (Walking Together in English) is a Timor-Leste non-government organisation that monitors, analyses and reports on the principal international institutions and systems engaged in Timor-Leste as they relate to the physical, economic and social reconstruction and development of the country. Also, works to facilitate effective Timorese participation, to improve communication between the international community and Timorese society, to provide resources on alternative development models, and to facilitate links between Timorese groups and groups abroad.	Lao Hamutuk
	Rede ba Rai (Network for Land Rights) is a non-government organisation representing other such organisations with similar objectives in promoting the principles of equal opportunity, equal access to resources, equal responsibility of protecting people and environment, and guaranteeing equality for all Timorese.	Rede ba Rai (Haburas)
	Timor-Leste National University is a centre for creating, disseminating and promoting culture, science and technology, articulating study and research, in order to enhance human development, as a strategic factor in the sustainable development of Timor-Leste.	National University of Timor-Leste (Portuguese abbreviation UNTL)
PSC Operators	Sunda Energy's wholly owned Timor-Leste subsidiary, SundaGas Banda Unipessoal Lda., is the operator of and 60% interest holder in the offshore Timor-Leste PSC TL-SO 19-16. The remaining 40% interest is held by a subsidiary of the Timor-Leste state oil company, TIMOR GAP, E.P., whose interest is carried by SundaGas.	SundaGas Banda Unipessoal Lda. (SundaGas)
	TIMOR GAP is a State-owned oil and gas company that acts on behalf of the State in conducting business within the petroleum and gas sectors. As the state-owned enterprise, TIMOR GAP E.P. owns 56.56% within the Greater Sunrise Field, while Woodside Energy owns 33.44% and Osaka Gas Australia owns the remaining 10%.	TIMOR GAP Greater Sunrise Unipessoal Lda.

10.6 Consultations Overview

As Eni prepares the draft SEIS and draft EMP, the initial stage of stakeholder consultation was carried out. A description and summary of Stage 1 of the consultation is included in this section. Additionally, this section captures the initial discussion with the regulatory authority, ANP, regarding Eni's preparation for Stage 2 of the consultation.

10.6.1 Stage 1: Initial Consultation

Acknowledging that after submitting the draft SEIS and draft EMP to ANP, there is an expectation for a 'public comment period', Eni was proactive in seeking stakeholder feedback as it began the work in drafting the SEIS and EMP.

This initial consultation began with in-person meetings then by distributing a slide pack containing a summary of the activity presented in English and/or Tetum.

The objective of Stage 1 consultation was to introduce Eni (as the operator of the PSC), inform identified stakeholders on the proposed survey activity, and encourage two-way dialogue. Eni sees the benefit of in-person meetings with each group, as it allows for direct and open communication with each stakeholder.

10.6.2 Stage 2: Public Consultation

According to Ministerial Diploma 47/2017 'Regulation on Procedures for Public Consultation and requirements during the Environmental Assessment Process', ANP requires Eni to organise a public forum once the draft SEIS and draft EMP are submitted for assessment.

Based on experience from the Phase 1 consultation, Eni sees the in-person meetings with stakeholders as an effective approach, which will allow for open and transparent communications. As such, Eni's suggestion for the public consultation is to organise for in-person meetings with identified stakeholders.

Based on early consultation in Phase 1, Eni understands ANP's position and definition for the public consultation. To comply with ANP's approach, Eni will be required to organise for a one-day consultation event to be held in Dili.

In the effort to ensure all institutions, organisations, groups, community and individuals are informed, the announcements for the public consultation will be issued through the most accessible media outlet in the country.

To notify stakeholders of the public comment period and to encourage feedback, Eni will promote the availability of, and invite comment on, the draft SEIS and draft EMP, across two widely distributed daily newspapers in the country.

As indicated by ANP, the public comment period for a draft SEIS and draft EMP is to be undertaken for a period of 14 working days.

10.6.3 Stage 3: Regular or Continuous Engagement

The stakeholder engagement approach presented in this section is part of an ongoing engagement process that will continue throughout the duration of the survey activity and other Eni activities in the country.

Maintaining regular engagements supports Eni's efforts to maintain open communication with all relevant stakeholders, while continuing to build positive relationships.

10.7 Summary of Stakeholder Consultation

10.7.1 Stage 1: Initial Consultation

Through this consultation approach, Eni was able to collect the most up to date information about relevant policies and regulations, as well as updated environmental and fisheries data. As the in-person consultations were held with relevant stakeholders directly involved with national projects conducted within Timor-Leste offshore areas, such as fibre optic installation, Eni received the latest data on security situations around the survey area.

Overall, Eni's request for in-person meetings was well received. Eni received positive feedback from all stakeholders encountered during the two-week consultation period, specifically in relation to the consultation methodology. Stakeholders found Eni's approach demonstrated respect for their roles.

Stakeholders also expressed that the content of the slides presented by Eni was informative and the slides' presentation in Tetum encouraged them to be involved in the dialogue.

Eni found the stakeholders were welcoming and supportive of the consultation methodology and confident to express their views. The feedback received from all stakeholders enriched Eni's understanding of the stakeholders' perspective and at the same time provided the most updated information for Eni to consider. Some of the recommendations or suggestions from stakeholders were assessed and implemented, including recommendations to meet additional government institutions, which proved to be valuable.

The information and feedback received during Phase 1 of the consultation are summarised in Table 10-2.

Table 10-2: Summary of Stage 1 stakeholder consultations

Stakeholder	Consultation Method/Date	Summary of Consultation	Inference for this SEIS
Autoridade Nacional do Petroleo (ANP)	In-person meeting (11.02.25) and presentation pack via email	• In-person meeting attended by the chairman of TL 22-23 and representatives from HSE department as well as other relevant departments within ANP. Two meetings with ANP were completed successfully. During the first meeting, Eni shared the slide pack prepared for the consultation and registered ANP's suggestions to improve the slide pack, such as: – Ensure slides are available in English and Tetum. – Eni to include risk matrix for assessment of environmental risks.	N/A
National Directorate of Quarantine Services	In-person meeting (11.02.25) and presentation pack via email	• In-person meeting completed with the National Director covering important aspects of the proposed survey activity. Eni's team presented the key points from the slides. The feedback from the National Director included: – It is important to protect Timor-Leste offshore areas by ensuring wastes are not disposed offshore. – Contaminated wastes should be managed as required by international conventions.	Vessel waste will be returned to shore and disposed of in accordance with all applicable waste requirements. Any discharges from vessels will be in accordance with MARPOL requirements for vessels (see Section 8.2.6).
SundaGas Banda Unipessoal Lda.	In-person meeting (11.02.25) and presentation pack via email	• Initial in-person meeting attended with technical team at SundaGas and Eni presented detailed information about the survey activity, including discussion on entry of the seismic vessel into SundaGas's PSC area. During the meeting, several points were covered: – SundaGas proposed to organise a second meeting to allow the Chief Executive Officer and other members of the technical team to attend. – Permission to enter SundaGas's PSC area should be discussed with the Chief Executive Officer.	N/A

Stakeholder	Consultation Method/Date	Summary of Consultation	Inference for this SEIS
National Directorate of Biodiversity	In-person meeting (12.02.25) and presentation pack via email	• In-person meeting completed with the National Director where Eni presented the slide pack. Important points were raised by the stakeholder, which included: – The department is involved in the environmental licencing process through providing support to ANLA during revision of the SEIS and EMP and all relevant documents. – Protection of the environment is crucial when completing the survey activity to ensure it does not create negative impact to the lives of the community.	The activity will be managed in accordance with the controls within Sections 8.2 and 8.3, which are expanded on in the survey activity EMP. Controls have been adopted to ensure the survey activity does not create negative impact to the lives of the community.
National Authority for Environmental Licensing (Portuguese abbreviation ANLA)	In-person meeting (12.02.25) and presentation pack via email	• In-person meeting attended by President of ANLA and relevant directors. During the meeting, Eni presented the slide pack, which covered detailed information about the proposed survey activity. Some of the main points from the discussion included: – Clarified ANLA's organisation structure within Ministry of Tourism & Environment. – Confirmed that ANLA and ANP agreed to share the responsibilities in approving Environmental Licenses. ANP has the authority to execute the requirement within Decree Law for Environmental Licensing (Decree Law No. 39/2022 first amendment to Decree Law No. 5/2011). The separation of duties applies for petroleum activities and mining activities. – Suggested including National Directorate of Fisheries as a stakeholder for consultation. – Based on the nature of the activity, ANLA suggested that Eni include Autoridade Maritima Nacional as a stakeholder.	N/A
SundaGas Banda Unipessoal Lda.	In-person meeting (12.02.25) and presentation pack via email	• Consequent meeting was organised to discuss details of the survey activity, including the formal process granting Eni's entry. • Details of the agreed process will be provided to ANP.	N/A

Stakeholder	Consultation Method/Date	Summary of Consultation	Inference for this SEIS
TIMOR GAP E.P.	In-person meeting (12.02.25) and presentation pack via email	• In-person meeting with TIMOR GAP E.P. was attended by Managing Directors for TL 22-23 and Managing Director for TIMOR GAP Greater Sunrise Unipessoal Ltd, as well as all the relevant members. During the meeting, Eni presented the details of the proposed survey activity. Some of the main points of the discussion included: – TIMOR GAP E.P. is willing to share new environmental data collected from recent seismic survey completed within the offshore blocks. – As a joint venture partner for Greater Sunrise, TIMOR GAP E.P. will provide information about the seismic survey to its joint venture partners.	N/A
National Directorate of Maritime Transportation (Portuguese abbreviation DNTM)	In-person meeting (13.02.25) and presentation pack via email	• In-person meeting completed with the National Director and other members of the department, where Eni presented the slide pack. Key feedback raised during the meeting included: – A representative from this department will need to be involved in inspection of the seismic vessel and the boats involved in the survey activity. – The selected vessel and boats will need to berth at Dili Port. – Recommended to include relevant government institutions during the consultation.	N/A
Customs Authority	In-person meeting (13.02.25) and presentation pack via email	• In-person meeting attended by Commissioner for Customs Authority and relevant head of department. During the meeting, Eni presented the slide pack covering detailed information about the proposed survey activity. The key message from the Customs Authority included: – Ensure Eni and its subcontractors comply with the relevant requirements for vessel entry.	N/A

Stakeholder	Consultation Method/Date	Summary of Consultation	Inference for this SEIS
Rede ba Rai (Haburas)	In-person meeting (13.02.25) and presentation pack via email	• Attended in-person meeting with Executive Director of Rede ba Rai and some of the members of the organisation. During the meeting, Eni presented detailed information about the proposed survey activity. The key point expressed during this meeting included: – Ensure civil society is provided with regular updates about Eni's activities in the country.	N/A
National Directorate for Fisheries, Aquaculture & Aquatic Resources Management	In-person meeting (14.02.25) and presentation pack via email	• In-person meeting completed with National Director and other members of the department, where Eni presented the slide pack. Some of the key feedback included: – Highlighted the importance of conservation classification of marine mammals and reptiles identified within Timor-Leste waters. – Marine mammals' migratory route is through north of the Timor Island and takes place between September to December every year. No records for migration path from south of Timor Island. – Fish aggregating devices and illegal fishing are considered to be risks around the survey area. – Based on the nature of the activity, suggested Eni includes National Directorate for Infrastructure Communication as a stakeholder. – Willing to share latest biodiversity and fisheries reports completed through collaborations with United Nations agencies and other bilateral arrangements. Eni to submit official request for the reports.	Section 5.2.8 identifies the protected species that may be present during the survey activity. Controls within Sections 8.2 and 8.3 (expanded on in the survey activity EMP) have been adopted to mitigate adverse impacts to marine mammals and reptiles. It has been recognised that fish aggregating devices and illegal fishing are considered to be risks around the survey area. Controls have been adopted including: • Support/chase vessels used to deter non-survey activity vessels from the survey area, as well as identify debris and fish aggregating devices. • Support/chase vessels will be able to identify, tow and recover fishing equipment and debris

Stakeholder	Consultation Method/Date	Summary of Consultation	Inference for this SEIS
Association of Women Enterprises (Portuguese abbreviation AEMTL)	In-person meeting (17.02.25) and presentation pack via email	• In-person meeting with President of AEMTL and members of the management structure. Eni presented the slide pack covering detailed information about the proposed survey activity. Key points expressed by AEMTL included: – Involvement of members of AEMTL in the industry is important for contribution to local content. – Members of AEMTL and local enterprises understand their limitations but prepared to evolve to ensure its participation in the industry.	N/A
Lao Hamutuk	In-person meeting (17.02.25) and presentation pack via email	• Attended in-person meeting with some members of Lao Hamutuk, where Eni presented the details of the proposed survey activity. During the meeting, some of the views expressed by Lao Hamutuk included: – Confirmed its alliance with global movement against any new oil and gas production and any other forms of extractive industry. – Expressed concern with potential CO_2 emission derived from seismic vessel and all support boats. – Understands the survey activity is part of Eni's obligation in the PSC, and it needs to be completed.	N/A

National Directorate for Communication Infrastructure (Portuguese abbreviation DNIC)	In-person meeting (20.02.25) and presentation pack via email	• Meeting requested with this department based on recommendations from stakeholders. • Attended in-person meeting with technical team within DNIC where Eni presented the slide pack with detailed information about the proposed survey activity. Some of the key points raised by DNIC's technical team included: – Confirmed fibre optic installation is completed, and it is now in preparation for commissioning, which should be completed in May 2025. – Identification of several fish aggregating devices offshore Timor-Leste around southeast of the island. – Illegal fishermen were issues during fibre optic installation. – Based on maps included in the slide pack, there is possibility of overlap between fibre optic route and Eni's survey activity. To confirm, DNIC requested for coordinates of the survey area and DNIC is willing to share coordinates of the fibre optic route.	The location of the fibre optic cable is 55km from the survey area (see figure in Section 5.3.2) It has been recognised that fish aggregating devices and illegal fishing are considered to be risks around the survey area. Controls have been adopted including: • Support/chase vessels used to deter non-survey activity vessels from the survey area, as well as identify debris and fish aggregating devices. • Support/chase vessels will be able to identify, tow and recover fishing equipment and debris Controls have been included to manage issues with illegal fisherman: • Support and chase vessels will have a communication sheet in Bahasa and Tetum with key survey information to be provided to fishers encountered during the survey activity. • Support and chase vessels will have FLOs onboard who are Bahasa and Tetum speakers.

Stakeholder	Consultation Method/Date	Summary of Consultation	Inference for this SEIS
National Maritime Authority (Portuguese abbreviation AMN)	In-person meeting (20.02.25) and presentation pack via email	• Meeting was organised with AMN based on suggestions or feedback received from stakeholders. • Attended in-person meeting with Chief of Staff for AMN and relevant members of the institution. Eni presented the slide content describing the proposed survey activity and some of the suggestions or feedback received included: – AMN as the entity responsible for coordinating all government entities to discuss activities to be undertaken offshore. – Incorporating images of seabed or images collected during bathymetry survey within PSC area will aid in describing Eni's environmental assessment process to the public.	N/A
Autoridade Nacional do Petroleo (ANP)	Follow-up meeting (21.02.25) and presentation pack via email.	• This meeting summarised the consultations completed. It is important that Eni was able to meet ANP to ensure the authority is well informed about the consultation process.	N/A
FONGTIL	In-person meeting (26.02.25) and presentation pack via email	• Presented to members of FONGTIL and held an open forum discussion with members of FONGTIL that attended the session. During the presentation session, Eni presented details of the proposed survey activity and received important feedback, including: – Consideration on possible environment impact from the survey activity, specifically in relation to GHG emissions. – Expressed its concern regarding illegal fishing activity that is taking place within Timor-Leste sovereign waters. – Requested for more time to hold internal discussion among the members.	N/A

Stakeholder	Consultation Method/Date	Summary of Consultation	Inference for this SEIS
National University of Timor-Leste (Portuguese abbreviation UNTL)	In-person meeting (26.02.25) and presentation pack via email	• Attended in-person meeting with Dean and Deputy Dean of Engineering Faculty of UNTL. During the meeting, Eni presented detail information about the proposed survey activity. Key feedback received included: – Recommended a presentation from Eni to the Geology Department in UNTL. The Engineering Faculty is willing to organise the session.	N/A
Chambers of Commerce and Industry, Timor-Leste	Unable to meet during Stage 1 consultation	• Despite all efforts to secure a meeting with CCI-TL, it could not be realised. Eni will continue its efforts to secure a meeting in the next stage of consultation. • Eni was able to meet with the Vice President of CCI-TL which has an additional role as President of AEMTL	N/A

11 DIFFICULTIES ENCOUNTERED

It was difficult to find information specifically relating to the survey area, which is in a remote location. It was therefore necessary to use information from other offshore marine areas in Timor-Leste and Australian waters, some of which are distant from the survey area. The primary stakeholder engagement process provided a valuable source of additional information related to the survey area and mitigated some of the data acquisition difficulties.

12 CONCLUSIONS AND RECOMMENDATIONS

The outcome of this SEIS conclude that the survey activity can be achieved while meeting the ecological, socioeconomic and regulatory expectations.

Stringent control measures have been identified (refer to Section 8.2 and Section 8.3), which when implemented, will reduce the risk of planned and potential unplanned impacts from the survey activity.

Alternatives to the survey activity have been considered within Section 6. It was concluded that there are no suitable alternative to the activity to meet the survey objectives.

The PSC TL-SO 22-23 Seismic Survey EMP (Eni-AH08-EXP-1000282) provides further details of the control measures assessed and adopted to manage the survey activity impacts and risks to ALARP and acceptable levels.

13 NON-TECHNICAL SUMMARY

A non-technical summary of the information provided in this EIS is summarised Table 13-1.

Table 13-1: Nontechnical summary for the activity

English	Portuguese	Tetum
Introduction Eni Timor 22-23 B.V. ("Eni") is the operator (87.5% equity) of Production Sharing Contract (PSC) TL-SO 22-23 ("TL 22-23") with Timor GAP as JV partner (12.5% equity, carried) located in Timor-Leste offshore waters. Eni proposes to acquire seismic data within PSC TL 22-23 survey area over a period of up to 10 weeks, using towed streamer operations commencing between July and September 2025. There is also a contingent option for an extra 35km^2 3D seismic to be acquired over the Sikatan-1/ST1 well location, in addition to the firm 2D seismic line.	**Introdução** A Eni Timor 22-23 B.V. ("Eni") é a operadora (participação de 87,5%) do Contrato de Partilha de Produção (CPP) TL-SO 22-23 ("TL 22-23"), tendo a Timor GAP como parceira no consórcio (participação de 12,5%, *carried*), localizado em águas *offshore* de Timor-Leste. A Eni propõe a aquisição de dados sísmicos na área de estudo do CPP TL 22-23 durante um período de até 10 semanas, utilizando operações de *streamer* rebocado, com início previsto entre julho e setembro de 2025. Existe ainda uma opção contingente para a aquisição de sísmica 3D adicional (35 km²) sobre a localização do poço Sikatan-1/ST1, além da linha sísmica 2D.	**Introdusaun** Eni Timor 22-23 B.V. ("Eni") nu'udar operadór (ekidade 87.5%) husi *Production Sharing Contract (PSC)* TL-SO 22-23 ("TL 22-23") ho Timor GAP nu'udar parseiru *JV* (12.5% ekuidade, lori ba oin) ne'ebé lokaliza iha tasi-laran Timor-Leste. Eni propoin atu hetan dadus sízmiku iha área levantamentu PSC TL 22-23 nia laran durante períodu ida to'o semana 10, uza operasaun sira *streamer* rebokadu nian ne'ebé hahú entre Jullu no Setembru 2025. Iha mós opsaun kontijente ida ba sízmiku 3D 35km^2 ekstra ida ne'ebé sei hetan iha lokalizasaun posu Sikatan-1/ST1, iha adisaun ba liña sízmiku 2D.

Project Description	Descrição do Projeto	Deskrisaun Projetu
The survey area encompasses both 3D and 2D seismic areas, as well as manoeuvring and shooting areas, and is located in the Timor Sea, south of the Sunrise-Troubadour Gas Field in Timor-Leste offshore waters (Figure 3-1). The survey is planned to commence between July and September 2025. The survey is expected to up to 10 weeks to complete, including mobilisation, scouting, data acquisition, streamer deployment and recovery. Seismic data acquisition will occur 24 hours a day, although temporary shutdown periods may be required. *Streamer configuration* The survey activity will comprise a seismic vessel towing 10 to 12 streamers, approximately 8km long, with 75 to 112.5m spacings between streamers. Streamers will be towed at a depth of approximately 20m. Each streamer will have a tail buoy attached to ensure the streamer remains straight and afloat. The tail buoy will also provide a visual reference for seismic survey crew and GPS. The final streamer configuration will be confirmed following award of the seismic contract. *Seismic sound source configuration* The survey will use air guns as the sound source, with a volume less than 3,500 in^3. The sound sources will be towed at a depth of 8m. The air guns will fire at a maximum interval of 37.5m with an 8 second recording length. The sound source array and shooting configuration	A área de levantamento abrange zonas de sísmica 3D e 2D, bem como áreas de manobra e disparo, localizando-se no Mar de Timor, ao sul do Campo de Gás Sunrise-Troubadour, em águas offshore de Timor-Leste (Figure 3-1). O levantamento está planeado para começar entre julho e setembro de 2025 e deverá levar até 10 semanas para ser concluído, incluindo mobilização, reconhecimento, aquisição de dados, implantação e recuperação de cabos streamers. A aquisição de dados sísmicos ocorrerá 24 horas por dia, embora possam ser necessários períodos temporários de interrupção. *Configuração de Streamers* A atividade do levantamento envolverá um navio sísmico rebocando entre 10 e 12 cabos streamers, com aproximadamente 8 km de comprimento e espaçamentos de 75 a 112,5 m entre eles. Os cabos streamers serão rebocados a uma profundidade de aproximadamente 20 m, com boias de cauda anexadas para garantir que permaneçam retos e flutuantes. Estas boias também fornecerão uma referência visual para a tripulação do levantamento sísmico e GPS. A configuração final dos cabos streamers será confirmada após a adjudicação do contrato sísmico. *Configuração da Fonte Sonora Sísmica* O levantamento usará canhões de ar como fonte sonora, com um volume inferior a 3.500 in^3. As fontes sonoras serão rebocadas a uma profundidade de 8 m e dispararão a um intervalo máximo de 37,5 m, com um tempo de gravação de 8 segundos. A configuração da matriz de fontes sonoras e disparos	Área levantamentu engloba tantu área sízmika 3D no 2D, nune'e mós área manobra no tiru, no lokaliza iha Tasi Timor, parte súl husi Kampu Gás Sunrise-Troubadour iha tasi-laran Timor-Leste (Figure 3-1). Levantamentu ne'e planeia atu hahú entre fulan-Jullu no Setembru 2025. Levantamentu ne'e hein to'o semana 10 atu kompleta, inklui mobilizasaun, eskuteiru, akizisaun dadus, implementasaun *streamer* no rekuperasaun. Akizisaun dadus sízmiku sei akontese oras 24 iha loron ida, maski períodu sira parajen temporáriu nian bele presiza. *Konfigurasaun Streamer* Atividade levantamentu nian sei kompostu hosi ró sízmiku ida ne'ebé reboka ró-ahi 10 to'o 12, ho naruk maizumenus 8km, ho espasu 75 to'o 112.5m entre *streamer* sira. *Streamer* sira sei dada iha profundidade maizumenus 20m. *Streamer* ida-idak sei iha bóia ikun ne'ebé maka kesi atu asegura katak *streamer* ne'e loos no namlele nafatin. Bóia ikus sei fornese mós referénsia vizuál ba ekipa levantamentu sízmiku no GPS. Konfigurasaun finál *streamer* nian sei konfirma tuir atribuisaun kontratu sízmiku nian. *Konfigurasaun fonte lian sízmiku* Levantamentu sei uza kilat aéreu sira hanesan fonte lian nian, ho volume menus hosi 3,500 in^3. Fonte sira lian nian sei dada iha profundidade 8m. Kilat aéreu sira sei tiru iha intervalu másimu 37.5m ho durasaun gravasaun segundu 8. Lista fonte lian nian no konfigurasaun tiru nian sei

will be finalised following award of the tender, and included in the final seismic acquisition plan. *Seismic Survey Plan* The seismic vessel will traverse the survey area via an array comprised of 'sail lines'. Sail lines are typically parallel and adjacent to each other and will be surveyed by the seismic vessel with the seismic sound source and streamers active throughout the activity. The sail lines are expected to be on average 31km in length. During recording, the seismic vessel will travel at a speed of approximately 4.5 knots. *2D Seismic Data Acquisition* Approximately 60km of 2D seismic will be acquired to tie in the Sikatan-1/ST1 well to the 3D seismic survey. The Sikatan-1/ST1 well is located approximately 75m south of TL 22-23 in SundaGas operated TL 19-16. Approximately 4km of seismic sail line will be required within TL 19-16 for full imaging of the Sikatan-1/ST1 well location. Seismic operations for the 2D seismic line will therefore extend south into PSC TL-SO 19-16 *Contingent extra 3D seismic data acquisition* There is a contingent option for an extra ~35km^2 3D seismic to be acquired over the Sikatan-1/ST1 well location, in addition to the firm 2D seismic line. This would be achieved by continuing the sail lines southwards in the south-west corner of the full fold area, to a total sail line length of around 37km. The total width of this extra 3D seismic area would be	será finalizada após a adjudicação do concurso e será incluída no plano final de aquisição sísmica. *Plano de Levantamento Sísmico* O navio sísmico atravessará a área do levantamento através de um conjunto de "linhas de navegação", que são geralmente paralelas e adjacentes umas às outras. Estas linhas, com um comprimento médio de 31 km, serão percorridas com a fonte sonora sísmica e os cabos streamers ativos durante toda a atividade. Durante a gravação, o navio sísmico viajará a uma velocidade de aproximadamente 4,5 nós. *Aquisição de Dados Sísmicos 2D* Aproximadamente 60 km de sísmica 2D serão adquiridos para conectar o poço Sikatan-1/ST1 ao levantamento sísmico 3D. O poço Sikatan-1/ST1 está localizado a aproximadamente 75 m ao sul de TL 22-23, na área TL 19-16 operada pela SundaGas. Serão necessários cerca de 4 km de linha sísmica dentro da área TL 19-16 para a obtenção de imagens completas da localização do poço Sikatan-1/ST1. As operações sísmicas para a linha sísmica 2D, portanto, estender-se-ão para o sul, na área contratual PSC TL-SO 19-16. *Aquisição Contingente de Dados Sísmicos 3D* Existe uma opção contingente para a aquisição de aproximadamente 35 km² adicionais de sísmica 3D sobre a localização do poço Sikatan-1/ST1, em complemento à linha sísmica 2D. Esta aquisição seria realizada mediante a extensão das linhas de navegação para sul, no canto sudoeste da área de cobertura total, alcançando um comprimento total de linha de navegação de cerca de 37 km. A largura total desta área adicional de sísmica 3D seria	finaliza tuir atribuisaun ba konkursu, no inklui iha planu akizisaun sísmiku finál. *Planu Levantamentu Sísmiku* Ró sísmiku sei atravesa área levantamentu liuhosi matriz ida ne'ebé kompostu hosi 'liña vela'. Liña vela sira tipikamente paralelu no adjasente ba malu no sei halo levantamentu hosi ró sízmiku ho fonte lian sízmiku no *streamers* ne'ebé ativu iha atividade tomak. Liña vela sira hein katak sei iha média 31km nia naruk. Durante gravasaun, ró sízmiku sei hala'o viajen ho velosidade maizumenus 4.5 *knots*. *Akizisaun Dadus Sízmiku 2D* Maizumenus 60km hosi sízmiku 2D sei hetan atu liga iha posu Sikatan-1/ST1 ba levantamentu sízmiku 3D. Posu Sikatan-1/ST1 lokaliza maizumenus 75m parte súl hosi TL 22-23 iha SundaGas operadu TL 19-16. Maizumenus 4km hosi liña vela sízmika sei presiza iha TL 19-16 nia laran ba imajen kompletu hosi lokalizasaun posu Sikatan-1/ST1. Operasaun sízmiku sira ba liña sízmiku 2D sei estende ba súl iha PSC TL-SO 19-16. *Akizisaun dadus sízmiku 3D estra kontinjente* Iha opsaun kontinjente ida ba sízmiku 3D ~35km^2 estra ida ne'ebé sei hetan iha lokalizasaun posu Sikatan-1/ST1, aleinde liña sízmiku 2D. Ida-ne'e sei atinji liuhosi kontinua liña vela sira ba parte súl iha kantu sudoeste hosi área dobramentu kompletu, ba liña vela totál ida ho naruk besik 37km. Luan totál hosi área sízmika 3D estra ida-ne'e sei maizumenus 6km no sei hetan área tiru sízmiku nia laran.

English	Portuguese	Tetum
approximately 6km and would be acquired within the seismic shooting area. *Gravity and Magnetic Data acquisition* The planned survey may also include the acquisition of gravity and magnetic data. *Crew and Vessel Services* The seismic survey will be performed using a seismic vessel with one support vessel and three chase vessels. Crew changes will be undertaken via the support vessel or possibly helicopter.	aproximadamente de 6 km e seria adquirida dentro da área de disparo sísmico. *Aquisição de Dados de Gravidade e Magnetismo* O levantamento pode incluir a aquisição de dados de gravidade e magnetismo. *Tripulação e Serviços de Embarcação* O levantamento sísmico será realizado com um navio sísmico, uma embarcação de apoio e três embarcações de escolta. Trocas de tripulação serão realizadas via embarcação de apoio ou, possivelmente, helicóptero.	*Akizisaun Dadus Gravidade no Magnétiku* Levantamentu ne'ebé planeia ona bele mós, inklui akizisaun dadus gravidade no magnétiku nian. *Servisu sira ba Tripulasaun no Ró nian* Levantamentu sízmiku sei hala'o uza ró sízmiku ida ho ró apoiu ida no ró perseguisaun tolu. Mudansa sira ba tripulasaun sei hala'o liuhosi ró apoiu nian ka karik helikópteru.

Legal Framework
The implementation of the project is governed by numerous Timor-Leste laws as well as international agreements and conventions related to environmental protection and management including:
• Decree Law No. 25/2019 Petroleum transition
• Decree Law No. 39/2022 Environmental Licensing
• Article 31, Law No. 13/2005
  ○ Law No. 1/2019 amendment
  ○ Law No. 6/2019 amendment
The Autoridade Naçional do Petróleo Timor-Leste (ANP) is responsible for administering Decree Law 25/2019.
Key international environmental agreements and conventions that apply are listed in Table 5-1.
	Enquadramento Jurídico
	A execução do projeto é regida por diversas leis de Timor-Leste, bem como por acordos e convenções internacionais relacionados com a proteção e gestão ambiental, incluindo:
	• Decreto-Lei n.º 25/2019 – Transição do Petróleo;
	• Decreto-Lei n.º 39/2022 – Licenciamento Ambiental;
	• Artigo 31.º da Lei n.º 13/2005;
	  ○ Alteração pela Lei n.º 1/2019;
	  ○ Alteração pela Lei n.º 6/2019.
	A Autoridade Nacional do Petróleo e Minerais de Timor-Leste (ANP) é responsável pela administração do Decreto-Lei n.º 25/2019.
	Os principais acordos e convenções internacionais sobre proteção ambiental aplicáveis estão enumerados na Tabela 5.1.
		Enkuadramentu Legál
		Implementasaun projetu ne'e regula husi lei barak Timor-Leste nian no mós akordu no konvensaun internasionál sira ne'ebé relasiona ho protesaun no jestaun ambientál inklui:
		• Dekretu-Lei No. 25/2019 Tranzisaun petrolífera
		• Dekretu-Lei No. 39/2022 Lisensiamentu Ambientál
		• Artigu 31, Lei No. 13/2005
		  ○ Alterasaun ba Lei No. 1/2019
		  ○ Alterasaun ba Lei No. 6/2019
		Autoridade Nasion'al Petróleu Timor-Leste (ANP) mak responsavel ba administrasaun Dekretu-Lei 25/2019.
		Akordu no konvensaun ambientál internasionál xave sira ne'ebé aplika maka lista iha
		Tabela 5-1.

English	Portuguese	Tetum
Description of the Environment The survey area is located on the Sahul Shelf, on the continental slope in an area of largely flat and featureless seabed ranging in depth from 40 to 180m. There are no shoals or banks located within the survey area. However, a system of shoals and banks does occur to the east, north and northwest. The marine fauna of the Timor Sea is part of the Indo-West Pacific biogeographical province. Most species are widely distributed in this region. IUCN listed species possible or likely within the survey area include turtles, whales, sharks, dolphins and manta rays. Key economic industries within the region include fishing and infrequent commercial shipping. The undeveloped Sunrise-Troubadour Gas Field is located to the north of the survey area within blocks JPDA 03-19 (operator Timor Gap Greater Sunrise 03-19 Unipessoal Lda, 62.33%) and NT/RL2 (operator Woodside Energy Ltd., 35%) which are directly adjacent to PSC TL-SO 22-23.	**Descrição do Ambiente** A área de estudo está localizada na Plataforma de Sahul, no talude continental, numa zona de fundo marinho maioritariamente plano e sem características relevantes, com profundidades entre os 40 e os 180 metros. Não existem baixios ou bancos dentro da área de estudo. No entanto, um sistema de baixios e bancos ocorre a leste, norte e noroeste. A fauna marinha do Mar de Timor integra a província biogeográfica Indo-Pacífico Ocidental. A maioria das espécies tem uma distribuição ampla nesta região. Espécies listadas pela UICN que poderão ocorrer na área de estudo incluem tartarugas, baleias, tubarões, golfinhos e mantas. As principais atividades económicas na região incluem a pesca e uma navegação comercial pouco frequente. O campo de gás não desenvolvido Sunrise-Troubadour está localizado a norte da área de estudo, nos blocos JPDA 03-19 (operador Timor Gap Greater Sunrise 03-19 Unipessoal Lda, 62,33%) e NT/RL2 (operador Woodside Energy Ltd., 35%), que são diretamente adjacentes ao PSC TL-SO 22-23.	**Deskrisaun kona-ba Ambiente** Área levantamentu nian lokaliza iha Plataforma Sahul, iha enklave kontinentál iha área ida ho tasi-ibun ne'ebé maka rai-tetuk no laiha karakterístika ho profundidade entre 40 to'o 180m. Laiha tasi-ninin ka tasi-ibun sira ne'ebé lokaliza iha área levantamentu nian. Maibé, sistema ida hosi tasi-ninin no tasi-ibun sira akontese iha leste, norte no noroeste. Animál tasi husi Tasi Timor halo parte província biojeográfika Indo-Osidentál Pasífiku nian. Espésie barak liu maka distribui barak iha rejiaun ida-ne'e. Espésie sira ne'ebé maka lista IUCN posivel ka provável iha área levantamentu nian inklui lenuk, baleia, tubaraun, golfiñu no raiu manta. Indústria ekonómika xave sira iha rejiaun laran inklui peska no ró komersiál ne'ebé ladún akontese. Kampu Gás *Sunrise-Troubadour* ne'ebé seidauk dezenvolve lokaliza iha parte norte hosi área levantamentu nian iha bloku sira JPDA 03-19 (operadór Timor Gap Greater Sunrise 03-19 Unipessoal Lda, 62.33%) no NT/RL2 (operadór Woodside Energy Ltd., 35%) ne'ebé besik diretamente ba PSC TL-SO. 22-23.

English	Portuguese	Tetum
Consultation Eni initiated early engagement and consultation with a wide range of Timor-Leste government agencies. Eni will conduct public consultation following the submission of the SEIS. After the consultation period, this SEIS will be updated with any recommendations identified during the stakeholder consultation process.	**Consulta Pública** A Eni iniciou um envolvimento e consulta precoces junto de diversas entidades governamentais de Timor-Leste. A Eni realizará uma consulta pública após a submissão do SEIS (Statement of Environmental Impact). Após o período de consulta, este SEIS será atualizado com quaisquer recomendações identificadas durante o processo de consulta das partes interessadas.	**Konsulta** Eni inisia akordu no konsultasaun sedu ho ajénsia governu Timor-Leste lubuk ida. Eni sei halao konsulta publiku tuir submisaun *SEIS*. Hafoin períodu konsultasaun, *SEIS* ida-ne'e sei atualiza ho rekomendasaun ruma ne'ebé identifika durante prosesu konsultasaun ho parte interesada sira.
Concerns and Complaints To date no concerns or complaints have been made regarding the survey activity.	**Preocupações e Reclamações** Até à data, não foram registadas quaisquer preocupações ou reclamações relativamente à atividade de estudo.	**Preokupasaun no Keixa sira** To'o ohin loron seidauk iha preokupasaun ka keixa kona-ba atividade levantamentu.

English	Portuguese	Tetum
Environmental Management Plan The EMP details how environmental risks and impacts will be monitored and managed during the project phases. Key risks associated with the seismic activities include: • Noise emissions • Interaction with other marine users • Planned vessel discharges Robust controls have been identified to manage these risks, and with the exception of Risk ID P2 (seismic noise) all resulting in the consequence / residual risk being assessed as low and therefore acceptable. Seismic source noise (Risk ID P2) remains a medium residual risk. However, a range of controls has been adopted to manage noise emissions and reduce the risk to marine fauna. Vessels will adhere to JNCC Guidelines for Minimising the Risk of Injury to Marine Mammals from Geophysical Surveys and Eni's Minimum HSE Requirements for Geophysical Operations, ensures compliance with industry best practices for noise-related impacts.	**Plano de Gestão Ambiental** O PGA detalha como os riscos e impactos ambientais serão monitorizados e geridos durante as fases do projeto. Os principais riscos associados às atividades sísmicas incluem: • Emissões de ruído • Interação com outros utilizadores do meio marinho • Descargas planeadas das embarcações Foram identificados controlos robustos para gerir estes riscos, e, com exceção do Risco ID P2 (ruído sísmico), todos resultam numa consequência/risco residual avaliado como baixo e, portanto, aceitável. O ruído da fonte sísmica (Risco ID P2) mantém-se como um risco residual médio. No entanto, foram adotadas diversas medidas de controlo para gerir as emissões de ruído e reduzir o risco para a fauna marinha. As embarcações cumprirão as *JNCC Guidelines for Minimising the Risk of Injury to Marine Mammals from Geophysical Surveys* e os *Minimum HSE Requirements for Geophysical Operations* da Eni, garantindo a conformidade com as melhores práticas da indústria para impactos relacionados com o ruído.	**Planu Jestaun Ambientál** EMP fó sai detalle kona-ba oinsá risku no impaktu ambientál sira sei monitoriza no jere durante faze projetu nian. Risku xave sira ne'ebé asosiadu ho atividade sízmiku sira inklui: • Emisaun barullu • Interasaun ho utilizadór tasi sira seluk • Descarga ró nian ne'ebé planeadu Kontrolu sira ne'ebé maka'as identifika ona atu jere risku sira-ne'e, no ho exesaun ba Risku ID P2 (barullu sízmiku) hotu-hotu rezulta iha konsekuénsia / risku reziduál ne'ebé maka avalia hanesan ki'ik no tanba ne'e aseitavel. Barullu fonte sízmiku (ID Risku P2) sai nafatin risku reziduál médiu. Maibé, kontrolu oioin maka adota ona atu jere emisaun barullu nian no hamenus risku ba fauna tasi nian. Ró sira sei adere ba Matadalan JNCC nian ba Minimizasaun Risku Kanek ba Mamíferu Tasi nian sira hosi Levantamentu Jeofíziku sira no Eni nia Rekizitu Mínimu HSE nian ba Operasaun Jeofíziku sira, garante kumprimentu ho prátika di'ak liu indústria nian ba impaktu sira relasiona ho barullu.

English	Portuguese	Tetum
Conclusions and Recommendations	**Conclusões e Recomendações**	**Konkluzaun no Rekomendasaun sira**
The outcomes of the SEIS conclude that the seismic activities in Timor-Leste can be achieved while meeting ecological, socioeconomic and regulatory expectations.	Os resultados do SEIS concluem que as atividades sísmicas em Timor-Leste podem ser realizadas cumprindo as expectativas ecológicas, socioeconómicas e regulamentares.	Rezultadu sira hosi SEIS konklui katak atividade sízmiku sira iha Timor-Leste bele alkansa enkuantu hatán ba espetativa ekolojia, sosioekonómiku no regulatóriu sira.
The survey activity environmental management plan (EMP) outlines robust control measures to manage project related risks to as low as reasonably practicable (ALARP) and acceptable levels.	O plano de gestão ambiental (PGA) da atividade de estudo define medidas de controlo robustas para gerir os riscos associados ao projeto a níveis tão baixos quanto razoavelmente praticável (ALARP) e aceitáveis.	Planu jestaun ambientál (PJA) atividade levantamentu nian trasa medida kontrolu sira ne'ebé maka'as atu jere risku sira relasiona ho projetu ba nivel sira ne'ebé ki'ik liu ne'ebé razoavelmente pratikavel (ALARP) no aseitavel.
The performance of the project will be managed and monitored by the Autoridade Naçional do Petróleo Timor-Leste (ANP).	O desempenho do projeto será gerido e monitorizado pela Autoridade Nacional do Petróleo de Timor-Leste (ANP).	Dezempeñu projetu nian sei jere no monitoriza hosi Autoridade Nasionál Petróleu Timor-Leste (ANP).

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