

# PROPOSED SPECULATIVE 3D SEISMIC SURVEY IN THE ALGOA, GAMTOOS AND OUTENIQUA BASINS OFF THE SOUTHEAST COAST, SOUTH AFRICA

**Algoa, Gamtoos, Outeniqua Basins**

Prepared for: CGG Services SAS

PASA Reference:12/1/037



SLR Project No.: 720.03122.00001  
Report No.: 1  
Revision No.:  
October 2021

## DOCUMENT INFORMATION

Title	Proposed Speculative Seismic Survey in the Algoa, Gamtoos and Outeniqua Basins off the Southeast Coast, South Africa
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Keywords	CGG, alga, seismic
Status	Draft
Report No.	1
SLR Company	SLR Consulting (South Africa) (Pty) Ltd

## DOCUMENT REVISION RECORD

Rev No.	Issue Date	Description	Issued By
A	September 2021	Draft for Client Review	EC
B	October 2021	Draft for I&AP Review	EC

## REPORT SIGN OFF AND APPROVALS

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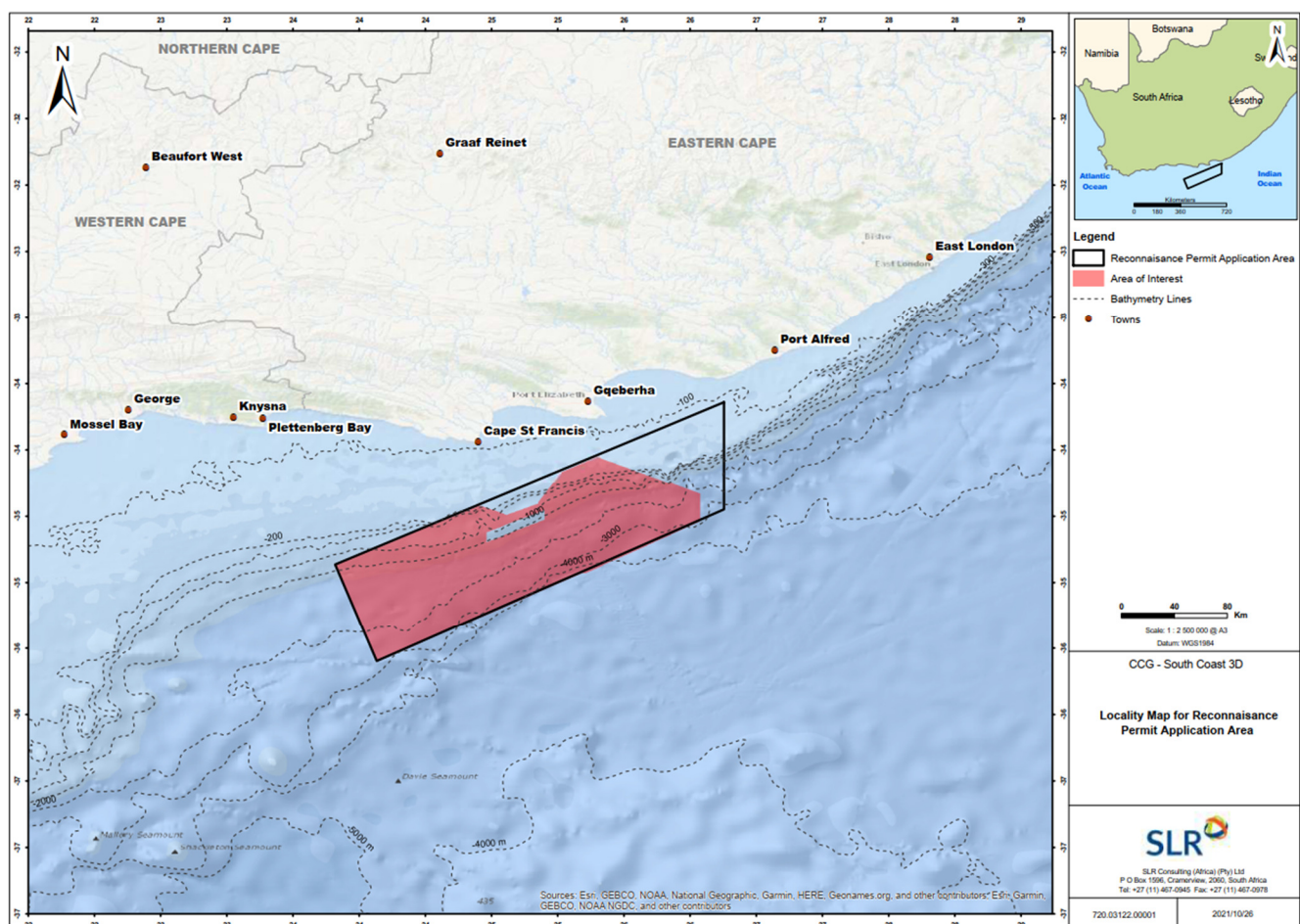
## EXECUTIVE SUMMARY

### 1. INTRODUCTION

#### 1.1 PROJECT BACKGROUND AND LOCATION

On 4 May 2021, the Petroleum Agency SA (PASA) accepted a Reconnaissance Permit Application submitted by CGG Services SAS (CGG) in terms of Section 74 of the Mineral and Petroleum Resources Development Act (No. 28 of 2002; MPRDA). The application provides for the undertaking of a multi-client speculative three-dimensional (3D) seismic survey in the Algoa, Gamtoos and Outeniqua Basins off the Southeast Coast of South Africa (see Figure 1).

The proposed survey area would be between 1 000 and 3 500 km<sup>2</sup> in extent within a 15 428 km<sup>2</sup> identified area of interest. The area of interest is located roughly between Gqeberha (previously Port Elizabeth) and a point approximately 120 km southeast of Plettenberg Bay, ranging between 30 km and 120 km from the coast in water depths between 150 m and 4 000 m. Actual survey commencement would ultimately depend on a permit award date and the availability of a survey vessel. It is currently anticipated that the survey would take up to five months to complete. Should the permit be awarded, it is anticipated that the proposed survey could commence in January 2022.



**Figure 1: Location of the Reconnaissance Permit area and Area of Interest for seismic acquisition in the Algoa, Gamtoos and Outeniqua Basins off the Southeast Coast**

At the time the Reconnaissance Permit Application was submitted to PASA, there was no requirement in the Environmental Impact Assessment (EIA) Regulations, 2014 (as amended) to apply for an Environmental Authorisation when applying for a Reconnaissance Permit, and as such PASA requested that CGG '*develop a plan for managing potential environmental impacts that may result from the proposed operations and notify and consult with affected parties*' and submit it to them for consideration by the Minister of Mineral Resources. For this application, the plan is referred to as an "Environmental Management Plan (EMP)". Although the Department of Forestry, Fisheries and the Environment (DFFE) subsequently published amendments to the EIA Regulations 2014, which now requires Environmental Authorisation for Reconnaissance Permit Applications, the transitional arrangements apply. Thus, this Reconnaissance Permit Application will be dispensed with in terms of the previous Regulations that were in place at the time of application submission.

CGG appointed SLR Consulting (South Africa) (Pty) Ltd (SLR) to compile this EMP and undertake the required public participation process for the proposed project.

## 1.2 OPPORTUNITY TO COMMENT

This draft version of the EMP has been distributed for a 30-day review and comment period from **29 October to 29 November 2021** in order to provide I&APs with an opportunity to comment on any aspect of the proposed project and the findings of the EMP. Copies of the full report are available on the SLR website (<https://slrconsulting.com/public-documents/cgg-southeast-coast>) and on a data free website (<https://slrpublicdocs.datafree.co/public-documents/cgg-southeast-coast>). The Executive Summary (available in English) is also available on the website and can be sent to stakeholders directly, via email or WhatsApp, on request. Any person who has trouble accessing the full report or Executive Summary is welcome to contact SLR for assistance. Hard copies of the EMP have been made available at the Walmer Library in Gqeberha (Main Road, Walmer), Jeffreys Bay Library (53 Diaz Road) and St Francis Community Library (3 Assissi Drive, St Francis Bay). A digital copy of the Summary can also be sent via Whatsapp, on request. Any person who has trouble accessing the full report or Executive Summary is welcome to contact SLR for assistance.

Any comments should be sent to SLR at the address or e-mail address shown below. Comments may also be sent by sending a written message or voice message (including leaving your contact information) by WhatsApp or SMS to the mobile number provided below. For comments to be included in the final EMP, comments should reach SLR by **no later than 29 November 2021**.

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## 2. EMP PROCESS

One technical modelling study and two specialist studies were commissioned to address the key issues that required further investigation and detailed assessment. These include:

- Technical Modelling Studies:
  - Underwater Acoustics Modelling Study.
- Specialist Studies / Assessments:

- Biodiversity and Ecosystem Services (marine fauna) Impact Assessment.
- Commercial Fisheries Impact Assessment.

The specialist studies and other relevant information / assessments have been integrated into the EMP. After closure of the comment period, all comments received on the draft report will be incorporated and responded to in a Comments and Responses Report. The draft report will then be updated to a final version, to which the Comments and Responses Report will be appended and submitted to PASA for consideration and review. After its review, PASA will provide a recommendation to the Department of Mineral Resources and Energy (DMRE) on whether to grant or refuse the Reconnaissance Permit.

After DMRE issues its decision, all I&APs on the project database will be notified of the outcome of the application and the reasons for the decision.

### 3. NEED AND DESIRABILITY

There is a drive from national and provincial Government to stimulate development and grow the economy of South Africa with a strong focus on job creation in all sectors, whilst protecting the environment. The COVID-19 pandemic has deepened the economic crisis in South Africa and as a result, inequality is expected to widen and poverty to deepen. In order to facilitate this economic growth, there is a critical need to ensure that there is sufficient capacity in the country's energy supply by diversifying the primary energy sources within South Africa. In this regard, South African Government policy currently supports exploration for indigenous hydrocarbon resources and currently promotes the use of hydrocarbons as part of the energy mix up to 2030 (per the IRP, 2019).

It is, however, acknowledged that the promotion of the oil and gas sector is not aligned with other National plans and policies, which identify the need to reduce the reliance on fossil fuels and shift to lower-carbon electricity generation options in order for South Africa to reduce Greenhouse Gas (GHG) emissions and meet commitments in this regard. Nevertheless, the current limitations of renewable energy technologies are such, that there is still a need (per the IRP, 2019) to include fossil fuels (notably natural gas) within the energy mix of the country at least in the short- to medium-term (up to 2030) to serve as bridge on the path to a carbon-neutral goal (as per the Paris Agreement). The no-go alternative would thus mean that other sources of energy would need to be identified and developed in order to meet the growing demand in South Africa.

The need to have a secure, reliable energy supply to ensure that the South African economy can grow and create jobs must be weighed up against the use of hydrocarbons in the short- to medium-term. Countries need to balance the three core dimensions of what has been defined as the Energy Trilemma: (1) affordability and access, (2) energy security and (3) environmental sustainability. It could, however, also be argued that in a country where the majority of our primary energy supply comes from coal, switching to hydrocarbons would be an improvement. In saying this it is acknowledged that the proposed exploration would result in the generation of information on petroleum resources (i.e. not in the production of petroleum). Thus, the need and desirability does not consider the benefits, or risks, of any possible future petroleum production. The proposed exploration activities would only allow for the determination of whether or not petroleum resources might be located off the Southeast Coast. By gaining a better understanding of the extent, nature and economic feasibility of extracting these potential resources, the viability of developing indigenous gas resources would be better understood.

Although there is general consensus that the world, including South Africa, must move towards a carbon-neutral society, the proposed exploration has no direct influence on South Africa's reliance on hydrocarbons and whether consumers use more or less oil or gas, nor on which types of fossil fuels contribute to the countries'

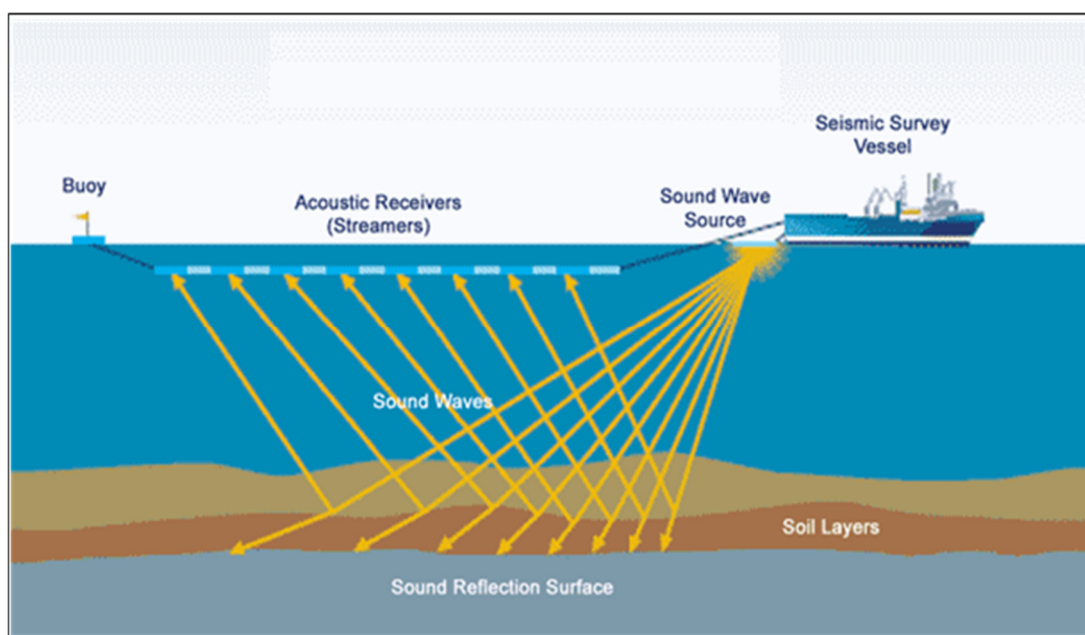


energy mix. The proposed project will not necessarily change how we use hydrocarbons and has no direct influence on GHG emissions that would arise from the consumption of fossil fuels. These aspects are influenced by South Africa's energy and climate change related policy, the financial costs of the various energy sources and consumer choices in this regard. The proposed project will potentially allow South Africa to optimise its own indigenous resources to provide for the hydrocarbon needs, rather than having to import. It won't necessarily change how we use hydrocarbons in the short- to medium-term.

## 4. PROJECT DESCRIPTION

### 4.1 Seismic Surveys

Marine seismic surveys are an essential part of exploring for hydrocarbons. They provide information on the depth, position and shape of underground geological formations. The principles of marine seismic acquisition are illustrated in Figure 2.



**Figure 2: Principles of offshore seismic acquisition surveys**

Source: <https://www.tes.com/>

During seismic surveys, high-level, low frequency sounds are directed towards the seabed from near-surface sound sources towed by a seismic vessel. The acoustic signal emitted into the water column penetrates the seabed, then is reflected by the rock formations encountered. The reflected signals are recorded by multiple receivers (or hydrophones) towed in a single or multiple streamer configuration. Analyses of the returned signals allow for interpretation of subsea geological formations.

A seismic acquisition campaign can be carried out in two or three dimensions (2D or 3D).

### 4.2 Project Scope and Activities

For this project, CGG is proposing to undertake a 3D seismic survey during the 2021/2022 summer survey window period (December to May inclusive), commencing in January 2022 at the earliest. CGG is likely to only acquire data in an area of approximately 1 000 km<sup>2</sup> to 3 500 km<sup>2</sup> within the proposed area of interest, with no data acquisition in Marine Protected Areas (MPAs) or within 30 km of the coast. The proposed survey would follow an evenly spaced north-south and east-west survey line grid (see Figure 1).

### 4.3 Technical Characteristics of the Seismic Acquisition

The main technical characteristics of the proposed 3D seismic survey is summarised in Table 1 below.

**Table 1: Characteristics of seismic acquisition operations (indicative)**

Airgun	
Type of Energy Source	Pressurized air
No. of airgun arrays	3
No. of active airguns	Approximately 36 per array
Spacings between airgun arrays	50 m to 100m
Towing depth of the airgun	Approximately 7 m
Source volume	Max 3 000 cubic inches each
Operational pressure	2 000 psi
Shot interval	Max every 5 seconds, 18.75 m interval between consecutive shot-points
Hydrophone Streamer	
Types of streamer	Solid
Number of streamers	8
Length of streamer	6 000 m
Depth of streamer	10 to 20 m

### 4.4 Main Project Components for Seismic Surveying

The main project components include the following:

- **Seismic survey vessel:** There will be a single survey vessel equipped with seismic source and streamers. Under the Convention on the International Regulations for Preventing Collisions at Sea (COLREGS, 1972, Part B, Section II, Rule 18), a seismic survey that is engaged in surveying is defined as a “*vessel restricted in its ability to manoeuvre*”, which requires that power-driven and sailing vessels give way to a vessel restricted in her ability to manoeuvre. Vessels engaged in fishing are required to, so far as possible, keep out of the way of the seismic operation. It is also considered to be an “offshore installation” in terms of the Marine Traffic Act, 1981 (No. 2 of 1981), and as such it is protected by a 500 m exclusion zone.
- **Support and escort (‘chase’) vessel:** The proposed survey would be supported by two vessels. The support vessel would perform logistics support (including crew changes, supply of equipment, fuel, food and water) to the survey vessel. The escort vessel will assist in monitoring for and alerting other vessels (e.g. fishing, transport, etc.) about the survey and the lack of manoeuvrability of the survey vessel. At a minimum, one Fisheries Liaison Officer (FLO) person speaking English and Afrikaans will be on board the escort vessel to facilitate communication in the local language with the fishing (or other) vessels that are in the area.
- **Onshore supply base:** The onshore supply base will be at the Port of Gqeberha. The service infrastructure required to provide the necessary onshore support is already in place in Gqeberha and no additional onshore infrastructure should be necessary for this project. It is also proposed to refuel in port during crew changes/re-provisioning.



## 5. RECEIVING ENVIRONMENT

### 5.1 Biophysical Environment

The water depths in the survey area of interest range from approximately 150 m to 4 000 m. A major bathymetric feature within the area of interest is Kingklip Ridge, situated on the slope between Gqeberha and Cape St Francis, a unique 40 km long, 500 m wide feature that rises from a depth of more than 700 m to as shallow as 350 m (Figure 3).

Along the Eastern Cape, westerly winds predominate in winter, frequently reaching gale force strengths. During summer, easterly wind directions increase markedly resulting in roughly similar strength/frequency of east and west winds during that season. The strongest winds are observed at capes, including Infanta, Robberg and Cape Recife.

On the Southeast coast, the majority of waves arrive from the south-west quadrant, dominating wave patterns during winter (June – August) and spring (September – November). Waves from this direction frequently exceed 6 m and can reach up to 10 m. The survey area of interest is located along the Eastern Agulhas Bank. The western Agulhas Bank is associated with higher nutrient values driven by coastal upwelling, whereas the shelf edge of the eastern Agulhas Bank is characterised by nutrient-poor surface waters and nutrient-rich bottom water, while the major part of the eastern Agulhas Bank is under the influence of the far-eastern Agulhas Bank upwelling cell, which provides nutrient rich bottom water.

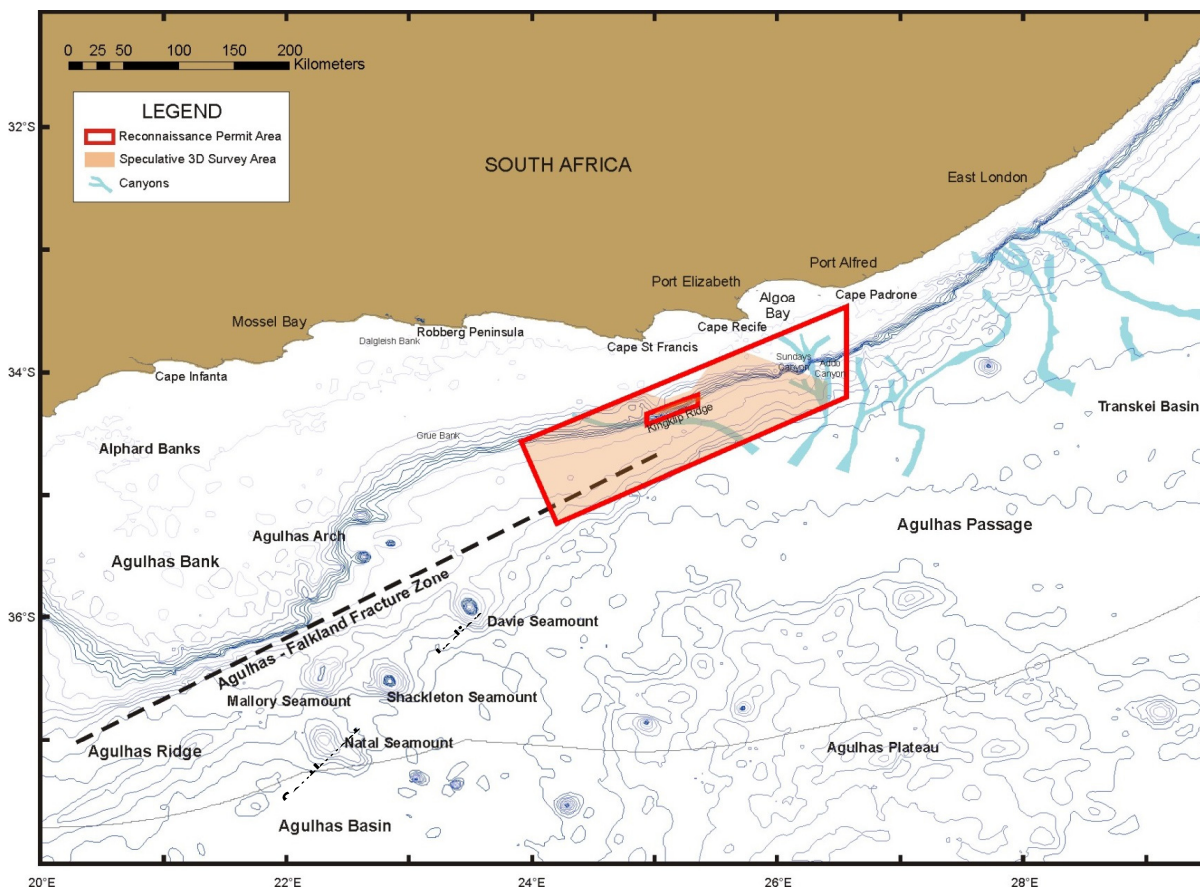
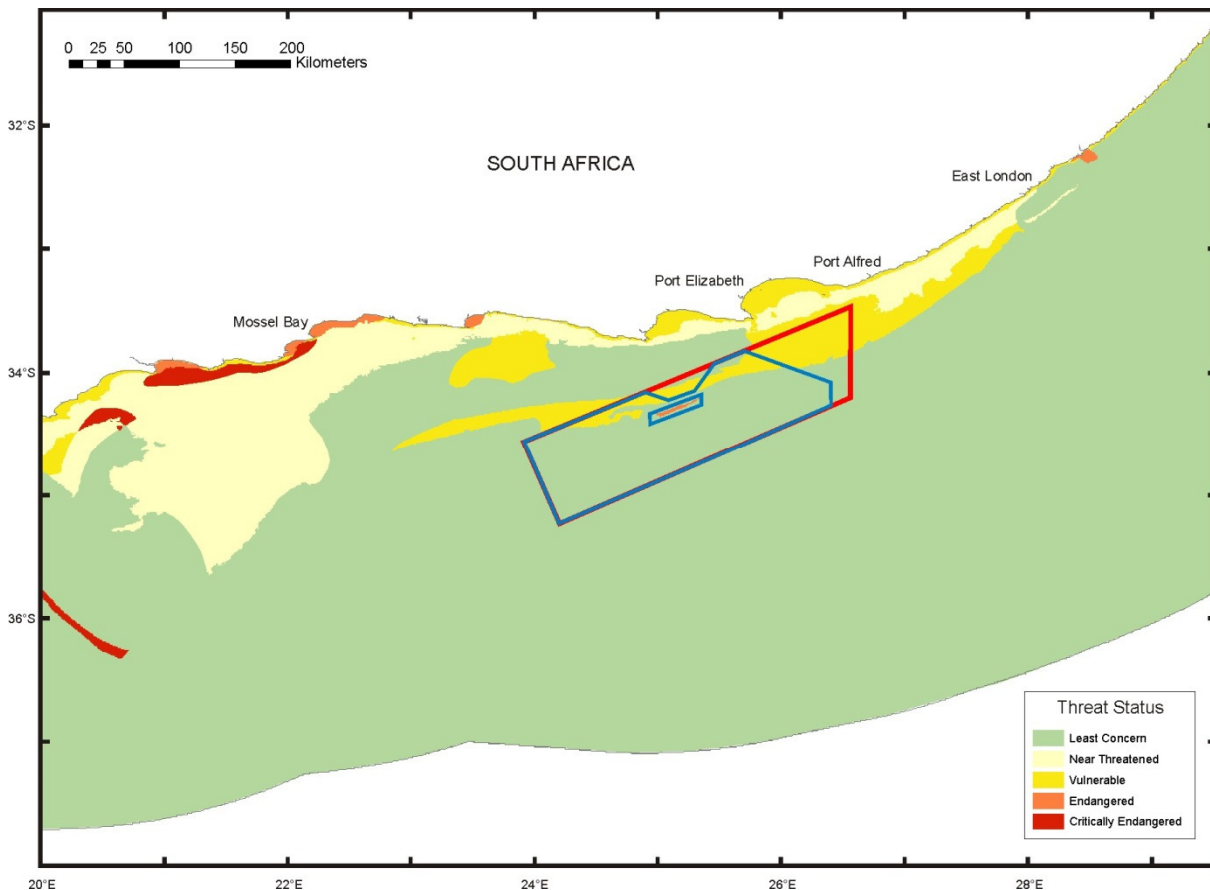


Figure 3: Area of interest (shaded) in relation to bathymetry and seabed features off the Southeast Coast

## 5.2 Biological Oceanography

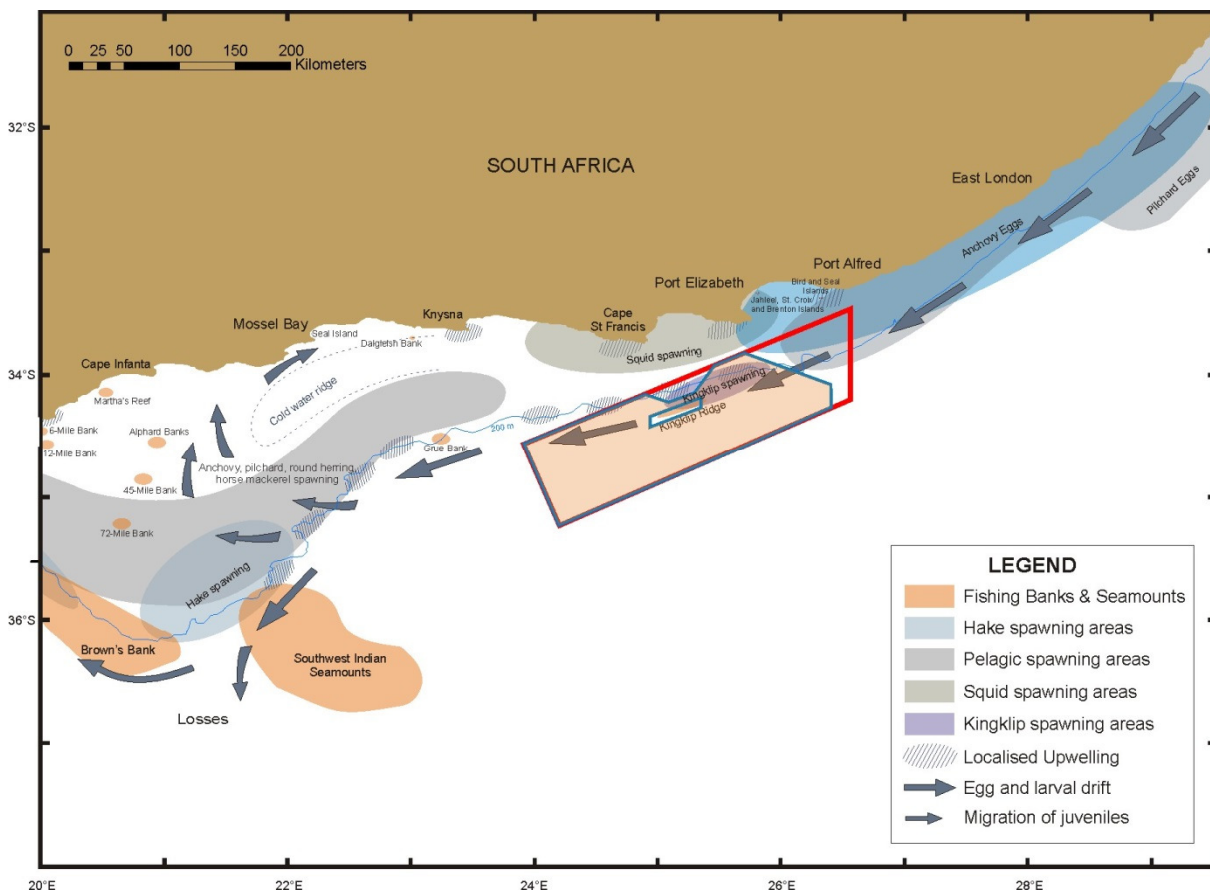
The survey area of interest falls into the Southwest Indian Deep Ocean ecoregion, with only the inshore portions falling into the Agulhas ecoregion. It is located beyond the 200 m depth contour, comprising primarily deepwater benthic habitats and the water body. The 2018 National Biodiversity Assessment rated the benthic habitat types and the offshore pelagic habitat types along most of the Southeast coast and within most of the Reconnaissance Permit Area as 'Least Threatened'. The Agulhas Coarse Sediment Shelf Edge, Agulhas Sandy Outer Shelf, Agulhas Upper Canyon and Kingklip Koppies ecosystem types are considered 'Vulnerable' and the Kingklip Ridge ecosystem type is considered 'Endangered' (see Figure 4).



**Figure 4: Area of interest (shaded) in relation to ecosystem threat status on the Southeast Coast**

A variety of pelagic fish species, including anchovy, round herring and horse mackerel, spawn east of Cape Agulhas between the shelf-edge upwelling and the cold-water ridge (see Figure 5). Spawning of the shallow-water hake occurs primarily over the shelf (<200 m) whereas that by the deep-water hake occurs off the shelf. Although hake are reported to spawn throughout the year (Strømme *et al.* 2015), they move to the western Agulhas Bank and southern West Coast to spawn in late winter and early spring (key period), when offshore Ekman losses are at a minimum. Their eggs and larvae drift northwards and inshore to the West Coast nursery grounds, where the greatest concentration of eggs and larvae occurs between September – October. Kingklip aggregate to spawn in an isolated area off the shelf edge to the south of St Francis and Algoa Bay referred to as the 'spawning box'. Spawning starts from August through to September and is habitat associated, occurring mostly in areas dominated by deep-water corals at depths of between 300 m and 500 m. Although the survey is not proposed during the key spawning season, there is some overlap of the inshore areas of the survey area of interest with the key kingklip spawning area (see Figure 5). Ichthyoplankton abundance in the inshore portions of the 3D survey area is thus likely to be seasonally high.

Small pelagic species include the sardine/pilchard, anchovy, chub mackerel, horse mackerel and round herring. These shoaling species generally occur within the 200 m contour and thus unlikely to be encountered in the majority of the survey area of interest. The fish most likely to be encountered on the shelf, beyond the shelf break and in the offshore waters of the proposed survey area are the large migratory pelagic species, including various tunas, billfish and sharks.



**Figure 5: The project area in relation to major spawning areas off the southeast coast**

Five species of turtle occur along the East Coast, with the Leatherback and Loggerhead turtles being the most likely to be encountered in the offshore waters of the area of interest during foraging migrations. Their abundance in the study area is expected to be low.

Fifteen seabird species breed within the Southeast Coast region, including Cape Gannets and African penguins, Cape Cormorants, White-breasted Cormorant, Roseate Tern, Swift Tern and Kelp Gulls. Most of the breeding resident seabird species feed on fish (with the exception of the gulls, which scavenge, and feed on molluscs and crustaceans), at times intensively target shoals of pelagic fish, particularly during the 'sardine run'. Small pelagic species such as anchovy and pilchard form important prey items for Agulhas Bank seabirds, particularly the Cape Gannet and the various cormorant species. African Penguin colonies in the vicinity of the Reconnaissance Permit Area occur at Cape Recife, and on the Algoa Bay islands (St Croix Island, Jaheel Island, Bird Island, Seal Island, Stag Island and Brenton Rocks), located 30 km and between 56 km and 70 km inshore of the survey area of interest, respectively. This species forages at sea with most birds being found within 20 km of the coast. The majority of Algoa Bay penguins forage to the south and east of Cape Recife and thus inshore of the area of interest. Cape Gannets may feed further offshore and may be encountered in the survey area of interest.

Between 28 and 38 species or sub-species/populations of cetaceans (whales and dolphins) are known or likely to occur in the waters of the Southeast Coast. The most common species within the project area (in terms of

likely encounter rate not total population sizes) are likely to be the long-finned pilot whale, sperm whale, southern right and humpback whale.

The Cape fur seal is the only species of seal that has breeding colonies along the Southeast coast, namely on the northern shore of the Robberg Peninsula in Plettenberg Bay and at Black Rocks (Bird Island group) in Algoa Bay, approximately 110 km and 70 km inshore of the survey area of interest, respectively.

### 5.3 Marine Protected Areas and other Conservation Areas

Approved Marine Protected Areas (MPAs) and Ecologically or Biologically Significant Areas (EBSAs) within the broad project area are shown in Figure 6. One offshore MPA, Port Elizabeth Corals MPA, is located within the area of interest, with three coastal MPAs located inshore of the survey area of interest, namely the Tsitsikamma, Sardinia Bay and Addo Elephant MPAs. No seismic survey operations would be undertaken within these MPAs. The survey area of interest also overlaps areas mapped as Critical Biodiversity Area 1 (CBA 1) Critical Biodiversity Area 2 (CBA 2) and Ecological Support Area (see Figure 7).

Coastal Important Bird Areas (IBAs) are all located inshore of the Reconnaissance Permit area and should not be directly affected by the proposed seismic survey. The eastern area of the Reconnaissance Permit area does, however, overlap with a portion of the proposed Alexandria coastal belt/Algoa Bay Islands Nature Reserve Marine IBA, specifically aimed at protecting the African Penguin, Cape Gannet, Kelp Gull, Damara Tern and Roseate Tern.

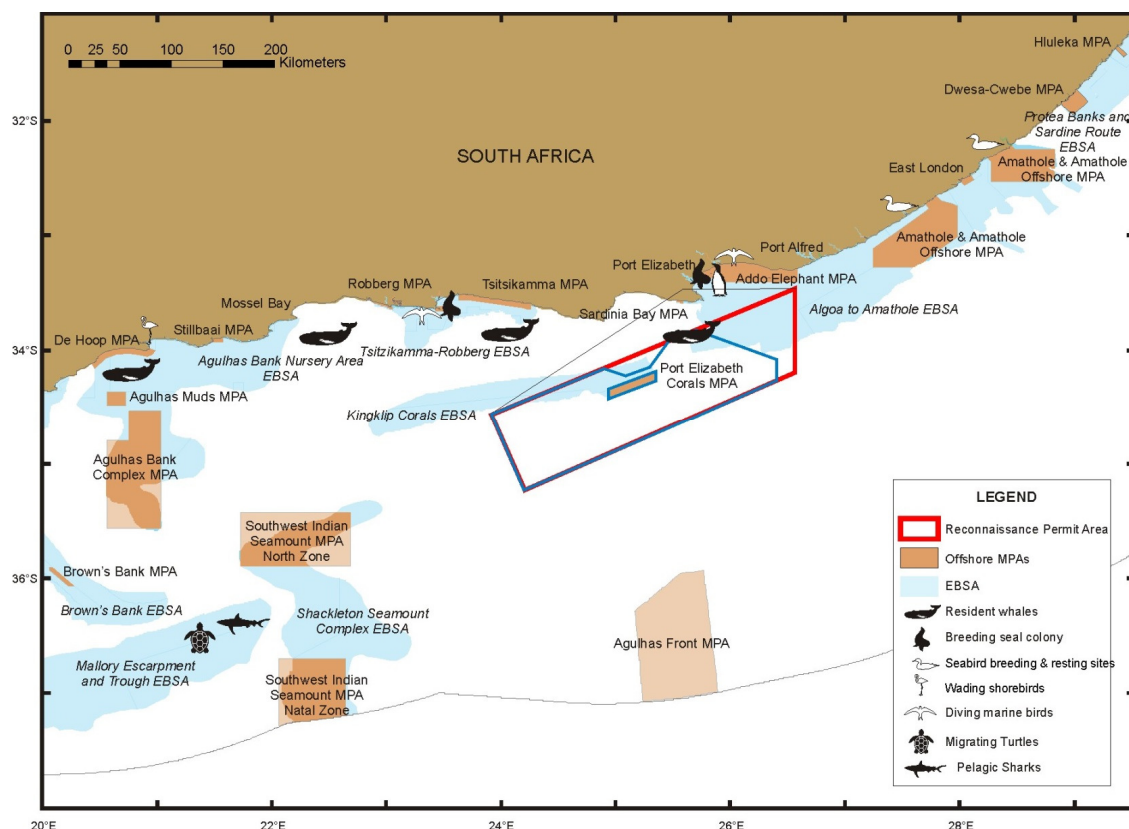
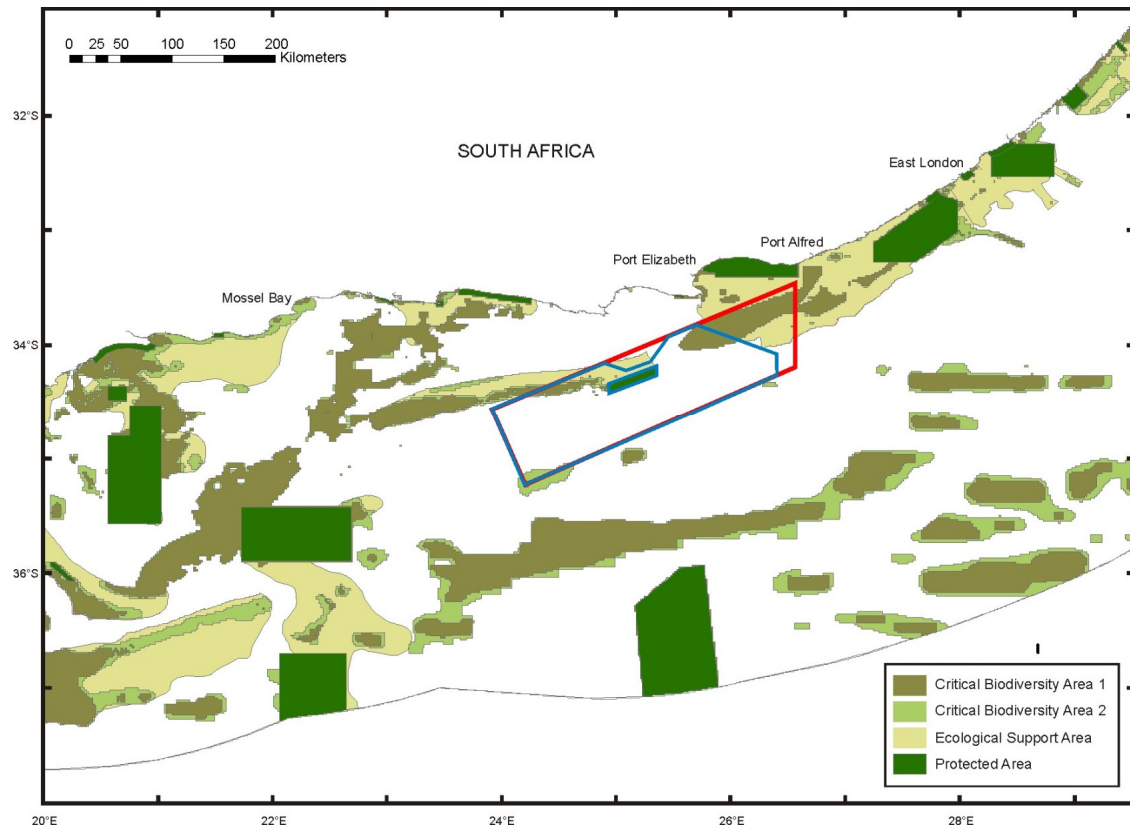


Figure 6: The survey area of interest in relation to MPAs and EBSAs off the southeast coast



**Figure 7: The survey area of interest in relation to CBAs off the southeast coast**

#### 5.4 Social Context and Human Utilisation

The project's area of influence encompasses the survey operational area within the proposed survey area of interest (including turning circles), the Port of Gqeberha for logistical support and the marine traffic route between Gqeberha and the survey area of interest. The survey area of interest is located offshore of the Sarah Baartman District Municipality and Nelson Mandela Bay Metropolitan Municipality in the Eastern Cape Province. The Sarah Baartman DM is further divided into seven local municipalities, four of which are located along the coast, namely: the Kou-Kamma, Kouga, Sundays River Valley and Ndlamba Local Municipalities.

The inshore areas of the proposed survey area of interest overlaps marginally with the Southeast Coast fishing grounds of the squid jig and small-scale fisheries (squid) sectors (<0.1%) (% of national catch indicated in brackets). Five other fisheries overlap with the majority of the proposed survey area of interest, including demersal trawl (13.3%), midwater trawl (29.2%), hake-directed demersal longline (7.1%), large pelagic longline (5%) and South Coast rock lobster (15.3%). Refer to Figures 8 to 13 for the proximity of the proposed project in relation to the key fishing sectors.



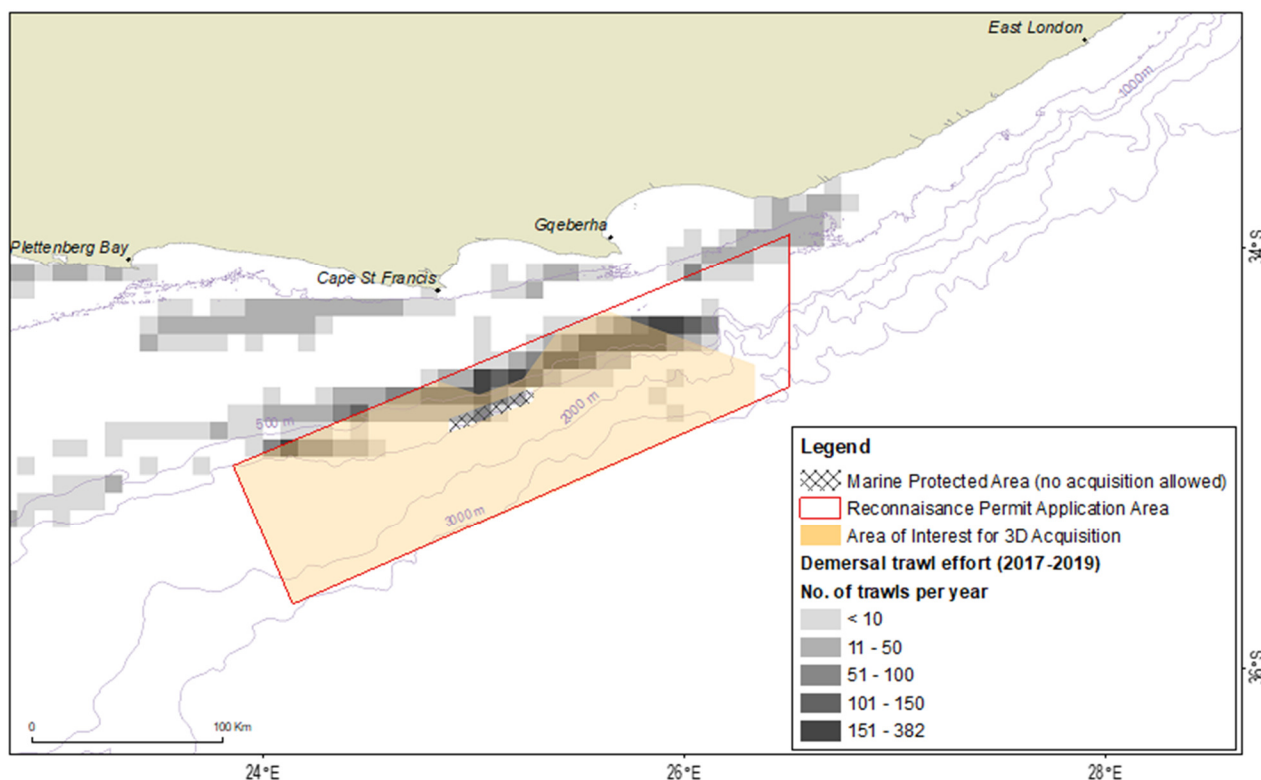


Figure 8: Survey area on interest in relation to the spatial distribution of demersal trawl effort (2017-2019)

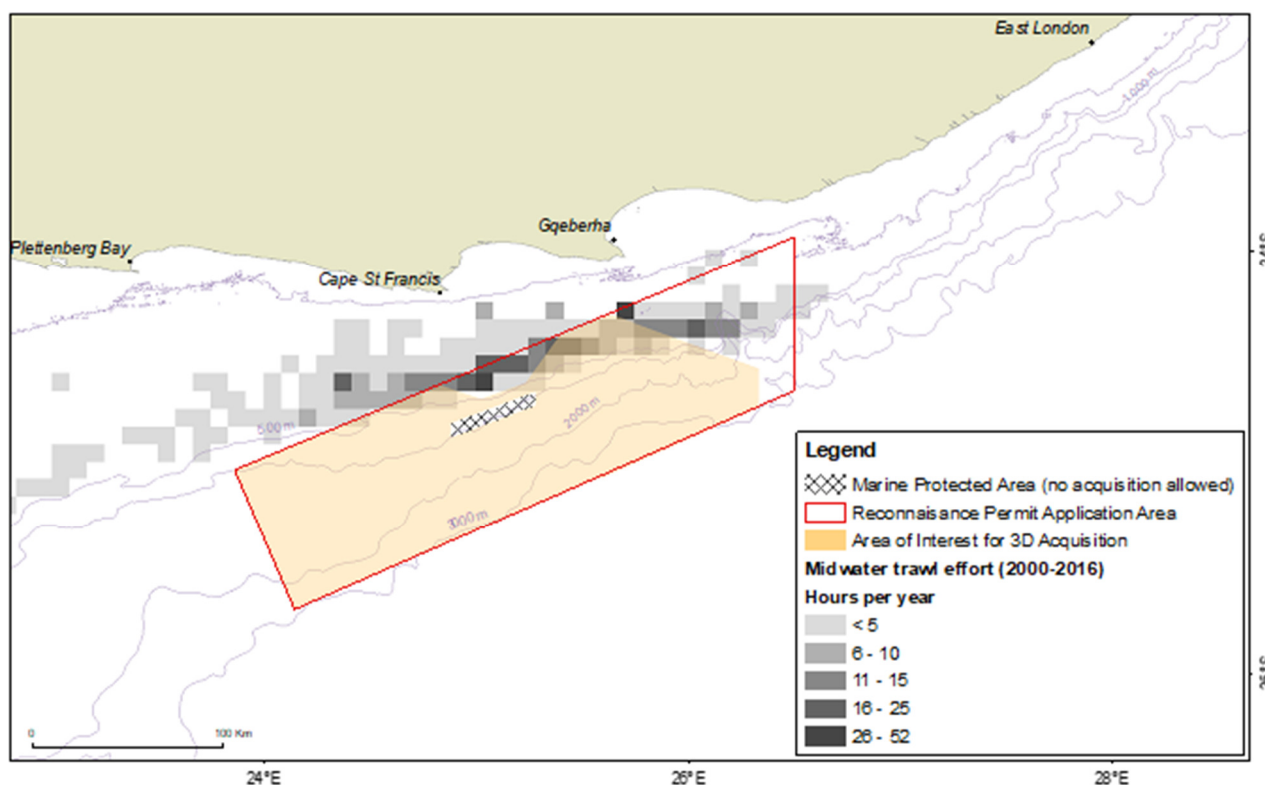


Figure 9: Survey area of interest in relation to the spatial distribution of mid-water trawl effort targeting horse mackerel (2000-2016)



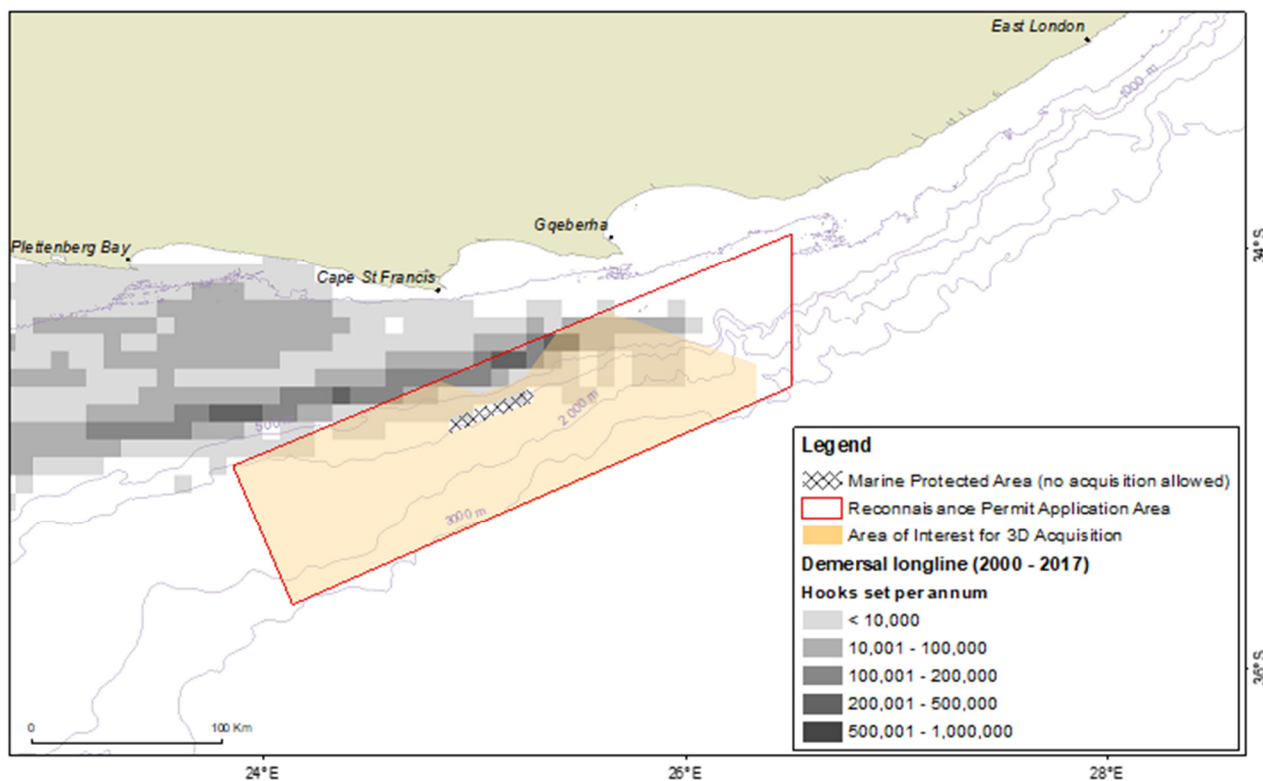


Figure 10: survey area in relation to the spatial distribution of hake-directed demersal longline effort (2000-2017)

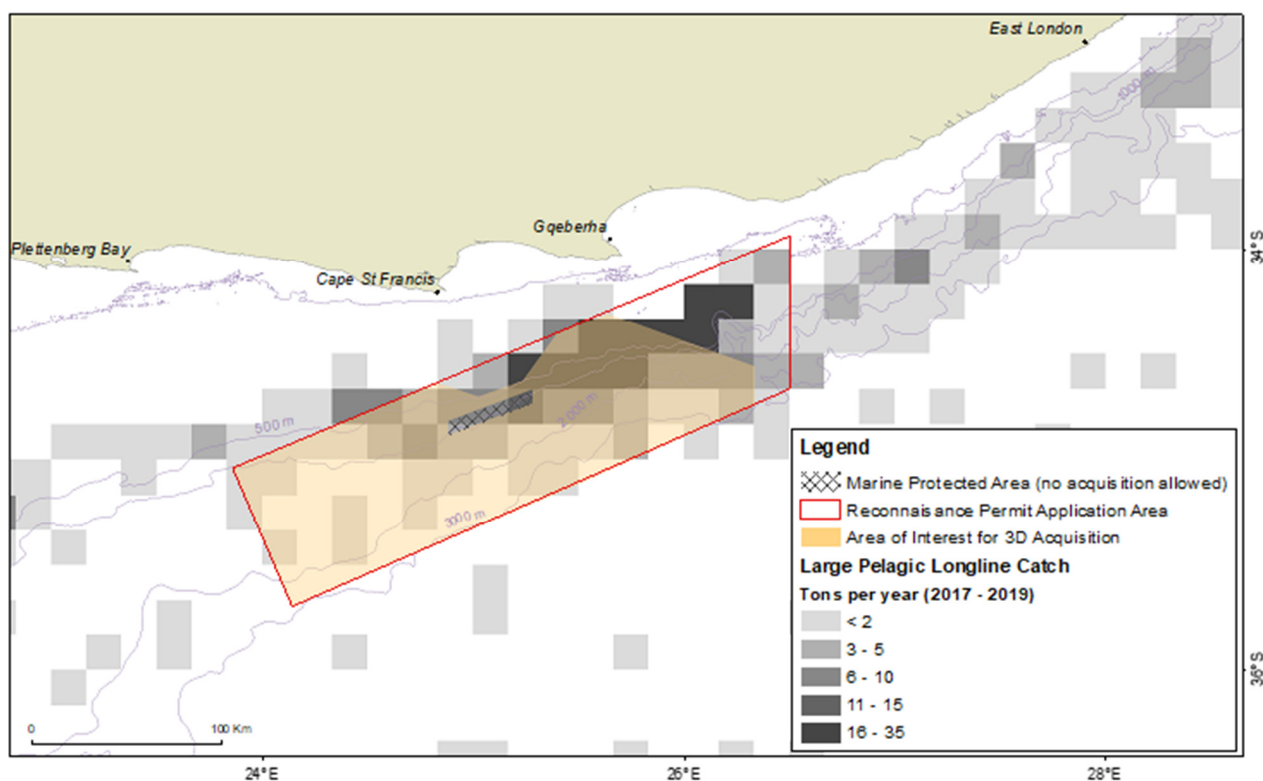
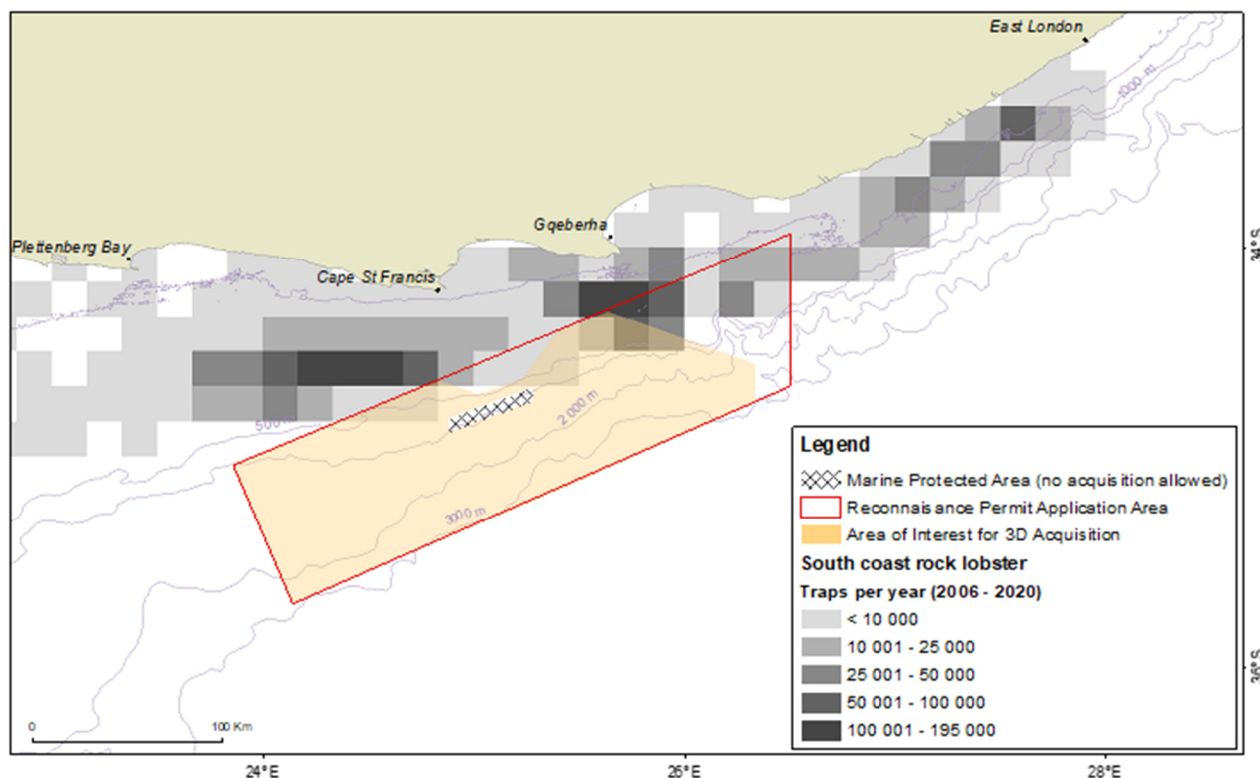
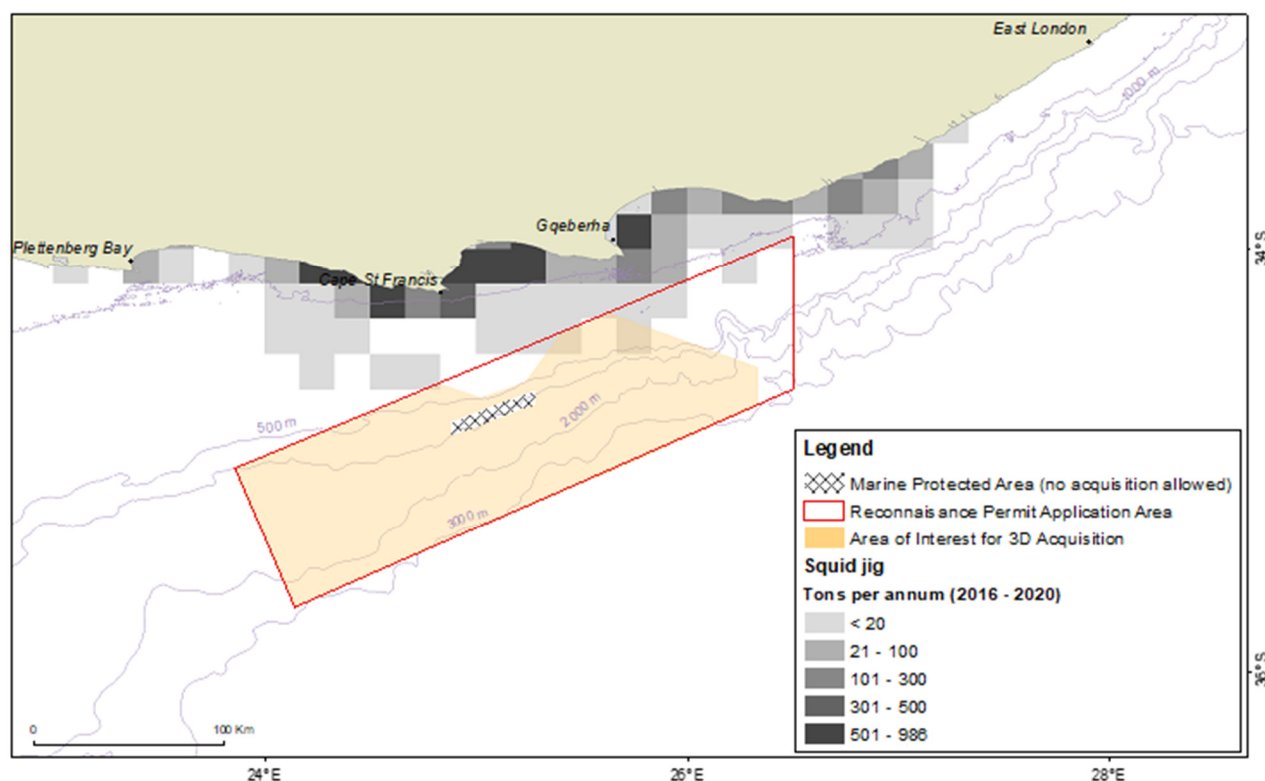


Figure 11: Survey area of interest in relation to the spatial distribution of large pelagic longline catch (2017-2019)



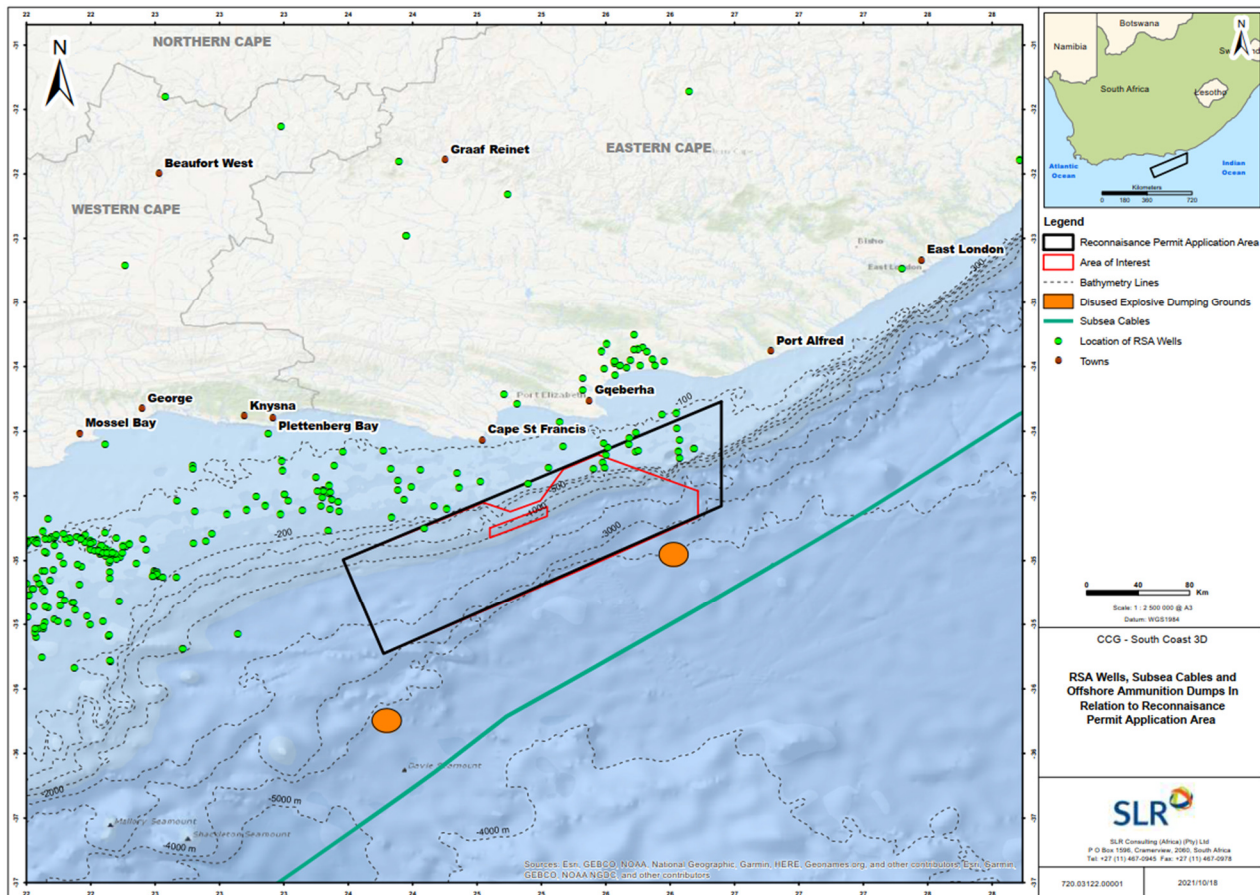
**Figure 12:** Survey area of interest in relation to the spatial distribution of South Coast rock lobster fishing effort (2006-2020)



**Figure 13:** Survey area of interest in relation to the spatial distribution of catch taken by the squid jig fishery (2016-2020)

Although the majority of vessel traffic, including commercial and fishing vessels, remains close inshore, a significant amount of ship traffic can be anticipated to pass through the area of interest.

Figure 14 shows the area of interest in relation to existing wells (exploration, appraisal and production), submarine cables and offshore ammunition dumps.



**Figure 14:** Survey area of interest in relation to existing wells, submarine cables and offshore ammunition dumps

## 6. IMPACT ASSESSMENT SUMMARY TABLE

A summary of the assessment of potential impacts and proposed mitigation is provided in Table 2 overleaf.

**Table 2: Summary of the significance of the impacts associated with the proposed speculative seismic survey off the Southeast Coast**

Note: (1) Neg = Negligible; VL = Very Low; L = Low; M = Medium; H = High; VH = Very High; +ve = Positive.

(2) \* indicates that no mitigation is possible and/or considered necessary, thus significance rating remains.

(3) \*\* indicates that although the significance rating of the impact remains the same, the intensity of the impact decreases due to the proposed mitigation.

No.	Activities	Aspects	Impacts on Main Receptors	Pre-Mitigation Significance	Key Mitigation / Project Controls	Residual Significance
1	OPERATION OF VESSELS (SURVEY AND SUPPORT)					
1.1	Emissions to Atmosphere					
1.1.1	Emissions from the operation of the project vessels	Increase of air pollutants	Local reduction in air quality	NEG	Compliance with MARPOL 73/78 Annex VI	NEG**
1.1.2			Contribution to global greenhouse gas emissions	NEG		NEG
1.2	Routine Operational Discharges to Sea					
1.2.1	Liquid and solid discharges to sea	Local reduction in water quality	Impact marine ecology/environment	VL	Compliance with MARPOL 73/78 Annexes I, IV and V	VL
1.2.1	Discharge of ballast water and vessel / equipment transfer	Potential introduction of alien invasive species	Impact on marine biodiversity	VL	Compliance with IMO 2004 Ballast Water Management Convention	NEG
1.3	Underwater noise from project vessels transit					
1.3.1	Vessel operation	Increased underwater noise levels	Impact on marine fauna	VL	None	VL*
1.4	Lighting from vessels					
1.4.1	Vessel operation (at night)	Increased ambient lighting	Impact on marine fauna	VL	Optimise lighting	VL**
1.5	Noise from helicopters					
1.5.1	Helicopter operation (unlikely, emergencies)	Increased ambient airborne noise levels	Impact on coastal and marine fauna	VL	<ul style="list-style-type: none"><li>Avoid sensitive areas</li><li>Maintain specified altitudes</li></ul>	VL**

No.	Activities	Aspects	Impacts on Main Receptors	Pre-Mitigation Significance	Key Mitigation / Project Controls	Residual Significance
<b>2</b>	<b>SEISMIC ACQUISITION</b>					
<b>2.1</b>	<b><i>Underwater Noise from Airguns</i></b>					
2.1.1	Seismic acquisition / firing of the airguns	Increased underwater ambient noise levels	Impact on cetaceans	M	<ul style="list-style-type: none"> <li>Avoid key migration period</li> <li>Pre-shoot watch (MMO &amp; PAM)</li> <li>“Soft-start” procedures</li> <li>MMO observation during surveying (daylight)</li> <li>PAM during surveying (24/7)</li> <li>Shut-downs</li> </ul>	L
2.1.2						
2.1.3			Impact on seals	L	<ul style="list-style-type: none"> <li>Pre-shoot watch (MMO)</li> <li>“Soft-start” procedures</li> <li>MMO observation during surveying (daylight)</li> <li>Shut-downs</li> </ul>	VL
2.1.4			Impact on turtles	M	<ul style="list-style-type: none"> <li>Pre-shoot watch (MMO)</li> <li>“Soft-start” procedures</li> <li>MMO observation during surveying (daylight)</li> <li>Shut-downs</li> </ul>	L
2.1.5			Impact on penguins and feeding diving seabirds	L	<ul style="list-style-type: none"> <li>Pre-shoot watch (MMO)</li> <li>“Soft-start” procedures</li> <li>MMO observation during surveying (daylight)</li> <li>Shut-downs</li> </ul>	VL
2.1.6			Impact on fish	M	<ul style="list-style-type: none"> <li>Avoid key spawning period</li> <li>Pre-shoot watch (MMO)</li> <li>“Soft-start” procedures</li> <li>MMO observation during surveying (daylight)</li> <li>Shut-downs</li> </ul>	L

No.	Activities	Aspects	Impacts on Main Receptors	Pre-Mitigation Significance	Key Mitigation / Project Controls	Residual Significance
2.1.7	Seismic acquisition / firing of the airguns	Increased underwater ambient noise levels	Impact on invertebrates	VL	<ul style="list-style-type: none"><li>“Soft-start” procedures</li><li>Shut-downs</li></ul>	NEG**
2.1.8			Impact on plankton	VL	<ul style="list-style-type: none"><li>Avoid key spawning period (September - December)</li></ul>	VL
2.1.9			Impact on demersal trawl, midwater trawl, demersal longline, large pelagic longline, South Coast rock lobster	L	<ul style="list-style-type: none"><li>Survey inshore areas last (March onwards)</li><li>Stakeholder notification</li><li>Navigational warning</li></ul>	L
2.1.10			Impact on squid jig, small pelagic purse-seine, small-scale fisheries	VL	<ul style="list-style-type: none"><li>Fisheries Liaison Officer (FLO)</li><li>Grievance mechanism</li></ul>	VL
2.2	Temporary Safety Zone around Survey Vessel and Array					
2.2.1	Operation of seismic vessel	Temporary safety zone around survey vessel and array	Impact on demersal trawl, midwater trawl, demersal longline, large pelagic longline, South Coast rock lobster	L	<ul style="list-style-type: none"><li>Survey inshore areas last (March onwards)</li><li>Stakeholder / vessel notification</li></ul>	L
2.2.2			Impact on squid jig, small-scale fisheries	VL	<ul style="list-style-type: none"><li>Navigational warning</li><li>Vessel lighting</li></ul>	VL
2.2.3			Disruption to commercial shipping	L	<ul style="list-style-type: none"><li>Grievance mechanism</li></ul>	L**
3	INTERACTION WITH THE LOCAL ECONOMY					
3.1	Employment and Business Opportunities					
3.1.1	Provision of services	Local employment and local business opportunities	Economic benefits for local service providers and suppliers	NEG +ve	<ul style="list-style-type: none"><li>Contracting of local companies</li><li>Manage community expectations</li><li>Grievance mechanism</li></ul>	NEG +ve



No.	Activities	Aspects	Impacts on Main Receptors	Pre-Mitigation Significance	Key Mitigation / Project Controls	Residual Significance
4	UNPLANNED EVENTS					
4.1	Collisions with project vessels and equipment					
4.1.1	Ship strikes and entanglement	Obstruction on sea surface, seafloor or in water column	Health and safety impacts to coastal recreation and fishing	NEG	<ul style="list-style-type: none"><li>Emergency Response Plan</li><li>Stakeholder information</li><li>Navigation warning</li><li>Implement a grievance mechanism</li></ul>	NEG**
4.1.2			Impacts on marine fauna	L	<ul style="list-style-type: none"><li>‘Turtle-friendly’ tail buoys</li><li>Reduced transit speed</li><li>Ensure all equipment used is thoroughly cleaned</li></ul>	L**
4.2	Accidental Release of Oil at Sea					
4.2.1	Vessel or equipment damaged and bunkering of fuel	Release of fuel into the sea and localised reduction in water quality	Impacts on marine ecology/environment	M	<ul style="list-style-type: none"><li>Bunkering procedure</li><li>Shipboard Oil Pollution Emergency Plan – MARPOL Annex I</li><li>Emergency Response Plan and notification</li><li>Spill training and clean-up equipment</li></ul>	L
4.2.2			Impacts on offshore commercial fishing	VL		VL**
			Impacts on commercial fishing	L		L**
4.3	Loss of Equipment at Sea					
4.3.1	Accidental loss of equipment	Obstruction on seafloor or in water column	Impacts on marine ecology/environment	VL	<ul style="list-style-type: none"><li>Maintenance and lifting procedures</li><li>Retrieve of lost objects / equipment, where practicable</li><li>Notify PASA, SAMSA and the SAN Hydrographer</li></ul>	VL**
4.3.2			Impacts on commercial fishing	VL		VL**

## 7. CONCLUSIONS

### 7.1 Normal operation

#### 7.1.1 Operation of Project Vessels: Emissions, Routine Discharges, Lighting and Noise

The majority of the impacts associated with the normal operation of the project vessels will occur in the vicinity of the area of interest, which is the offshore marine environment, more than 30 km offshore, removed from sensitive coastal receptors (e.g. key faunal breeding / feeding areas and bird or seal colonies). The area of interest, however, overlaps with the Port Elizabeth Corals MPA, portions of two EBSAs and CBAs.

The dominant wind and current direction will ensure that any **emissions and discharges** move mainly in a south-westerly direction away from the coast. These impacts will largely be regional (although generally localised at any one time), of short-term duration (up to five months) and of very low to low intensity, and are considered to range from **NEGLIGIBLE** to **VERY LOW** significance with mitigation. Key mitigation includes ensuring that the project vessels comply with MARPOL 73/78 standards.

**De-ballasting** of project vessels could lead to the introduction of exotic species and harmful aquatic pathogens to the marine ecosystem. The risk of impacts on marine biodiversity related to the introduction of alien species is significantly reduced by adherence to the 2004 IMO guidelines governing discharge of ballast, which specifies minimum discharge distances from the nearest land. Considering the dynamic location of the survey area and compliance with the IMO guidelines for ballast water, the residual impact is considered to be of very low intensity in the short-term (due to invasive species not being able to establish) and of regional extent. Thus, the residual impact is of **NEGLIGIBLE** significance.

The **noise generated by the operation of the project vessels** falls within the hearing range of most fish and marine mammals, and would be audible for considerable ranges before attenuating to below threshold levels. However, underwater noise from vessels is not considered to be of sufficient amplitude to cause direct harm to marine life, even at close range. The impact related to vessel noise is considered to be of **VERY LOW** significance. No mitigation measures are proposed or deemed necessary.

**Operational lighting** used to illuminate the project vessels at night will increase ambient lighting in offshore areas, which may disturb and disorientate pelagic seabirds feeding in the area. Since the survey area is located within a busy traffic route along the Southeast Coast of South Africa, which experiences high vessel traffic, animals in the area should be accustomed to vessel traffic within a few days. The residual impact related to vessel lighting is considered to be of **VERY LOW** significance.

These impacts are not unique to the project vessels, but common to the numerous vessels that pass through South African coastal waters on a daily basis.

#### 7.1.2 Helicopter Operations

Crew changes will most likely occur by support or survey vessel calling to port. However, if necessary for personnel transfer or in emergency situations, the helicopter may fly over or in close proximity to sensitive coastal receptors, such as seal and seabird breeding colonies, which could be affected by a flight path between the survey area of interest and the airport. Although exposure during crew changes will be limited over the five-month survey duration and be of a temporary nature while the helicopter passes overhead, indiscriminate or direct low altitude flying over seabird and seal colonies or breeding cetaceans could impact fauna behaviour and breeding success. Specified flight paths that avoid these sensitive receptors will reduce the impact intensity on marine fauna, but maintain the **VERY LOW** significance.

### 7.1.3 Seismic Acquisition

Seismic noise could impact **marine fauna** in number of different ways, including physiological injury (e.g. permanent - PTS and temporary - TTS), disturbance and / or behavioural changes, masking of environmental sounds and communication, and effects on predator-prey relationships. Any impact to fish and fish behaviour could, in turn, impact commercial fisheries that operate in the area through the reduction in catch rates and/or an increase in fishing effort.

The maximum estimated zones of impact for PTS, TTS and behaviour for the various faunal groups are summarised in Table 3 below.

**Table 3: Zones of Impact from seismic pulses for all faunal groups**

Type of animal		Zones of impact – maximum horizontal distances from source to impact threshold levels				
		Immediate Impact from Single Pulses		Cumulative Impact from Multiple Pulses		Behaviour
		Injury (PTS) onset	TTS onset	Injury (PTS) onset	TTS onset	
Mammals	Cetaceans	480 m (VHF cetaceans)	850 m (VHF cetaceans)	800 m (LF cetaceans)	12 000 m (LF cetaceans)	4 400 m
	Seals	25 m	35 m	-	< 10 m	-
Type of animal		Mortality & Mortal Injury	Recovery injury	Mortality & Mortal Injury	Recovery injury	
Fish	Fish (with swim bladder)	240 m	240 m	20 m	50 m	5 000 m
Sea turtles		240 m	-	< 10 m	-	3 100 m
Notes:						
<ul style="list-style-type: none"> <li>A dash indicates the threshold is not applicable.</li> <li>If the zone of impact for cumulative is smaller than that for the single pulse, then the marine species are likely to be more sensitive to pressure impact than energy impact.</li> </ul>						

Thus, animals would need to be in relatively close proximity to operating airguns to suffer permanent physiological injury, and, most being highly mobile, it is assumed that they would avoid sound sources at distances well beyond those at which injury is likely to occur. Behavioural effects, although with a slightly larger zone of impact, are generally short-term with duration of the effect being less than or equal to the duration of exposure, although these vary between species and individuals, and are dependent on the properties of the received sound.

With the implementation of the recommended mitigation, the residual impact on **marine fauna** ranges from **LOW** (cetaceans, turtles and fish) to **VERY LOW** (diving seabirds, seals and plankton) to **NEGLIGIBLE** (invertebrates and other plankton) significance. Key mitigation includes ensuring the seismic survey avoids the key cetacean migration period from June to November (inclusive) and key spring fish spawning periods (September to December (inclusive)), implementing a 60-minute pre-watch period and “soft-start” procedure, monitoring the faunal activity within the mitigation zone when the airgun array is active and terminating seismic shooting, as specified.

The area of interest overlaps with the fishing grounds of seven **fishing sectors**, namely demersal trawl, midwater trawl, demersal longline, large pelagic longline, South Coast rock lobster, squid jig and small-scale fishing for squid (marginally).

With the implementation of the mitigation measures related to the temporary exclusion zone, which will ensure good communication and coordination with the fishing sectors and avoidance of the inshore fishing areas until March (if possible), the residual impact on the demersal trawl, midwater trawl, demersal longline, large pelagic longline and South Coast rock lobster is assessed to be of **LOW** significance. Due to the minimal overlap with the fishing grounds and limited catch recorded, the impact on the squid jig and small-scale fisheries is assessed as of **VERY LOW** significance. There would be no exclusion zone impacts on the traditional linefish and small pelagic purse-seine sectors. Although fishing activities will be temporarily excluded from the safety zone around the survey vessel and its array, fishing could continue in adjacent areas.

Similarly, **commercial shipping** would be excluded from portions of the survey area at any one time and may require these vessels to adjust their course slightly (detour) to avoid the survey vessel and lines being shot. With the implementation of the mitigation measures, which includes the broadcasting of a navigational warning for the duration of the survey, residual impacts on commercial shipping are assessed to be of **LOW** significance.

#### 7.1.4 Interaction with the Local Economy

The seismic activities will result in limited **economic benefits** with respect to the recruitment and the use of local service providers or suppliers. The demand for such local services will largely be limited to crew accommodation, meals, basic goods, and refuelling, provided in the selected supply port, Gqeberha. In addition, the workforce required for the exploration activities is expected to be 100 persons in total. Although the majority of these positions will be filled by international experts employed by the seismic survey contractor, there will be indirect employment via the contracting of local service providers and suppliers. The maximisation of opportunities for locals will result in a residual impact of **NEGLIGIBLE (positive)** significance. Due to the limited nature of this work, it is important to actively manage community expectations related to local procurement, local content, and local employment opportunities.

### 7.2 UNPLANNED EVENTS

Unplanned events may conceivably occur as a result of accidents or abnormal operating conditions, including a vessel collision and faunal strikes, accidental spills from bunkering or a vessel accident, and lost equipment.

**Oil or diesel spilled** in the marine environment will have an immediate detrimental effect on water quality. Being highly toxic, marine diesel released during an operational spill (e.g. during bunkering, vessel or equipment damage) will negatively affect any marine fauna in which it comes into contact. In the unlikely event of a spill, the intensity of the impact would depend on whether the spill occurred in offshore waters where encounters with pelagic seabirds, turtles and marine mammals would be low due to their extensive distribution ranges, or whether the spill occurred closer to the shore where encounters with sensitive receptors will be higher. Due to the dominant winds and currents, a diesel slick in the survey area would be blown in a south-westerly direction and away from sensitive coastal receptors. A small diesel spill would remain at the surface for less than 5 days (short-term) with no chance of it reaching sensitive coastal habitats. A spill within the port limits during bunkering / loading could, however, be easily managed and contained, and is less likely to pose a risk to the nearshore environment. A spill outside the port near the coast (e.g. in the unlikely event of a vessel collision) could reach the shore and mariculture activities through wave action and tidal currents. As the intensity of a nearshore spill may be higher than an offshore spill, the residual impacts on marine ecology and nearshore fishing (mariculture and small-scale) are considered to be of **LOW** significance, while the residual impacts on commercial fishing (offshore) are considered to be of **VERY LOW** significance.

significance. Key project controls include implementing the Shipboard Oil Pollution Emergency Plan and Emergency Response Plan.

The potential impacts associated with **lost equipment** to the seabed may initially crush benthic fauna, whereafter it would provide a localised area of hard substrate in an area of otherwise unconsolidated sediments. This would be of short-term duration as any lost object will likely sink into the sediments and be buried over time. Since the proposed survey area of interest overlaps with demersal fishing grounds along the shelf break, snagging of demersal gear due to equipment that sinks to the seabed is considered possible. The loss of a streamer would also result in entanglement and collision hazards in the water column before they sink under their own weight. The residual impacts on marine fauna and commercial fishing are both considered to be of **VERY LOW** significance. Due to the cost of the equipment, gear will be recovered, where possible, thereby reducing the likelihood of these impacts.

Movement of vessels between the survey area and the supply port may result in limited interaction with recreational and fishing boats that could lead to **vessel collisions** and related damage to vessels and death / injuries to humans. To be prepared for a collision event, the project will implement an emergency response system. As standard practice, an Emergency Response Plan and Medical Evacuation Plan will be implemented. Assuming compliance with port control and laws of the sea when navigating in the vicinity of the supply port, it is unlikely that collisions would occur, and the potential residual impact is assessed to be of **NEGLIGIBLE** significance.

**Faunal strikes** with the project vessels or the towed array, although unlikely, may occur during vessel transit or surveying. The residual impact is considered to be of **LOW** significance with the use of 'turtle-friendly' tail buoys, ensuring that all equipment that has been used in other regions is thoroughly cleaned prior to and regularly during use (less likely to attract animals wanting to feed off organisms growing on the equipment) and reducing transit speed from 12 knots to 10 knots in the vicinity of sensitive marine fauna and within 25 km from the coast.

### 7.3 CUMULATIVE IMPACT

The assessments of impacts of seismic sounds provided in the scientific literature usually consider short-term responses at the level of individual animals only, as scientific understanding of how such short-term effects relate to adverse residual effects at the population level are limited. Data on behavioural reactions to seismic noise acquired over the short-term could, however, easily be misinterpreted as being less significant than the cumulative effects over the long-term. Despite the density of seismic survey coverage over the past years in the South African offshore and particularly along the southern coast, the number of Southern right and Humpback whales around the southern African coast have increased, and their lingering on West Coast feeding grounds long into the summer, suggest that those surveys conducted over the past decades have not negatively influenced the distribution patterns of these two migratory species at least. Information on the population trends of resident species of baleen and toothed whales is unfortunately lacking, and the potential effects of seismic surveys on such populations remains unknown. Consequently, suitable precautionary mitigation measures must be implemented during seismic data acquisition to ensure the least possible disturbance of marine fauna in an environment where the cumulative impact of increased background anthropogenic noise levels has been recognised as an ongoing and widespread issue of concern.

There is the possible chance of an increase in disturbance and disruption to fisheries active in the area should additional exploration activities be undertaken during the same survey window period. There is also the possibility of cumulative benefits being accrued to local service providers and suppliers if multiple exploration activities become active either in parallel or in close sequence to each other. The need for ongoing support

from local service providers and suppliers over multiple projects may see possible cumulative benefits over a longer period of time, but may also raise strong expectations.

Thus, should other speculative or proprietary seismic survey campaigns be undertaken concurrently with CGG's proposed survey programme in the Algoa, Gamtoos and Outeniqua Basins (although unlikely to be undertaken in the same area during the same survey window due to impacts on operation and data acquisition), cumulative impacts may be likely and there would need to be alignment in planning of such concurrent operations in order to avoid cumulative impacts.

#### 7.4 RECOMMENDATION

All residual impacts related to normal operations, are of **NEGLIGIBLE** to **LOW** significance with the implementation of the recommended mitigation measures. Based on the nature, duration (short-term) and extent (regional, although generally localised at any one time) of the proposed seismic survey and the findings of the specialist studies, SLR is of the opinion that there is no reason why the proposed project should not, with implementation of the project controls and proposed mitigation measures, receive a favourable decision and the issuing of a Reconnaissance Permit.



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## APPENDICES

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## ACRONYMS AND ABBREVIATIONS

Acronym / Abbreviation	Definition
3D	Three-dimensional
ACAP	Agreement on the Conservation of Albatrosses and Petrels, 2004
ACE	African Coast to Europe
AEL	Atmospheric Emissions Licence
ALARP	As Low as Reasonably Practicable
BAT	Best Available Technology
BCC	Benguela Current Commission
BOD	Biological Oxygen Demand
BWM	International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (in force from 2017)
CBA	Critical Biodiversity Area
CBA 1	Critical Biodiversity Area 1
CBA 2	Critical Biodiversity Area 2
CGG	CGG Services (UK) Ltd
CITES	Convention on International Trade in Endangered Species
CLC	International Convention on Civil Liability for Oil Pollution Damage, 1969
CMS	Convention on Migratory Species
COGSA	Carriage of Goods by Sea Act, 1986 (No. 1 of 1986)
COLREGS	Convention on the International Regulations for Preventing Collisions at Sea, 1972
DFFE	Department of Forestry, Fisheries and the Environment
DMRE	Department of Mineral Resources and Energy
EBSA	Ecologically or Biologically Significant Area
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
ERP	Emergency Response Plan
ESA	Ecological Support Area
EMP	Environmental Management Plan
ESMP	Environmental and Social Management Plan
FLO	Fisheries Liaison Officer
FRAP	Fishery Rights Allocation Process
GDP	Gross Domestic Product
GHG	Greenhouse gas
GIIP	Good International Industry Practice
GIS	Geographical Information System
GN	Government Notice
HABs	Harmful Algal Blooms

Acronym / Abbreviation	Definition
HFO	Heavy Fuel Oil
HSE	Health, Safety and Environment
I&APs	Interested and Affected Parties
IBA	Important Bird Area
ICCAT	International Commission for the Conservation of Atlantic Tunas
IEP	Integrated Energy Plan
IFC	International Finance Corporation
ILO	International Labour Organisation
IMO	International Maritime Organisation
IRP	Integrated Resource Plan
IUCN	International Union for Conservation of Nature
JNCC	Joint Nature Conservation Committee
MARPOL 73/78	International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978
MGO	Marine Gas Oil
MMO	Marine Mammal Observer
MPA	Marine Protected Area
MPRDA	Mineral and Petroleum Resources Development Act (No. 28 of 2002)
NDP	National Development Plan
NEMA	National Environmental Management Act (No. 107 of 1998), as amended
NEM: AQA	National Environmental Management: Air Quality Act, 2004 (No. 39 of 2004), as amended
NEM: PAA	National Environmental Management: Protected Areas Act, 2003 (No. 57 of 2003), as amended
NEM: WA	National Environmental Management: Waste Act, 2008 (No. 59 of 2008), as amended,
NGO	Non-Government Organisation
NGP	New Growth Path
OECMs	Other Effective Area-Based Conservation Measures
OMZ	Oxygen Minimum Zone
OPRC Convention	International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990
PAM	Passive Acoustic Monitoring
PASA	Petroleum Agency SA
PIM	Particulate Inorganic Matter
POM	Particulate Organic Matter
PTS	Permanent hearing Threshold Shift
QMAs	Quota Management Areas
ROV	Remotely Operated Vehicle
SACNASP	South African Council for Natural Scientific Professions
SACW	South Atlantic Central Water



Acronym / Abbreviation	Definition
SAFE	South Africa Far East
SAHRA	South African Heritage Resources Agency
SAMSA	South African Maritime Safety Authority
SAT3	South Atlantic Telecommunications cable No.3
SLR	SLR Consulting (South Africa) (Pty) Ltd
SME	Small and Medium Enterprise
SMS	Short Messaging System
SOPEP	Shipboard Oil Pollution Emergency Plan
SPL	Sound Pressure Level
SSA	Statistics South Africa
TAC	Total Allowable Catch
TOPS	Threatened or Protected Species
TNPA	Transnet National Ports Authority
TSPM	Total Suspended Particulate Matter
TTS	Temporary hearing Threshold Shift
UN	United Nations
UNCLOS	United Nations Law of the Sea Convention, 1982
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC CoP21	United Nations Framework Convention on Climate Change
VMEs	Vulnerable Marine Ecosystems
VOCs	Volatile Organic Compounds
WACS	West Africa Cable System