

PROPOSED SPECULATIVE 2D SEISMIC SURVEY OFF THE WEST COAST OF SOUTH AFRICA: ENVIRONMENTAL MANAGEMENT PLAN

DRAFT EMP

WEST COAST OF SOUTH AFRICA: ORANGE BASIN

PREPARED FOR: SPECTRUM

PASA REF: 12/1/033



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Project Manager	Eloise Costandius
Project Manager Email	ecostandius@slrconsulting.com
Author	Eloise Costandius
Reviewer	Andrew Bradbury
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EXECUTIVE SUMMARY

1 INTRODUCTION

1.1 PROJECT BACKGROUND AND LOCATION

The Petroleum Agency SA (PASA) on 16 July 2020 acknowledged the acceptance of a Reconnaissance Permit submitted by Spectrum Geo Limited (Spectrum) for the undertaking of a multi-client speculative two-dimensional (2D) seismic survey in a number of petroleum licence blocks in the Orange Basin off the West Coast of South Africa (see Figure 1). Section 74 of the Mineral and Petroleum Resources Development Act (No. 28 of 2002; MPRDA) makes provision for such an application.

The proposed survey area would be in the order of 180 000 km², stretching from the Namibian border along the entire West Coast up to a point approximately 200 km southwest of Cape Point and ranges between 40 and 440 km from the coast. Water depths in the proposed survey area range from 100 m to beyond 4 500 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 on 01 December 2021.

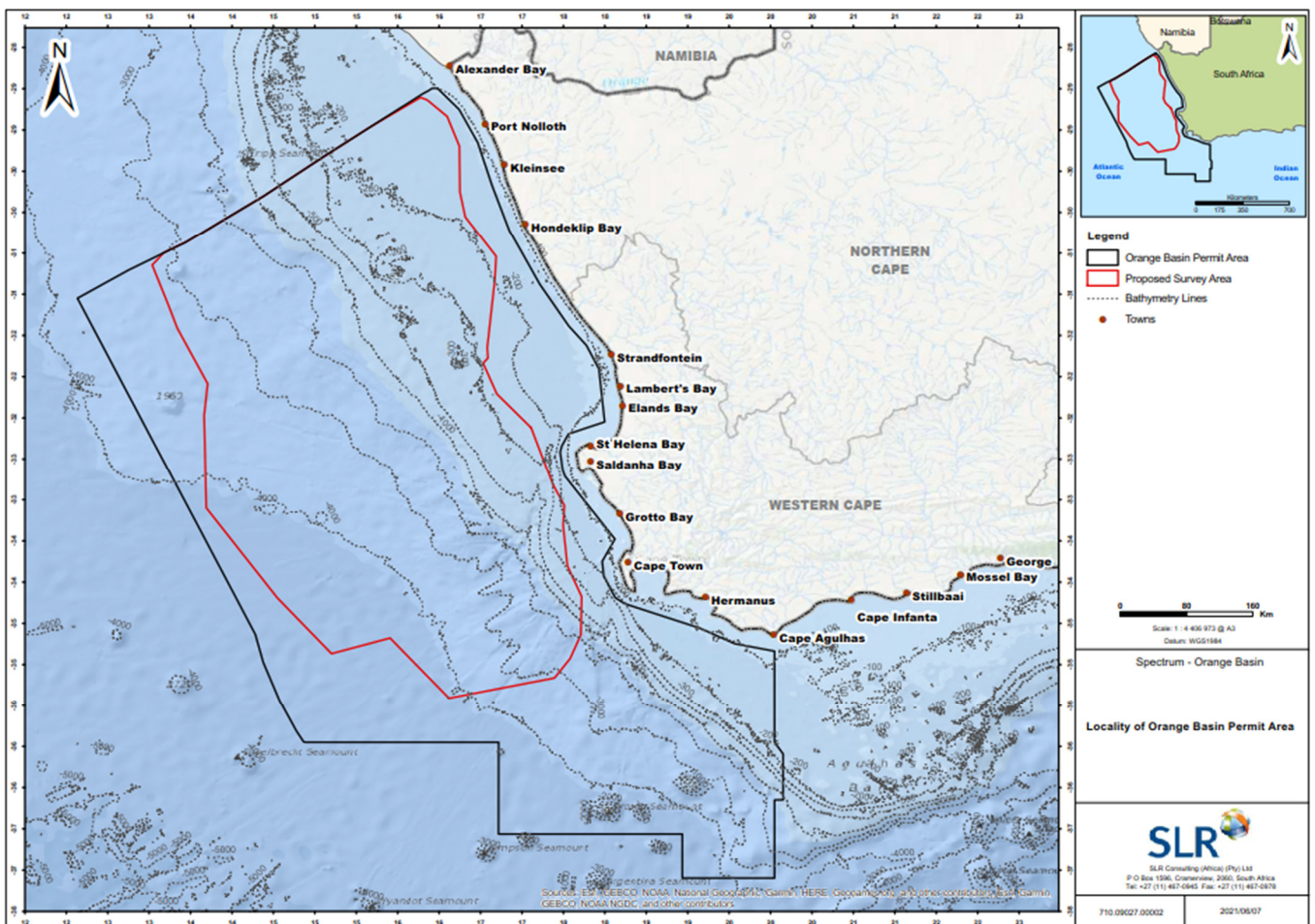


Figure 1: Location of the Reconnaissance Permit area and proposed survey area in the Orange Basin off the West Coast of South Africa

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 Spectrum ‘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.

Spectrum 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 **04 August to 06 September 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/spectrum-west-coast>) and on a data free website (<https://slrpublicdocs.datafree.co/public-documents/spectrum-west-coast>). Due to current Covid-19 protocols being implemented at local libraries, full hard copies of reports could not practically be made available for review. Hard copies of this Executive Summary (English and Afrikaans) have, however, been made available for collection at the Saldanha Bay Library (Berg Street, Saldanha), Lamberts Bay Library (Church Street, Lamberts Bay) and at the AJ Bekeur Library in Port Nolloth (Robson Street). A digital copy of the Summary can also be sent via Whatsapp if so requested. 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 06 September 2021**. **Please use “Spectrum” as reference when submitting comments or requests.**

SLR Consulting (South Africa) (Pty) Ltd

Attention: Eloise Costandius

PO Box 798, Rondebosch, 7701

5th Floor Letterstedt House, Newlands on Main Building, Newlands, 7700

Tel: (021) 461 1118 WhatsApp / SMS: 063 900 5536

Email: ecostandius@slrconsulting.com

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 West 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.

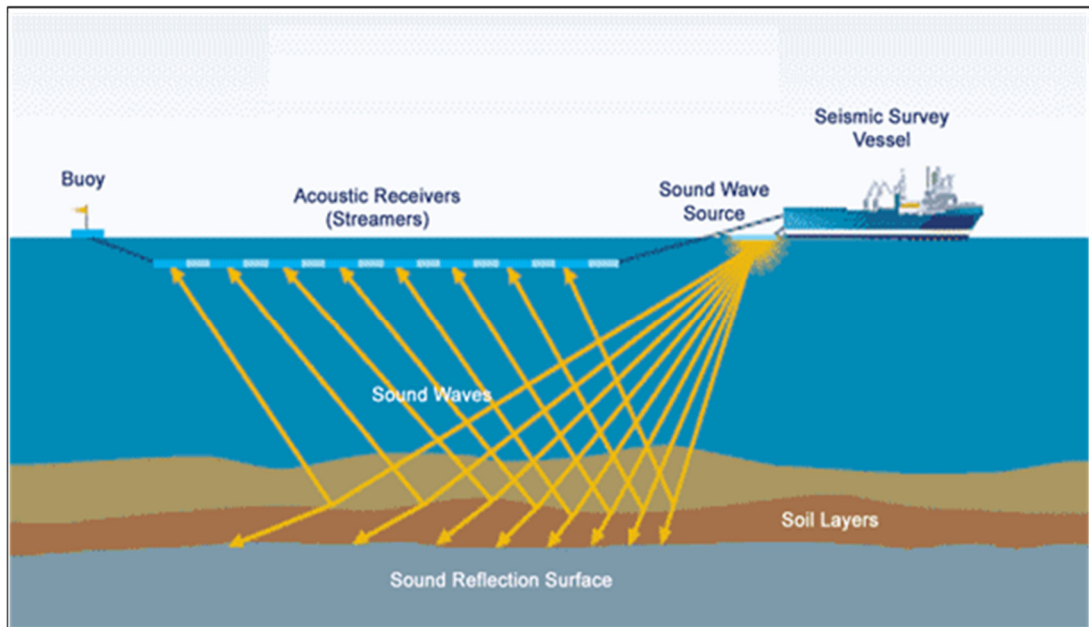


Figure 2: Principles of offshore seismic acquisition surveys

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, Spectrum is proposing to undertake a 2D seismic survey during the 2021/2022 summer survey window period (December to May inclusive). The western extent of the survey area is located between 220 and 440 km from the coast. The total length of the survey would be up to 14 000 km, with the proposed survey following an evenly spaced survey line grid, with between 13 and 15 lines in a north-south direction and between 26 and 28 lines in an east-west direction. The total proposed 2D survey area, including turning circles, would amount to approximately 193 980 km² within the northern portion of the Reconnaissance Permit area. No survey activities are currently proposed between Cape Point and Cape Agulhas (see Figure 1).

4.3 TECHNICAL CHARACTERISTICS OF THE SEISMIC ACQUISITION

The main technical characteristics of the proposed 2D 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	2
No. of active airguns	Approximately 36 per array (note: only one active array for each shot point)
Spacings between airgun arrays	50 m to 100m
Towing depth of the airgun	Approximately 8 m
Source volume	Max 4 300 cubic inches each
Operational pressure	2 500 psi
Shot interval	Max every 5 seconds, 12.5 m interval between consecutive shot-points
Hydrophone Streamer	
Types of streamer	Solid
Number of streamers	1
Length of streamer	10 000 m
Depth of streamer	10 to 15 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 streamer. 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.
- **Escort (‘chase’) vessel:** The proposed survey would be support by one escort 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 in the Port of Cape Town. The service infrastructure required to provide the necessary onshore support is already in place in Cape Town 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 proposed survey area from approximately 100 m to over 4 500 m. Major bathymetric features on the continental shelf on the West Coast include: Tripp Seamount (in Namibian waters), Child's Bank and Cape Canyon (Figure 3).

Winds are one of the main physical drivers of the nearshore Benguela Region. Most winds in summer come from the south to south-south-east. Winter remains dominated by southerly to south-easterly winds, but the closer proximity of the winter cold-front systems results in a significant south-westerly to north-westerly component.

Most of the West Coast region is classified as exposed, experiencing strong wave action. Winter swells are strongly dominated by those from the south-west to south-south-west. During the summer there is a slightly more pronounced southerly swell component and swells tend to be smaller on average.

The proposed survey area is primarily located within the Southern Benguela system. A major feature of the Benguela Current is coastal upwelling. The eastern boundary of the proposed survey area is located on the western edge of these upwelling events and although waters are expected to be comparatively warm and nutrient poor, seasonal upwelling can be expected. This upwelling is associated with extremely high seasonal production of phytoplankton and zooplankton, and can result in low-oxygen water moving up onto the inner shelf and into nearshore waters.

5.2 BIOLOGICAL OCEANOGRAPHY

The proposed survey area falls into the Southern Benguela and Southeast Atlantic Deep Ocean Ecoregion and is characterised by a wide variety of ecosystem types covering both the inner, mid- and outer shelves, the Southeast Atlantic continental slope and the Cape Basin Abyss. The 2018 National Biodiversity Assessment rated the South Atlantic bathyal and abyssal unconsolidated habitat types that characterise depths beyond 500 m, as being of 'Least Concern', with only those communities occurring along the shelf edge (500 m) being considered 'Vulnerable' (see Figure 4).

Various pelagic and demersal fish species are known to spawn in the inshore regions of the southern Benguela (see Figure 5). The major spawning areas of the small pelagic shoaling species are on the continental shelf and along the shelf edge from Lambert's Bay to Mossel Bay. The eggs and larvae are carried around Cape Point and up the coast in northward flowing surface waters. At the start of winter every year, the juveniles recruit in large numbers into coastal waters across broad stretches of the shelf between the Orange River and Cape Columbine to utilise the shallow shelf region as nursery grounds before gradually moving southwards in the inshore southerly flowing surface current, towards the major spawning grounds east of Cape Point. There is, therefore, some overlap of the inshore eastern sections of the proposed survey area with the northward egg and larval drift

of commercially important species, and the return migration of recruits (see Figure 5). Ichthyoplankton abundance in the inshore portions of the 2D 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 proposed survey area. 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.

Three species of turtle occur along the West Coast, with the Leatherback being the most likely to be encountered in the offshore waters of west South Africa. Their abundance in the study area is unknown but expected to be low. Loggerhead and Green turtles are expected to occur only as occasional visitors.

Most of the pelagic seabird species in the region reach highest densities offshore of the shelf break (200 – 500 m depth), with highest population levels during their non-breeding season (winter). Fourteen species of seabirds breed in southern Africa, including Cape Gannet, African Penguin, four species of Cormorant, White Pelican, three Gull and four Tern species. The breeding areas are distributed around the coast with islands being especially important. The closest breeding islands to the project area are Bird Island at Lambert's Bay and the Saldanha Bay Islands. Most of the breeding seabird species forage at sea with most birds being found relatively close inshore (10 - 30 km). Cape Gannets, however, are known to forage within 200 km offshore, and African Penguins have also been recorded as far as 60 km offshore. The extreme inshore areas of the proposed 2D survey area thus slightly overlaps with the foraging areas of penguins.

Thirty-three species or sub-species/populations of cetaceans (whales and dolphins) are known or likely to occur in the waters of the West 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 resident along the West Coast. There are a number of Cape fur seal colonies within the broader study area: at Bucchu Twins near Alexander Bay, at Cliff Point (~17 km north of Port Nolloth), at Kleinzee (incorporating Robeiland), Strandfontein Point (south of Hondeklipbaai), Paternoster Rocks and Jacobs Reef at Cape Columbine, Vondeling Island, Robbesteen near Koeberg, Seal Island in False Bay and Geysers Rock at Dyer Island, Quoin Point and Seal Island in Mossel Bay. Non-breeding colonies and haul-out sites occur at Doringbaai south of Cliff Point, Rooiklippiers, Swartduin and Noup between Kleinzee and Hondeklipbaai, at Spoeg River and Langklip south of Hondeklip Bay, on Bird Island at Lambert's Bay, at Paternoster Point at Cape Columbine and Duikerklip in Hout Bay. These colonies all fall inshore and to the east of the proposed survey area.

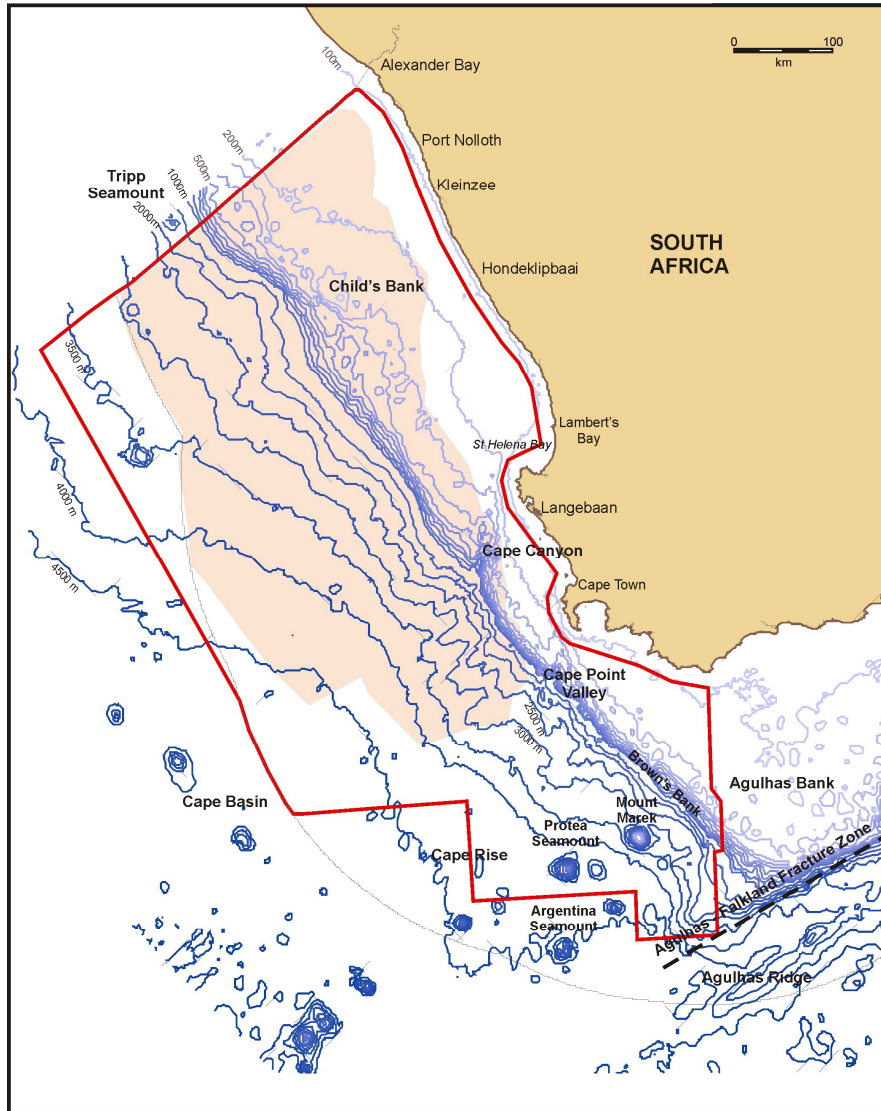


Figure 3: Proposed survey area (shaded) in relation to bathymetry and seabed features off the West Coast

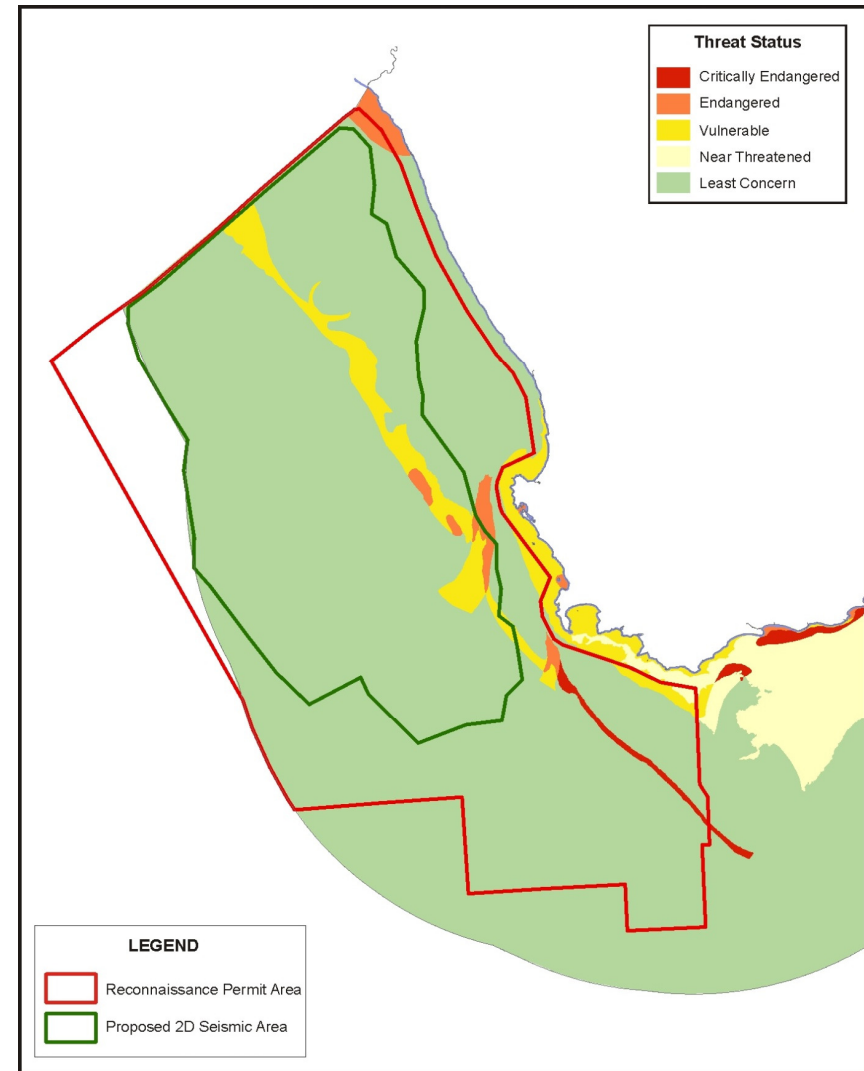


Figure 4: Proposed survey area in relation to ecosystem threat status on the West Coast

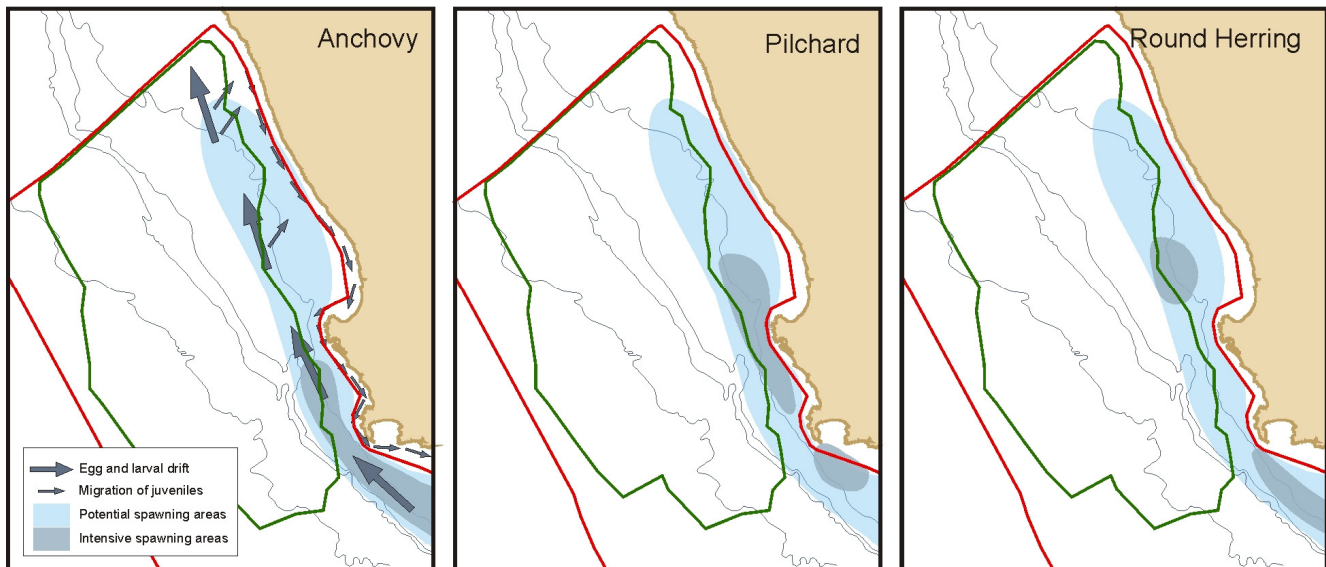


Figure 5: The project area in relation to major spawning areas in the southern Benguela region

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. There are three offshore MPAs that are located within, two adjacent and another three inshore of the proposed survey area, namely the Orange Shelf Edge MPA, Child’s Bank MPA, Benguela Muds MPA, Namaqua Fossil Forest MPA, Cape Canyon MPA, Namaqua National Park MPA, Robben Island MPA and the Table Mountain National Park MPA. No seismic survey operations would be undertaken within these MPAs. The proposed survey area also overlaps areas mapped as Critical Biodiversity Area 1 (CBA 1) and Critical Biodiversity Area 2 (CBA 2) (see Figure 7).

Coastal Important Bird Areas (IBAs) are all located inshore of the Reconnaissance Permit area and proposed survey area and should in no way be directly affected by the proposed seismic survey. The inshore area of the proposed survey area does, however, overlap with a portion of the proposed Bird Island / Dassen Island / Heuningnes river and estuary system / Lower Berg river wetlands marine IBA.

5.4 SOCIAL CONTEXT AND HUMAN UTILISATION

The project’s area of influence encompasses the entire West Coast, includes three districts, namely the City of Cape Town Metropolitan Municipality (Western Cape Province), the West Coast District Municipality (Western Cape Province) and the Namakwa District Municipality (Northern Cape Province).

Three fisheries areas overlap with the inshore areas of the proposed survey area (% of national catch indicated in brackets), including mid-water trawl (4.1%), small pelagic purse-seine (1.9%) and traditional line fish (0.02%). Another four fisheries overlap with the majority of the proposed survey area, including demersal trawl (35.1%), demersal longline (27.3%), large pelagic longline (15%) and tuna pole (51.6%). There is no overlap with small-scale fishing sector and west coast rock lobster sector. Refer to Figures 8 to 13 for the proximity of the proposed project in relation to the key fishing sectors.

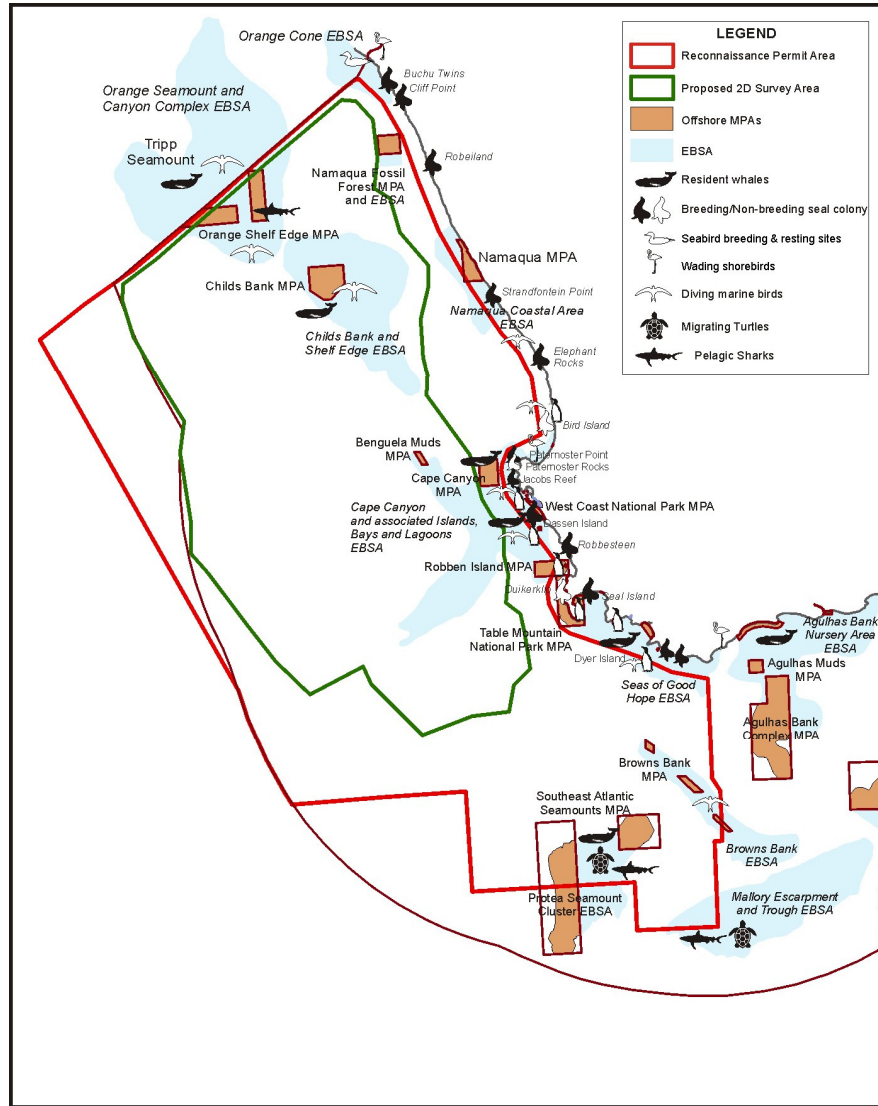


Figure 6: Proposed survey area in relation to MPAs and EBSAs off the West Coast

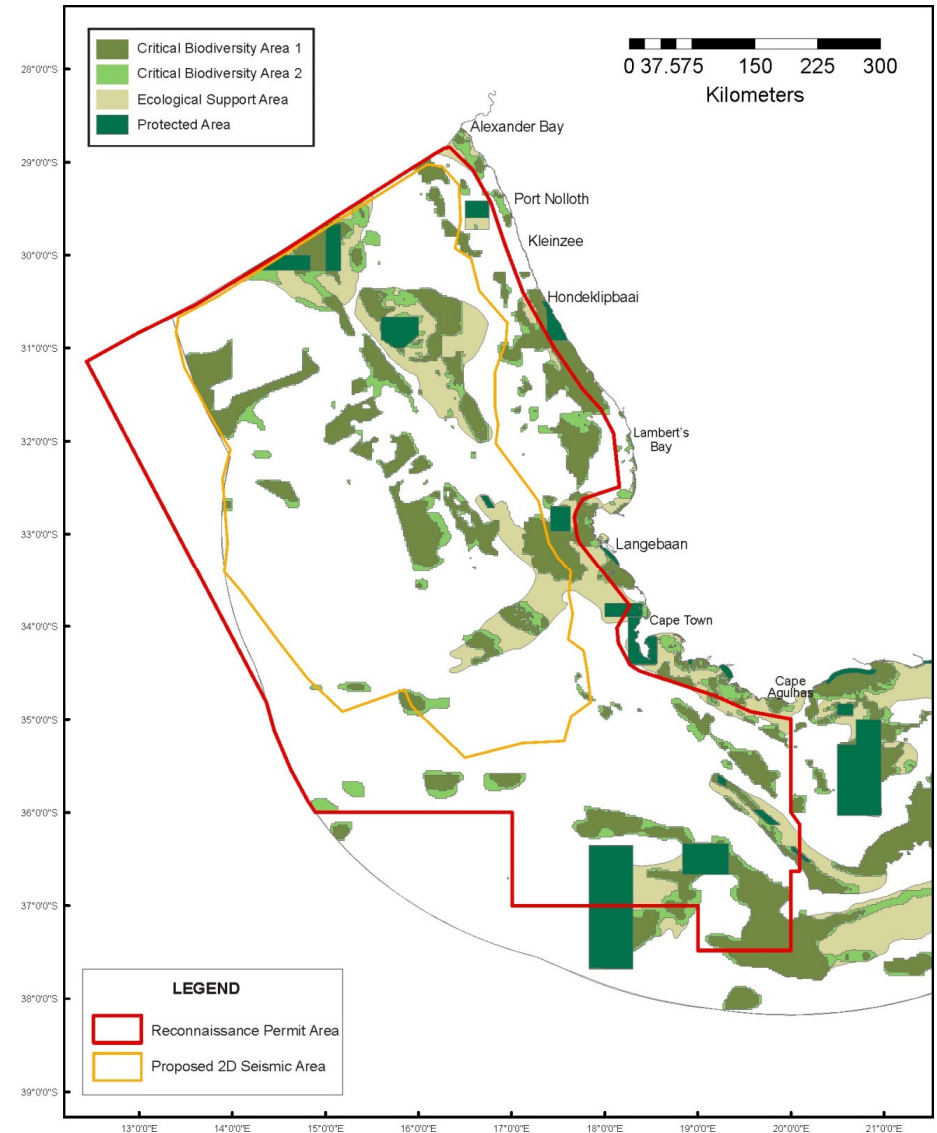


Figure 7: Proposed survey area in relation to CBAs off the West Coast

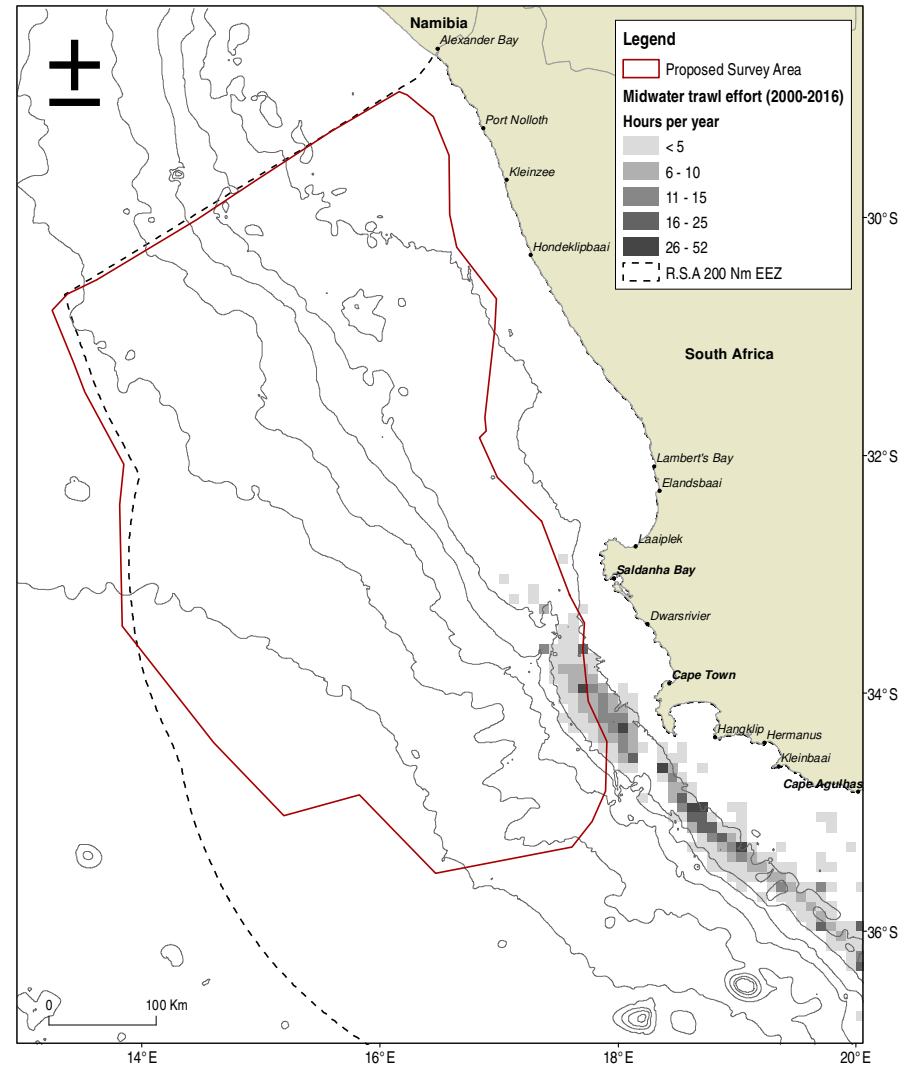
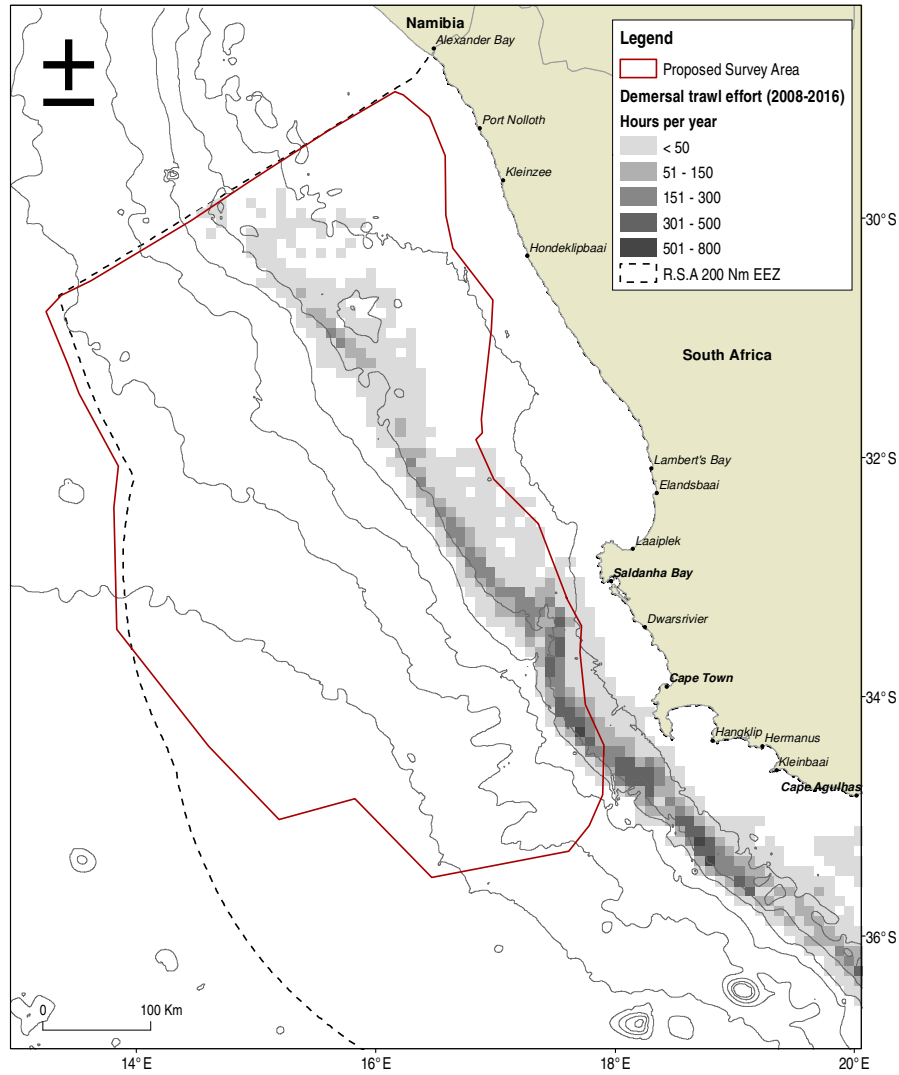


Figure 8: Proposed survey area in relation to the spatial distribution of demersal trawl effort (2008-2016)

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

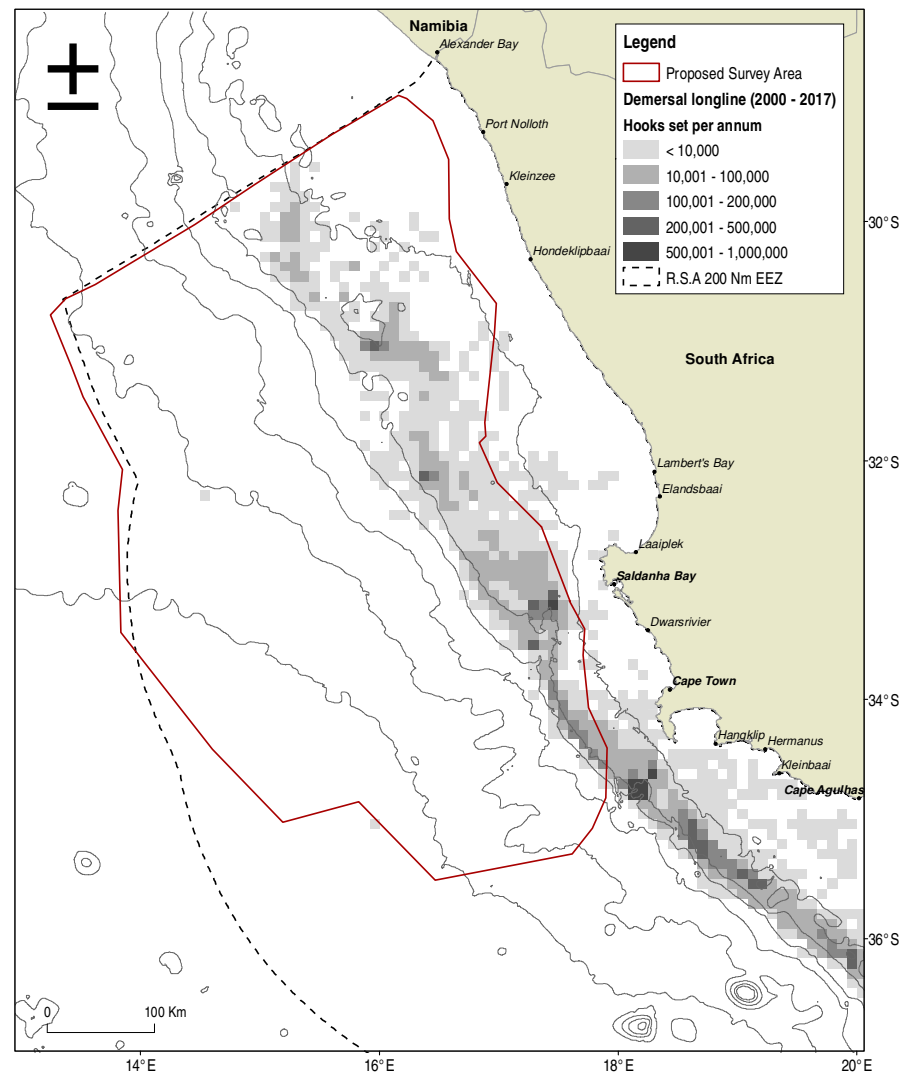
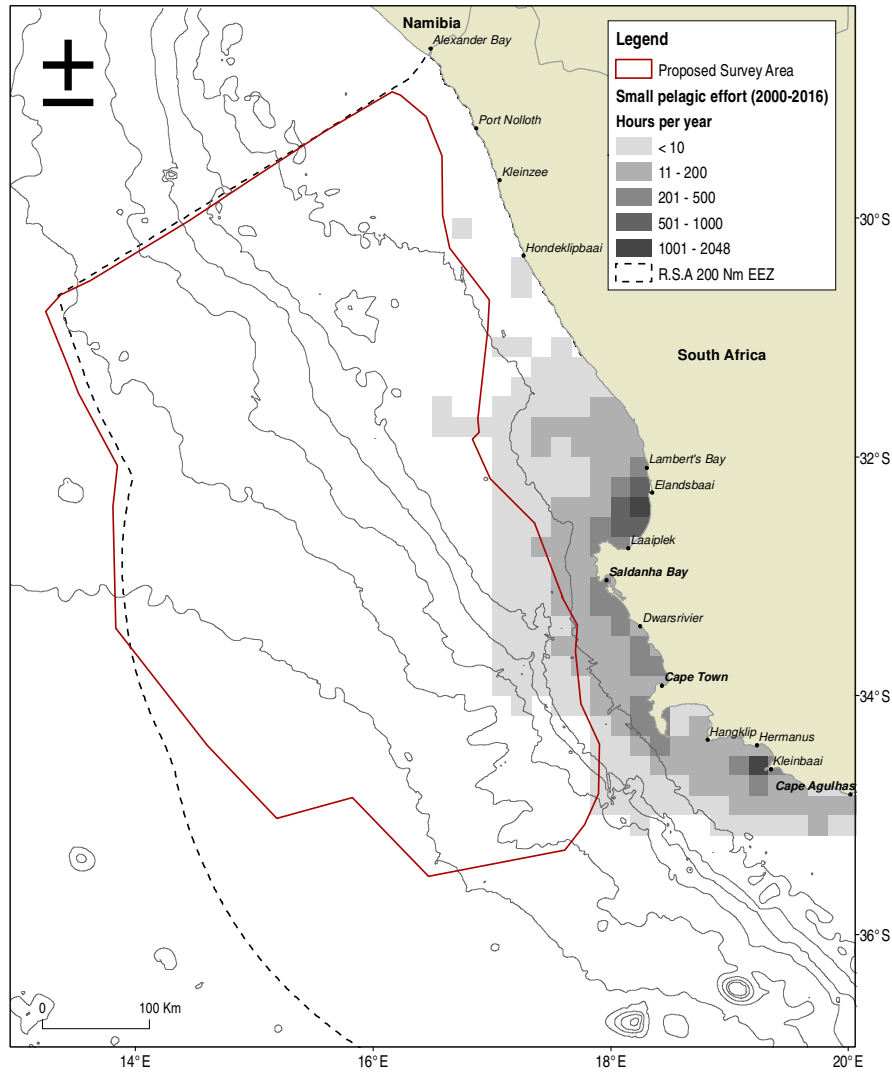


Figure 10: Proposed survey area in relation to the spatial distribution of purse-seine effort targeting small pelagic species (2000-2016)

Figure 11: Proposed survey area in relation to the spatial distribution of hake-directed demersal longline effort (2000-2017)

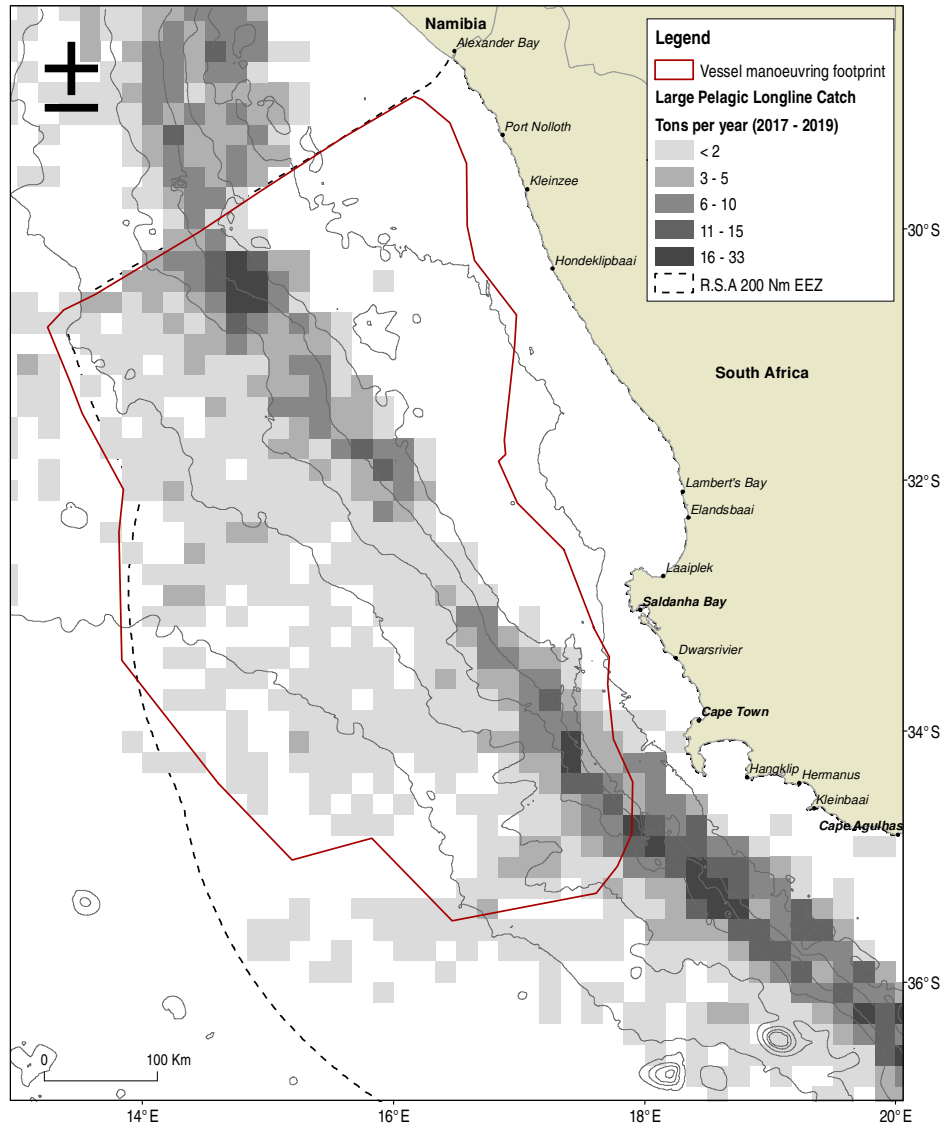


Figure 12: Proposed survey area in relation to the spatial distribution of large pelagic longline catch (2017-2019)

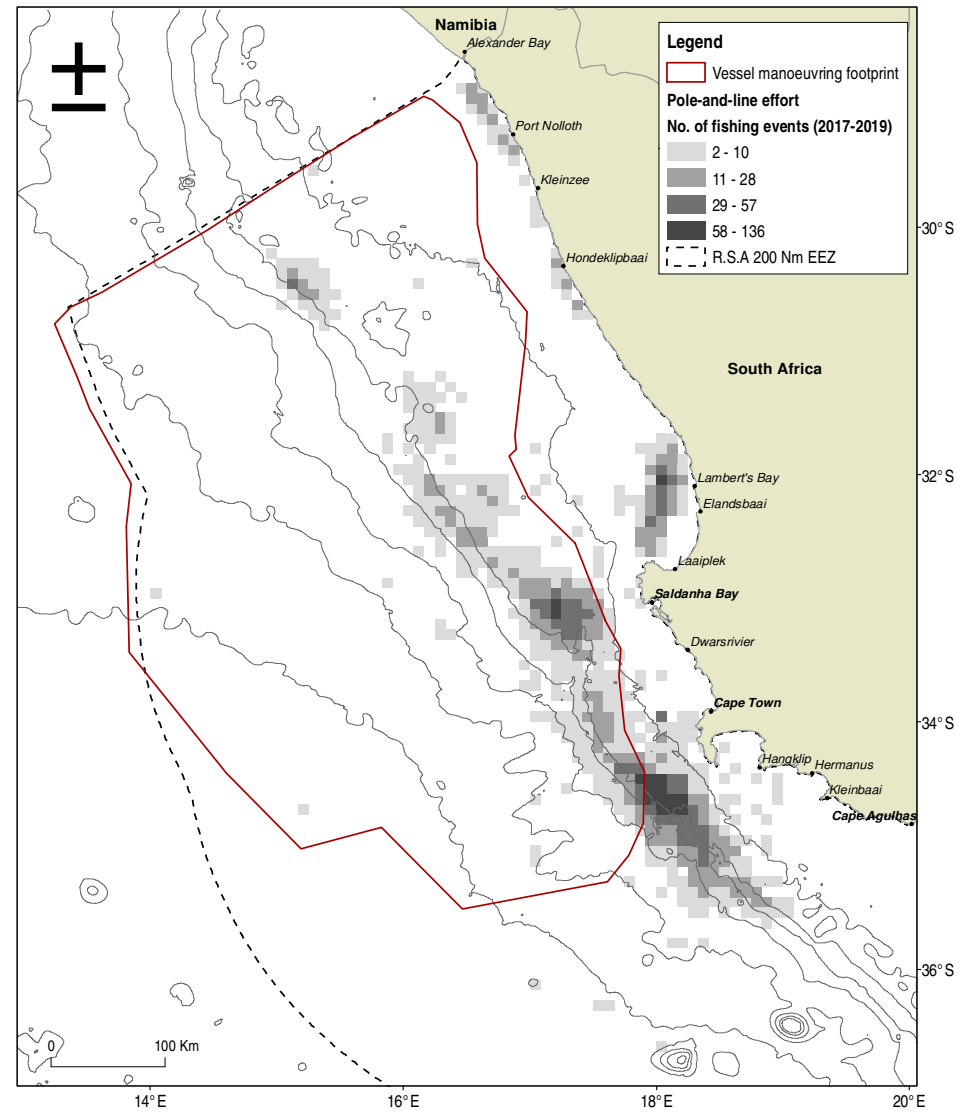


Figure 13: Proposed survey area in relation to the spatial distribution of tuna pole effort (2017-2019)

The majority of the international shipping traffic is located on the outer edge of the continental shelf, and as such a significant amounts of ship traffic can be anticipated to pass through the proposed survey area.

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

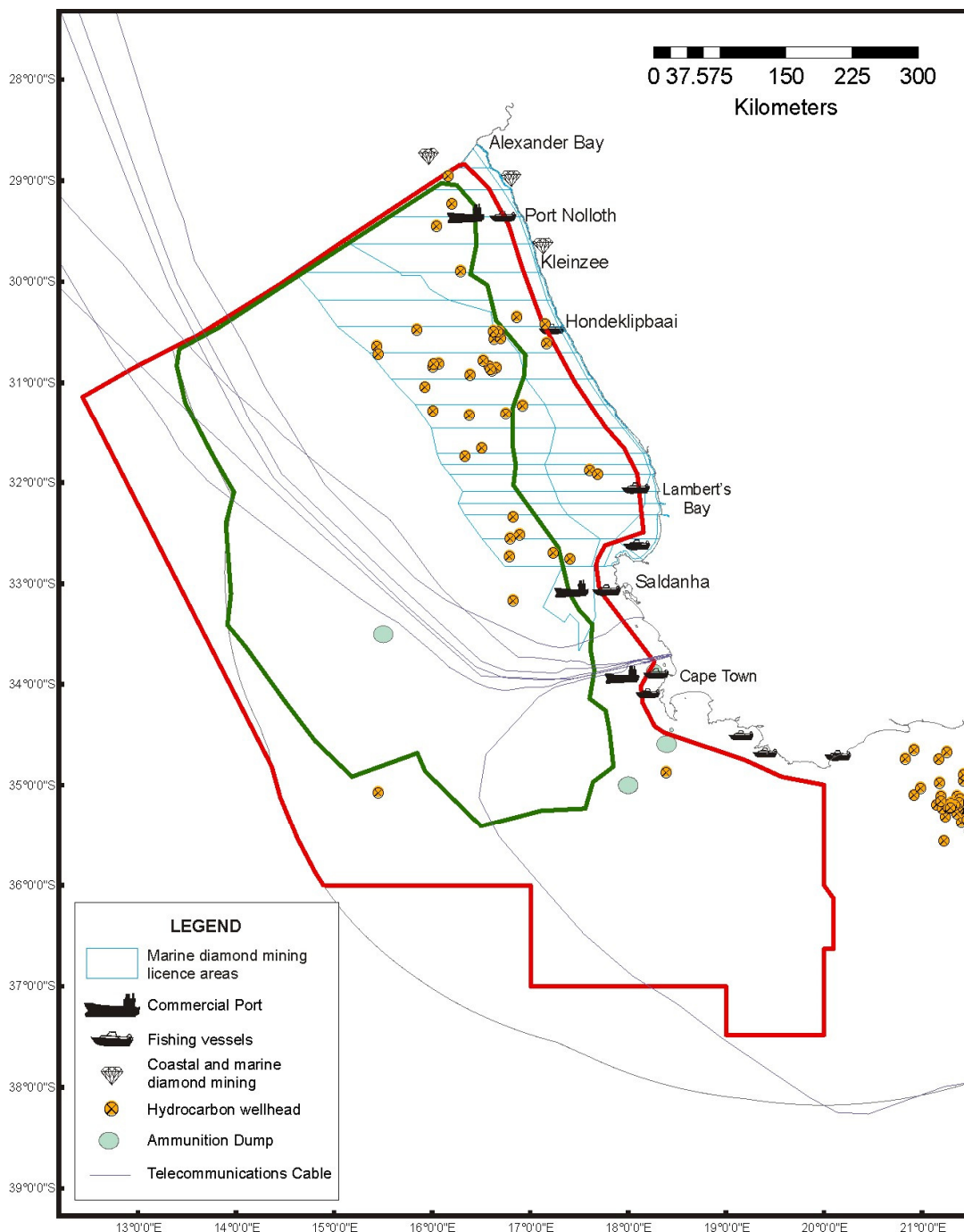


Figure 14: Proposed Project area in relation to existing wells, submarine cables and offshore ammunition dumps

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 in the Orange Basin off the West 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**

No.	Activities	Aspects	Impacts on Main Receptors	Pre-Mitigation Significance	Key Mitigation / Project Controls	Residual Significance
2	SEISMIC ACQUISITION					
2.1	Underwater Noise from Airguns					
2.1.1	Seismic acquisition / firing of the airguns	Increased underwater ambient noise levels	Impact on cetaceans	M	<ul style="list-style-type: none"> Avoid key migration period Undertake survey from North to South Pre-shoot watch (MMO & PAM) “Soft-start” procedures MMO observation during surveying (daylight) PAM during surveying (24/7) Shut-downs 	L
2.1.2						
2.1.3			Impact on seals	L	<ul style="list-style-type: none"> Pre-shoot watch (MMO) “Soft-start” procedures MMO observation during surveying (daylight) Shut-downs 	VL
2.1.4			Impact on turtles	M	<ul style="list-style-type: none"> Pre-shoot watch (MMO) “Soft-start” procedures MMO observation during surveying (daylight) Shut-downs 	L
2.1.5			Impact on penguins and feeding diving seabirds	L	<ul style="list-style-type: none"> Pre-shoot watch (MMO) “Soft-start” procedures MMO observation during surveying (daylight) Shut-downs 	VL
2.1.6			Impact on fish	M	<ul style="list-style-type: none"> Avoid key spawning period Pre-shoot watch (MMO) “Soft-start” procedures MMO observation during surveying (daylight) Shut-downs 	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	NEG	<ul style="list-style-type: none"> “Soft-start” procedures Shut-downs Avoid key spawning period Avoid key tuna pole fishing period by undertaking survey from North to South Stakeholder notification Navigational warning Fisheries Liaison Officer (FLO) Grievance mechanism 	NEG**
2.1.8			Impact on plankton	M		VL
2.1.9			Impact on demersal trawl, demersal longline	M		M
2.1.10			Impact on tuna pole	M		L
2.1.11			Impact on mid-water trawl, large pelagic longline	L		L
2.1.13			Impact on small pelagic purse-seine, traditional line fish	NEG		NEG
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, demersal longline	M	<ul style="list-style-type: none"> Avoid key tuna pole fishing period by undertaking survey from North to South Stakeholder / vessel notification Navigational warning Vessel lighting Grievance mechanism 	M
2.2.2			Impact on tuna pole	M		L
2.2.3			Impact on mid-water trawl, large pelagic longline	L		L
2.2.4			Impact on small pelagic purse-seine, traditional line fish	NEG		NEG
2.2.5			Disruption to commercial shipping	L		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"> Contracting of local companies Manage community expectations Grievance mechanism 	NEG +ve

No.	Activities	Aspects	Impacts on Main Receptors	Pre-Mitigation Significance	Key Mitigation / Project Controls	Residual Significance
4	UNPLANNED EVENTS					
4.1	<i>Collisions with project vessels and equipment</i>					
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"> Emergency Response Plan Stakeholder information Navigation warning Implement a grievance mechanism 	NEG**
4.1.2			Impacts on marine fauna	L		<ul style="list-style-type: none"> 'Turtle-friendly' tail buoys Reduced transit speed Ensure all equipment used is thoroughly cleaned
4.2	<i>Accidental Release of Oil at Sea</i>					
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"> Bunkering procedure Shipboard Oil Pollution Emergency Plan – MARPOL Annex I Emergency Response Plan and notification Spill training and clean-up equipment 	L
4.2.2			Impacts on commercial nearshore fishing (mariculture and small-scale)	L		L
			Impacts on commercial fishing	VL		VL
4.3	<i>Loss of Equipment at Sea</i>					
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"> Maintenance and lifting procedures Retrieve of lost objects / equipment, where practicable Notify PASA, SAMSA and the SAN Hydrographer 	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 survey area, which is the offshore marine environment, roughly more than 40 km offshore, far removed from coastal islands and any sensitive coastal receptors (e.g. key faunal breeding / feeding areas and bird or seal colonies). The proposed survey area does, however, overlap with the Orange Shelf Edge MPA, Child's Bank MPA and the Benguela Muds MPA, as well as the Child's Bank and Shelf Edge EBSA and portions of the Orange Seamount and Canyon Complex EBSA and the Cape Canyon and associated Islands, Bays and Lagoons EBSA. The likelihood of encountering high numbers of faunal species of conservation concern in these conservation areas and the rest of the proposed survey area is, however, considered to be low.

The dominant wind and current direction will ensure that any **emissions and discharges** move mainly in a north-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, unlike the noise generated by airguns, 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. However, seabirds and marine mammals will become accustomed to the presence of the project vessels within a few days. Since the survey area is located along a main traffic route on the West Coast of South Africa, which experiences high vessel traffic, animals in the area should be accustomed to vessel traffic. 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.

7.1.3 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 – <u>maximum</u> horizontal distances from source to impact threshold levels (considering immediate impact from single pulses)		
	PTS onset	TTS onset	Behaviour
Cetaceans	530 m (VHF cetaceans)	1 070 m (VHF cetaceans)	5 000 m
Seals	25 m	35 m	-
Sea turtles	350 m	-	3 000 m
Fish	350 m	350 m	4 000 - 5 000 m

Notes: A dash indicates the threshold is not applicable. VHF = very high frequency hearing range

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 ichthyoplankton) 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), planning the survey to commence in the North and working southwards, 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 proposed survey area overlaps with the fishing grounds of seven **fishing sectors**, namely mid-water trawl, small pelagic purse-seine and traditional line fish in the inshore areas of the survey area and demersal trawl, demersal longline, large pelagic longline and tuna pole over the majority of the survey area. Although a limited percentage of the national catch have recorded within the proposed survey area by the mid-water trawl (4.1%), small, pelagic purse-seine (1.9%) and traditional line fish (0.02%) sectors, substantially higher catch rates have been recorded for the other overlapping fishing sectors. For these the percentage catch recorded in the

proposed survey area ranged from 15% for the large pelagic longline sector and 27.3% for the demersal longline sector to 35.1% for the demersal trawl and 51.6% for the tuna pole sectors.

Should the proposed survey commence in the northern portion of the survey area, it would result in avoiding the busy tuna pole fishing grounds in the vicinity of the Cape Canyon during December. In addition, with the implementation of the mitigation measures related to the temporary exclusion zone, which will ensure good communication and coordination with the fishing sectors, the residual impact on the tuna pole, mid-water trawl and large pelagic longline sectors are assessed to be of **LOW** significance. Due to the relatively high fishing effort within the proposed survey area, the residual impact on the demersal trawl and demersal longline would remain of **MEDIUM** significance. Due to the minimal overlap with the fishing grounds and limited catch recorded, the impact on the small pelagic purse-seine and traditional line fish sectors is assessed as **NEGLIGIBLE**. There would be no exclusion zone impacts on the small-scale fisheries and beach-seine and gillnet fisheries.

Potential behavioural responses from commercial fish species to seismic noise could also result in reduced catch rates, specifically for species with swim bladders fished by the demersal trawl, midwater trawl, demersal longline and large pelagic longline sectors. For these sectors the residual impact of reduced catch rates as a result of seismic noise is assessed to range from **LOW** to **MEDIUM** significance.

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, Cape Town. In addition, the workforce required for the exploration activities is expected to be 60 to 70 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 north-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. Although the intensity of a nearshore spill may be higher than an offshore spill, the residual impacts on marine ecology are considered to be of **LOW** significance while the residual impact on commercial fishing (offshore) is considered to be of **VERY LOW** significance and inshore mariculture and small-scale sectors as of **LOW** significance. Key project controls include implementing the Shipboard Oil Pollution Emergency Plan (SOPEP) and Emergency Response Plan (ERP).

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 survey area 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 commercial, recreational and fishing boats that could lead to **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 impacts is assessed as of **VERY LOW** 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 and pressure on local services and facilities 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 Spectrum's proposed survey in the Orange Basin (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 **MEDIUM** 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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ACRONYMS AND ABBREVIATIONS

Acronym / Abbreviation	Definition
2D	Two-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
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

Acronym / Abbreviation	Definition
HABs	Harmful Algal Blooms
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

Acronym / Abbreviation	Definition
SACNASP	South African Council for Natural Scientific Professions
SACW	South Atlantic Central Water
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
TMNP	Table Mountain National Park
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