Environmental Impact Assessment Report for a Diamond Prospecting Right in Offshore Concession Areas 4C and 5C – West Coast of South Africa

Report Prepared for

Samara Mining (Pty) Ltd

Report Number 576461/Environmental Impact Assessment Report

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Applicant, Future Rights Holder:	**Acting Agent and Geologist:**	**Independent EAP:**
Samara Mining (Pty) Ltd	NDi Geological Consulting Services Pty (Ltd)	srk consulting

May 2023

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SRK Project Number 576461/Environmental Impact Assessment Report

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Executive Summary

Introduction

Samara Mining (Pty) Ltd (Samara) intends to undertake an exploration programme in Sea Concession Areas 4C and 5C located approximately from 10 km to 195 km seaward of the West Coast shoreline of South Africa.

Samara is represented in this application by acting agent, NDI Geological Consulting Services (Pty) Ltd (NDI) situated in Kimberley in the Northern Cape. NDI provides geological services and has submitted all the relevant project applications to the Department of Mineral Resources and Energy (DMRE). Accordingly NDI is recognised as the independent Environmental Assessment Practitioner (EAP) at the DMRE. SRK Consulting (South Africa) (Pty) (SRK), acts on behalf of NDI as the independent EAP to undertake and manage the Environmental Impact Assessment (EIA) and to undertake the Stakeholder Engagement Process.

Samara lodged an application in terms of Section 22 of the Mineral and Petroleum Resources Act (Act No. 28 of 2002) (MPRDA), as amended by the Mineral and Petroleum Resources Development Amendment Act (Act No. 49 of 2008) (MPRDAA) for a Prospecting Right with the DMRE. The application is for a Prospecting Right for bulk sampling for diamonds, which will be undertaken in a phased approach.

To prospect for diamonds, Samara Mining intends to use both invasive and non-invasive methods. The non-invasive method will be made up of desktop studies, geophysical surveys, 3D geological modelling and resource estimation. The invasive methods will comprise of Exploration Drilling and Bulk (Trench) Sampling.

Desktop studies entail combining available historic data in order to get a clear understanding of the proposed diamond deposit character.

Geophysical surveys will be done to identify geological features where further exploration sampling will be undertaken. The equipment for the survey will be deployed from a vessel appropriate for the depth and survey method to be used.

Where geological features of interest (showing potential for diamond prospecting) have been identified, follow up surveys and sampling will be undertaken. Sampling will consist of two methods of which, the first will be extraction of unconsolidated sediment from the seabed using drill technology from a dedicated exploration vessel and the second method will be extraction of unconsolidated sediment using a dedicated bulk sampling vessel to dredge exploration trenches using crawler technology. The sampled material will be treated on board the vessels through a diamond processing plant inclusive of final diamond recovery.

The National Environmental Management Act (Act No. 107 of 1998) (NEMA) and the EIA Regulations, 2014 (Government Notice Regulation (GN R) 982)[1] (promulgated in terms of NEMA) warrant that listed activities require an Environmental Authorisation (EA). The EIA Regulations, lays out two alternative authorisation processes. Depending on the type of activity that is proposed, either a Basic Assessment (BA) process or a Scoping and EIA process is required to obtain EA. Listing Notice (LN) 1[2] lists activities that require a BA process, while LN 2[3] lists activities that require Scoping and EIA. LN 3[4] lists activities in certain sensitive geographic areas that require a BA process.

The proposed project triggers activities listed in terms of LN 1 and LN 2 of the EIA Regulations, 2014, requiring a Scoping and EIA Authorisation process to be undertaken. As potential fossil material should be collected for later identification and evaluation, Samara should also apply to the South African Heritage Resources Agency (SAHRA) for a general permit to destroy, damage, excavate, disturb and collect fossils identified during

[1] As amended by GN R327, GN R325 and GN R324 on 7 April 2017 & GN R517 on 11 June 2021
[2] GN R983 of 2014, as amended by GN 327 of 2017 & GN R517 on 11 June 2021
[3] GN R984 of 2014, as amended by GN 325 of 2017 & GN R517 on 11 June 2021
[4] GN R985 of 2014, as amended by GN 324 of 2017 & GN R517 on 11 June 2021

sampling, as per the National Heritage Resources Act (Act No. 25 of 1999) (NHRA) and any recovered material is to be temporarily stored by the company.

It is not anticipated that other key authorisations, permits or licences might be required before the project may proceed.

Statement of SRK and NDI Independence

Neither SRK nor any of the authors of this Report, including NDI, have any material present or contingent interest in the outcome of this Report, nor do they have any pecuniary or other interest that could be reasonably regarded as being capable of affecting their independence or that of SRK.

SRK and NDI have no beneficial interest in the outcome of the assessment which is capable of affecting its independence.

Environmental Authorisation Process

The EIA Regulations, 2014, define the detailed approach to the Scoping and EIA Authorisation process, which consists of two phases: the Scoping Phase (completed) and the Impact Assessment Phase (the current phase) (Figure ES - 1).

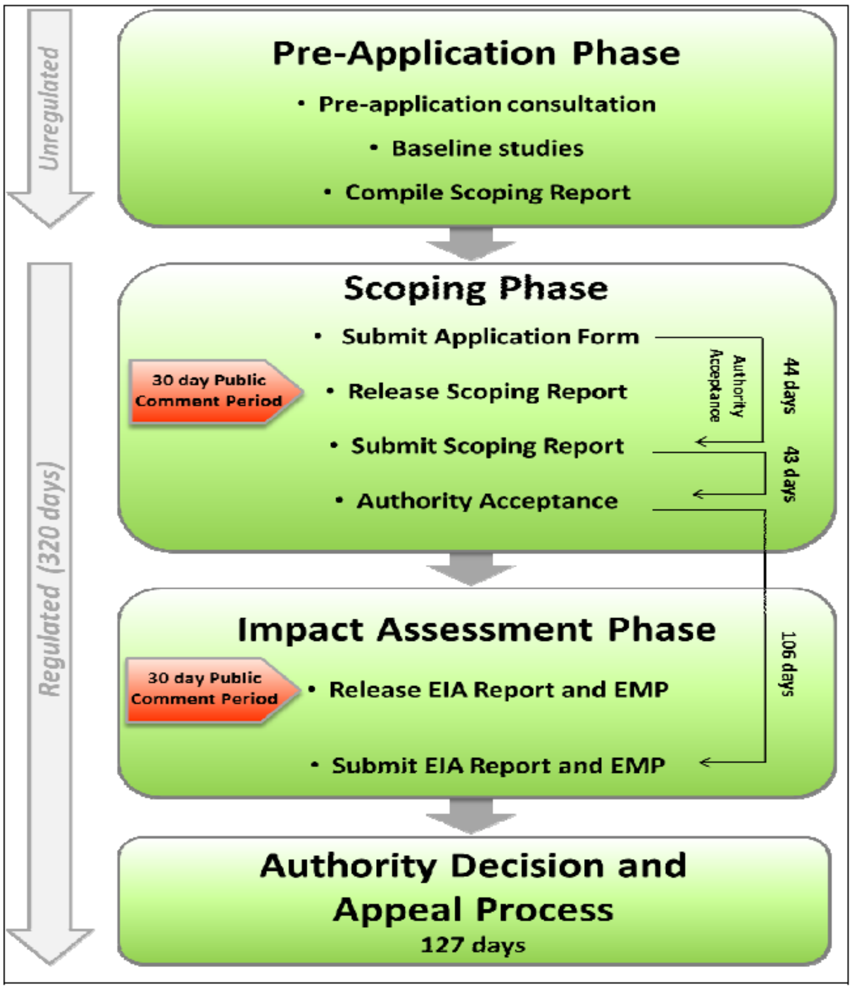

Figure ES - 1: Scoping and Environmental Impact Assessment Process

Stakeholder Engagement

Stakeholder engagement is a key component of the S&EIR process and is being undertaken in accordance with Chapter 6 of the EIA Regulations, 2014. Key stakeholder engagement activities undertaken during the Pre-Application and Scoping Phases are summarised in Table ES - 1

Table ES - 1: Stakeholder Engagement Activities undertaken during the Pre-Application and Scoping Phases

Activity	Date
<u>Submit Application Forms to DMRE</u> • *Register the applications for EA, Prospecting Right and confirm authority requirements.*	9 February 2021
<u>Development of Stakeholder Database:</u> • *The stakeholder database comprises of a variety of stakeholders identified from previous projects in the area, newly identified stakeholders and through the initial registration process as well as the Scoping and EIA Phases of the project; and* • *The stakeholder database included institutions and organisations at various levels of government.*	July 2021 - Ongoing
<u>Public Participation Plan:</u> • *To address, prevent and combat the spread of COVID-19 relating to National Environmental Management permits and licences; and* • *It is noted that the Public Announcement and the Scoping Phase were undertaken during Covid Restriction Level 3 and Level 4 and as such, no public meetings could be held at the time.*	13 August 2021
<u>Letter of Invitation to Register as I&APs:</u> • *To provide stakeholders with an opportunity to participate in the EA application process and to register as an I&AP; and* • *To notify stakeholders of the commencement of the EIA process and to provide a description of the proposed project and the affected environment, as well as a description of potential environmental issues, and the proposed approach to the Impact Assessment Phase.*	2 August 2021
<u>Place posters on-site:</u> • *To notify stakeholders of the commencement of the EIA process and to provide a description of the proposed project and the affected environment, as well as a description of potential environmental issues, and the proposed approach to the Impact Assessment Phase; and* • *Site notices were erected at several places in Port Nolloth and Kleinsee.*	31 July 2021 and 1 August 2021
<u>Advertise commencement of S&EIR process:</u> • *To notify stakeholders of the commencement of the EIA process and to provide a description of the proposed project and the affected environment, as well as a description of potential environmental issues, and the proposed approach to the Impact Assessment Phase; and* • *Media advertisements were placed in the Die Burger, Die Plattelander, and Gemsbok.*	30 July 2021
Release of Draft Scoping Report including CRR for public comment period: • *To record and respond to all issues and concerns raised during the project announcement phase and collate these comments;* • *To provide an opportunity for stakeholders to review the Scoping Report and make comments;* • *Copies of the complete Draft Scoping Report were made available for public review at the following location: SRK's website: https://www.srk.com/en/ww-library; and* • *Electronic copies of the Complete Draft Scoping Report were also made available to the commenting authorities and other I&APs upon request.*	27 August 2021 to 29 September 2021
<u>Update CRR, Compile Issues and Responses Summary and finalise Scoping Report</u>: • *To record and respond to all issues and concerns raised and collate these comments.*	October 2021
<u>Submit Final Scoping Report (CRR and Issues and Responses Summary) to DMRE:</u> • *To provide authority with information for decision-making.*	28 October 2021

It is noted that, following the submission of the Scoping Report to the DMRE, the application for EA was suspended pending the outcome of an appeal process regarding the application for a prospecting right by Samara. The DMRE finalised the appeal process and subsequently accepted the Scoping Report advising

Samara to proceed with the tasks contemplated in the plan of study for the EIA Phase of the project (DMRE Letter dated 26 January 2023). It was further indicated that the Final EIA Report needs to be submitted to the DMRE within 106 days (9 May 2023) of acceptance of the Scoping Report.

As the EAP experienced challenges in appointing a suitably qualified Marine Ecologist[5] to undertake the Marine Ecology impact assessment, a request was submitted to the DMRE to extend the submission date with the additional 50 days (NDI letter dated 9 March 2023). The DMRE granted an extension for the submission of the Final EIAR to 26 June 2023 (DMRE Letter dated 9 March 2023).

The stakeholder engagement activities related to the EIA Phase are summarised in Table ES - 2.

Table ES - 2: Stakeholder Engagement undertaken during the EIA Phase

Activity	Date
Letter sent to Registered I&APs notifying them that the EA process is proceeding.	8 March 2023

EIAR public comment period including distribution of an Executive Summary to all registered stakeholders:
• *To provide stakeholders with the opportunity to review and comment on the results of the Impact Assessment Phase;*
• *To obtain written comments from stakeholders and key stakeholders on the EIA Report;*
• *Hard copies of the report will be placed at the:*
  ○ *Port Nolloth Municipality;*
  ○ *Recreation Club in Kleinzee; and*
  ○ *Hondeklipbaai Municipality;*
• *Copies of the complete Draft EIAR will be made available for public review at the following location: SRK's website: https://www.srk.com/en/ww-library; and https://www.srk.com/en/public-documents/samara-draft-eiar.*
• *Electronic copies of the Complete Draft EIAR will also made available to the commenting authorities and other I&APs upon request; and*
• *Electronic, large file transfer links will be made available to selected authorities, to facilitate their review of the EIA Report and comment.*
	17 May 2023 – 15 June 2023

Public Consultation Meetings: • *To provide stakeholders with the opportunity to review and comment on the results of the EIA Phase:* • *Public meetings to be held in Port Nolloth, Kleinsee and Hondeklipbaai.*	23 May 2023 – 25 May 2023
Update CRR, Compile Issues and Responses Summary and finalise EIAR: • *To record and respond to all issues and concerns raised and collate these comments.*	June 2023
Release of the Final EIAR to the DMRE: • *To present the findings of the EIA process, incorporating stakeholder comment and submit the EIA Report to the authorities to facilitate their decisions.*	26 June 2023

*Stakeholders are provided with an opportunity to participate in the public review period of the Draft EIA Report from **17 May 2023 – 15 June 2023**. Comments received during the commenting period will be incorporated into the Final EIAR.*

[5] Aquatic Ecosystem Services was appointed to undertake the Marine Ecology Impact Assessment for the Samara Project.

Summary of Issues Raised

Issues that have been raised to date by I&APs and other Stakeholders can be summarised as:

- Request received from the Department of Forestry Fisheries and the Environment (DFFE): Protected Areas Planning and Management Effectiveness to amend the footprint area of the proposed prospecting area to exclude the Namaqua Fossil Forest Marine Protected Area (MPA) completely. The Namaqua Fossil Forest MPA has been excluded from the proposed prospecting area;
- Feedback received from the SAHRA with regards to:
  - Incorrect information reflected in the Draft Scoping Report with regards to the number of shipwrecks recorded and the responsible Authority. Response: The information was updated accordingly in the Final Scoping Report. However, during the EIA Phase of the project, ACO Associates cc was appointed to undertake a Heritage Impact Assessment (HIA) (ACO, 2023). Although a 2017 HIA produced for portions of the concession areas suggests that five wrecks have the potential to be present within the concession area boundaries, the ACO assessment believes, that with the exception of the *Eros*, which on balance is more likely to be located near Lamberts Bay than in the vicinity of the concession areas, it is possible, but unlikely, that the remains of the *Haab*, *Jessie Smith*, *Ocean King* and *La Porte* lie within the concession areas. ACO therefore did not record any wrecks within Concession Areas 4C and 5C. Although unlikely, the possibility does exist for the remains of currently unknown and unrecorded wrecks to be present in the concession areas;
  - Request to include mitigation measures when any shipwreck material is identified outside of known shipwreck sites. Heritage mitigation measures were included as part of the HIA undertaken for the project area and forms part of the EMPr (Appendix F) developed;
- Feedback received from De Beers Group of Companies (DBCM):
  - Concern with regards to the submission of the Samara application and that the date of submission reflected in the Draft Scoping Report was while DBCM was still the holder of the prospecting rights of Concession Areas 4C and 5C. Response: Samara Mining submitted an EA application as well as a Prospecting Right Application on 9 February 2021. Please note that the date of 8 February 2021 was incorrectly reflected in the Draft Scoping Report and was amended to 9 February 2021 in the Final Scoping Report; and
  - Concerns were raised with regards to I&APs not included in the Stakeholder Database. Response: SRK has updated the Stakeholder Database with readily available contact details and will pursue obtaining additional contact information to provide newly identified I&APs opportunity to provide inputs;
- De Beers submitted an appeal against the Samara Prospecting Right Application. The DMRE finalised the appeal process and subsequently accepted the Scoping Report advising Samara to proceed with the tasks contemplated in the plan of study for the EIA Phase of the project (DMRE Letter dated 26 January 2023); and
- The Samara prospecting area overlaps with the approved Tosaco's exploration right for offshore oil and gas. Tosaco has been included as an I&AP and the potential impacts associated with the Tosaco 3D seismic survey of the area evaluated, as part of the cumulative impact assessment undertaken for the Samara project.

Comments received from stakeholders thus far were addressed, as indicated in the responses provided in the CRR (Appendix E_ 7). These comments and recommendations have been considered in the assessment of impacts in Section 7 of this report.

Project Description

In order to prospect for diamonds, Samara intends to execute a comprehensive and systematic exploration programme to develop the concession areas. Both invasive and non-invasive methods will be used. This programme will be executed in three phases and will commence with non-invasive methods and thereafter progress to invasive exploration methods. The Prospecting Work Programme (PWP) outlines a programme consisting of three phases which are only executed once results of the previous phase substantiate activation and detail planning of the next phase.

Phase 1 (Non-invasive Methods): This phase will use non-invasive methods that will consist of desktop-literature studies, geophysical surveys within the Concession Areas, geophysical data processing and interpretation, compilation of a GIS database, geological modelling and delineation of potential diamond trap-sites which will form the knowledge base to plan and design the exploration sample programme. This phase will be executed in eight stages.

Phase 2 (Invasive Exploration Sampling): An invasive exploration sample programme will be undertaken. This programme will consist of reconnaissance exploration sample drilling within the Concession Areas. The results of the reconnaissance drilling programme will firstly identify which of the potential trap-sites carry a positive grade and secondly which of the positive trap-sites have an overall grade and footprint size to justify either further infill geophysical survey lines and/or infill detail drilling to increase confidence towards an estimate diamond resource. The planning and design of the in-fill geophysical survey and in-fill drill exploration programmes will lead to Phase three. This phase will be executed in four stages.

Phase 3 (Non-invasive Geophysical Surveys, Invasive Infill Drilling and Bulk Sampling): This phase will consist of non-invasive detail infill geophysical surveys and invasive detail infill drilling within priority trap-site features. Results of the first detail infill exploration work will determine the level of confidence reached to either justify resource estimation and preliminary mine plan design or do a second programme of detail infill drilling to then reach a confidence level for resource estimation and preliminary mine plan design. Preliminary mine plan will be followed by a trench bulk sampling programme to simulate mining, finalise the mine plan and gather geotechnical and production data for the feasibility study. This phase will determine the feasibility and decision on proceeding with the mining project in concession 4C and 5C and will be executed in eleven stages.

Alternatives

Appendix 2 Section 2 (h)(i) of the EIA Regulations, 2014, requires that all S&EIR processes must identify and describe feasible and reasonable alternatives, including the option of not implementing the activity (No-Go Alternative).

The proposed project site is preferred due to the history of rich diamond deposits in the area. The invasive prospecting phase will be dependent on the results of the preceding phase. The location and extent of the bulk sampling cannot be determined at this stage, therefore mapping of the specific prospecting activity site could not be undertaken at this stage. For the purposes of this report, the overall prospecting site is presented in Figure ES - 2.

The proposed technologies have been chosen based on long term proven success in diamond prospecting.

The option of not implementing the activity will result in a loss of valuable information regarding the mineral status (diamond deposits) present. In addition to this, should economically diamond deposits be present, and the applicant does not have the opportunity to prospect, the opportunity to utilise the deposits will be lost.

Furthermore employment will increase incrementally as the project develops with the anticipated mining phase bringing substantial revenue to the local and national treasury.

It is noted that due care will be applied in the execution schedule of the non-invasive geophysical surveys not to overlap with the migratory season of whales, thereby conducting geophysical survey work from June to November.

Description of the Site and Environment

The project is located in Sea Concession Areas 4C and 5C (Figure ES - 2), which are offshore areas located approximately from 10 km to 195 km seaward of the West Coast of South Africa. The total Prospecting Right area is approximately 781 362 hectares (excluding Namaqua Fossil Forest MPA). The application area is approximately 12.5 km from Kleinsee and 60 km from Hondeklipbaai.

It is noted that the Prospecting area excludes the Namaqua Fossil Forest MPA (as well as a 5 km buffer area around the area), located within the Offshore Concession Areas.

Baseline information for the EIAR was sourced through desktop analysis, information contained in similar studies as well as from Specialist Impact Assessments conducted as part of the EIA Phase of the Samara Project. A summary of the main baseline aspects is included in Table ES - 3. It serves to set the scene and provide context to the area for which the EIA was conducted.

Table ES - 3: Summary of the Profile of the Receiving Environment

Aspect	Description
Meteorology	The terrestrial climate along the West Coast of South Africa is considered moderate. Weather patterns along the West Coast are influenced largely by the mid-latitude cyclones that are generated to the southwest of the country, and the South Atlantic and Indian Ocean high pressure systems. Winds are one of the main physical drivers of the nearshore Benguela region, both on an oceanic scale, generating the heavy and consistent South-westerly swells that impact this coast, and locally, contributing to the northward-flowing longshore currents, and being the prime mover of sediments in the terrestrial environment. Seasonal changes result in substantial differences between the typical summer and winter wind patterns in the region, as the southern hemisphere anti-cyclonic high-pressures system, and the associated series of cold fronts, moves northwards in winter, and southwards in summer. Virtually all winds in summer come from the South to South-Southeast. 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.
Geophysical Dynamics	The continental shelf of the West Coast of South Africa is wide and deep, in contrast to the East Coast which is narrow and steep. The nearshore is generally narrow and rocky, and slopes steeply until approximately 80m of depth. Thereafter the slope between the middle and outer shelf is gentle to the shelf break at a depth of approximately 300m depth. The Concession Area is found within the deep sub-photic zone, along the continental shelf. The continental shelf within this area includes the Orange Bank (Shelf or Cone), a shallow zone (150 - 200 m) that reaches a maximum width of 180 km offshore of the Orange River mouth and the Childs Bank. The geological and sediment formations within the area of the Orange river mouth are thought to be related to a series of interglacial changes in sea level. As sea levels dropped due to historic glacial formation in the Northern Hemisphere, coastal erosion processes formed terraces, gullies, potholes, and sea cliffs. With each subsequent sea level retreat, these erosion-formed features were filled with coarse beach sediments due to wave action. Importantly, the lack of sediments both to the north and south away from the Orange river mouth, suggests that the sediments are derived from fluvial deposition. While coarse sediments are generally deposited North of the Orange river mouth, muddy sediments are found west, north and south of the Orange river mouth, probably dispersed by slow-moving ocean scale currents. This dispersal system is thought to have been operating since the Eocene (56 – 33 Ma). The geology and seabed geomorphology of the coastal and inner continental shelf areas differ significantly. The inner shelf is composed of bedrock, while the middle and outer shelf areas consist of sediments. However, due to erosion, sediment cover is thin, especially on the continental shelf. The sediments become finer as one moves further offshore, changing from sand on the inner and outer shelves to muddy sand and sandy mud in deeper water. This general pattern has been modified by biological deposition, where large areas of shelf

Aspect	Description
	sediments contain high levels of calcium carbonate. A 500-km-long mud belt, up to 40 km wide and with an average thickness of 15 m, is located over the inner edge of the middle shelf between the Orange River and St Helena Bay. Offshore, sediment is dominated by muddy sands, sandy muds, mud, and some sand. The continental slope, seaward of the shelf break, has a smooth seafloor and is underlain by calcareous ooze.
Biophysical Dynamics	The Benguela region's nearshore dynamics are primarily wind driven, both on a large scale, with winds driving south-westerly swells that impact the coast, and locally, with winds contributing to northward-flowing inshore currents, which in turn distribute sediments both in the marine environment and back on shore. Seasonal changes in wind direction and intensity affect both upwelling dynamics, long shore current flow and therefore sedimentation rates. Wind intensity and direction in the Benguela region are primarily influenced by the South Atlantic high-pressure cell and associated mid-latitude cyclones to the south of southern Africa, and seasonal atmospheric cut-off low pressures. The South Atlantic high pressure undergoes seasonal variations, being strongest during summer and weakening and migrating north-westwards in winter. Mid-latitude cyclones dominate during the winter months while cut-off lows developed during seasonal transitions in spring and autumn. The Concession Area is located offshore, being mainly influenced by the Benguela Upwelling System (BUS). The BUS is one of the most productive upwelling driven eastern boundary currents globally, where the dominant south-easterly wind described above displaces warm nutrient poor surface water offshore during the summer months, causing cold nutrient rich water from a deeper origin to replace it. The result is a cold northerly flowing eastern boundary current, rich in nutrients that supports phytoplankton growth in the presence of sunlight and therefore the base of the region's marine food web.
Biological Aspects	The Concession Area is situated in the cold temperate Namaqua Bioregion. The marine ecology of the southern Benguela region is primarily shaped by the coastal, wind-induced upwelling that characterises the Northern Cape coastline described in the previous paragraphs. The Benguela system is known for its cold surface water, high biological productivity, and highly variable physical, chemical, and biological conditions. Despite this, the West Coast is characterised by low marine species richness and low endemicity. Marine communities in the southern African West Coast region are generally abundant and specific only to substrate type or depth zone. These communities often comprise of varying numbers of species that often display considerable spatio-temporal variability. Within the broader Namaqua Bioregion, habitats comprise of both consolidated and unconsolidated sediments, hard reefs, and the pelagic water column. The main faunal species found in these habitats are therefore described below so that the effects of the potential exploratory activity can be assessed correctly. The majority (85%) of the Concession Area lies between 150-200m, with 14% in 100-150m and less than 1% deeper than 200m. The Concession Area is located within the Southern Benguela Ecoregion which extends from Cape Agulhas to Namibia, and falls within two broad ecosystem types: 1. Deep rocky shelf, found towards the Concession Area 's East (9 % of Concession Area); and 2. Deep soft shelf, found throughout the Concession Area unless otherwise stated. (91 % of the Concession Area). The entire deep rocky shelf broad ecosystem within the Concession Area consists of Namaqua Muddy Mid Shelf Mosaic (NMMSM) (9 % of Concession Area). Three ecosystems are found over the deep soft shelf habitat: • The Namaqua Sandy Mid Shelf (NSMS) (2 % of Concession Area); • The Namaqua Muddy Sands (NMS) (53 % of Concession Area); and • The Southern Benguela Sandy Outer Shelf (SBSOS) (36 % of Concession Area). All four of these ecosystem types are considered to be of Least Concern with regards to ecosystem collapse risk potential by the International Union for Conservation of Nature and Natural Resources (IUCN) (www.iucnredlist.org; accessed 15/04/2023). Of these ecosystems the Namaqua Muddy Mid Shelf Mosaic NMMSM, NSMS and SBSOS are all partially protected due to overlap with either the Namaqua Fossil Forest MPA or the Orange Shelf Edge MPA. Due to the NMS ecosystem not overlapping with any protected areas, this ecosystem is the only area of the Concession Area that does not receive any spatial protection from MPAs.
Ecology	The biological productivity that results from the wind driven upwelling is the main characteristic of the ecology of the area. The unique combination of seasonal increases in surface water nutrient levels combined with biological communities that have adapted to take advantage of this phenomenon leads to a particular pelagic and benthic faunal

Aspect	Description
	community in the Concession Area comprising low diversity and low endemicity. This faunal assemblage represents both sedentary (resident) and transient (migratory) fauna that either utilise the area seasonally or are confined to the area during their life history. The Benguela system displays cold surface water, significant biological productivity, and notable fluctuations in physical, chemical, and biological conditions.
Marine Protected Areas	In 2019, a network of 20 new MPAs was gazetted in South Africa which increased the protection of the coastal waters within South Africa's Exclusive Economic Zone (EEZ) to approximately 5.4%. The Namaqua Fossil Forest MPA is one of the recently proclaimed MPAs which is located adjacent to the Concession Areas 4C and 5C, 17 km offshore of Port Nolloth within the 120 to 150 m depth range and encompasses an area of approximately 875 km^2. The MPA was established due to the presence of a small rocky outcrop formed by fossilized yellowwood trees, including a species new to science. The outcrop formed by slabs of fossils trees has become colonised by sensitive cold water scleractinian corals. The MPA also incorporates unprotected mud habitat and a habitat forming sponge. The primary ecosystem types of the MPA comprises: • 4% Namaqua mid shelf fossils; • 52% Namaqua muddy mid shelf mosaic; • 29% Namaqua sandy mid shelf; and • 16% Namaqua muddy sands.
Heritage (Archaeology/Palaeontology)	According to SAHRA's Maritime and Underwater Cultural Heritage database, there are at least 68 wrecks recorded between the Oliphants and Orange Rivers. Sixteen of these shipwrecks are known to be on or close to the shore between Port Nolloth and Swartkop, landward of the concession areas, and these wrecks will thus not interfere with or be impacted by the proposed prospecting. There are no recorded wrecks within Concession Areas 4C and 5C, although a 2017 heritage impact assessment produced for portions of the concession areas suggests that five wrecks have the potential to be present within the concession area boundaries. ECO (2023), however believes, that with the exception of the *Eros* which on balance is more likely to be located near Lamberts Bay than in the vicinity of the concession areas, it is possible, but unlikely, that the remains of the *Haab*, *Jessie Smith*, *Ocean King* and *La Porte* lie within the concession areas. Although unlikely, the possibility does exist for the remains of currently unknown and unrecorded wrecks to be present in the concession areas.
Fisheries	Approximately 14 different commercial fishery sectors currently operate within South African waters. Primary fisheries in terms of economic value and overall tonnage of landings are the demersal (bottom) trawl and long-linefisheries targeting the Cape hakes and the pelagic-directed purse-seine fishery targeting pilchard, anchovy, and red-eye round herring. Highly migratory tuna and tuna-like species are caught on the high seas and seasonally within the South African waters by the pelagic long-line and pole fisheries. Targeted species include albacore, bigeye tuna, yellowfin tuna and swordfish. The traditional linefishery targets a large assemblage of species close to shore including snoek, Cape bream, geelbek, kob, yellowtail and other reef fish. Crustacean fisheries comprise a trap and hoop netfishery targeting West Coast rock lobster, a line trap fishery targeting the South Coast rock lobster and a trawl fishery based solely on the East Coast targeting penaeid prawns, langoustines, deep-water rock lobster and red crab. Other fisheries include a mid-water trawl fishery targeting horse mackerel predominantly on the Agulhas Bank, South Coast and a hand-jig fishery targeting chokka squid exclusively on the South Coast. In addition to commercial sectors, recreational fishing occurs along the coastline comprising shore angling and small, open boats generally less than 10 m in length. The commercial and recreational fisheries are reported to catch over 250 marine species, although fewer than 5% of these are actively targeted by commercial fisheries, which comprise 90% of the landed catch.
Air Quality	There are no significant sources of air pollution in the area. It is therefore expected that air quality in the project area is good.
Noise	There are no significant sources of noise in the area, other than vessels.

Aspect	Description
Prospecting and Mining	Offshore Namaqualand, marine diamond prospecting and mining is conducted in the nearshore surfzone, A-Concession (up to 1 km offshore), B-Concession (1 to 5 km offshore) and C-Concession (5 km up to 200 m isobath) areas. Work in the surfzone area is conducted by divers using suction hoses operating directly from the shore. A- and B-Concession areas use small vessels (up to est. 30 m length) with diver assist suction hoses for mining. These vessels are small enough to operate from the small harbours of Alexander Bay and Port Nolloth. C-Concession areas require larger vessels and remotely operated equipment. These larger vessels cannot use the small local harbours and have to return to Cape Town for maintenance.
Oil and Gas Exploration	Exploration for oil and gas is currently undertaken in a number of licence blocks off the West Coast of South Africa. Although now development or production from the South African West Coast offshore, exploration for oil and gas is being undertaken in the area.
Anthropogenic structures	Human intervention in the marine environment has introduced certain hazards on the seafloor. The Annual Summary of South African Notices to Mariners and charts from the South African Navy or Hydrographic Office provides detailed information on the location of different underwater hazards along the West Coast. These include undersea cables and archaeological sites.
Undersea Cables	There are a number of submarine telecommunications cable systems across the Atlantic and the Indian Ocean, including the WACS and ACE cables. The SAT3/SAFE cables (SAT-1 [abandoned], SAT-2 and SAT-3) are laid on the seafloor approximately on the 3 000 m isobaths, running up the Cape Canyon to land at Melkbosstrand.

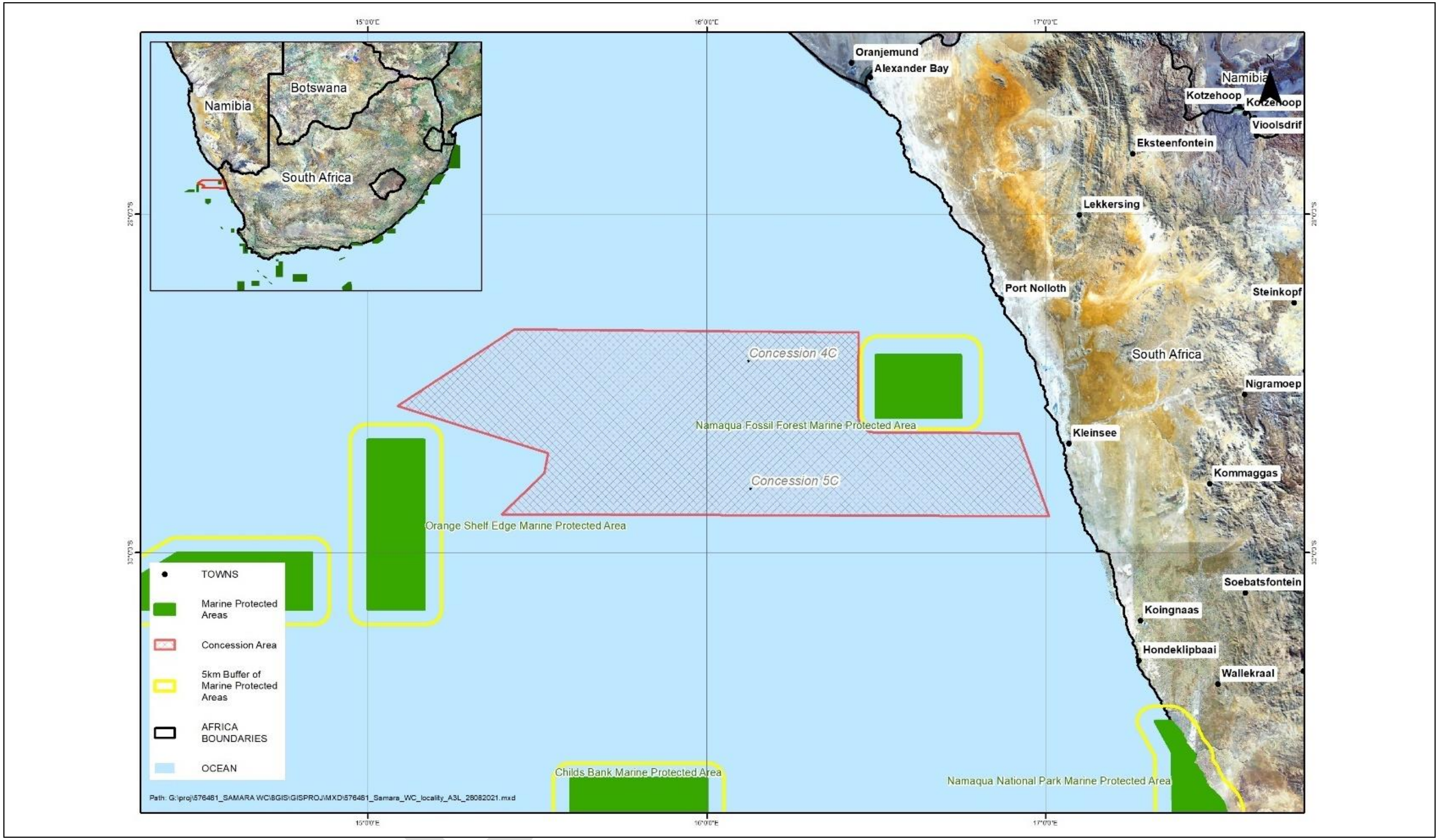

Figure ES - 2: Locality map

Potential Environmental and Social Impacts

The impacts of a project are mostly linked to the sensitivity of the receiving environment and proximity of receptors, the extent or footprint and nature of the development, expected discharges and stakeholders' perceptions.

Based on the above considerations as well as the professional experience of the Environmental Assessment Practitioners and input from specialists, the following key environmental issues – potential negative impacts and potential benefits of the project in its proposed setting – have been identified.

- Marine ecology - Potential impact on marine biota and resources, including the seabed;
- Underwater heritage – Potential impacts on sites of archaeological or palaeontological significance;
- Marine transport routes – Potential impact on marine transport routes a result of the statutory safety zone requirements around prospecting vessels;
- Fishing: Potential impact on fishing resulting in economic loss; and
- Socio-economic – Benefits of employment opportunities and local investment opportunities. Potential impact on other marine prospecting/mining and exploration operations.

Certain impacts, while important, are considered likely to be less significant, including air quality, traffic and visual (or sense of place) aspects.

Specialist Studies

To address the potential issues and impacts identified thus far, the following specialist studies were conducted:

- Underwater Heritage Impact Assessment (ACO Associates cc);
- Marine Ecology Impact Assessment (Aquatic Ecosystem Services); and
- Fisheries Impact Assessment (Capricorn Marine Environmental (Pty) Ltd).

Specialists were required to provide detailed baseline information and to identify and assess the potential impacts of the proposed project within their particular field of study. In addition, specialists were required to identify practicable mitigation and optimisation measures to avoid or minimise potential negative impact and/or enhance any benefits. SRK's standard impact rating methodology was employed in the assessment of impacts.

Results from the completed specialist studies were collated into the EIAR and Environmental Management Programme (EMPr). The EIAR and EMPr will be released for public comment through notifications to registered I&APs. Key authorities will also be consulted as part of the process.

All comments received will be incorporated into a Comments and Responses Summary, which will be appended to the Final EIAR. The EIAR and EMPr will then be submitted to the DMRE for their consideration in decision-making.

Environmental Impact Assessment

A summary of the impact assessment results is presented in Table ES - 4.

Table ES - 4: Summary of the Findings of the Environmental Impact Assessment

Activities	Aspect	Potential Impact	Significance Without Mitigation	Significance With Mitigation
Geophysical surveying; Drill/bulk sampling activities.	Marine Ecology	Potential noise impacts on invertebrates.	VERY LOW	VERY LOW
		Potential noise impacts on fish.	VERY LOW	VERY LOW
		Potential noise impacts on marine mammals.	VERY LOW	VERY LOW
		Potential vessel strikes on marine mammals.	VERY LOW	INSIGNIFICANT
		Drill/bulk sampling impacts on benthic fauna.	LOW	VERY LOW
		Potential crushing of epifaunal communities by crawler tracks.	VERY LOW	VERY LOW
		Increased turbidity in the water column due to the suspension of fine sediments during Drill/Bulk sampling activities.	VERY LOW	VERY LOW
		Potential sedimentation impacts on benthic communities due to coarse tailings.	LOW	INSIGNIFICANT
		Marine pollution originating from operational discharges during vessel operations.	VERY LOW	INSIGNIFICANT
	Fisheries	Impact of multi-beam and sub-bottom profiling sonar on fisheries.	VERY LOW	VERY LOW
		Impact of temporary exclusion of fishing operations during survey and sampling operations.	INSIGNIFICANT	INSIGNIFICANT
		Impact of noise from sampling/trenching operations on fisheries.	VERY LOW	VERY LOW
		Impact of sediment plumes on fish stock recruitment.	VERY LOW	VERY LOW
		Impact of temporary exclusion of fishing operations during exploration sampling operations.	INSIGNIFICANT	INSIGNIFICANT
	Archaeology/ Palaeontology	Potential significant loss of Cretaceous fossil woods.	MEDIUM	LOW (+)
		Potential significant loss of Cenozoic shelly macrofauna.	VERY LOW	VERY LOW
		Potential significant loss of fossil bones and teeth.	MEDIUM	VERY LOW

Activities	Aspect	Potential Impact	Significance Without Mitigation	Significance With Mitigation
		Potential significant loss of shells from the last Transgression Sequence	**MEDIUM**	**LOW**
		Potential significant loss of submerged prehistoric archaeological sites and materials	**MEDIUM**	**LOW (+)**
	Marine Prospecting/Exploration/Mining	The presence of survey and support vessels may have an impact due to the legislative requirement of a 500 m safety zone around these vessels.	**LOW**	**VERY LOW**
	Marine Transport Routes	The presence of survey and support vessels may have an impact due to the legislative requirement of a 500 m safety zone around these vessels.	**LOW**	**VERY LOW**
	Socio-Economic	Creation of employment and business opportunities.	**LOW (+)**	**LOW (+)**
	Cumulative	Potential impact on benthic environment.	**LOW**	**LOW**
		Potential impact on the socio-economic environment.	**LOW**	**LOW**
	No-Go alternative	Option of not continuing with the planned prospecting activities.	**MEDIUM**	**MEDIUM**

Mitigation and Monitoring

In terms of the Samara Concession and EA application for prospecting, all negative environmental and social impacts identified will be managed and mitigated to acceptable levels whilst the positive impact will be enhanced to realise the potential positive impacts through the implementation of the commitments stipulated in the EMPr. Samara will be responsible for ensuring that all environmental and social obligations pertinent to the Samara Concession Prospecting Project are met. The implementation of the EMPr and meeting of the environmental objectives and targets are also the responsibility of Samara.

An EMPr specific to the Samara Concession Prospecting Project has been prepared. The EMPr contains specific management measures recommended by the specialists that should be implemented.

Conclusion

This EIAR has identified and assessed the potential biophysical and socio-economic impacts associated with the Samara Concession Prospecting Project, which entails planned prospecting, including bulk sampling, in an offshore area for diamonds in the Namaqua District Municipality around the Nama Khoi and Richtersveld Local Municipalities in the Northern Cape Province.

In terms of Section 31 (n) of NEMA, the EAP is required to provide an opinion as to whether the activity should or should not be authorised. In this section, a qualified opinion is ventured, and in this regard SRK believes that sufficient information is available for DMRE to take a decision.

The project will result in unavoidable negative environmental impacts, however, these are of limited intensity and limited scale, assuming the implementation of recommended mitigation and are not considered unacceptably significant. In addition, the project could potentially contribute to ongoing regional socio-economic benefits.

The Stakeholder Engagement Process conducted during the EIA process has given stakeholders the opportunity to assist with the identification of issues and potential impacts, and to submit their comments. Various Organs of State submitted comments, and none raised objections or fatal flaws.

Working on the assumption that Samara is committed to ensuring that the project is operated and constructed to high standards, achieved through implementation of the recommended mitigation measures and ongoing monitoring of performance, SRK believes, and the EIAR demonstrates that, through effective implementation of the stipulated mitigation measures, the adverse impacts can be reduced to levels compliant with national standards or guidelines.

The fundamental decision is whether to allow the prospecting for diamonds, which is generally consistent with development policies for the area, but which may have limited biophysical impacts.

The HIA specialist’s reasoned opinion is that the proposed prospecting activities in Concession Areas 4C and 5C are likely to have a very low impact on palaeontological and submerged prehistoric archaeological resources, and no impact on maritime archaeological sites and materials. Provided the recommendations to mitigate and offset potential impacts are implemented, the proposed prospecting can be considered to be archaeologically acceptable.

According to the Marine Impact Assessment the most significant impact concern relating to the proposed prospecting application is that of bulk sampling and the dumping of tailings over potentially sensitive habitat types found within the Concession Area. While the existing Concession Area layout to excludes potentially sensitive areas around the two MPAs found in the immediate vicinity by including 5 km buffer zones, there are other areas that have been identified in the National Coastal and Marine Spatial Biodiversity Plan (NCMSBP) as Critical Biodiversity Areas (CBAs) which are not compatible with the current proposed exploration proposal. The CBA maps identify 32% of the Concession Area as Critical Biodiversity Area in a natural state (CBA-N), 3% as an Ecological Support Area (ESA) and <0.001% considered as Critical Biodiversity Areas that require recovery (CBA-R). The remaining 65% of the Concession Area is unclassified in terms of the CBA maps. Based on this recent marine spatial planning, a significant portion of the proposed Concession Area is not compatible with the proposed bulk sampling methods. The remaining potential impacts on the marine environment include the presence of the ship and the associated surveying activities are not seen to be major cause for concern if specific mitigation measures are implemented which have been outlined in this report.

The Marine Impact Assessment specialist is thus of the opinion that exploration in the Concession Areas that fall outside the areas delineated on the CBA maps should be approved. Approval for non-invasive studies (drilling and bulk sampling) in the CBA and ESA areas should be granted. Approval for invasive sampling in the CBAs and ESAs should be withheld at this stage pending further information on the mineral resources in this area based on the findings of the geophysical survey from which a detailed spatial sampling plan can be developed.

It is the opinion of the Fisheries Impact Assessment specialist that, if all environmental guidelines, and appropriate mitigation measures and management actions advanced in this report, and the EIA and EMPr for the proposed prospecting operations as a whole, are implemented, there is no reason why the proposed prospecting activities should not proceed.

In conclusion SRK is of the opinion that on purely 'environmental' grounds (i.e., the project's potential socio-economic and biophysical implications) the application as it is currently articulated should be approved, provided the essential mitigation measures are implemented. Ultimately, however, the DMRE will need to consider whether the project benefits outweigh the potential impacts (and if the negative socio-economic impact of the No-Go alternative is acceptable in the context of relatively low significance biophysical impacts of the development alternative).

If approved, it is SRK's opinion that the authorisation should be valid for a period of 5 years.

YOUR COMMENT ON THE ENVIRONMENTAL IMPACT ASSESSMENT REPORT

This EIAR/EMPr will be available for comment from 17 May 2023 to 15 June 2023. Copies of the EIAR/EMPr will be made available at the following public places for review:

- Port Nolloth Municipality;
- Recreation Club in Kleinzee; and
- Hondeklipbaai Municipality.

In addition to emailing an Executive Summary of the EIAR to registered I&APs, the Report will also be made available to the public via the SRK's website at www.srk.com by clicking on the following link: *https://www.srk.com/en/public-documents/samara-draft-eiar*.

I&APs are requested to provide comments and information on the following aspects of the proposed project:

- Information on how I&APs consider that the proposed activities will impact on them or their socio-economic conditions;
- Written responses stating their suggestions to mitigate the anticipated impacts of each activity;
- Information on current land uses and their location within the area under consideration;
- Information on the location of environmental features on site to make proposals as to how and to what standards the impacts on site can be remedied; and
- How to mitigate the potential impacts on their socio-economic conditions and to make proposals as to how the potential impacts on their infrastructure can be managed, avoided, or remedied.

DUE DATE FOR COMMENT

15 June 2023

Please submit comments to the stakeholder engagement officer[6]:

Ms. Marissa Swart	**Dr Laetitia Coetser**
PostNet Suite #177, Private Bag X20009	PostNet Suite #177, Private Bag X20009
Garsfontein, GT-South Africa, 0042	Garsfontein, GT-South Africa, 0042
+27 (0) 12 361 1908	+27 (0) 12 361 1908
MSwart@srk.co.za	LCoetser@srk.co.za

[6] *As of 1 July 2021, there have been some changes to the Protection of Personal Information Act 4 of 2013 (POPIA), which aims to promote protection of personal information. It is assumed that in providing your Personal Information to be registered as an Interested and Affected Party for this Project you authorise SRK to:*

- *Retain and use your Personal Information as part of a contact database for this and/or other Social and Environmental Impact Assessment Project(s);*
- *Contact you regarding this and/or other Social and Environmental Impact Assessment processes;*

You may request for your Personal Information to be deleted from the I&AP database at any time by contacting SRK by e-mail or in writing at the addresses given above. Please note that all comments received will be included in the project documentation. This may include personal information.

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Disclaimer

The opinions expressed in this Report have been based on the information supplied to SRK Consulting (South Africa) (Pty) Ltd (SRK) by Samara Mining (Pty) Ltd (Samara). The opinions in this Report are provided in response to a specific request from Samara to do so. SRK has exercised all due care in reviewing the supplied information. Whilst SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information and does not accept any consequential liability arising from commercial decisions or actions resulting from them. Opinions presented in this report apply to the site conditions and features as they existed at the time of SRK's investigations, and those reasonably foreseeable. These opinions do not necessarily apply to conditions and features that may arise after the date of this Report, about which SRK had no prior knowledge nor had the opportunity to evaluate.

Environmental Assessment Practitioner Affirmation

Section 16 (1) (b) (iv), Appendix 1 Section 3 (1) (r), Appendix 2 Sections 2 (i) and (j) and Appendix 3 Section 3 (s) of the Environmental Impact Assessment (EIA) Regulations, 2014 (promulgated in terms of the National Environmental Management Act 107 of 1998 (NEMA), require an undertaking under oath or affirmation by the Environmental Assessment Practitioner (EAP) in relation to:

- The correctness of the information provided in the report;
- The inclusion of comments and inputs from stakeholders and interested and affected parties;
- Any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties; and
- The level of agreement between the EAP and interested and affected parties on the Plan of Study for undertaking the environmental impact assessment.

SRK and the EAPs managing this project hereby affirm that:

- To the best of our knowledge the information provided in the report is correct, and no attempt has been made to manipulate information to achieve a particular outcome. Some information, especially pertaining to the project description, was provided by the applicant and/or their sub-contractors. In this respect, SRK's standard disclaimer (inserted in this report) pertaining to information provided by third parties applies.
- To the best of our knowledge all comments and inputs from stakeholders and interested and affected parties have been captured in the report and no attempt has been made to manipulate such comment or input to achieve a particular outcome. Written submissions are appended to the report while other comments are recorded within the report. For the sake of brevity, not all comments are recorded verbatim and are mostly captured as issues, and in instances where many stakeholders have similar issues, they are grouped together, with a clear listing of who raised which issue(s).
- If applicable, information and responses provided by the EAP to interested and affected parties are clearly presented in the report. Where responses are provided by the applicant (not the EAP), these are clearly indicated.
- With respect to EIA Reports, SRK will take account of interested and affected parties' comments on the Plan of Study and, insofar as comments are relevant and practicable, accommodate these during the Impact Assessment Phase of the EIA process.

I <u>Susanna Elizabeth (Laetitia) Coetser</u> herewith undertake that the information provided in the foregoing report is correct, and that the comments and inputs from stakeholders and Interested and Affected parties has been correctly recorded in the report

SRK Consulting - Certified Electronic Signature

srk consulting

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3764-5810-2958-COES-16/05/2023

This signature has been printed digitally. The Authorhas given permission forits use forthis document. The details are stored in the SRK Signature Database

Signature of the Environmental Assessment Practitioner:

SRK Consulting (South Africa) (Pty) Ltd

Name of company:

15 May 2023

Date:

Applicant's Details

DMRE Reference No	DMRE Reference Number: NCS 30/5/1/1/2/1 (12855) PR
Name of Applicant	Samara Mining (Pty) Ltd
Company Registration	K2018/052869/07
Responsible Person	Dr Simphiwe Dywili
Postal Address	PO Box 11124 Hadison Park Kimberley 8306
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Facsimile	+27 53 839 4880
E- mail	Info@samaramining.com
Type of minerals for which rights are applied for	Diamonds

List of Abbreviations

AEL	Atmospheric Emission Licence
BA	Basic Assessment
BUS	Benguela Upwelling System
CBA	Critical Biodiversity Areas
CBA-N	Critical Biodiversity Areas – Natural State
CBA-R	Critical Biodiversity Areas - Restored
CPUE	Catch Per Unit Effort
CRR	Comments and Responses Report
DBCM	De Beers Group of Companies
DEA	National Department of Environmental Affairs
DFFE	Department of Forestry, Fisheries and the Environment
DMRE	Department of Mineral Resources and Energy
DMS	Dense Media Separation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EIS	Environmental Impact Statement
EMPr	Environmental Management Programme
ESA	Ecological Support Areas
ESIA	Environmental and Social Impact Assessment
FEPA	Freshwater Ecosystem Priority Area
SR	Scoping Report
GN	Government Notice
GN R	Government Notice Regulation
GPS	Global Positioning System
HIA	Heritage Impact Assessment
I&AP	Interested and Affected Party
ICCAT	International Convention for the Conservation of Atlantic Tunas
IDP	Integrated Development Plan
IEM	Integrated Environmental Management
IOTC	Indian Ocean Tuna Commission
IUCN	International Union for Conservation of Nature and Natural Resources
LN	Listing Notice
LPF	Large Pelagic Fishes
LSA	Later Stone Age
MARPOL	International Convention for the Prevention of Pollution from Ships
MIS	Marine Isotope Stage
MLRA	Marine Living Resources Act No. 18 of 1998
MMO	Marine Mammal Observer

MPA	Marine Protected Area
MPRDA	Mineral and Petroleum Resources Development Act No. 28 of 2002
MPRDAA	Mineral and Petroleum Resources Development Amendment Act No. 49 of 2008
MSA	Middle Stone Age
NCMSBP	National Coastal and Marine Spatial Biodiversity Plan
NDI	NDI Geological Consulting Services (Pty) Ltd
NEM: AQA	National Environmental Management: Air Quality Act No. 39 of 2004
NEM: ICMA	National Environmental Management: Integrated Coastal Management Act No. 24 of 2008
NEM: PAA	National Environmental Management: Protected Areas Act No. 57 of 2003
NEM: WA	National Environmental Management: Waste Act No. 59 of 2008
NEMA	National Environmental Management Act No. 107 of 1998 as amended
NDM	Namaqua District Municipality
NHRA	National Heritage Resources Act
NMMSM	Namaqua Muddy Mid Shelf Mosaic
NMS	Namaqua Muddy Sands
NSMS	Namaqua Sandy Mid Shelf
PAM	Passive Acoustic Monitoring
PSDF	Provincial Spatial Development Framework
S&EIR	Scoping and Environmental Impact Reporting
SADSTIA	South African Deep-Sea Trawling Industry Association
SAHRA	South African Heritage Resources Agency
SAMLMA	South African Marine Linefish Management Association
SAMSA	South African Maritime Safety Authority
SANHO	South African Navy Hydrographic Office
SBSOS	Southern Benguela Sandy Outer Shelf
SDO	Spatial Development Objective
SDF	Spatial Development Framework
SPF	Small Pelagic Fishes
SRK	SRK Consulting (South Africa) (Pty) Ltd
TAC	Total Allowable Catch
TAE	Total Allowable Effort
ToR	Terms of Reference
UNCLOS	United Nations Convention on the Law of the Sea
VMS	Vessel Monitoring System

Glossary

Archaeology	Remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures.
Baseline	Information gathered at the beginning of a study which describes the environment prior to development of a project, and against which predicted changes (impacts) are measured.
Bathymetry	The measurement of water depths in the oceans, seas, and lakes.
Benguela Current	The broad, northward flowing ocean current that forms the eastern portion of the South Atlantic Ocean.
Benthic	Living or occurring on or in the seabed.
Biodiversity	The diversity, or variety, of plants, animals and other living things in a particular area or region. It encompasses habitat diversity, species diversity and genetic diversity
Biota	The plant and animal life of a particular area.
Cartilagenous fish	A fish having a skeleton of cartilage rather than bone; includes the sharks, rays, and chimaeras.
Community	Those people who may be impacted upon by the construction and operation of the project. This includes neighbouring landowners, local communities, and other occasional users of the area.
Concession Area	The area being investigated by this study. It is the combination of Concession Area 4C and 5C.
Construction Phase	The stage of project development comprising site preparation as well as all construction activities associated with the development.
Consultation	A process for the exchange of views, concerns, and proposals about a project through meaningful discussions and the open sharing of information.
Cumulative Impacts	Direct and indirect impacts that act together with current or future potential impacts of other activities or proposed activities in the area/region that affect the same resources and/or receptors.
Demersal	Living or occurring near the bottom of a water body or the water column.
Early Stone Age	The archaeology of the Stone Age between 700 000 and 2 500 000 years ago.
Ecology	The study of the interrelationships of organisms with and within their physical surroundings.
Ecosystem	The interconnected assemblage of all living organisms that occupy a given area and the physical environment with which they interact.
Endemic / Endemism	Species unique (native or restricted) to a defined geographic location, i.e., ecological state of a species being unique to a defined geographic location.
Environment	The external circumstances, conditions and objects that affect the existence of an individual, organism or group. These circumstances include biophysical, social, economic, historical, and cultural aspects.
Environmental Authorisation	Permission granted by the competent authority for the applicant to undertake listed activities in terms of the NEMA EIA Regulations.
Environmental Impact Assessment	A process of evaluating the environmental and socio-economic consequences of a proposed course of action or project.

Environmental Impact Assessment Report	The report produced to relay the information gathered and assessments undertaken during the Environmental Impact Assessment.
Environmental Management Programme	A description of the means (the environmental specification) to achieve environmental objectives and targets during all stages of a specific proposed activity.
Epifauna	Animals that live on the surface of the seabed sediments.
Fauna	The collective animals of a particular region, habitat or geological period.
Heritage	That which is inherited and forms part of the National Estate (Historical places, objects, fossils as defined by the National Heritage Resources Act 25 of 1999.
Heritage Resources	Refers to something tangible or intangible, e.g., a building, an area, a ritual, etc. that forms part of a community's cultural legacy or tradition and is passed down from preceding generations and has cultural significance.
Holocene	The most recent geological time period which commenced 10 000 years ago.
Hominin	A member of the tribe Hominini which comprises those species regarded as human, directly ancestral to humans, or very closely related to humans.
Impact	A change to the existing environment, either adverse or beneficial, that is directly or indirectly due to the development of the project and its associated activities.
Independent EAP	An independent person with the appropriate qualifications and experience appointed by the Applicant to manage the Environmental Impact Assessment process on behalf of the Applicant.
Integrated Environmental Management	The practice of incorporating environmental management into all stages of a project's life cycle, namely planning, design, implementation, management, and review.
Isobath	An underwater depth contour line.
Late Stone Age	The archaeology of the last 20 000 years associated with fully modern people.
Macrofauna	Animals that are retained on a 1 mm mesh.
Marine Isotope Stage	Alternating warm and cool periods in the Earth's paleoclimate, deduced from oxygen isotope data reflecting changes in temperature derived from data from deep sea core samples.
Middle Stone Age	The archaeology of the Stone Age between 20 000-300 000 years ago associated with early modern humans.
Mitigation measures	Design or management measures that are intended to avoid and / or minimise or enhance an impact, depending on the desired effect. These measures are ideally incorporated into a design at an early stage.
Operational Phase	The stage of the works following the Construction Phase, during which the development will function or be used as anticipated in the Environmental Authorisation.
Pleistocene	A geological time period (of 3 million – 10 000 years ago).
Prospecting	*"Intentionally searching for any minerals by means of any method which disturbs the surface or sub-surface of the earth, including any portion of the earth that is under the sea or under other water…"*
Quaternary	The current and most recent of the three periods of the Cenozoic Era spanning the period from ± 2.5 million years ago to the present.

Red Data List	Species of plants and animals that, because of their rarity and/or level of endemism, are included on a Red Data List (usually compiled by the IUCN) which provides an indication of their threat of extinction and recommendations for their protection.
Scoping	A procedure to consult with stakeholders to determine issues and concerns and for determining the extent of and approach to an EIA and EMPr (one of the phases in an EIA and EMPr). This process results in the development of a scope of work for the EIA, EMPr and specialist studies.
Shelf Break	The shelf break is the division between the part of the continental shelf beyond the influence of light (~30 m), and the continental slope. As this break occurs at vastly different depths, it is referred to simply as the shelf break, without an actual depth value being assigned to it. On the West Coast it varies from about 400 m in the Namaqua bioregion to 200 m in the Agulhas bioregion.
Specialist study	A study into a particular aspect of the environment, undertaken by an expert in that discipline.
Stakeholder engagement	The process of notifying and consulting stakeholders about a proposed project and providing opportunities for input into the EIA process and project design. Also referred to as Public Participation.
Stakeholders	All parties affected by and/or able to influence a project, often those in a position of authority and/or representing others.
Sustainable development	Sustainable development is generally defined as development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs. NEMA defines sustainable development as the integration of social, economic, and environmental factors into planning, implementation and decision-making so as to ensure that development serves present and future generations.

1 Introduction

1.1 Background of the project

Samara Mining (Pty) Ltd (Samara) intends to undertake an exploration programme in Sea Concession Areas 4C and 5C located approximately from 10 km to 195 km seaward of the West Coast shoreline of South Africa.

Samara is represented in this application by acting agent, NDI Geological Consulting Services (Pty) Ltd (NDI) situated in Kimberley in the Northern Cape. NDI provides geological services and has submitted all the relevant project applications to the Department of Mineral Resources and Energy (DMRE). Accordingly, NDI is recognised as the independent Environmental Assessment Practitioner (EAP) at the DMRE. SRK Consulting (South Africa) (Pty) (SRK), acts on behalf of NDI as the independent EAP to undertake and manage the Environmental Impact Assessment (EIA) and to undertake the Stakeholder Engagement Process.

Samara lodged an application in terms of Section 22 of the Mineral and Petroleum Resources Act (Act No. 28 of 2002) (MPRDA), as amended by the Mineral and Petroleum Resources Development Amendment Act (Act No. 49 of 2008) (MPRDAA) for a Prospecting Right with the DMRE. The application is for a Prospecting Right for bulk sampling for diamonds, which will be undertaken in a phased approach.

To prospect for diamonds, Samara Mining intends to use both invasive and non-invasive methods. The non-invasive method will be made up of desktop studies, geophysical surveys, 3D geological modelling and resource estimation. The invasive methods will comprise of Exploration Drilling and Bulk (Trench) Sampling.

Desktop studies entail combining available historic data in order to get a clear understanding of the proposed diamond deposit character.

Geophysical surveys will be done to identify geological features where further exploration sampling will be undertaken. The equipment for the survey will be deployed from a vessel appropriate for the depth and survey method to be used.

Where geological features of interest (showing potential for diamond prospecting) have been identified, follow up surveys and sampling will be undertaken. Sampling will consist of two methods of which, the first will be extraction of unconsolidated sediment from the seabed using drill technology from a dedicated exploration vessel and the second method will be extraction of unconsolidated sediment using a dedicated bulk sampling vessel to dredge exploration trenches using crawler technology. The sampled material will be treated on board the vessels through a diamond processing plant inclusive of final diamond recovery.

The National Environmental Management Act (Act No. 107 of 1998) (NEMA) and the Environmental Impact Assessment (EIA) Regulations, 2014 (Government Notice Regulation (GN R) 982)[7] (promulgated in terms of NEMA) warrant that listed activities require an Environmental Authorisation (EA). The EIA Regulations, lays out two alternative authorisation processes. Depending on the type of activity that is proposed, either a Basic Assessment (BA) process or a Scoping and EIA process is required to obtain EA. Listing Notice (LN) 1[8] lists activities that require a BA process, while LN 2[9] lists

[7] As amended by GN R327, GN R325 and GN R324 on 7 April 2017 & GN R517 on 11 June 2021
[8] GN R983 of 2014, as amended by GN 327 of 2017 & GN R517 on 11 June 2021
[9] GN R984 of 2014, as amended by GN 325 of 2017 & GN R517 on 11 June 2021

activities that require Scoping and EIA. LN 3[10] lists activities in certain sensitive geographic areas that require a BA process.

The proposed project triggers activities listed in terms of LN 1 and LN 2 of the EIA Regulations, 2014, requiring a Scoping and EIA Authorisation process to be undertaken. As potential fossil material should be collected for later identification and evaluation, Samara should also apply to the South African Heritage Resources Agency (SAHRA) for a general permit to destroy, damage, excavate, disturb and collect fossils identified during sampling, as per the National Heritage Resources Act (Act No. 25 of 1999) (NHRA) and any recovered material is to be temporarily stored by the company.

It is not anticipated that other key authorisations, permits or licences might be required before the project may proceed.

1.2 Objective of the EIA Process

The objectives of the EIA Phase, as per the EIA Regulations, are to:

(a) Determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;

(b) Describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the development footprint on the approved site as contemplated in the accepted scoping report;

(c) Identify the location of the development footprint within the approved site as contemplated in the accepted scoping report based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;

(d) Determine the-

- *(i) Nature, significance, consequence, extent, duration, and probability of the impacts occurring to inform identified preferred alternatives; and*
- *(ii) Degree to which these impacts-*
  - *(aa) Can be reversed;*
  - *(bb) May cause irreplaceable loss of resources; and*
  - *(cc) Can be avoided, managed or mitigated;*

(e) Identify the most ideal location for the activity within the development footprint for the approved site as contemplated in the accepted scoping report based on the lowest level of environmental sensitivity identified during the assessment;

(f) Identify, assess, and rank the impacts the activity will impose on the development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity;

(g) Identify suitable measures to avoid, manage, or mitigate identified impacts, and

(h) Identify residual risks that need to be managed and monitored.

[10] GN R985 of 2014, as amended by GN 324 of 2017 & GN R517 on 11 June 2021

1.3 Purpose of the Report

The EIA Report (EIAR) documents the steps undertaken during the Impact Assessment Phase to assess the significance of potential impacts and determine measures to mitigate the negative impacts and enhance the benefits (or positive impacts) of the proposed project. The report presents the findings of the Impact Assessment Phase and the public participation that forms part of the process.

The EIAR is accompanied by an Environmental Management Programme (EMPr), which documents the management and monitoring measures that need to be implemented during the design, construction and operational phases of the project to ensure that impacts are appropriately mitigated and benefits enhanced.

More specifically, the objectives of this EIAR are to:

- Inform the stakeholders about the proposed project and the Scoping and Environmental Impact Reporting (S&EIR) (also referred to as EIA) process followed;
- Obtain contributions from stakeholders (including the applicant, consultants, relevant authorities and the public) and ensure that all issues, concerns and queries raised are fully documented and addressed;
- Assess in detail the potential environmental and socio-economic impacts of the project;
- Identify environmental and social mitigation measures to address the impacts assessed; and
- Produce an EIA Report that will assist DMRE to decide whether (and under what conditions) to authorise the proposed development.

1.4 Profile and Expertise of EAPs

As mentioned previously, Samara is represented in this application by acting agent, NDI. NDI provides geological services and has submitted all the relevant project applications to the DMRE. Accordingly NDI is recognised as the independent EAP at the DMRE. SRK, acts on behalf of NDI as the independent EAP to undertake and manage the EIA and to undertake the Stakeholder Engagement Process.

NDI is a young South African based black and woman owned consulting company. The company has established offices in Kimberley and the Northern Cape. The company now has another branch in Johannesburg, Gauteng. NDI personnel have geological, environmental, and geotechnical engineering experience in the exploration and mining background. The company has more than 20 years combined team experience in the exploration and mining fields. The team has experience in commodities such as gold, platinum, coal, diamonds, iron ore, manganese, chrome, uranium, rare earth elements and mineral sands. NDI is well versed with the government regulations and policies. NDI's experience has been acquired locally and in other African countries.

SRK (EAP) was established in 1974 and has since undertaken a large variety of environmental studies. SRK is a South African founded international organisation of professionals providing a comprehensive range of consulting services to natural resource industries and organisations. South African offices are staffed with over 400 professional consultants in nine offices, operating in a range of disciplines, mainly related to the environment, water, social, and mining sectors. Back-up and peripheral expertise are available within these offices for all environmental projects.

A copy of the EAP and project team's Curriculum Vitae and qualifications, as well as copies of professional registration certificates are attached in Appendix A. As required by NEMA, the qualifications and experience of the key independent EAPs undertaking the EIA are detailed as follow:

Project Director (SRK): Christopher Dalgliesh, BBusSc (Hons); MPhil (EnvSci)
Christopher Dalgliesh is an SRK Director and Principal Environmental Consultant with over 35 years' experience, primarily in Southern Africa, West Africa, South America, the Middle East, and Asia. Christopher has worked on a wide range of projects, notably in the natural resources, Oil & Gas, waste, infrastructure, and industrial sectors. He has directed and managed numerous Environmental and Social Impact Assessments (ESIAs), in accordance with international standards (e.g., International Finance Corporation). He regularly provides high level review of ESIAs, frequently directs Environmental and Social Due Diligence studies and monitors project on behalf of financial institutions, and has a depth of experience in Strategic Environmental Assessment and Resource Economics. He holds a BBusSci (Hons) and M Phil (Env) and is a Registered Environmental Assessment Practitioner.

Project Manager/Reviewer: Dr Laetitia Coetser (SRK), PhD (Water Resource Management), *Pri.Sci. Nat 400312/06*
Dr Laetitia Coetser is a Partner within SRK and has been involved in the field of water and environmental management for more than 25 years. She holds a PhD. in Water Resource Management at the University of Pretoria and is a registered Professional Natural Scientist (SACNASP) (Pr. Sci. Nat 400312/06). She has an in-depth understanding and application of Integrated Environmental Management. She provides specialist advise to EIAs and Environmental Management Programmes as well as to Water Use Authorisations/Permitting. Laetitia has a range of specialisations including water resource management, surface water management, stakeholder engagement, data management and interpretation, environmental compliance auditing and due diligences. She has solid knowledge and understanding of the environmental legislation and subsequent regulations. Laetitia has further been involved with acid mine treatment and diffuse pollution and has compiled numerous articles and presentations on these matters. She is therefore well placed to be the Team Leader on this project.

Principal Scientist/Report Author: Andrew Caddick (SRK), MSC (Environmental Management), *Pr.Sci.Nat. 400021/156, EAPASA (2019/1540)*
Mr. Andrew Caddick (Project Manager) holds a Master's degree in Geography and Environmental Science. He is an environmental scientist at SRK with 14 years' experience in the environmental field. His experience lies in the management of EIA and EMPr processes, coordination and execution of stakeholder engagement, and management of multi-disciplinary project teams, mainly for mining related projects. He is also involved in conducting EMPr audits, site assessments, Waste Management Licenses and plans, and closure liability assessment. Mr Andrew Caddick is appropriately qualified and registered with the relevant professional bodies as a Professional Natural Scientists (Pr.Sci.Nat. 400021/156) with the South African Council of Natural Scientific Professions, as well as a Professional Environmental Assessment Practitioner with the Environmental Assessment Practitioner Association of South Africa (2019/1540).

Geologist and Client Representative: Ndivhudzannyi Mofokeng (NDI), BSc (Hons) Earth Sciences in Mining and Environmental Geology
Ndivhudzannyi holds BSc (Hons) Earth Sciences in Mining and Environmental Geology. She has close to 13 years' experience in the exploration and open cast work in the mining industry. She has proven leadership skills from supervising exploration rigs (Reverse Circulation and percussion drilling). She has proven working experience in field exploration and mapping, borehole logging, borehole sampling, sample preparation for laboratory analysis, handling of Global Positioning System (GPS), supervisory duties within the field, geological report and progress report writing, including Prospecting Work Programmes (PWPs) and Environmental Management Plans, handling the DMRE documents in general. Ndivhudzannyi has as a solid technical background in GIS Arcview software (GSSA Prof Reg), Rockworks, Turbo-Cad and Turbo-Sketch, and Global Mapper 9 Application.

1.5 Contact Person and Correspondence Address

Contact details of the project team is provided in Table 1-1.

Table 1-1: Contact Details of the Environmental Assessment Practitioner.

Details	Project Manager/EAP	Stakeholder Engagement
SRK Consulting (South Africa) (Pty) Ltd		
Name	Dr Laetitia Coetser	Marissa Swart
Tel No	012 361 9821	012 361 9821
Fax No	012 361 9912	012 361 9912
E-mail Address	LCoetser@srk.co.za	MSwart@srk.co.za

1.6 Statement of SRK and NDI Independence

Neither SRK nor any of the authors of this Report, including NDI, have any material present or contingent interest in the outcome of this Report, nor do they have any pecuniary or other interest that could be reasonably regarded as being capable of affecting their independence or that of SRK.

SRK and NDI have no beneficial interest in the outcome of the assessment which is capable of affecting its independence.

1.7 Scope of Work

Samara requires that a Scoping and EIA process be conducted, and the associated reports produced and submitted to the competent authority (in this case DMRE), to inform DMRE’s decision whether to issue the necessary environmental authorization for the project.

In broad terms the Scope of Work (SoW) includes:

- Conducting an EIA and associated Stakeholder Engagement Process in support of the application for EA for the proposed diamond prospecting in terms of the South African EIA Regulations;
- Ensuring that the necessary Specialist Studies are provided for and conducted during the EIA process - consultation with relevant Governmental Departments during EIA commencement is a requirement to confirm what Specialist Studies must be conducted;
- Compiling an EMPr in compliance with the EIA Regulations;
- Submitting the application and all necessary EIARs to the appropriate environmental authorities for consideration; and
- Attending meetings/site visits with the project owners, environmental authorities, and other relevant correspondence.

1.8 Structure of this Report

This report discusses relevant environmental legislation and its application to this project, outlines the S&EIR process, presents a detailed project description and environmental baseline, details the Stakeholder Engagement Process followed and assesses the potential impacts of the project before concluding the report with a set of pertinent findings and key recommendations. The report consists of the following sections:

Section 1: Introduction

Provides an introduction and background to the proposed project and outlines the purpose of this document and the assumptions and limitation applicable to the study.

Section 2: Governance Framework

Provides a brief summary and interpretation of the relevant legislation as well as pertinent strategic planning documents.

Section 3: Environmental Impact Assessment Process

Provides the process followed during the application process for an EA.

Section 4: Project Description

Describes the location and current status of the site and provides a brief summary of the surrounding land uses as well as background to, motivation, and description of, the proposed project.

Section 5: Description of the Affected Environment

Describes the biophysical and socio-economic characteristics of the affected environment against which potential project impacts are assessed.

Section 6: Impact Identification

Describes the impacts that can be expected from the proposed project activities during all the project phases.

Section 7: Environmental Impact Assessment

Describes the specialist studies undertaken and assesses the potential impacts of the project utilising SRK's proven impact assessment methodology.

Section 8: Conclusions and Recommendations

Provides an Environmental Impact Statement (EIS), describes the need and desirability of the project, summarises the recommendations of the EIAR.

The EIAR has been prepared in accordance with Section 25 and Section 26 of the EIA Regulations, 2014.

1.9 Content of Report

The EIA Regulations, 2014 GN R 982, which came into effect on 8 December 2014, as amended by GN R 517 of 2021), Chapter 4, Part 4, Section 26 prescribes the required content in an EIAR. These requirements and the sections of this EIAR in which they are addressed, are summarised in Table 1-2.

Table 1-2: Content of EIA Report as per EIA Regulations, 2014.

GN 982, Section 26:	Item	Reference in Report
(3) (a)	Details of:	
(3) (a) (iii)	The Environmental Assessment Practitioner (EAP) who prepared the report; and	Section 1.4
(3) (a) (iv)	The expertise of the EAP, including a Curriculum Vitae;	Section 1.4 Appendix A
(3) (b)	Location of the activity, including-	
(3) (b) (i)	The 21-digit Surveyor General code of the properties;	Not Applicable
(3) (b) (ii)	The physical address and farm name (where available);	Not Applicable

GN 982, Section 26:	Item	Reference in Report
(3) (b) (iii)	Where the required information in terms of (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	Not Applicable[11]
(3) (c)	A plan indicating the location of the proposed activity or activities applied for as well as the associated infrastructures at an appropriate scale, or, if it is-	Figure 4-1
(3) (c) (i)	A linear activity, a description, and coordinates of the corridor in which the proposed activity or activities is to be undertaken;	Not Applicable
(3) (c) (ii)	On land where the property has not been defined, the coordinates within which the activity is to be undertaken;	Not Applicable
(2) (d)	A description of the scope of the proposed activity, including-	
(3) (d) (i)	All listed and specified activities triggered and being applied for; and	Table 2-1
(3) (d) (ii)	A description of the associated structures and infrastructure related to the development;	Section 4.2
(3) (e)	A description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context;	Section 2
(3) (f)	A motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred development footprint within the approved site as contemplated in the accepted scoping report;	Section 4.7
(3) (g)	A motivation for the preferred development footprint within the approved site as contemplated in the accepted scoping report;	Section 4.8
(3) (h)	A full description of the process followed to reach the proposed development footprint within the approved site as contemplated in the accepted scoping report, including-	
(3) (h) (i)	Details of the development footprint alternatives considered	Section 4.8
(3) (h) (ii)	Details of the public participation process undertaken in terms of Regulation 41 of the Regulations, including copies of the supporting documents and inputs;	Section 3.3 Appendix E
(3) (h) (iii)	A summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;	Section 3.3
(3) (h) (iv)	The environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage, and cultural aspects;	Section 5
(3) (h) (v)	The impacts and risks identified including the nature, significance, consequence, extent, duration, and probability of the impacts, including the degree to which these impacts- (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed, or mitigated;	Section 6 Section 7
(3) (h) (vi)	The methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;	Section 7.1
(3) (h) (vii)	Positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Section 6.1
(3) (h) (viii)	The possible mitigation measures that could be applied and level of residual risk;	Section 7.4 Appendix F

[11] Table 4-1 depicts the co-ordinates of the Boundary Points of Sea Concession 4C and 5C.

GN 982, Section 26:	Item	Reference in Report
(3) (h) (ix)	If no alternative development footprints for the activity were investigated, the motivation for not considering such; and	Section 4.8
(3) (h) (x)	A concluding statement indicating the location of the preferred alternative development footprint within the approved site as contemplated in the accepted scoping report;	Section 4.8 Section 8.1.2
(3) (i)	A full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred development footprint on the approved site as contemplated in the accepted scoping report through the life on the activity, including-	Section 7.1
(3) (i) (i)	A description of all environmental issues and risks that were identified during the environmental impact assessment process; and	Section 6
(3) (i) (ii)	An assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;	Section 7.2
(3) (j)	An assessment of each identified potentially significant impact and risk, including-	Section 7.2
(3) (j) (i)	Cumulative impacts;	Section 7.2
(3) (j) (ii)	The nature, significance and consequences of the impact and risk;	Section 7.2
(3) (j) (iii)	The extent and duration of the impact and risk;	Section 7.2
(3) (j) (iv)	The probability of the impact and risk occurring;	Section 7.2
(3) (j) (v)	The degree to which the impact and risk can be reversed;	Section 7.2
(3) (j) (vi)	The degree to which the impact and risk may cause irreplaceable loss of resources; and	Section 7.2
(3) (j) (vii)	The degree to which the impact and risk can be mitigated;	Section 7.2
(3) (k)	Where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these regulations and an indication as to how these findings and recommendations have been included in the final assessment report;	Section 7.2
(3) (l)	An environmental impact statement which contains-	Section 8.1
(3) (l) (i)	A summary of the key findings of the environmental impact assessment;	Section 8.1.1
(3) (l) (ii)	A map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred development footprint on the approved site as contemplated in the accepted scoping report indicating any areas that should be avoided, including buffers; and	Figure 4-1
(3) (l) (iii)	A summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;	Section 7.3
(3) (m)	Based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation;	Section 7.4 Appendix F
(3) (n)	The final proposed alternatives which respond to the impact management measures, avoidance and mitigation measures identified through the assessment;	Section 4.8
(3) (o)	Any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;	None
(3) (p)	A description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;	Section 1.10

GN 982, Section 26:	Item	Reference in Report
(3) (q)	A reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	Section 8.4
(3) (r)	Where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded, and the post construction monitoring requirements finalised;	No construction will take place Section 4.5 Appendix F
(3) (s)	An undertaking under oath or affirmation by the EAP in relation to-	
(3) (s) (i)	The correctness of the information provided in the reports;	Page xxx
(3) (s) (ii)	The inclusion of comments and inputs from stakeholders and I&APs;	Page xxx
(3) (s) (iii)	The inclusion of inputs and recommendations from the specialist reports where relevant; and	Page xxx
(3) (s) (iv)	Any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;	Page xxx
(3) (u)	An indication of any deviation from the approved scoping report, including the plan of study, including-	Not Applicable
(3) (u) (i)	Any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and	Not Applicable
(3) (u) (ii)	A motivation for the deviation;	Not Applicable
(3) (v)	Any specific information that may be required by the competent authority; and	None
(3) (w)	Any other matters required in terms of Section 24 (4) (a) and (b) of the Act.	Section 4.10

1.10 Assumptions and Limitations

1.10.1 General

As is standard practice, the report is based on a number of assumptions and is subject to certain limitations. These are as follows:

- It is assumed that information provided by Samara, their legal advisers and other consultants and specialists is accurate; and
- It is assumed that the person appointed by Samara will manage the risk of contamination of the receiving environment and that the person is competent in their field.

Notwithstanding the above, SRK are confident that these assumptions and limitations do not compromise the overall findings of this report.

1.10.2 Underwater Heritage Impact Assessment

The Underwater Heritage Impact Assessment (HIA) (ACO, 2023) (Appendix G) is based on several assumptions and is subject to certain limitations, which should be borne in mind when considering information presented in the report. The validity of the findings of the study is not expected to be affected by these assumptions and limitations:

- South Africa's record of maritime and underwater cultural heritage resources is based on a mix of information derived in the main from historical documents and other secondary sources. Information primary sources such as geophysical data and other field-based observations and site recordings is very limited and comprises only a small fraction of the available data;

- Similarly, direct evidence for submerged pre-colonial archaeological sites and materials on the South African continental shelf is very limited, but sites found in similar offshore contexts elsewhere in the world and the known terrestrial archaeology of the West Coast illustrate the potential for such sites on the continental shelf; and
- While every effort has been made to ensure the accuracy of the information presented in the HIA, the reliance on secondary data sources means that there are gaps and inaccuracies in this record and the locations of most of the wrecks referred to in the various sections are approximate. The potential also exists for currently unknown and/or unrecorded maritime heritage sites to be encountered within the Concession Areas in the course of prospecting activities.

Any other assumptions made in the HIA Report (ACO, 2023) (Appendix G) are explicitly stated in the relevant sections.

1.10.3 Marine Ecology Impact Assessment

The Marine Ecology Impact Assessment (Aquatic Ecosystem Services, 2023) (Appendix G) is based on a number of assumptions and is subject to certain limitations, which should be borne in mind when considering information presented in this report. The validity of the findings of the study is not expected to be affected by these assumptions and limitations:

- The study was conducted on a desktop basis only, no primary data collection was undertaken;
- The study has followed the categorisations provided by the marine spatial planning guidelines as published by the National Coastal and Marine Spatial Biodiversity (Department of Forestry, Fisheries and the Environment (DFFE) *et al*., 2022); and
- The applicable legislation presented in this report is based on searches on similar projects that have been authorised in the marine environment in South Africa and does not represent a qualified legal opinion or review.

Other assumptions made in the Marine Ecology Impact Assessment (Aquatic Ecosystem Services, 2023) (Appendix G) are explicitly stated in the relevant sections.

1.10.4 Fisheries Impact Assessment

The Fisheries Impact Assessment (Capricorn Marine Environmental (Pty) Ltd) (Appendix G) is based on a number of assumptions and is subject to certain limitations, which should be borne in mind when considering information presented in this report. The validity of the findings of the study is not expected to be affected by these assumptions and limitations:

- The official governmental record of fisheries data was used to display fishing catch and effort relative to the proposed project area. These data are derived from logbooks that are completed by skippers, and it is assumed that there will be a proportion of erroneous data due to mistakes in the capturing of these data into electronic format. The proportion of erroneous data is estimated to be up to 10% of the total dataset and would be primarily related to the accurate recording or transcription of the fishing position (latitude and longitude). Where obvious errors in the reporting of fishing positions were identified these were excluded from the analysis;
- Unlike other commercial fishing sectors, the reporting requirements for small-scale fishers do not include GPS-referenced fishing locations therefore the mapping of the spatial extent of fishing grounds used by this sector is less accurate than that of the commercial sectors. Fishing areas have been inferred from the spatial distribution of commercial sectors, which share targeted fish stocks namely, the inshore and offshore west coast rock lobster trap sectors, the traditional and

commercial linefish sector, the snoek-directed fishing activity reported by the tuna pole-line sector and the netfish sectors; and

- The effects of sound on the Catch Per Unit Effort (CPUE) of fish and invertebrates have been drawn from the findings of international studies. To date there have been no studies focused directly on the species found locally. Although the results from international studies are likely also to be representative for local species, current gaps in knowledge on the topic lead to uncertainty when attempting to accurately quantify the potential loss of catch for each type of fishery. Research into the effects of sound on marine fauna is ongoing.

Other assumptions made in the Fisheries Impact Assessment (Capricorn Marine Environmental (Pty) Ltd) (Appendix G) are explicitly stated in the relevant sections.

1.11 Opportunity to Comment

This EIAR/EMPr will be available for comment from 17 May 2023 to 15 June 2023. Copies of the EIAR/EMPr have been made available at the following public places for review:

- Port Nolloth Municipality;
- Recreation Club in Kleinzee; and
- Hondeklipbaai Municipality;

In addition to emailing an Executive Summary of the EIAR to registered Interested and Affected Parties (I&APs), the Report will also be made available to the public via the SRK's website at www.srk.com by clicking on the following link: *https://www.srk.com/en/public-documents/samara-draft-eiar*.

I&APs are requested to provide comments and information on the following aspects of the proposed project:

- Information on how I&APs consider that the proposed activities will impact on them or their socio-economic conditions;
- Written responses stating their suggestions to mitigate the anticipated impacts of each activity;
- Information on current land uses and their location within the area under consideration;
- Information on the location of environmental features on site to make proposals as to how and to what standards the impacts on site can be remedied; and
- How to mitigate the potential impacts on their socio-economic conditions and to make proposals as to how the potential impacts on their infrastructure can be *managed, avoided, or remedied.

The commenting period is open from 17 May 2023 to 15 June 2023. Comments can be submitted to one of the stakeholder engagement officers.

Ms. Marissa Swart	Dr Laetitia Coetser
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2 Governance Framework

2.1 Legal Requirements

There are a number of regulatory requirements at local, provincial and national level with which the project must conform. Some of the key environmental legal requirements include the following:

- NEMA;
- EIA Regulations, promulgated in terms of NEMA;
- Financial Provisioning Regulations, 2015, promulgated in terms of NEMA;
- MPRDA (As amended by the MPRDAA) and MPRDA Regulations, 2004;
- National Environmental Management: Integrated Coastal Management Act (Act No. 24 of 2008) (NEM: ICMA);
- Marine Living Resources Act (Act No. 18 of 1998) (MLRA); and
- National Environmental Management: Protected Areas Act (Act No. 57 of 2003) (NEM: PAA).

A brief summary of SRK's understanding of the relevant Acts and Regulations that are applicable to this study is provided in Section 2.1.1 to Section 2.1.10. Note that other legislative requirements may also pertain to the proposed project. As such, the summary provided in Section 2.1.1 to Section 2.1.10 is not intended to be definitive or exhaustive and serves only to highlight key environmental legislation and obligations.

2.1.1 National Environmental Management Act (Act No. 107 of 1998)

NEMA establishes a set of principles which all authorities have to consider when exercising their powers. These include the following:

- Development must be sustainable;
- Pollution must be avoided or minimised and remedied;
- Waste must be avoided or minimised, reused or recycled;
- Negative impacts must be minimised; and
- Responsibility for the environmental consequences of a policy, project, product or service applies throughout its life cycle.

Section 28(1) states that "*every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring*". If such degradation/pollution cannot be prevented, then appropriate measures must be taken to minimise or rectify such pollution. These measures may include:

- Assessing the impact on the environment;
- Informing and educating employees about the environmental risks of their work and ways of minimising these risks;
- Ceasing, modifying or controlling actions which cause pollution/degradation;
- Containing pollutants or preventing movement of pollutants;
- Eliminating the source of pollution; and

- Remedying the effects of the pollution.

Legal requirements for this project:

Samara (the proponent) has a responsibility to ensure that the proposed activities and the S&EIR process conform to the principles of NEMA. The proponent is obliged to take actions to prevent pollution or degradation of the environment in terms of Section 28 of NEMA, and to ensure that the environmental impacts associated with the project (of which none are anticipated) are considered and mitigated where possible.

EIA Regulations, 2014

Sections 24 and 44 of NEMA make provision for the promulgation of regulations that identify activities which may not commence without an EA issued by the competent authority (DMRE). In this context, the EIA Regulations, promulgated in terms of NEMA, govern the process, methodologies and requirements for the undertaking of EIAs in support of EA applications. LNs 1-3, in terms of NEMA, list activities that require EA ("NEMA listed activities").

GN R982[12] of the EIA Regulations lays out two alternative authorisation processes. Depending on the type of activity that is proposed, either a BA process or an S&EIR process is required to obtain EA. LN 1[13] lists activities that require a BA process, while LN 2[14] lists activities that require S&EIR. LN 3[15] lists activities in certain sensitive geographic areas that require a BA process.

The regulations for both processes – BA and S&EIR - stipulate that:

- Stakeholder engagement must be undertaken as part of the assessment process;
- The assessment must be conducted by an independent EAP;
- The relevant authorities must respond to applications and submissions within stipulated time frames;
- Decisions taken by the authorities can be appealed by the proponent or any other I&AP; and
- A Draft EMPr must be compiled and released for public comment.

GN R982 (Appendix 1-5) sets out the procedures to be followed and content of reports compiled during the BA and S&EIR processes.

The NEMA National Appeal Regulations[16] make provision for appeal against any decision issued by the relevant authorities. In terms of the Regulations, an appeal must be lodged with the relevant authority in writing within 20 days of the date on which notification of the decision (EA) was sent to the applicant or I&AP (as applicable). The applicant, the decision-maker, I&APs and organ of state must submit their responding statement, if any, to the appeal authority and the appellant within 20 days from the date of receipt of the appeal submission.

The proposed project includes activities that are listed in terms of the EIA Regulations, 2014, and require authorisation through this process (Table 2-1).

[12] As amended by GN R327, GN R325 and GN R324 on 7 April 2017 & GN R517 on 11 June 2021
[13] GN R983 of 2014, as amended by GN R327 of 2017 & GN R517 of 2021
[14] GN R984 of 2014, as amended by GN R325 of 2017 GN R517 of 2021
[15] GN R985 of 2014, as amended by GN R324 of 2017 GN R517 of 2021
[16] GN R993 of 2014, as amended by GN R205 of 2015

Table 2-1: NEMA Listed Activities (2014) applicable to the project which require authorisation.

No.	Listed activity	
Listing Notice 1 (GN R983)		**Comment**
19A	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles, or rock of more than 5 cubic metres from the seashore.	Dredging of sea material as part of the prospecting activities over a 781 362 ha area (excluding Namaqua Fossil Forest MPA).
20	Any activity including the operation of that activity which requires a prospecting right in terms of Section 16 of the Mineral and Petroleum Resources Development Act, as well as any other applicable activity as contained in this Listing Notice or in Listing Notice 3 of 2014, required to exercise the prospecting right.	Prospecting Right Application in terms of Section 16 and Regulation 7(1) of the Mineral and Petroleum Resources Development Act.
22	The decommissioning of any activity requiring a prospecting right.	Decommissioning of the prospecting activities.
Listing Notice 2 (GN R984)		**Comment**
19	The removal and disposal of a mineral, which requires a permission acted in terms of Section 20 of the Mineral and Petroleum Resources Development Act, as well as any other applicable activity as contained in this Listing Notice, in Listing Notice 1 of 2014 or Listing Notice 3 of 2014, required to exercise the permission.	Bulk sampling as part of the prospecting activities over an area of 781 362 ha (excluding Namaqua Fossil Forest MPA).

Legal requirements for this project:

The proponent is obliged to apply for EA for the listed activity and to undertake a S&EIR process in support of the EA application, in accordance with the procedure stipulated in GN R982 under NEMA.

National Web Based Environmental Screening Tool

In terms of Regulation 16(1)(b)(v) of the NEMA EIA Regulation, 2014, an application for EA must include "the report generated by the national web based environmental screening tool". On 20 March 2020, notice was given that that the submission of such a report is compulsory for all applications submitted after 4 October 2019 (GN R960 of 2019).

The national web-based screening tool is based on broad scale national environmental sensitivity data and identifies specialist studies that may be required for the EIA. It was the responsibility of the EAP to confirm whether these specialist studies needed to be conducted or provide a motivation as to why the specialist studies will not be conducted as part of the EIA process.

Legal requirements for this project:

The screening tool report has informed the identification of specialist studies (Marine Ecology, Fisheries and Heritage) required for the EIA (Please refer to Appendix B *for a copy of the Screening Report).*

Financial Provision Regulations, 2015

Sections 44 (aE), 44 (aF), 44 (aG) and 44 (aH) of NEMA make provision for the promulgation of regulations relating to environmental liability and financial provisions. In this context, the Financial Provisioning Regulations, 2015 (GN R1147 of 2015), promulgated in terms of NEMA, govern the financial provision for the costs associated with undertaking management, rehabilitation, and remediation of environmental impacts of prospecting, exploration, mining, and production operations through the lifespan of such operations and latent or residual environmental impacts.

The regulations define:

- The method for determining financial provision for annual rehabilitation, final rehabilitation and the remediation of latent environmental impacts;
- Financial vehicles available for financial provision;
- The requirements for the review, assessment and adjustment of financial provision;
- The responsibilities of the holder of a right or a permit;
- Powers of the Minister; and
- Requirements for care and maintenance.

Legal requirements for this project:

Samara Mining must ensure that the requirements of NEMA in terms of financial provision for remediation of environmental damage are met by allocating operational costs to meet EMPr requirements and that sampling vessels maintain adequate Protection and Indemnity Insurance Cover to allow for potential clean-ups in the event of a hydrocarbon spill and other incidents. Samara Mining must also provide sufficient funds to execute the EMPr in the event of premature closure or in the event that, on closure, the EMPr has not been successfully executed.

2.1.2 National Environmental Management: Waste Act (Act No. 59 of 2008)

The National Environmental Management: Waste Act (Act No. 59 of 2008) (NEM: WA) was implemented on 1 July 2009 and Section 20 of the Environment Conservation Act (Act No. 73 of 1989), under which waste management was previously governed, was repealed.

The NEM: WA reforms the law regulating waste management in order to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development; and to provide for:

- National norms and standards for regulating the management of waste by all spheres of government;
- Specific waste management measures;
- The licensing and control of waste management activities;
- The remediation of contaminated land; to provide for the national waste information system; and
- Compliance and enforcement.

In terms of the NEM: WA, all waste management activities must be licensed. According to Section 44 of the Act, the licensing procedure must be integrated with an EIA process in accordance with the Regulations GN R982 published in terms of the NEMA. GN R718 listed the waste management activities that require licensing. On 29 November 2013, GN R718 was repealed and replaced by a new list of waste activities under GN R921 and amended in July 2015 by GN R633. A distinction is made between Category A waste management activities, which require a basic assessment, and Category B activities, which require a full EIA (scoping followed by impact assessment), and Category C waste management activities which do not require a waste management licence but compliance with relevant requirements or standards.

Legal requirements for this project:

NEM: WA is not applicable to offshore activities and therefore no Waste Management Licence in terms of NEM: WA will be required. Waste aspects will be managed in terms of the requirements of the International Convention for the Prevention of Pollution from Ships (MARPOL 1973/1978).

2.1.3 National Environmental Management: Protected Areas Act (Act No. 57 of 2003)

The protection and management of South Africa's protected areas are controlled by the National Environmental Management: Protected Areas Act (Act No. 57 of 2003) (NEM: PAA). The Act provides for:

- Declaration of nature reserves and determination of the type of reserve declared;
- Declaration of Marine Protected Areas (MPAs);
- Cooperative governance in the declaration and management of nature reserves;
- A system of protected areas to manage and conserve biodiversity; and
- The utilization and participation of local communities in the management of protected areas.

According to Section 14 of NEM: PAA, an MPA declared under the MLRA, and which existed when the NEM: PAA Amendment Act, 2014 took effect, must be regarded as an MPA declared under Section 22A of the NEM:PAA.

Legal requirements for this project:

Although there are a number of declared MPAs off the West Coast, Samara Mining does not intend prospecting in these areas and consequently there will be no impact in or near these MPAs.

2.1.4 National Environmental Management: Integrated Coastal Management Act (Act No. 24 of 2008)

National Environmental Management: Integrated Coastal Management Act (Act No. 24 of 2008) (NEM: ICMA) provides for the integrated management of the coastal zone, including the promotion of social equity and best economic use, while protecting the coastal environment.

Chapter 8 of the Act establishes an integrated system for regulating the disposal of effluent and waste into the sea. Section 70 prohibits incineration at sea and restricts dumping at sea unless done so in terms of a permit and in accordance with South Africa's obligations under international law.

Legal requirements for this project:

As Samara Mining does not intend on disposing effluent and waste into the sea, no authorisations are required in terms of NEM:ICMA.

2.1.5 National Environmental Management: Air Quality Act (Act No. 39 of 2004)

The National Environmental Management: Air Quality Act (Act No. 39 of 2004) (NEM: AQA) lists activities that generate atmospheric emissions that have or may have a significant detrimental effect on the environment and require licensing in terms of NEM:AQA. An Atmospheric Emission Licence (AEL) from the competent authority is required for these activities, which are listed in GN R893 of 2013. All applications must conform to the requirements of NEMA and the application must be accompanied by "such documentation and information as may be required by the licensing authority".

Legal requirements for this project:

Metropolitan and district municipalities are charged, in terms of Section 36 of the Act, to implement the AEL system, but as the project area is located offshore, the project area does not fall within the borders of a metropolitan or district municipality. In terms of NEM: AQA, there is no formal application of the AEL system in offshore environments. MARPOL dictates that on-board incineration of waste is permitted.

2.1.6 Mineral and Petroleum Resources Development Act (Act No. 28 of 2002)

The MPRDA, as amended by the MPRDAA, makes provision for equitable access to and sustainable development of South Africa's mineral and petroleum resources and aims to inter alia provide for security of tenure in respect of prospecting, exploration, mining, and production operations. In terms of previous mining legislation, mineral rights were held privately by landowners (and in some instances by the State), but the MPRDA vests all mineral rights in the State. The fundamental principles of the MPRDA are:

- Mineral resources are non-renewable;
- Mineral resources belong to the nation and the State is the custodian;
- Protection of the environment for present and future generations to ensure sustainable development of the resources by promoting economic and social development;
- Promotion of local and rural development of communities affected by mining;
- Reformation of the industry to bring about equitable access to the resources and eradicating discriminatory practices; and
- Guaranteed security of tenure.

In terms of the MPRDA, a Prospecting Right must be obtained prior to the commencement of any prospecting activities. A requirement for obtaining a Prospecting Right is that an applicant must submit an application in terms to Section 16 (1) of the MPRDA to the Regional Manager, who must accept the application within 14 days if, inter alia, no other person holds a Prospecting Right, Mining Right, Mining Permit or Retention Permit for the same mineral and land. If the application for a Prospecting Right is accepted, the Regional Manager must request that the applicant comply with Chapter 5 of NEMA with regards to consultation and reporting.

Legal requirements for this project

In support of the Prospecting Right application, Samara Mining is required to undertake an EIA and to obtain an EA in compliance with the requirements of NEMA and the EIA Regulations, 2014.

2.1.7 Marine Living Resources Act (Act No. 18 of 1998)

The MLRA governs MPAs and states in Section 43 that:

(2) No person shall in any marine protected area, without permission in terms of subsection (3)—

(a) take or destroy any fauna and flora other than fish;

(b) dredge, extract sand or gravel, discharge or deposit waste or any other polluting matter, or in any way disturb, alter or destroy the natural environment;

(c) carry on any activity which may adversely impact on the ecosystems of that area.

Legal requirements for this project:

Although there are a number of declared MPAs off the West Coast, Samara Mining does not intend prospecting in these areas and consequently there will be no impact on these MPAs.

2.1.8 National Heritage Resources Act (Act No. 29 of 1999)

The NHRA came into force in April 2000 with the establishment of SAHRA, replacing the National Monuments Act (Act No. 28 of 1969) (as amended) and the National Monuments Council as the national agency responsible for the management of South Africa's cultural heritage resources.

The NHRA reflects the tripartite (national/provincial/local) nature of public administration under the South African Constitution and makes provision for the devolution of cultural heritage management to the appropriate, competent level of government.

Because national government is responsible for the management of the seabed below the mean high-water mark, however, the management of maritime and underwater cultural heritage resources under the NHRA does not devolve to provincial or local heritage resources authorities but remains the responsibility of the national agency, SAHRA.

The NHRA gives legal definition to the range and extent of what are considered to be South Africa's heritage resources. According to Section 2(xvi) of the Act a heritage resource is "any place or object of cultural significance". This means that the object or place has aesthetic, architectural, historical, scientific, social, spiritual, linguistic, or technological value or significance.

In terms of the definitions provided in Section 2 of the NHRA, maritime and underwater cultural heritage can include the following sites and/or material relevant to this assessment:

- Material remains of human activity which are in a state of disuse and are in or on land [which includes land under water] and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures (Section 2(ii));
- Wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the Republic, a defined respectively in Sections 3, 4 and 6 of the Maritime Zones Act, 1994 (Act No. 15 of 1994), and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation (Section 2(ii)); and
- Any movable property of cultural significance which may be protected in terms of any provisions of the NHRA, including any archaeological artefact or palaeontological specimen (Section 2(xxix)).

Legal requirements for this project:

Of the heritage resource types protected by the NHRA, the proposed prospecting in Concession Areas 4C and 5C has the potential to impact the following:

- *Palaeontological features and material, which are defined by the NHRA as the fossilised remains or fossil trace of animals or plants which lived in the geological past;*
- *Maritime and underwater cultural heritage sites and material, which are principally historical shipwrecks; and possibly*
- *Submerged pre-colonial archaeological sites and materials.*

As per the definitions provided above, these cultural heritage resources are protected by the NHRA and a permit from SAHRA is required to destroy, damage, excavate, alter, deface, or otherwise disturb any such site or material.

It is also important to be aware that in terms of Section 35(2) of the NHRA, all archaeological objects and material are the property of the State and must, where recovered from a site, be lodged with an appropriate museum or other public institution.

2.1.9 Maritime Zones Act (Act No. 15 of 1994)

South Africa's Maritime Zones Act (Act No. of 1994) is the national legislative embodiment of the international maritime zones set out in the United Nations Convention on the Law of the Sea (UNCLOS). The Act defines the extent of the territorial waters, contiguous zone (also known as the maritime cultural zone), Exclusive Economic Zone (EEZ) and continental shelf (which together comprises of some 4.34 million square kilometres of seabed) and sets out South Africa's rights and responsibilities in respect of these various maritime zones.

Under the terms of Sections 4(2) and 6(2) of the Maritime Zones Act respectively, "*any law in force in the Republic, including the common law, shall also apply in its territorial waters*" and "*subject to any other law the Republic shall have, in respect of objects of an archaeological or historical nature found in the maritime cultural zone, the same rights and powers as it has in respect of its territorial waters*". The NHRA applies, therefore, within South Africa's territorial waters (12 nautical miles seaward of the baseline) and to the outer limit of the maritime cultural zone / contiguous zone (24 nautical miles seaward of the baseline).

Any offshore activity that has the potential to disturb or damage cultural heritage resources located in or on the seabed within the territorial waters and maritime cultural zone requires the involvement of SAHRA, as a commenting body in respect of the NEMA environmental assessment process (see below) and as permitting authority where impacts to sites or material cannot be avoided and damage or destruction will occur.

Legal requirements for this project:

Concession Areas 4C and 5C straddle the territorial waters, contiguous zone and the EEZ. Within the former two maritime zones the NHRA therefore applies to the proposed activities.

With respect to those portions of the Concession Areas within the EEZ, Section 9 of the Maritime Zones Act states that activities undertaken from installations operating within this zone may be subject to the requirements of any law in force in the Republic. Included in the definition of "installation" set out in Section 1(ii) of the Act, is "any exploration or production platform used in prospecting for or the mining of any substance" (S1(ii)(b)).

In terms of the Maritime Zones Act, therefore, the NHRA will apply to prosecting activities carried out across the entire extent of Concession Areas 4C and 5C.

2.1.10 Additional Legislation

In addition to the aforementioned legal requirements, the following list of national legislation might also be applicable. These include the:

- Companies Act (Act No.71 of 2008);
- Climate Change – Carbon Tax Act (Act No. 15 of 2019);
- Climate Change – National Climate Change Response White Paper;
- Constitution of South Africa;

- Carriage of Goods by Sea Act (Act No.1 of 1986);
- Dumping at Sea Control Act (Act No. 73 of 1980);
- Hazardous Substances Act (Act No. 85 of 1983);
- Marine Pollution (Control and Civil Liability) Act (Act No. 6 of 1981);
- Marine Pollution (Intervention) Act (Act No. 65 of 1987);
- Marine Pollution (Prevention of Pollution from Ships) Act (Act No. 2 of 1986);
- Marine Safety Authority Act (Act No. 5 of 1998);
- Marine Safety Authority Levies Act (Act No. 6 of 1998);
- Marine Traffic Act (Act No. 2 of 1981);
- Marine Zones Act (Act No. 15 of 1994);
- Merchant Shipping Act (Act No. 57 of 1951);
- Occupational Health and Safety Act (Act No. 85 of 1993);
- Sea Shore Act (Act No. 21 of 1935);
- Sea Birds and Seals Protection Act 46 of 1973;
- Ship Registration Act (Act No. 58 of 1998);
- Water Act (Act No. 36 of 1998); and
- Wreck and Salvage Act (Act No. 94 of 1995).

A list of international maritime conventions that might apply to the proposed project activities include the:

- International Convention for the Prevention of Pollution from Ships and its amendment, 1973/178 (MARPOL) and its amendment;
- International Convention on Oil Pollution Preparedness, Response and Cooperation,1990 (OPRC);
- UNCLOS, 1982;
- Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 (London Convention) and the Protocol, 1996;
- International Convention relating to Intervention on the High Seas in case of Soil Pollution Casualties, 1969 and the Protocol on the Intervention on the High Seas in case of Marine Pollution by Substances other than Oil, 1973.;
- Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal, 1989;
- Convention on Biological Diversity, 1992; and
- Convention on Migratory Species, 1999.

2.2 Planning Policy Framework

This section discusses a number of key formal planning policies relevant to the project. As Samara operations are of regional socio-economic significance, provincial plans are considered in this section, in addition to regional and local policies. The policies and plans briefly discussed include regional and local development and spatial plans, such as the:

- Marine Spatial Planning Framework;
- Northern Cape Provincial Spatial Development Framework;
- Namaqua District Municipality Integrated Development Plank;
- Namaqua District Municipality Spatial Development Framework;
- Nama Khoi, Richtersveld, and Kamiesberg Local Municipalities' Integrated Development Plan;
- Nama Khoi and Richtersveld Local Municipalities' Spatial Development Framework; and
- Mining and Biodiversity Guideline.

2.2.1 Marine Spatial Planning Framework (2017)

The national DFFE (formerly known as Department of Environmental Affairs (DEA)) implemented the Marine Spatial Planning Framework in May 2017.

The framework aims to provide high-level direction for Marine Spatial Planning in the context of South African legislation and policies as well as existing planning regimes. It aims to guide the national regulatory authorities as the entities responsible for preparation of Marine Area Plans, intended to enable the sustainable development of South Africa's ocean territory. Marine Spatial Planning aims to promote a culture of good ocean governance and:

- Facilitate the unlocking of the ocean economy and sustainable ocean economic development;
- Enhance the achievement of societal benefits and strengthen the level of society's interaction with the ocean;
- Promote a healthy marine environment and the sustainable use of marine resources; and
- Contribute to good ocean governance.

The nine principles that guides Marine Spatial Planning are *(abridged)*:

1. *Sustainable development:* Economic development that is socially and environmentally sustainable and ensures that special consideration is given to ensuring long-term provision of ocean services;
2. *Spatial efficiency:* Promote the optimal use of marine space in as coordinated a manner as possible. It also requires that decision-making procedures are designed to minimise negative financial, economic, social or environmental impacts of alternative uses of marine space;
3. *Collaboration and responsible ocean governance:* Horizontal and vertical cooperation and integration within government as well as good administration will lead to stronger and more complementary decisions and actions;
4. *Justice, equity and transformation:* South Africa's ocean territory and its resources are held in trust by the state. Marine space should be planned and managed as part of the public domain in a manner that addresses the injustices of the past through required transformation;
5. *Ecosystem and earth system approach:* Ecosystems are dynamic, changing and sometimes poorly understood, and a primary focus lies on maintaining and, where feasible, restoring ecosystem structure and functioning;

6. *Precautionary approach:* If a decision could cause severe or irreversible harm to society or the environment, the burden of proof falls on those who advocate taking the action. The costs of potential pollution or damage should be paid by the party responsible for the disturbance;
7. *Adaptive management:* This principle recognises that knowledge of ecosystem functions is deficient and subject to ongoing time and evidence-based research. It requires that planning processes be iterative, respond to the best available scientific knowledge and flexible to provide for adaptive planning and use of South Africa's ocean territory. The principle further requires the periodic monitoring and evaluation of the performance of management actions and ecosystem response;
8. *Coherent planning and management:* This principle recognises that marine spatial planning in South African ocean space may comprehend existing and emerging activities that have enhanced competition in the ocean space. The decision making process should take into account the degree of commonality and compatibility of activities in any area or space in the marine environment; and
9. *Use of best available science and information:* The use of best available science and information serves to promote all aspects required for marine spatial planning.

The Framework also contains four Spatial Planning Goals:

- *Goal 1: Unlocking the ocean economy* to stimulate the sustainable economic growth of South Africa's marine sectors to increase the ocean contribution to the national Gross Domestic Product, create jobs, and, ultimately, eradicate poverty through compatible uses and efficient use of resources;
- *Goal 2: Engaging with the ocean* to strengthen marine identity and increase awareness of the value, opportunities and societal benefits of South Africa's ocean territory;
- *Goal 3: Ensuring healthy marine ecosystems* by managing living and non-living resources in a harmonious manner by identifying ecologically and biologically important areas and integrating biodiversity objectives into decision-making; and
- *Goal 4: Contributing to good ocean governance* through collaborative approach between organs of state relating to ocean matters and relations with non-state organisations and communities.

The relationship between goals and principles of the Marine Spatial Planning Framework is shown in Figure 2-1.

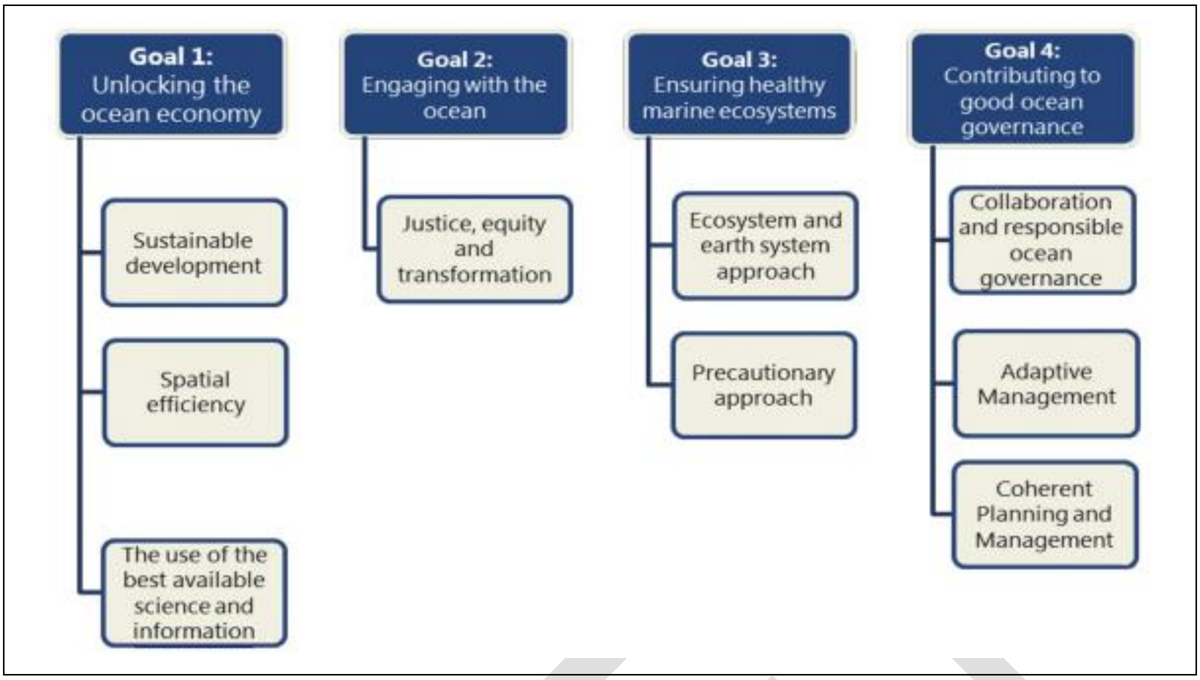


Figure 2-1: Relationship between goals and principles of the marine spatial planning framework (DEA, 2017).

The Framework also makes reference to the diamond mining along the South African West Coast.

2.2.2 Northern Cape Provincial Spatial Development Framework (2012)

The Western Cape Provincial Spatial Development Framework (PSDF) is a spatial planning document that guides district and local spatial initiatives such as Integrated Development Plants (IDPs) and Spatial Development Frameworks (SDFs). The Northern Cape SDF aims to implement actions to comply with the National SDF. The National SDF aims to create an environment that is developing. The ultimate goal of this PSDF is thus to enhance the future of the Northern Cape Province and its people and takes into recognition the mining sector's importance and contribution to the province's economic growth. Furthermore, the PSDF aims to manage any significant impacts on the use of resources and promote positive socio-economic conditions after the resource has been depleted.

It is finally also noted in the PSDF that:

- *The greatest value from marine and coastal resources is generated through the mining and fishing sectors; and*
- *Northern Cape has an abundance of diamond deposits both onshore and in marine deposits. This has led to the development of a large diamond mining sector, which has become the dominant activity of the coastal zone.*

The activities that will be undertaken in this project are thus included in the operation of a well-established sector that contributes to the Northern Cape Province's development.

2.2.3 Namaqua District Municipality Integrated Development Plan (2022 – 2027)

The Namaqua District Municipality (NDM) IDP recognises mining in the Namaqua District as a contributing factor towards South Africa's mining industry. Major coastal towns in this district include Alexander Bay, Port Nolloth, Kleinsee, and Hondeklipbaai. The focus of the towns is mainly focused on fishing and diamond mining. Mining in contributes the most to this district's economy (3.9%) to the Northern Cape's economy.

Furthermore, the IDP also notes a high level of poverty in the NDM and a need to enhance job creation projects that alleviate poverty.

The strategic objectives of the NDM's IDP include:

1. Monitoring and support of local municipalities to deliver basic services which include water, sanitation, housing, electricity and waste management;
2. Support vulnerable groups in the district;
3. Improve administrative and financial viability and capability;
4. Promote and facilitate local economic development (including tourism);
5. Enhance good governance;
6. Promote and facilitate spatial transformation and suitable urban development;
7. To render municipal health services;
8. To coordinate the disaster management and fire management services in the district; and
9. Caring for the environment.

The NDM IDP also lists various environmental sector plans that have been developed to ensure environmental integrity for the Namaqua District. Among a few are Water Services Development Plan, Biodiversity Sector Plan, Integrated Waste Management Plan; Climate Change Response Plan, Ait Quality Plan, and compiling an Environmental Profile for the District.

2.2.4 Namaqua District Spatial Development Framework (2012)

The purpose of the NDM's SDF (2012) is to provide a tool that guides spatial development at District level. The SDF contextualises the Spatial Development Objectives (SDOs) presented in the Framework by describing the following spatial development challenges:

1. Access to land;
2. Land development;
3. Spatial integration;
4. Sustainable land management;
5. Proper distribution network;
6. Land reform and restitution
7. Land conservation; and
8. Water resource challenges.

The SDF recognises that development is critical, especially in rural areas, but that sensitive cultural and biophysical resources need to be protected. The four main SDO's are as follow:

- SDO 1: The construction of a dam in the lower Orange River before 2014;
- SDO 2: Establish and implement an operational Mariculture Park in Port Nolloth and Hondeklipbaai by 2010;
- SDO 3: Increase road maintenance funding and implementation of a structured road maintenance plan before 2010; and
- Develop the human potential through a Training Retaining Plan before 2010.

Regarding mining specifically, objectives from the Mining and Mineral Sector Strategy links in with this SDF and are to:

1. Assist entrepreneurs to establish beneficiation businesses around the mining sector aimed at promoting the wellbeing of the people of the province;
2. Mitigate environmental damage as far as possible; and
3. Facilitate environmental degradation caused by mining activities.

2.2.5 Nama Khoi Local Municipality Integrated Development Plan (2022 – 2023)

The Nama Khoi Local Municipality IDP (2022 – 2023) is the over-arching municipal strategic plan with the main purpose of articulating the vision of Nama Khoi Local Municipality and how it should be accomplished.

Strategic goals of the IDP to address these challenges are to:

- To ensure sustainable delivery in respect of water and sanitation, electricity, solid waste management, and roads and water and storm water services to all residents of Nama Khoi Municipality;
- Strategic and sustainable budgeting, revenue protection and debt control, grow and diversity revenue, and value for money in expenditure through the integrated financial plan;
- Development and implementation of Nama Khoi Local Economic Development strategy to ensure the alignment to the economic sectors and also assist the Small, Medium and Micro Enterprises (SMMEs) in cooperation with other stakeholders;
- Initiate, lead and sustain an environment for job creation in the Nama Khoi Municipal Area;
- Leverage municipal procurement process with the view to stimulate redistribution and growth;
- Provide an overarching framework for sustainable municipal performance improvement;
- Provide a framework for municipal transformation and institution development;
- Ensure an unqualified audit report;
- Institutionalise community based planning at strategic and operational levels; and
- Enhance the public profile, reputation and positioning of the Nama Khoi Municipality.

According to the IDP "*Mining was one of the biggest contributors to job creation in our municipality and with the downscaling of mining activities in Nama Khoi we as a municipality with the district municipality; regional and provincial departments must take hands to tackle the big monster on poverty. Mining companies Social and Labour plans are used as a method or a tool to support communities living in area. The Social and Labour Plans are the social responsibilities of these mining companies*".

2.2.6 Richtersveld Local Municipality Integrated Development Plan (2022 – 2027)

The Richtersveld Local Municipality IDP (2022 – 2027) also serves as the over-arching municipal strategic plan with the main purpose of articulating the vision of Richtersveld Local Municipality and how it should be accomplished.

The six critical areas where thus addressed in the strategy, namely:

- Opportunity;
- Responsiveness;

- Service delivery;
- Honesty;
- Redress of past inequalities; and
- Safe communities.

Strategic objectives of the IDP include the following:

- For every household to have access to clean water, electricity and sanitation;
- To treat all people with pride and dignity;
- To be an effective and efficient local government;
- To be an effective instrument of change within our community;
- To be a local government that is accountable with community driven development; and
- To be the gateway for Local Economic Development and Tourism in the Northwestern Coast of the Northern Cape.

This IDP states that the local government will work with mining companies located in the Richtersveld region in order to make sure that projects are implemented smoothly and rapidly to further assist with the development of communities.

2.2.7 Kamiesberg Local Municipality Integrated Development Plan (2021 – 2022)

The Kamiesberg Local Municipality IDP (2021 – 2022) serves to guide the Kamiesberg Local Municipality's strategic plan. The IDP sets out eight millennium development goals which includes the following:

- Eradicate extreme poverty and hunger;
- Achieve universal primary education;
- Promote gender equality and empower women;
- Reduce child mortality;
- Improve maternal health;
- Combat HIV/AIDS, malaria, and other diseases; and
- Ensure environmental sustainability.

2.2.8 Nama Khoi Local Municipality Spatial Development Framework (2014)

The Nama Khoi Local Municipality SDF is intended to be read with the IDP for this region and provides a framework and strategy for future development in the Nama Khoi Local Municipality. Goals that were identified in the SDF includes the following:

- To promote accessibility to opportunities and services in the towns and larger region through improved road infrastructure, public transport and communication networks;
- To improve and restore the quality of the infrastructure, services, neighbourhoods, built structures and spaces in the towns and settlement areas;
- To explore new economic and development opportunities and ventures, and to encourage and support local economic development and job creation strategies (including support for small

scale farming, small scale mining, agro-processing, local manufacturing, SMME's and various other community projects);

- To address social decay, health care, overall living quality and community development (specifically amongst the youth);
- To strengthen the relationship and communication between communities, governments and concerned role players;
- To strengthen and stabilise communities through leadership development, capacity building, skills development, public support and community building programmes;
- To improve the management and conservation of the pristine natural environment and agricultural land for tourism, local opportunities and for future generations;
- To provide quality recreation and entertainment in the towns specifically for the youth;
- To improve the planning, management and maintenance of towns and the region including the effective and on-going implementation of development strategies; and
- To promote land utilisation and development opportunities, land ownership and access to quality habitable and farmland, for local benefit in terms of farming, cultivation, eco- tourism, and possible mining.

Numerous broad development frameworks were set in place for different settlement areas with the use of the spatial analysis as a basis. These frameworks provide a general overview of the direction and vision for the growth direction for each area. Support was provided for the offshore extraction of resources for the Kleinsee area as this type of activity has the potential to contribute towards the economy of this area. Along with this, a strategy is also required to rehabilitate the coastline and areas that are degraded as a result of mining and prospecting activities.

2.2.9 Mining and Biodiversity Guideline (2013)

The DMRE's Mining and Biodiversity Guideline, 2013 was Drafted to inform decisions between economic growth (in this case, mining if justified by the results of the PWP) and environmental protection, and to minimise the impact of mining on the country's biodiversity and ecosystem services through a practical, user-friendly approach for integrating biodiversity considerations into the planning processes for mines and managing biodiversity during operations.

The Guideline provides explicit direction in terms of where mining-related impacts are legally prohibited, where biodiversity priority areas may present high risks for mining projects, and where biodiversity may limit the potential for mining. The Guideline distinguishes between four categories of biodiversity priority areas in relation to their importance from a biodiversity and ecosystem service point of view as well as the implications for mining in these areas:

1. Legally protected areas, where mining is prohibited;
2. Ares of highest biodiversity importance, which pose the highest risk to mining, including:
    a. Critically Endangered and Threatened ecosystems;
    b. Critical Biodiversity Areas (CBAs);
    c. River and wetland Freshwater Ecosystem Priority Areas (FEPA), including a 1 km buffer;
    d. RAMSAR sites;
3. Areas of high biodiversity importance, which pose a high risk to mining, including:

a. Protected areas buffers;
b. Transfrontier Conservation Areas;
c. Other identified priorities from provincial spatial biodiversity plans;
d. High water yield areas;
e. Coastal Protection Zones;
f. Esturine function zones;

4. Areas of moderate biodiversity importance, which pose a moderate risk to mining, including:
   a. Ecological Support Areas (ESAs);
   b. Vulnerable ecosystems; and
   c. Focus areas for land based protected area expansion and focus areas for offshore protection.

The Guideline dictates that the site is of low risk to mining as:

- Protected areas have been identified and buffer zones made
- The proposed project area is located in an area either already mined, or approved for mining;
- Mining is set-back from the Groot-Georaap River (a FEPA) by at least 100 m;
- The area is not a high-water yield area; and
- Only benign impacts on the Coastal Protection Zone are anticipated from the expansion of infrastructure here.

3 Environmental Impact Assessment Process

The general approach to this study is guided by the principles contained in Section 2 and Section 3 of NEMA and those of Integrated Environmental Management (IEM).

NEMA lists a number of principles that apply to the actions of organs of state and that also serve as reference for the interpretation of environmental legislation and administration of environmental processes. The principles most relevant to environmental assessment processes and projects for which authorisation is required are summarised as:

- **Principles relevant to the EIA process:**
  - Adopt a risk-averse and cautious approach;
  - Anticipate and prevent or minimise negative impacts;
  - Pursue integrated environmental management;
  - Involve stakeholders in the process; and
  - Consider the social, economic, and environmental impacts of activities.
- **Principles relevant to the project:**
  - Place people and their needs at the forefront of concern and serve their needs equitably;
  - Ensure development is sustainable, minimises disturbance of ecosystems and landscapes, pollution and waste, achieves responsible use of non-renewable resources and sustainable exploitation of renewable resources;
  - Assume responsibility for project impacts throughout its life cycle; and
  - Polluter bears remediation costs.

This S&EIR process complies with these principles through its adherence to the EIA Regulations, 2014 and associated guidelines, which set out clear requirements for, *inter alia,* impact assessment and stakeholder involvement, and through the assessment of impacts and identification of mitigation measures during the Impact Assessment Phase (which may be superfluous for this solely desktop project). An initial analysis of the project's compliance with the aims of sustainable development is provided in the impact assessment.

In accordance with the IEM Information Series (DEAT, 2004), an open, transparent approach, which encourages accountable decision-making, has been adopted.

The underpinning principles of IEM require:

- Informed decision making;
- Accountability for information on which decisions are made;
- A broad interpretation of the term "environment";
- An open participatory approach in the planning of proposals;
- Consultation with interested and affected parties;
- Due consideration of alternatives;
- An attempt to mitigate negative impacts and enhance positive impacts of proposals;
- An attempt to ensure that the social costs of development proposals are outweighed by the social benefits;

- Democratic regard for individual rights and obligations;
- Compliance with these principles during all stages of the planning, implementation and decommissioning of proposals; and
- The opportunity for public and specialist input in the decision-making process.

Although various EAs, permits or licences are required before the proposed project may proceed, the regulatory authorities are committed to the principle of cooperative governance and in order to give effect to this principle, a single S&EIR process is required to inform all applications. To this end, a single EIAR and EMPr were compiled and will be submitted to the DMRE in support of the application for an EA of NEMA listed activities.

The study was also guided by the requirements of the EIA Regulations, which are more specific in their focus and define the detailed approach to the S&EIR process.

The competent authority for this project is the DMRE in the Northern Cape.

3.1 Scoping and Environmental Impact Assessment Process

The S&EIR process consist of three phases before decision making by the competent authority (DMRE). The Pre-Application and Scoping Phases (which have been completed) and an Impact Assessment Phase (the current phase) (Figure 3-1).

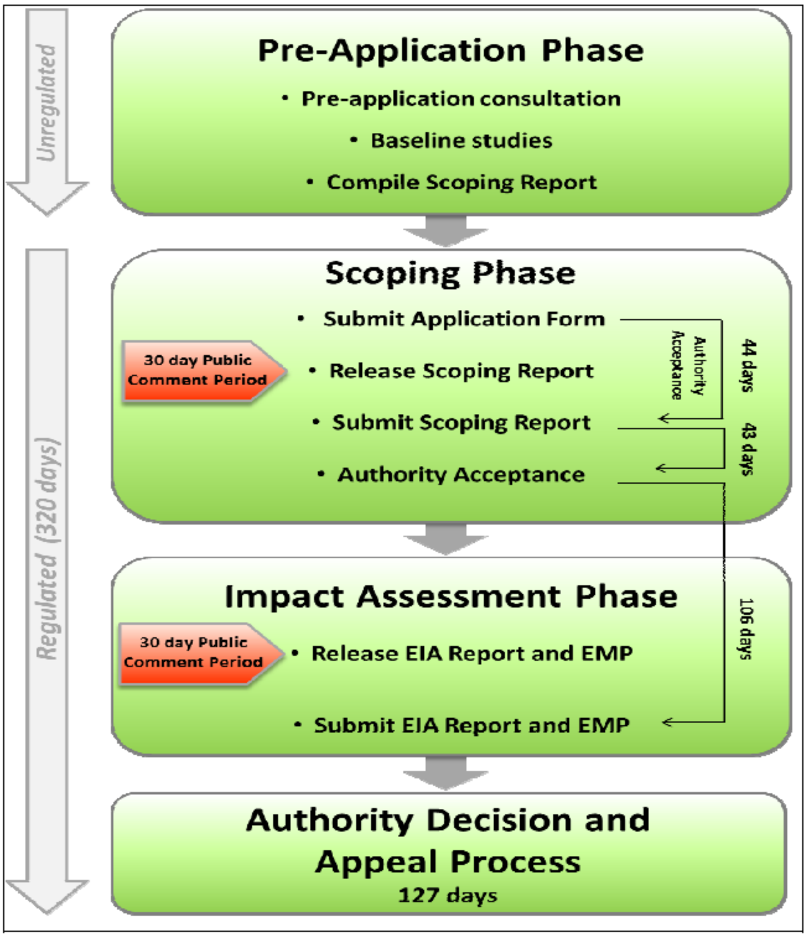


Figure 3-1: Scoping and Environmental Impact Assessment process.

3.1.1 The Objectives of the Pre-Application Phase were to:

- Identify appropriate specialist studies using the national screening tool prescribed by Regulation 16(1)(b)(v) of the NEMA EIA Regulations;
- Identify stakeholders, including neighbouring landowners/ residents and authorities;
- Compile Draft Scoping Report describing the affected environment and present an analysis of the potential environmental issues and benefits arising from the proposed project that may require further investigation in the Impact Assessment Phase;
- Develop ToR for specialist studies to be undertaken in the Impact Assessment Phase.

3.1.2 The Objectives of the Scoping Phase were to:

- Inform stakeholders of the proposed activity, feasible alternatives and the S&EIR process;
- Provide stakeholders with the opportunity to participate effectively in the process and identify any issues and concerns associated with the proposed activity, review specialist study ToR and the Plan of Study for EIA; and
- Submit a Scoping Report to the relevant authorities (in this case DMRE).

3.1.3 The Objectives of the Impact Assessment Phase are to:

- Inform and obtain contributions from stakeholders, including relevant authorities, the public and local communities and address their relevant issues and concerns;
- Build capacity amongst stakeholders during the S&EIR process so that they may actively and meaningfully participate;
- Document and contextualise the biophysical baseline conditions of the study area and the socio-economic conditions of affected communities;
- Assess in detail the potential environmental and socio-economic impacts of the project;
- Identify environmental and social mitigation measures to avoid and/or address the impacts assessed; and
- Develop and/or amend environmental and social management plans based on the mitigation measures developed in the EIAR and EMPr.

3.1.4 Submission of Applications

Various EAs, permits and licences are required before the proposed project may proceed. Application forms must generally be submitted at the outset of the S&EIR process. The required authorisations and their status are listed in Table 3-1.

Table 3-1: Environmental Authorisations, Permits and Licences Required for the Project.

Application	Authority	Status
NEMA: EA	DMRE	Application was submitted to the DMRE on 9 February 2021 in compliance with Section 16 of the EIA Regulations, 2014.
MPRDA: Prospecting Right	DMRE	Prospecting Right application for bulk sampling submitted to the DMRE by Samara Mining on 9 February 2021.

Application	Authority	Status
General permit to destroy, damage, excavate, disturb and collect fossils identified during sampling	SAHRA	To be applied for before any site work is undertaken.

3.2 Description of Tasks

The Impact Assessment Phase can be divided into key steps, namely:

- Consultation with relevant authorities;
- Specialist studies;
- Compilation of an EIAR and an EMPr;
- Stakeholder engagement; and
- Submission of the Final EIAR and EMPr to the competent authority, in this case DMRE.

3.2.1 Consultation with the Relevant Authorities

Consultation was conducted with DMRE (Northern Cape) and other relevant authorities to clarify their requirements for the Impact Assessment Phase of the proposed development, other permit and licence applications for the project and to ensure that comments from the key authorities can be received in time to allow for them to be addressed in the EIA. The authorities (and other organs of state) that were consulted include:

- DMRE (Northern Cape, Springbok);
- DMRE (Northern Cape, Kimberley);
- Petroleum Agency South Africa;
- Department of Agriculture, Forestry and Fisheries (DAFF): Marine Resources Management: Offshore and High Seas Fisheries;
- Department of Environment and Nature Conservation, Northern Cape;
- Department of Environmental Affairs and Development Planning (DEADP);
- Department of Environmental Affairs and Nature Conservation;
- Department of Environmental Affairs and Nature Conservation, Kimberley;
- DFFE: Oceans & Coast;
- DFFE, National;
- DFFE, National Forestry Management;
- DFFE, Upington Forestry Management;
- Department of Public Works, Northern Cape;
- Department of Rural Development and Land Reform;
- Northern Cape Heritage Resources Agency;
- South Africa Navy Hydrographic Office;
- SAHRA;

- South African Maritime Safety Authority (SAMSA);
- South African National Biodiversity Institute (SANBI); and
- Transnet National Ports Authority.

3.2.2 Specialist Studies

Specialist assessments were undertaken as part of the Impact Assessment Phase to investigate the key potential environmental issues and impacts identified during Scoping. These key issues and impacts have been identified based on:

- The legal requirements;
- The nature of the proposed activity;
- The nature of the receiving environment; and
- The professional experience of the EIA team.

To address the potential issues and impacts identified thus far, the following specialist studies were conducted:

- Underwater Heritage Impact Assessment (ACO Associates cc);
- Marine Ecology Impact Assessment (Aquatic Ecosystem Services); and
- Fisheries Impact Assessment (Capricorn Marine Environmental (Pty) Ltd).

The specialist studies are attached as Appendix G and the findings and recommendations are provided and discussed in Section 7.2.

3.2.3 Compilation of the Environmental Impact Assessment Report

The compilation of the EIAR and EMPr included the following tasks:

- Assimilation of the specialist studies/input into the EIAR and EMPr;
- Identification and assessment of environmental impacts based on the results of the specialist studies / input and professional judgment of the EIA team. This entails an assessment of the duration, extent, probability and intensity of the impacts to determine their significance;
- Identification of mitigation measures and recommendations for the management of the proposed project to avoid and minimise environmental impacts and maximise benefits; and
- Collation of the above information into an EIAR and EMPr for the design, construction, and operational phases of the project.

3.3 Stakeholder Engagement

Stakeholder engagement forms a key component of the S&EIR process. The objectives of stakeholder engagement are outlined in this section, followed by a summary of the approach followed in compliance with Chapter 6 of the EIA Regulations, 2014 and issues raised by the public with regard to the proposed development during Pre-Application and Scoping Phases.

3.3.1 Objectives and Approach to Stakeholder Engagement

The overall aim of public consultation is to ensure that all stakeholders have adequate opportunity to provide input into the process and raise their comments and concerns. More specifically, the objectives of public consultation are to:

- Identify I&APs and inform them about the proposed development and S&EIR process;
- Provide the public with the opportunity to participate effectively in the process and identify relevant issues and concerns;
- Coordinate cooperation between organs of state in the consideration of the assessment; and
- Provide the public with the opportunity to review documentation and assist in identifying mitigation and management options to address potential environmental issues.

The NEMA Regulations (GN R982) distinguishes between potential I&APs and registered I&APs. I&APs, as stated in Section 24(4)(d) of the NEMA include:

- Any person, group of persons or organisation interested in or affected by an activity; and
- Any organ of state that may have jurisdiction over any aspect of the activity. In terms of the Regulations "registered I&APs" means:

An I&AP's whose name is recorded in the register opened for that application. For that purpose, an EAP managing an application must open and maintain a register which contains the names, contact details and addresses of:

- All persons who have submitted written comments or attended meetings with the applicant or EAP;
- All persons who have requested the applicant or EAP managing the application, in writing, for their names to be placed on the register; and
- All organs of state which have jurisdiction in respect of the activity to which the application relates.

A wide variety of I&APs were identified for the Stakeholder Engagement Process including but not limited to:

- ***National Government:*** Such as the Department of Forestry, Fisheries and the Environment (DFFE);
- ***Provincial Government:*** DMRE, DAFF: Marine Resources Management: Offshore and High Seas Fisheries, Department of Environment and Nature Conservation Northern Cape, Department of Environmental Affairs and Development Planning (DEADP), DFFE: Oceans & Coast, Department of Public Works Northern Cape, Department of Rural Development and Land Reform and Northern Cape Heritage Resources Agency;
- ***Local and District Government:*** Namaqua District Municipality; Nama Khoi Local Municipality and Richtersveld Local Municipality;
- ***Traditional Authorities:*** According to SRK's knowledge, no Traditional Authorities are present in the project area;
- ***I&APs:*** Community members residing within or in close proximity to the proposed project area;
- ***Non-Governmental Organisations (NGO's)/Other Organisations:*** The West Coast Rock Lobster Association (WCRLA); Ezemvelo KZN Wildlife; SA Inshore Fishing Association; SANParks; South African Deep Sea Trawling Industry Association (SADSTIA); WildoceansSA Placer Resource Management; and
- ***Business and Commerce/Mining and Industry/Parastatals:*** LK Mining, SA Inshore Fishing Association and South African Pelagi Fishing Industry Association.

A full stakeholder database is appended as Appendix E_ 3.

3.3.2 Stakeholder Engagement during the Project Announcement Phase

The key stakeholder engagement activities undertaken during the Scoping Phase are summarised in Table 3-2.

Table 3-2: Stakeholder engagement activities during the Scoping Phase.

Activity	Date
<u>Submit Application Forms to DMRE</u> • *Register the applications for EA, Prospecting Right and confirm authority requirements.*	9 February 2021
<u>Development of Stakeholder Database:</u> • *The stakeholder database comprises of a variety of stakeholders identified from previous projects in the area, newly identified stakeholders and through the initial registration process as well as the Scoping and EIA Phases of the project; and* • *The stakeholder database included institutions and organisations at various levels of government.*	July 2021 - Ongoing
<u>Public Participation Plan:</u> • *To address, prevent and combat the spread of COVID-19 relating to National Environmental Management permits and licences; and* • *It is noted that the Public Announcement and the Scoping Phase were undertaken during Covid Restriction Level 3 and Level 4 and as such, no public meetings could be held at the time.*	13 August 2021
<u>Letter of Invitation to Register as I&APs:</u> • *To provide stakeholders with an opportunity to participate in the EA application process and to register as an I&AP; and* • *To notify stakeholders of the commencement of the EIA process and to provide a description of the proposed project and the affected environment, as well as a description of potential environmental issues, and the proposed approach to the Impact Assessment Phase.*	2 August 2021
<u>Place posters on-site:</u> • *To notify stakeholders of the commencement of the EIA process and to provide a description of the proposed project and the affected environment, as well as a description of potential environmental issues, and the proposed approach to the Impact Assessment Phase; and* • *Site notices were erected at several places in Port Nolloth and Kleinsee.*	31 July 2021 and 1 August 2021
<u>Advertise commencement of S&EIR process:</u> • *To notify stakeholders of the commencement of the EIA process and to provide a description of the proposed project and the affected environment, as well as a description of potential environmental issues, and the proposed approach to the Impact Assessment Phase; and* • *Media advertisements were placed in the Die Burger, Die Plattelander, and Gemsbok.*	30 July 2021

Public Participation Plan

To address, prevent and combat the spread of COVID-19 relating to National Environmental Management permits and licences, a Public Participation Plan was developed and submitted to the DMRE on 13 August 2021.

Distribution of Notification Letters

Notification letters were sent to identified I&APs of which contact information was available on 2 August 2021 onwards, informing them of the proposed project. I&APs were requested to:

- Declare their interests in the project;

- Provide contact details; and
- To provide comments and/or objections to the application.

A copy of the notification letter is attached as Appendix E_ 2.

Newspaper Advertisement

Newspaper advertisements announcing the commencement of the S&EIR process and inviting I&APs to register on the project database were placed on 30 July 2021 in the following newspapers:

- Die Burger (in Afrikaans);
- Die Plattelander (in Afrikaans and English); and
- Gemsbok (in Afrikaans).

A copy of the newspaper advertisements is attached in Appendix E_ 3.

On-Site Notices

Site notices (Size A2: 600 mm X 420 mm) notifying stakeholders and I&APs of the proposed project were placed in English and Afrikaans at conspicuous places in the project area on 31 July and 1 August 2021. Images as well as copy of the site notices and proof of their placement is provided in Appendix E_ 4.

Table 3-3: List of site notice placements.

Site Notice	Location	Coordinates	
		Latitude	Longitude
1	West Coast Shopping Centre Kleiner	S29 °40 °	E017° 04
2	Dorp Entrance Port Nolloth	S29 °14 °	E016° 52°
3	Fabriek Port Nolloth	S29 °15 °	E016° 52°
4	Usave Porth Nolloth	S29 °15 °	E014° 52°
5	Kings Super Market Port Nolloth	S19 °15 °	E016° 52°
6	Tamil General Store	S29 °15 °	E016° 52°
7	Southpansweg Port Nolloth	S29 °14 °	E016° 52°
8	Car Wash Port Nolloth	S29 °14 °	E016° 52°
9	Circul Port Nolloth	S29 °15 °	E016° 52°
10	Port Nolloth Spar	S29 °15 °	E016° 52°
11	Kleinsee Library	S29 °40 °	E017° 04°
12	Port Nolloth Highway	S29 °38 °	E017° 04°
13	Groser Shop	S29 °12 °	E017° 05°
14	Groser Shop Hospital Road Kleinsee	S29 °40 °	E017° 03

3.3.3 Stakeholder Engagement during the Scoping Phase

The stakeholder database has been updated as new I&APs registered and with the identification of additional stakeholders. All stakeholders were notified of the availability of the Draft Scoping Report for comment.

The key stakeholder engagement activities undertaken during the Scoping Phase are summarised in Table 3-4.

Table 3-4: Stakeholder engagement activities during the Environmental Impact Assessment Phase.

Activity	Date
Release of Draft Scoping Report including CRR for public comment period: • *To record and respond to all issues and concerns raised during the project announcement phase and collate these comments;* • *To provide an opportunity for stakeholders to review the Scoping Report and make comments;* • *Copies of the complete Draft Scoping Report were made available for public review at the following location: SRK's website: https://www.srk.com/en/ww-library; and* • *Electronic copies of the Complete Draft Scoping Report were also made available to the commenting authorities and other I&APs upon request.*	27 August 2021 to 29 September 2021
Update CRR, Compile Issues and Responses Summary and finalise Scoping Report: • *To record and respond to all issues and concerns raised and collate these comments.*	October 2021
Submit Final Scoping Report (CRR and Issues and Responses Summary) to DMRE: • *To provide authority with information for decision-making.*	28 October 2021

Comments submitted during the public review period are provided in Appendix E_ 7. Correspondence between stakeholders is attached as Appendix E_ 8 and Appendix E_ 9.

Notification Letters

Stakeholders were notified of the project and the availability of the Draft Scoping Report as follows:

- Distribution of notification letters via emails on 27 August 2021.

Proof of notification in the form of email delivery is attached in Appendix E_ 5.

Commenting Authorities and Interested and Affected Parties

The Draft Scoping Report was made available to identified stakeholders and registered I&APs for a 30-day review and commenting period (28 August 2021 to 29 September 2021) as prescribed by the NEMA. Copies of the complete Draft Scoping Report were made available for public review at the following location: SRK's website: https://www.srk.com/en/ww-library.

Electronic copies of the Complete Draft Scoping Report were also made available to the commenting authorities and other I&APs upon request.

The Final Scoping Report including the comments received by stakeholders and I&APs during all phases of the project was submitted to the DMRE for approval.

Scoping Phase Comments and Response Register

Comments received throughout EIA process have been collated into a CRR. The CRR has been updated with comments received and responses provided during the Draft Scoping Report commenting period as part of the Final Scoping Report was submitted to the DMRE. The CRR has been attached to this report as Appendix E_ 7. Correspondence between stakeholders is attached as Appendix E_ 8 and Appendix E_ 9.

Issues and Concerns Raised by I&APs during Scoping

Comments received were incorporated into the CRR and are appended to this report as Appendix E_ 7. Correspondence between stakeholders is attached as Appendix E_ 8 and Appendix E_ 9. These comments and recommendations have been considered in the assessment of impacts in Section 7 of this report.

Submission and Acceptance of Final Scoping Report

The Final Scoping Report, which was prepared in compliance with Section 21 of the EIA Regulations, was submitted to the DMRE on 27 August 2021, within 44 days of the submission of the application for EA.

It is noted that, following the submission of the Scoping Report to the DMRE, the application for EA was suspended pending the outcome of an appeal process regarding the application for a prospecting right by Samara. The DMRE finalised the appeal process and subsequently accepted the Scoping Report advising Samara to proceed with the tasks contemplated in the plan of study for the EIA Phase of the project (DMRE Letter dated 26 January 2023). It was further indicated that the Final EIA Report needs to be submitted to the DMRE within 106 days (9 May 2023) of acceptance of the Scoping Report.

As the EAP experienced challenges in appointing a suitably qualified Marine Ecologist[17] to undertake the Marine Ecology impact assessment, a request was submitted to the DMRE to extend the submission date with the additional 50 days (NDI letter dated 9 March 2023). The DMRE granted an extension for the submission of the Final EIAR to 26 June 2023 (DMRE Letter dated 9 March 2023).

3.3.4 Stakeholder Engagement during the Impact Assessment Phase

Stakeholder engagement activities during the Impact Assessment Phase were aimed at ensuring that the specialist studies and assessment by the EIA project team adequately address the issues and concerns raised during the Scoping Phase. Opportunity to raise further issues is also provided.

The key Stakeholder engagement activities during the Impact Assessment Phase are summarised in Table 3-5.

Table 3-5: Stakeholder engagement activities during the Impact Assessment Phase.

Activity	Date
Letter sent to Registered I&APs notifying them that the EA process is proceeding.	8 March 2023

EIAR public comment period including distribution of an Executive Summary to all registered stakeholders:
• *To provide stakeholders with the opportunity to review and comment on the results of the Impact Assessment Phase;*
• *To obtain written comments from stakeholders and key stakeholders on the EIA Report;*
• *Hard copies of the report will be placed at the:*
  ○ *Port Nolloth Municipality;*
  ○ *Recreation Club in Kleinzee; and*
  ○ *Hondeklipbaai Municipality;*
• *Copies of the complete Draft EIAR will be made available for public review at the following location: SRK's website: https://www.srk.com/en/ww-library; and*
• *Electronic copies of the Complete Draft EIAR will also made available to the commenting authorities and other I&APs upon request; and https://www.srk.com/en/public-documents/samara-draft-eiar.*
• *Electronic, large file transfer links will be made available to selected authorities, to facilitate their review of the EIA Report and comment.*
	17 May 2023 – 15 June 2023

Public Consultation Meetings: • *To provide stakeholders with the opportunity to review and comment on the results of the EIA Phase:*	23 May 2023 – 25 May 2023

[17] Aquatic Ecosystem Services was appointed to undertake the Marine Ecology Impact Assessment for the Samara Project.

Activity	Date
• *Public meetings to be held in Port Nolloth, Kleinsee and Hondeklipbaai.*	
Update CRR, Compile Issues and Responses Summary and finalise EIAR: • *To record and respond to all issues and concerns raised and collate these comments.*	June 2023
Release of the Final EIAR to the DMRE: • *To present the findings of the EIA process, incorporating stakeholder comment and submit the EIA Report to the authorities to facilitate their decisions.*	26 June 2023

Notification of Draft EIA Report for Public Comment

Registered stakeholders will be notified of the release of the Draft EIAR for public review. Notifications, including copies of the Executive Summary, were e-mailed to all registered I&APs on the same date (a list of registered I&APs notified of the Draft EIAR is included as Appendix E_ 6).

Copies of the notification letter sent to all registered I&APs on 17 May 2023 are attached to the Final EIAR as Appendix E_ 5.

The report is accessible as an electronic copy on SRK's website www.srk.co.za (via https://www.srk.com/en/public-documents/samara-draft-eiar).

A 30-day comment period commenced on 17 May 2023 and I&APs were requested to submit comments to SRK Consulting by 15 June 2023.

Commenting Authorities and Interested and Affected Parties

The Draft EIAR will be made available to identified stakeholders and registered I&APs for a 30-day review and commenting period as prescribed by the NEMA. Copies of the complete Draft EIAR was made available for public review at the following location: SRK's website www.srk.co.za (via https://www.srk.com/en/public-documents/samara-draft-eiar).

Electronic, large file transfer links will be made available to selected authorities, to facilitate their review of the EIA Report and comment.

Electronic copies of the Complete Draft EIAR will be made available to I&APs upon request.

The Final EIAR including the comments received by stakeholders and I&APs during all phases of the project will be submitted to the DMRE for approval.

Issues and Concerns Raised by I&APs during Impact Assessment

Comments received in response to the Draft EIAR/EMPr will be included in the EIAR CRR and attached to the Final EIAR/EMPr as Appendix E_ 7. Correspondence between stakeholders is attached as Appendix E_ 8 and Appendix E_ 9.

3.3.5 Way Forward

Following the commenting period, a CRR will be compiled for inclusion with the Final EIAR, which will be submitted to the DMRE.

3.3.6 Summary of Issues Raised

Issues that have been raised to date by I&APs and other Stakeholders can be summarised as:

- Request received from the DFFE: Protected Areas Planning and Management Effectiveness to amend the footprint area of the proposed prospecting area to exclude the Namaqua Fossil Forest MPA completely. The Namaqua Fossil Forest MPA has been excluded from the proposed prospecting area;

- Feedback received from the SAHRA with regards to:
  - Incorrect information reflected in the Draft Scoping Report with regards to the number of shipwrecks recorded and the responsible Authority. Response: The information was updated accordingly in the Final Scoping Report. However, during the EIA Phase of the project, ACO Associates cc was appointed to undertake a HIA (ACO, 2023). Although a 2017 HIA produced for portions of the concession areas suggests that five wrecks have the potential to be present within the concession area boundaries, the ACO assessment believes, that with the exception of the *Eros*, which on balance is more likely to be located near Lamberts Bay than in the vicinity of the concession areas, it is possible, but unlikely, that the remains of the *Haab*, *Jessie Smith*, *Ocean King* and *La Porte* lie within the concession areas. ACO therefore did not record any wrecks within Concession Areas 4C and 5C. Although unlikely, the possibility does exist for the remains of currently unknown and unrecorded wrecks to be present in the concession areas;
  - Request to include mitigation measures when any shipwreck material is identified outside of known shipwreck sites. Heritage mitigation measures were included as part of the HIA undertaken for the project area and forms part of the EMPr (Appendix F) developed;
- Feedback received from DBCM:
  - Concern with regards to the submission of the Samara application and that the date of submission reflected in the Draft Scoping Report was while DBCM was still the holder of the prospecting rights of Concession Areas 4C and 5C. Response: Samara Mining submitted an EA application as well as a Prospecting Right Application on 9 February 2021. Please note that the date of 8 February 2021 was incorrectly reflected in the Draft Scoping Report and was amended to 9 February 2021 in the Final Scoping Report; and
  - Concerns were raised with regards to I&APs not included in the Stakeholder Database. Response: SRK has updated the Stakeholder Database with readily available contact details and will pursue obtaining additional contact information to provide newly identified I&APs opportunity to provide inputs;
- De Beers submitted an appeal against the Samara Prospecting Right Application. The DMRE finalised the appeal process and subsequently accepted the Scoping Report advising Samara to proceed with the tasks contemplated in the plan of study for the EIA Phase of the project (DMRE Letter dated 26 January 2023); and
- The Samara prospecting area overlaps with the approved Tosaco's exploration right for offshore oil and gas. Tosaco has been included as an I&AP and the potential impacts associated with the Tosaco 3D seismic survey of the area evaluated, as part of the cumulative impact assessment undertaken for the Samara project.

Comments received from stakeholders thus far were addressed, as indicated in the responses provided in the CRR (Appendix E_ 7). These comments and recommendations have been considered in the assessment of impacts in Section 7 of this report.

4 Project Description

This section provides general project information, describes the needs and desirability for the proposed project, considers alternatives as well as provides information on the different phases associated with the Samara Project.

4.1 Project Background

This project is associated with operations that take place within the Samara proposed prospecting area only. This project description therefore focuses on the proposed prospecting site. Details of the Samara Concession Prospecting site are described in more detail in Section 4.2.

To prospect for diamonds, Samara Mining intends to use both invasive and non-invasive methods. The non-invasive method will be made up of desktop (including analytical desktop) studies, geophysical surveys, 3D geological model and resource estimation. The invasive methods will comprise of Exploration Drilling and Bulk Sampling.

The prospecting programme aims to gather sufficient data on the proposed prospecting right concession to complete a feasibility and decision on proceeding with the mining project. A three phased approach to exploration will be undertaken. Phase 1 will commence with non-invasive methods of desktop studies, geophysical surveys and the identification of potential diamond trap-sites to plan and design the exploration drill sample programme on. Phase 2 will be the invasive method of reconnaissance exploration drill sampling that aims to identify which potential trap-sites carry a positive grade. Phase 3 will consist of non-invasive detail infill geophysical surveys and invasive detail infill drilling. Results will determine the level of confidence reached to either justify resource estimation or do a second programme of detail infill drilling to increase confidence for resource estimation and preliminary mine plan design. The preliminary mine plan will be followed by a trench bulk sampling programme to simulate mining, finalise the mine plan and gather geotechnical production data for the feasibility study. This phase will determine the feasibility and decision on proceeding with the mining project.

Commencing with additional geophysical data acquisition over areas where coverage is not adequate to support sampling and adjacent to areas onshore which show potential for diamond prospecting. The objective of the 1st phase of sampling will be to ground truth geophysics and identify mineralization. At the latter end of the sampling voyage, it is proposed that follow up sampling be taken around positive results to expand on mineralization continuity.

The prospecting activities will follow a standard phased approach which will be undertaken on a scheduled timeline, with some activities being run concurrently, while others will follow sequentially. A description of the project phases and requirements is provided in Section 4.2.

4.1.1 Details of Sea Concession Area

The location of the infrastructure will be determined based on the location of the prospecting activities, which will only be determined during Phase 1 of the Prospecting Works Programme, as well as the presence of sensitive environmental attributes such as sites of archaeological and palaeontological importance. All infrastructure will be temporary and/or mobile (refer to Section 4.2 of this report).

The project is located in Sea Concession Areas 4C and 5C (Figure 4-1), which are offshore areas located approximately from 10 to 195 km seaward of the West Coast shoreline of South Africa. The total Prospecting Right area is approximately 781 362 hectares (excluding Namaqua Fossil Forest MPA). The application area is approximately 12.5 km from Kleinsee and 60 km from Hondeklipbaai.

The study area is located in the central subregion of the Benguela region[18] dominated by the cold Benguela Current, but also influenced by intrusions of warm-water eddies of the Agulhas Current.

The terrestrial climate along the West Coast of South Africa is considered moderate. Weather patterns along the West Coast are influenced largely by the mid-latitude subtropical cyclones that are generated to the southwest of the country, and the South Atlantic and Indian Ocean high pressure systems (Schuman *et al*., 1995).

The inner shelf along the West Coast is underlain by Precambrian bedrock (Pre-Mesozoic basement), whilst the middle and outer shelf areas are composed of Cretaceous and Tertiary sediments (Dingle, 1973; Dingle *et al*., 1987; Birch *et al*., 1976; Rogers, 1977; Rogers & Bremner, 1991). As a result of erosion on the continental shelf along the West Coast, the unconsolidated sediment cover is generally thin, often less than 1 m. Sediments are finer seawards, changing from sand on the inner and outer shelves to muddy sand and sandy mud in deeper water. Further offshore, benthic habitats are dominated by lower bathyal and abyssal unconsolidated muds and sandy muds. The continental slope, seaward of the shelf break, has a smooth seafloor, underlain by calcareous ooze.

Please refer to Figure 4-1 and Appendix D for the project locality.

Table 4-1: Co-Ordinates of the Boundary Points of Sea Concession 4C and 5C.

<table>
<tr><td rowspan="11">Sea Concessions 4C and 5C (Coordinates of the boundary):</td><td>Point</td><td>Latitude</td><td>Longitude</td></tr>
<tr><td>A</td><td>15° 23' 41.729" E</td><td>29° 53' 9.292" S</td></tr>
<tr><td>B</td><td>17° 0' 39.610" E</td><td>29° 53' 30.475" S</td></tr>
<tr><td>C</td><td>16° 55' 17.297" E</td><td>29° 38' 55.884" S</td></tr>
<tr><td>D</td><td>16° 29' 4.514" E</td><td>29° 38' 36.963" S</td></tr>
<tr><td>E</td><td>16° 27' 3.580" E</td><td>29° 36' 45.392" S</td></tr>
<tr><td>F</td><td>16° 26' 57.021" E</td><td>29° 20' 59.416" S</td></tr>
<tr><td>G</td><td>15° 25' 59.395" E</td><td>29° 20' 25.185" S</td></tr>
<tr><td>H</td><td>15° 5' 18.746" E</td><td>29° 34' 0.002" S</td></tr>
<tr><td>I</td><td>15° 31' 55.313" E</td><td>29° 42' 21.062" S</td></tr>
<tr><td>J</td><td>15° 31' 15.615" E</td><td>29° 45' 55.726" S</td></tr>
<tr><td>Application area (Ha)</td><td colspan="3">987 039 ha (Total for both concessions as per PWP);
781 362 ha (Total for both concessions excluding the Namaqua Fossil Forest MPA)</td></tr>
<tr><td>Magisterial district:</td><td colspan="3">Not Applicable</td></tr>
<tr><td>Distance and direction from nearest town</td><td colspan="3">The project is located in offshore areas approximately from 3 to 195 km seaward of the West Coast shoreline of South Africa. The application area is approximately 12.5 km from Kleinsee and 60 km from Hondeklipbaai.</td></tr>
<tr><td>21-digit Surveyor General Code for each farm portion</td><td colspan="3">Not Applicable. The Samara Concession Prospecting project is located offshore.</td></tr>
</table>

[18] The Benguela region extends the length of the Benguela Current from approximately Cape Point in the South, to the position of the Angola-Benguela front in the North. The Benguela Region can be divided into three subregions, namely the Southern Benguela (Cape Point to Cape Columbine), Central Benguela (Cape Columbine to Lüderitz) and Northern Benguela (Lüderitz to the Angola-Benguela front).

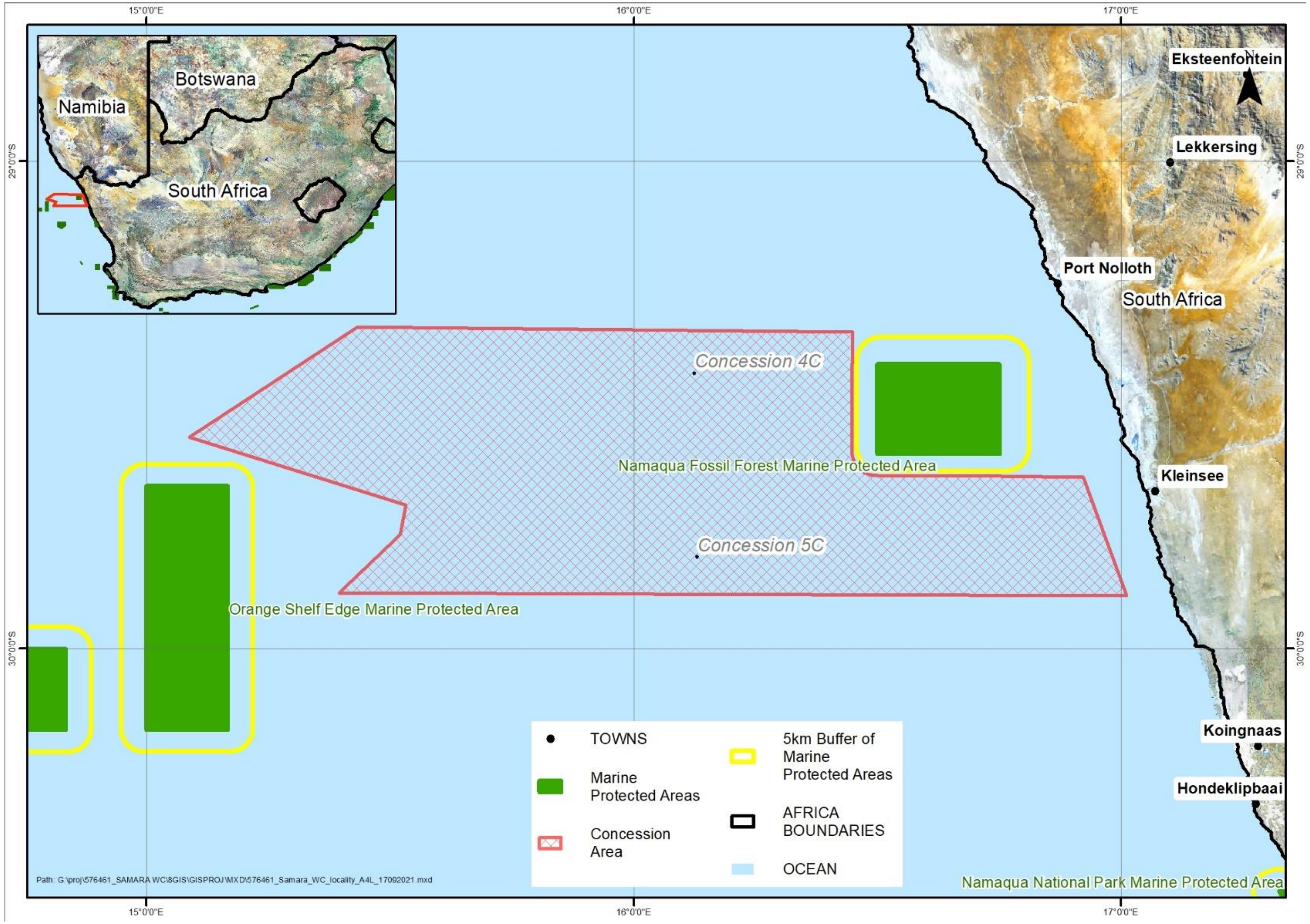


Figure 4-1: **Locality map.**

4.2 Scope of the Proposed Overall Activity

The prospecting activities will follow a standard phased approach which will be undertaken on a scheduled timeline, with some activities being run concurrently, while others will follow sequentially.

A summary of the project phases and requirements is provided in Table 4-3 and are described in more detail in the following sections. The PWP outlines a programme consisting of three phases which are only executed once results of the previous phase substantiate activation and detail planning of the next phase.

4.2.1 Phase 1: Non-invasive Methods (Month 1-23)

This phase will be implemented in eight stages as detailed below.

Stage one will comprise of a desktop-literature study that will investigate and source all available historical and recent data on regional and Concession Area scale. This stage aims to source geographical, geological, environmental, geotechnical, logistical, exploration, resource mineralisation, production, and commercial data.

Stage two will focus on studying the sourced data to compile a geological database with maps and reporting to enable an experienced marine geologist to extrapolate existing data into areas with little to no data coverage. The aim is to delineate areas within the Concession Areas that show high mineralization potential, moderate potential, and no potential on a reconnaissance scale.

Stage three consists of planning and layout of geophysical survey lines in areas of moderate to high mineralisation potential by an experienced marine geologist / geophysicist. The layout of the survey lines will focus on survey line orientation i.t.o. the prevailing swell and ocean current as well as the orientation of the prospective geological features. The ideal survey line orientation will provide the best possible quality geophysical data. Survey line spacing will be determined by the selection of the appropriate geophysical survey equipment to provide adequate coverage as well as by the water depth of each potential area.

Selection of the geophysical survey equipment will include a decimetre accurate GPS, tide gauge, high resolution swath bathymetric system and high resolution seismic sub-bottom profiler.

Deliverables of Stage three will be the survey design and scope of work for the reconnaissance remote geophysical survey to be conducted from a suitable survey vessel. This will include mapped-out survey lines with coordinates, total survey line kilometres, selection of geophysical survey equipment per survey line, survey vessel suitable to the water depths and selection of equipment and deliverables for the post-survey data processing. This comprehensive geophysical survey design is aimed at achieving the best outcome per line kilometre surveyed and will form the scope of work for the final costing of the geophysical survey.

Stage four will activate the tender process for selection of the best suitable geophysical survey contractor and survey vessel to conduct the survey programme as well as the post-survey data procession, interpretation, and specified deliverables.

Stage five is the execution of the reconnaissance geophysical survey programme at sea within the Concession Areas. This will be conducted by a well experienced and qualified survey team consisting of Samara's representative, Party Chief, Geophysicist, Surveyor, Technician and Data loggers/Data processors.

Stage five activities will start with mobilisation of all survey equipment onto the survey vessel in Cape Town, sea trials in Table Bay for testing vessel and equipment-offset positioning as well as equipment data capture, quality, and resolution. After successful sea trials and acceptance sign-off by Samara's representative, the survey vessel will transit to the Concession Areas.

Survey data collection at sea will be done during good to fair weather conditions to ensure the best possible quality geophysical data. Data collection will be stopped once sea conditions deteriorate from fair to poor, as data quality and accuracy will deteriorate and be of little use to map the identified areas. Therefore, the duration of the total sea time until completion is an estimate.

Data quality assurance and quality control (QA and QC) will be applied during surveying operations to ensure rectifying problems as soon as detected. The QA/QC process entails the regular on-board post-processing of data to allow evaluation of adjacent survey lines i.t.o. accurate positioning, data correlation with the different geophysical systems, resolution, and image quality. Once all planned survey lines have been surveyed and collected on board, the Samara representative will sign off completion of the at sea fieldwork part of the survey programme. The survey vessel will transit back to Cape Town and all geophysical equipment demobilised.

<u>Stage six</u> will commence with in-office geophysical data post-processing and interpretation after the geophysical survey datasets have been backed-up.

Post-processing of swath bathymetric data entails merging of the collected tide gauge data with the swath bathymetric data to achieve a mean sea floor level, as well as applying cleaning and signal enhancing filters to remove noise spikes and improve the 3D image. The final deliverable is a high resolution geographically accurate digital terrain model of the sea floor surface that will form part of the GIS database. This data will allow interpretation of the sediment-rock contact, identifying different surface sediment coarseness areas and bedrock signature structures like fractures, joints, and faults.

Post-processing of the seismic sub-bottom profiler data involves applying filters to smooth out the sea swell oscillation of the sea floor surface reflector and enhance the signal and deeper reflectors. Interpretation will seek to digitise the deepest seismic bedrock reflector from the sea floor outcrop down to the deepest sediment cover as well as digitising internal reflectors within the sediment package that might indicate a consolidated layer that could have acted as a diamond trap site above bedrock or that may course problems with penetration during drill sampling and mining.

All above datasets and interpretations are combined in the GIS database compiled from Stage two above.

<u>Stage seven</u> is the process of designing the reconnaissance exploration drill programme. This process involves studying and modelling the GIS database by a marine geologist experienced in marine diamond exploration with focus on identifying diamond trap-site features. Once all trap-sites have been identified will they be given a rating i.t.o. their orientation, shape, size, sediment thickness and water depth to rank them in order of highest to lowest potential. This rating will form the basis of compiling exploration target areas required to design the reconnaissance exploration drill programme.

The parameters used to decide on the coordinates and spacing of exploration drill positions will depend on the ranking, size, and orientation of the trap-sites. Drill positions for a reconnaissance programme will typically be on a grid spacing of between 200 and 100 m. The total numbers of reconnaissance drill positions required will depend on the total trap-sites identified from geophysical data, the ranking, and their footprint size.

The reporting of above studies, the evaluation, drill positions and a scope of work will be compiled to design the reconnaissance exploration drill programme to allow for final costing of the drill programme.

Stage eight will identify suitable exploration drill contractors, completing the tender process and appointment of an experienced contractor with exploration drill and processing plant equipment mobilised on a fit-for-purpose vessel.

The choice of exploration drill equipment will be proven technology for marine diamond exploration providing reliable results which will place confidence in ultimately defining and estimating a resource to be mined with proven mine technology suitable for water depths of the Concession Areas.

The identified exploration drilling tool is Wirth Drill technology capable of vertical drilling 10 to 12 m into the sea floor that can operate in water depths up to 160 m. The footprint of this drill is typically 3 to 5 m^2 providing a large enough area for confidence in the results.

A vessel equipped with this drill technology typically has a central moonpool for deployment and recovery of the drill platform. Furthermore, the vessel will have deck capacity for an in-line dense medium separation (DMS) plant that will receive the drilled material and process it via an in-line X-Ray concentrator up to final recovery. This processing method will provide on board grade results to enable the on-board exploration geologist to evaluate and augment the exploration drill programme to achieve the best possible outcome per drill position.

Furthermore, the vessel will be equipped with a dynamic positioning (DP) system to provide < 1 m accuracy and able to move swiftly from one drill position to the next.

4.2.2 Phase 2: Invasive Methods (Month 24-37)

This phase will be implemented through four stages consisting of mostly invasive but also non-invasive methods.

Stage one will execute the reconnaissance exploration drill (vertical) programme within the Concession Areas to determine the mineralisation of each diamond trap-site feature.

The exploration drill vessel will depart from Cape Town and transit to the Concession Area with the on-board Samara representative. Drilling will be conducted in a specific pre-determined order to reduce sailing time in between drill sites thereby increasing drill sites per day. The successful and crucial execution of each drill site depends on the drill head reaching bedrock footwall and the dredge pump properly removing loose material from the bedrock surface.

During drill sampling, results of the mineralisation grade per drill site and grade per trap-site feature will be regularly evaluated on board and discussed to compare with trap-site rating given during design of the drill programme. This dynamic approach will allow shifting of following drill positions to align better with the mineralisation grade results and to gain more geological information on the trap-site features and related mineralisation model.

On completion of the reconnaissance drill programme all recorded data (drill logs, geotechnical data, and mineralisation grade) will be combined into the database for use in the next stage.

Stage two comprises detailed evaluation and correlation (ground-truthing) of drill data (geological, geotechnical and diamond grade) with geological bedrock features and seismic reflectors mapped out from the remote sensing geophysical survey data.

This process of ground-truthing is crucial to adjust interpretations from the geophysical survey data, to revisit and update the trap-site rating as well as to identify positive grade diamond trap-site features that require infill drilling to increase knowledge and confidence towards understanding and modelling the mineralised geological features. The ground-truthing process also identify areas where infill geophysical seismic survey lines are required where bedrock micro-topography lead to poor extrapolation in between adjacent seismic survey lines.

An all-important part of this stage is the study and evaluation of the geotechnical data to predict the mine-ability of the deposit since the vertical penetration ability of the drill does not simulate the mine tool geotechnical ability.

Deliverables from this Stage two will be a post-reconnaissance exploration drill programme report detailing mapped out diamond trap-site features with adjusted priority rating and an updated geological model.

Stage three will use the recommendations from Stage two report on further exploration work required which entails infill seismic survey lines followed by an infill drill programme at 100 to 50 m spacing to increase confidence to ultimately achieve a resource estimation as well as determining the geotechnical character of the ore body that could impact mining and the feasibility.

This study and recommendations will lead to the design of the infill geophysical survey and infill drill programmes.

The placing and number of infill seismic survey lines and infill drill sites are dependent on the results of the reconnaissance drill programme and therefore an unknown at this stage.

Stage four will repeat the process of engaging with the geophysical survey contractor and the drill contractor to cost and execute the next phase of an infill exploration programme. It is imperative to use the same contractors to ensure geophysical and geotechnical repeatability and therefore placing confidence in correlation and upgrading the previous reconnaissance programme drill results.

4.2.3 Phase 3: Invasive Methods (Month 38-60)

This phase will be implemented through eleven stages consisting of mostly invasive but also non-invasive methods.

Stage one will be execution of the infill geophysical survey programme at sea within the Concession Areas. This will be conducted with the same survey contractor as before with their team accompanied by the Samara representative.

Stage two will commence with geophysical data post-processing and interpretation of the infill survey lines.

The seismic reflectors mapped out will be added to the GIS database to improve the resolution to better define the bedrock topography, geological modelling and improve knowledge of bedrock features that control diamond trap-site grade and a better understanding of the mineralised features as identified through drilling.

Stage three will use the detailed geophysical infill data to augment the infill drill programme in adjusting drill positions to be better aligned with the higher resolution dataset.

Stage four is the execution of the infill exploration drill programme using the same drill contractor as previously, again accompanied by the Samara representative.

On completion of the infill drill programme all recorded data (drill logs, geotechnical data, and mineralisation grade) will be combined into the GIS database for use in the next stage.

Stage five is the culmination and focus of the systematic and comprehensive exploration programme (or the PWP) aimed at placing Samara in a well informed and results-based position to make a decision on the viability of a future mining programme.

This stage starts with detailed evaluation and correlation (ground-truthing) of the latest infill drill data (geological, geotechnical and diamond grade) with the infill survey data and existing dataset.

The careful evaluation of all geophysical survey and drill exploration data, interpretation, extrapolation, geological modelling, and delineation of diamond grade trap-site features will identify and allow estimation of diamond resource deposits.

The data coverage and detailed geological data mapped during the exploration programme will determine the level of confidence which will either identify data gaps for further infill exploration (Stage- 1, Stage-4) or justify proceeding to the next Stage 6 of the design of a preliminary mine plan.

Stage six follows the previous stage that will serve as basis to design a preliminary mine plan inclusive of geotechnical parameters to equal the chosen mine tool and vessel technical abilities and thereby supporting the feasibility and conclusion on proceeding with the mining project in concession 4C and 5C.

Stage seven will engage with the chosen mine contractor to deliberate the nature of the resource deposits, the expected bedrock type and topography, possible consolidated internal sedimentary layers, total sediment thickness, sedimentary assemblage and expected diamond grade.

Together with the mine contractor a trench (bulk) sampling programme will be agreed on. This programme design will stipulate that execution must be with the chosen future mine tool technology, thereby increasing confidence in mine ability of the deposits.

Stage eight is the execution of the trench sampling programme with the selected vessel and mine technology of the future mine contractor.

During the trench sampling programme, the future mine contractor will evaluate the diamond recovery (mining tool and processing plant) and geotechnical data to increase confidence in the mineability of the deposits.

Figure 4-2: Schematic Representation of a Seabed Crawler in Operation (https://waterkeeper.org/news/why-you-should-care-about-seabed-mining/, 2023).

Stage nine will comprise engagement with the selected future mine contractor to discuss the trench sampling results, nature of the resource deposits, bedrock type and topography, possible problematic consolidated internal sedimentary layers, total sediment thickness, sedimentary assemblage, gravel processing, diamond recovery and diamond grade expected for future mining operations.

Grade results from exploration drilling will be correlated with grades achieved during trench sampling to calculate the expected grade from drilling versus the real grade from mining. Results will be used to recalculate and improve confidence in the earlier resource estimation.

Stage ten addresses the rehabilitation of the sea floor after the invasive methods of exploration drilling and trench sampling.

Environmental impacts will be on a comparable scale to those by previous operators in the same environment with similar sampling tools. Given that the areas disturbed will be a very small percentage of the licence (less than 0.002%), that only lower biodiversity sediment areas are affected (i.e., not high biodiversity reef areas), that the sea floor tends to self-rehabilitate and that the beneficiation process is non-toxic the impact is likely to be of very low significance. Previous EIA's have shown that while marine diamond sampling does disturb the marine benthic fauna communities, the magnitude is low, the duration is short, the spatial extent very local and of low impact. There is little effect to sea water quality, marine fauna, cetaceans, marine mammals, or commercial fishing.

In light of the very small area impacted and that swell with sediment movement acts as a natural recovery of the sea floor, no rehabilitation is required.

Stage eleven will be a comprehensive feasibility study incorporating the geological model, defined resource deposits, resource estimation, geotechnical data, mine tool ability, expected daily mining rate, recoverable diamond grade, life of mine and diamond market.

Table 4-2 summarises the description of the bulk sampling activities.

Table 4-2: Description of Bulk Sampling Activities.

ACTIVITY		DETAILS		
Number of pits/trenches planned		Twenty trenches (an estimate, as exploration and geological results will determine requirement)		
Dimensions of pits/trenches, per pit/trench	**Number of pits/trenches**	**Length**	**Breadth**	**Depth**
	20 (est.)	240m	20m	1 to 4 m
Locality		Exact location of trenches will be determined on completion of Phase 3, Stage 5.		
Volume Overburden (Waste)		9 600 m^3 on each excavation		
Volume Ore		2 400 m^3 on each excavation		
Density Overburden		Estimate: 1.7 g/cm^3		
Density Ore		Estimate: 2.0 g/m^3		
Phase(s) when bulk sampling will be required		During Phase 3		
Timeframe(s)		4 months for design, execution and results of geotechnical analysis of trench sampling programme		

4.3 Vessel Emissions and Discharges

Types of emissions and discharges that are expected when undertaking the geophysical surveys, exploration and other related activities can be summarised as follows:

- Discharges to sea:
  - Deck drainage (including detergents used for washing exposed marine deck spaces), machinery space wastewater etc.: The concentration of oil in discharge water from any vessel needs to comply with the MARPOL Regulation 21 stand (less than 15 ppm oil in water). Further any oily water would be processed using a suitable separation and treatment system meeting the MARPOL Annex I standard before being discharged to sea. Drainage from the deck spaces will wash directly overboard;
  - Sewage: The contracted vessels will be required to comply with MARPOL Annex IV Regulations for the Prevention of Pollution by Sewage from ships;
  - Disposal of solid waste such as food (galley) waste: Food waste disposal into the sea is permitted in terms of MARPOL Annex V when it has been ground and the vessel is located more than 3 nautical miles (approximately 5.5 km) from land. Such ground food wastes shall be capable of passing through a screen with openings no greater than 25 mm. Disposal overboard without macerating can occur greater than 12 nautical miles (approximately 22 km) from the coast. The average daily discharge from a vessel is typically in the order of 0.15 m^3;
- Waste (including general waste, scrap metal, drums, containers, chemicals and hazardous wastes, used oil, infectious waste) disposal to land: A number of other types of wastes generated during the Geophysical Surveying and Drill/Bulk sampling activities, would not be discharged at sea but would be transported onshore for ultimate disposal. Waste transported to land would be disposed at a licenced municipal landfill facility or at an alternative approved site. Operators would co-operate with local authorities to ensure that waste disposal is carried out in an environmentally acceptable manner.
- Vessel machinery emissions: Compliance with the requirements of MARPOL Annex VI - Prevention of Air Pollution from Ships will be required for all vessel engines and where vessels are fitted with garbage incinerators.

4.4 Financial Provisioning

Section 24 of NEMA states that an EA application for a Prospecting Right should be compliant with the financial provisioning as prescribed for the management and mitigation of any negative impacts during the closure phase, rehabilitation, and post-decommissioning phase of prospecting activities.

Financial provisioning is in place for Samara for the proposed prospecting area. Reset Properties (Pty) Ltd (Reset) will be responsible for funding of the proposed project and has financial provisioning in place for this rights area.

Samara Mining must ensure that the requirements of NEMA in terms of financial provision for remediation of environmental damage are met by allocating operational costs to meet EMPr requirements and that sampling vessels maintain adequate Protection and Indemnity Insurance Cover to allow for potential clean-ups in the event of a hydrocarbon spill and other incidents. Samara Mining must also provide sufficient funds to execute the EMPr in the event of premature closure or in the event that, on closure, the EMPr has not been successfully executed.

4.5 Proposed Work Programme

The target mineral is marine diamonds. The proposed project will entail to use both invasive and non-invasive methods. The non-invasive method will be made up of desktop (including analytical desktop) studies, geophysical surveys, 3D geological model and resource estimation. The invasive methods will comprise of Exploration Drilling and Bulk Sampling.

The proposed prospecting works programme may have to be modified, extended or curtailed as data and analyses become available. It is anticipated that the overall prospecting programme will run over a five-year period as summarised in Table 4-3.

Table 4-3: Project Phases and Requirements.

Phase	Activity (What are the activities that are planned to achieve optimal prospecting)	Skill(s) required (Refers to the competent personnel that will be employed to achieve the required results)	Timeframe (In months) for the activity)	Outcome (What is the expected deliverable, e.g., Geological report, analytical results, feasibility study, etc.)	Timeframe for outcome (Deadline for the expected outcome to be delivered)	What technical expert will sign off on the outcome? (e.g., geologist, mining engineer, surveyor, economist, etc.)
1	***Non – Invasive methods***					
	Project initiation	Directors / Managers	1		8 months	Shareholders
	<u>Stage-1</u>: Sourcing of historical data	Geologist with relevant knowledge and experience	3	Geological GIS database and maps showing potential areas for exploration.		Exploration Geologist
	<u>Stage-2</u>: Desktop literature study of sourced data	Geologist with relevant knowledge and experience	4			
	<u>Stage-3</u>: Geophysical survey - Design	Geologist / Geophysicist with relevant knowledge and experience	2	Geophysical survey design as a report and scope of work.	4 months	Geophysicist
	<u>Stage-4</u>: Geophysical survey - Tender process and contractor appointment	Directors and Geologist / Geophysicist	2	Appointment of geophysical survey contractor.		Geophysicist / Directors
	<u>Stage-5</u>: Geophysical survey - Execution	Survey contractor and Client's representative Geologist / Geophysicist	2	Geophysical post-survey Report.	6 months	
	<u>Stage-6</u>: Geophysical survey - Data processing and interpretation	Survey contractor and Geologist / Geophysicist	4	Geophysical data interpretation and updated GIS database.		Geophysicist
	<u>Stage-7</u>: Exploration drill programme - Design	Exploration Geologist with relevant knowledge and experience	3	Geological report with updated maps, geological models with drill target features and scope of work for exploration drill programme.	5 months	Senior Geologist

Phase	**Activity** (What are the activities that are planned to achieve optimal prospecting)	**Skill(s) required** (Refers to the competent personnel that will be employed to achieve the required results)	**Timeframe** (In months) for the activity)	**Outcome** (What is the expected deliverable, e.g., Geological report, analytical results, feasibility study, etc.)	**Timeframe for outcome** (Deadline for the expected outcome to be delivered)	**What technical expert will sign off on the outcome?** (e.g., geologist, mining engineer, surveyor, economist, etc.)
	Stage-8: Exploration drill programme - Tender process and contractor appointment	Directors, Mine manager and Exploration Geologist	2	Appointment of exploration drill contractor.		Mine Manager / Directors
2	***Invasive methods***					
	Stage-1: Exploration drill programme - Execution	Drill contractor and Client's representative geologist	4	Drill programme reporting on drill results (grade, technical and geotechnical data), update database and ranking of mineralised features.	8 months	Senior Geologist
	Stage-2: Exploration drill programme - Update database with results and delineating mineralised features.	Exploration Geologist	4			
	Stage-3: Survey and Drill Infill programme - Design of infill survey and infill drill programme.	Exploration Geologist with relevant knowledge and experience	3	Geophysical infill survey and Drill infill programme design as a report and scope of work.	6 months	Exploration Geologist
	Stage-4: Infill geophysical survey + Infill exploration drill programme - Tender process and contractor appointment	Directors, Mine manager and Exploration Geologist	3	Appointment of Geophysical survey contractor. Appointment of Exploration drill contractor.		Mine Manager / Directors
3	***Non – Invasive and Invasive methods***					
	Stage-1: Geophysical infill survey – Execution	Survey contractor and Client's representative Geologist / Geophysicist	2	Geophysical post-survey Report.	5 months	
	Stage-2: Geophysical infill survey - Data	Survey contractor and Geologist / Geophysicist	3	Geophysical data interpretation and updated GIS database.		Geophysicist

Phase	Activity (What are the activities that are planned to achieve optimal prospecting)	Skill(s) required (Refers to the competent personnel that will be employed to achieve the required results)	Timeframe (In months) for the activity)	Outcome (What is the expected deliverable, e.g., Geological report, analytical results, feasibility study, etc.)	Timeframe for outcome (Deadline for the expected outcome to be delivered)	What technical expert will sign off on the outcome? (e.g., geologist, mining engineer, surveyor, economist, etc.)
	processing and interpretation.					
	Stage-3: Exploration infill drill programme - Augment drill positions in design report.	Exploration Geologist with relevant knowledge and experience	1		7 months	
	Stage-4: Exploration infill drill programme - Execution	Drill contractor and Client's representative geologist	2	Drill programme reporting on drill results, geo-modelling of mineralised features and resource estimation. In position to decide on requirement for further infill exploration or to develop mine plan.		
	Stage-5: Exploration infill programme - Update database with results, Make decision on further infill exploration required or proceed to future mine programme.	Exploration Geologist, Resource Geologist	4			Mine Manager
	Stage-6: Preliminary mine plan - Design	Resource Geologist, Mine Manager	2		8 months	
	Stage-7: Trench sampling programme - Design	Exploration Geologist, Mine Manager	1			Senior Geologist / Mine Manager
	Stage-8: Trench sampling programme – Execution	Mine contractor and Client's representative geologist	2			
	Stage-9: Trench sampling programme - Update drill grade to grade achieved from trenching, recalculate resource estimation	Exploration Geologist, Resource Geologist	3	Geological and geotechnical report on mineability and recovery of diamonds, updated resource estimation.		Resource Geologist

Phase	Activity (What are the activities that are planned to achieve optimal prospecting)	Skill(s) required (Refers to the competent personnel that will be employed to achieve the required results)	Timeframe (In months) for the activity)	Outcome (What is the expected deliverable, e.g., Geological report, analytical results, feasibility study, etc.)	Timeframe for outcome (Deadline for the expected outcome to be delivered)	What technical expert will sign off on the outcome? (e.g., geologist, mining engineer, surveyor, economist, etc.)
	Stage-10: Rehabilitation	Natural recovery of the sea floor	0	Statutory reporting.	0 months	Environmental Officer
	Stage-11: Feasibility study - Comprehensive study to allow decision to activate mining phase	Multidisciplinary team of specialist consultants	3	Feasibility study report to decide on activation of mining.	3 months	Economist / Directors

4.6 Rehabilitation

Direct impact on the seabed results in the localised removal of the seabed habitat where fine sediment surface layers are replaced with coarse sediments. After the primary screening process, the majority of the material pumped to surface is returned directly back to the sea. Thus, coarse and to some extent finer tailings are discharged directly back into the disturbed areas. This avoids reprocessing the same sediments, minimises the disturbance footprint and provides material for re-establishment of habitat.

Sediments normally settle out to the seabed within minutes while mixing with descending seawater results in the dilution of finer sediment. Remaining particulate matter normally settles over a period of a few hours. Research programs have demonstrated the re-establishment of ecological functioning of the seabed after the removal of diamonds and recovery rates are linked to infill with fine sediment. Passive translocation of animals during storms or sediment slumping from nearby unaffected areas, immigration of mobile species, and immigration and settlement of pelagic larvae and juveniles result in recolonisation of the affected areas.

Given that the areas disturbed will be a small percentage of the licence, that only lower biodiversity sediment areas are affected (i.e. not high biodiversity reef areas), that the seafloor tends to self-rehabilitate and that the beneficiation process is non-toxic, the impact is likely to be of low overall significance. Previous EIA’s have shown that while marine diamond sampling and mining does disturb the marine benthic fauna communities, the magnitude is “low”, the duration “short”, the spatial extent “very local”, the likelihood “high” and the overall rating “low impact severity”. There is little effect to sea water quality, marine fauna, cetaceans, marine mammals or commercial fishing.

4.7 Needs and Desirability

Best practice, as well as the EIA Regulations, 2014 (Appendix 3 Section 3 [f]) requires that the need and desirability of a project (including viable alternatives) are considered and evaluated against the tenets of sustainability. This requires an analysis of the effect of the project on *social, economic and ecological* systems; and places emphasis on consideration of a project’s *justification* not only in terms of financial viability (which is often implicit in a [private] proponent’s intention to implement the project), but also in terms of the specific needs and interests of the community and the opportunity cost of development.

The principles in NEMA (Section 2.1.1) serve as a guide for the interpretation of the issue of “need”, but do not conceive "need" as synonymous with the "general purpose and requirements" of the project. The latter might relate to the applicant’s project motivation, while the "need" relates to the interests and needs of the broader public. In this regard, an important NEMA principle is that environmental management must ensure that the environment is "held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage".

There are various proxies for assessing the need and desirability of a project, notably national and regional planning documents which enunciate the strategic needs and desires of broader society and communities: project alignment with these documents must therefore be considered and reported on in the EIA process. With the use of these documents or - where these planning documents are not available - using best judgment, the EAPs (and specialists) must consider the project’s strategic context, or justification, in terms of the needs and interests of the broader community.

The consideration of need and desirability in EIA decision-making therefore requires the consideration of the strategic context of the project along with broader societal needs and the public interest.

However, it is important to note that projects which deviate from strategic plans are not necessarily undesirable. The DMRE notes that more important are the social, economic, and ecological impacts of the deviation, and "the burden of proof falls on the applicant (and the EAP) to show why the impact might be justifiable".

The *social* component of need and desirability can be assessed using *regional* planning documents such as SDFs, IDPs and Environmental Management Frameworks to assess the project's social compatibility with plans. These documents incorporate specific social objectives and emphasise the need to promote the social well-being, health, safety, and security of communities, especially underprivileged and/or vulnerable communities.

The economic need and desirability of a project can be assessed using national, provincial, district and local municipal planning documents to assess the project's economic compatibility with plans. These documents describe specific economic objectives and emphasise the need to:

- Promote economic growth;
- Ensure environmental integrity and reconcile ecosystem requirements with conflicting land development pressures;
- Promote tourism through the protection and rehabilitation of the environment;
- Integrate biodiversity conservation and mining through rehabilitation;
- Use environmental resources sustainably;
- Promote development in transformed areas and in areas with proven economic potential;
- Retain existing jobs;
- Reserve mineral deposits for future use;
- Attract new investments; and
- Promote social well-being of the community and share economic benefits.

Regional planning documents also emphasise the need to improve the environmental performance of development regionally. Further, there is an emphasis on increasing the role of the tourism sector, which promises to provide economic growth and employment coupled with greater protection of the environment (the main draw card for tourists in the area). Protection of the coastal zone is recognised as a key objective in this regard.

Notwithstanding the above, regional planning documents also highlight the need to retain existing jobs, use exploit mineral resources sustainably and promote development in transformed areas. The Nama Khoi and Richtersveld Local Municipalities also requires economic growth and job creation as a means for improved social wellbeing. If prospecting is deemed successful, potential mining will provide contribution to the economy of the Local Municipalities and boarder region.

Should diamonds be found in the project area, subject to acquisition of requisite approvals, Samara Mining will be able to mine the available reserves. This will result in job creation and boost local businesses.

Exploration activities typically require highly skilled people and therefore limited opportunities for unskilled labour. Where feasible, local labour could potentially be utilised but it is anticipated that this will be extremely limited, if at all. The majority of the work will be done remotely through the acquisition and processing of existing and new information. Should local labour be required, then travel will be from suitable ports.

Whilst the prospecting project activities are aligned with the National Framework for Marine Spatial Planning (2017), the National Development Plan 2030 (2012), various Regional and Local Policy and Planning Frameworks including the Northern PSDF, Namaqua District Municipality IDP Revision 2017 – 2022, the Nama Khoi Local Municipality SDF (2014), the Nama Khoi Local Municipality IDP (2019 – 2022) and the Kamiesberg Local Municipality IDP (2017 0 2022), due to the limited scope and extend of the exploration activities associated with the Samara Project, it is unlikely to promote or facilitate spatial transformation or urban development during the prospecting phase. Spatial transformation or urban development will materialise should feasible grade diamond deposits be found in the project area to justify activation of the mine programme.

4.7.1 DFFE Guideline on Need and Desirability

When considering an application for EA, the competent authority must comply with Section 24O of NEMA and must have regard for any guideline published in terms of Section 24J of the Act and any minimum requirements for the application. This includes the DFFE's Guideline on Need and Desirability (March 2017). Additionally, the EIA Regulations, 2014, (as amended) require EAPs who undertake environmental assessments, to have knowledge and take into account relevant guidelines. A person applying for an EA must abide by the Regulations, which are binding on the applicant.

The DFFE's Guideline on Need and Desirability (March 2017) sets out a list of questions which should be addressed when considering need and desirability of a proposed development. These are divided into questions that relate to the aspects of ecological sustainability and justifiable economic and social development of the proposed project. Table 4-4 sets out the list of questions as per the Guideline.

Table 4-4: Questions to be Engaged with When Considering Need and Desirability, as per Integrated Environmental Management Guideline on Need and Desirability (March, 2017).

Question	Refence in Report
1. How will this development (and its separate elements / aspects) impact on the ecological integrity of the area?	
1.1 How were the ecological integrity considerations taken into account? 1.1.1 Threatened Ecosystems; 1.1.2 Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure; 1.1.3 Critical Biodiversity Areas ("CBAs") and Ecological Support Areas ("ESAs"); 1.1.3 Conservation targets; 1.1.5 Ecological drivers of the ecosystem; 1.1.6 Environmental Management Framework; 1.1.7 Spatial Development Framework; and 1.1.8 Global and international responsibilities relating to the environment (e.g. RAMSAR sites, Climate Change, etc.).	Section 2; Section 4.7; and Section 5
1.2 How will this development disturb or enhance ecosystems and / or result in the loss or protection of biological diversity? What measures were explored to firstly avoid these negative impacts, and where these negative impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	Section 7; and Appendix F.
1.3 How will this development pollute and/or degrade the biophysical environment? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	Section 7; and Appendix F.
1.4 What waste will be generated by this development? What measures were explored to firstly avoid waste, and where waste could not be avoided altogether, what measures were explored to minimise, reuse and/or recycle the waste? What measures have been explored to safely treat and/or dispose of unavoidable waste?	A description of the anticipated types of waste, associated volumes are provided in Section 4.3. The proposed management measures are included in Section 7 and Appendix F.
1.5 How will this development disturb or enhance landscapes and/or sites that constitute the nation's cultural heritage? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	Section 7; and Appendix F.

<table>
<tr><th>Question</th><th></th><th>Refence in Report</th></tr>
<tr><td>1.6</td><td>How will this development use and/or impact on non-renewable natural resources? What measures were explored to ensure responsible and equitable use of the resources? How have the consequences of the depletion of the non-renewable natural resources been considered? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?</td><td rowspan="2">The purpose of the proposed prospecting operations are to determine the extent and economic viability of the diamond reserves in the sea concession area for future exploitation.

Thus, the proposed project could facilitate the future extraction of non-renewable mineral resources.

Notwithstanding the above, due to the high-costs of undertaking prospecting (and possible future mining) operations in the offshore environment, the location and extent of disturbed areas would be limited to only those areas targeted by the planned activities.</td></tr>
<tr><td>1.7</td><td>How will this development use and/or impact on renewable natural resources and the ecosystem of which they are part? Will the use of the resources and/or impact on the ecosystem jeopardise the integrity of the resource and/or system taking into account carrying capacity restrictions, limits of acceptable change, and thresholds? What measures were explored to firstly avoid the use of resources, or if avoidance is not possible, to minimise the use of resources? What measures were taken to ensure responsible and equitable use of the resources? What measures were explored to enhance positive impacts?

1.7.1 Does the proposed development exacerbate the increased dependency on increased use of resources to maintain economic growth or does it reduce resource dependency (i.e. de-materialised growth)? (note: sustainability requires that settlements reduce their ecological footprint by using less material and energy demands and reduce the amount of waste they generate, without compromising their quest to improve their quality of life);

1.7.2 Does the proposed use of natural resources constitute the best use thereof? Is the use justifiable when considering intra- and intergenerational equity, and are there more important priorities for which the resources should be used (i.e. what are the opportunity costs of using these resources this the proposed development alternative?); and

1.7.3 Do the proposed location, type and scale of development promote a reduced dependency on resources?</td></tr>
<tr><td>1.8</td><td>How were a risk-averse and cautious approach applied in terms of ecological impacts?

1.8.1 What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?

1.8.2 What is the level of risk associated with the limits of current knowledge?

1.8.3 Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?</td><td>Section 1.10</td></tr>
</table>

Question	Refence in Report
1.9 How will the ecological impacts resulting from this development impact on people's environmental right in terms following: 1.8.1 Negative impacts: e.g. access to resources, opportunity costs, loss of amenity (e.g. open space), air and water quality impacts, nuisance (noise, odour, etc.), health impacts, visual impacts, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts? 1.8.1 Positive impacts: e.g. improved access to resources, improved amenity, improved air or water quality, etc. What measures were taken to enhance positive impacts?	Section 7; and Appendix F.
1.10 Describe the linkages and dependencies between human wellbeing, livelihoods and ecosystem services applicable to the area in question and how the development's ecological impacts will result in socioeconomic impacts (e.g. on livelihoods, loss of heritage site, opportunity costs, etc.)?	Section 5; and Section 7.
1.11 Based on all of the above, how will this development positively or negatively impact on ecological integrity objectives/targets/considerations of the area?	Section 7.
1.12. Considering the need to secure ecological integrity and a healthy biophysical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the "best practicable environmental option" in terms of ecological considerations?	Section 4.8
1.13 Describe the positive and negative cumulative ecological/biophysical impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and existing and other planned developments in the area?	See impact assessment included in Section 7.
2.1 What is the socio-economic context of the area, based on, amongst other considerations, the following considerations?: 2.1.1 The IDP (and its sector plans' vision, objectives, strategies, indicators and targets) and any other strategic plans, frameworks of policies applicable to the area; 2.1.2 Spatial priorities and desired spatial patterns (e.g. need for integrated of segregated communities, need to upgrade informal settlements, need for densification, etc.); 2.1.3 Spatial characteristics (e.g. existing land uses, planned land uses, cultural landscapes, etc.); and 2.1.4 Municipal Economic Development Strategy ("LED Strategy").	Section 2.2; and Section 4.7.
2.2 Considering the socio-economic context, what will the socio-economic impacts be of the development (and its separate elements/aspects), and specifically also on the socio-economic objectives of the area? 2.1.1 Will the development complement the local socio-economic initiatives (such as local economic development (LED) initiatives), or skills development programs?	Section 2.2; and Section 4.7.
2.3 How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities?	Section 2.2; Section 4.7; and Appendix F.
2.4 Will the development result in equitable (intra- and inter-generational) impact distribution, in the short and long-term? Will the impact be socially and economically sustainable in the short- and long-term?	Section 5.

Question	Refence in Report
2.5 In terms of location; describe how the placement of the proposed development will: 2.5.1 Result in the creation of residential and employment opportunities in close proximity to or integrated with each other; 2.5.2 Reduce the need for transport of people and goods; 2.5.3 Result in access to public transport or enable non-motorised and pedestrian transport (e.g. will the development result in densification and the achievement of thresholds in terms public transport); 2.5.4 Compliment other uses in the area; 2.5.5 Be in line with the planning for the area; 2.5.6 For urban related development; make use of underutilised land available with the urban edge; 2.5.7 Optimise the use of existing resources and infrastructure; 2.5.8 Opportunity costs in terms of bulk infrastructure expansions in non-priority areas (e.g. not aligned with the bulk infrastructure planning for the settlement that reflects the spatial reconstruction priorities of the settlement); 2.5.9 Discourage "urban sprawl" and contribute to compaction/densification; 2.5.10 Contribute to the correction of the historically distorted spatial patterns of settlements and to the optimum use of existing infrastructure in excess of current needs; 2.5.11 Encourage environmentally sustainable land development practices and processes; 2.5.12 Take into account special locational factors that might favour the specific location (e.g. the location of a strategic mineral resource; access to the port; access to rail; etc.); 2.5.13 The investment in the settlement or area in question will generate the highest socio-economic returns (i.e. an area with high economic potential); 2.5.14 Impact on the sense of history; sense of place and heritage of the area and the socio-cultural and cultural-historic characteristics and sensitivities of the area; and 2.5.15 In terms of the nature; scale and location of the development promote or act as a catalyst to create a more integrated settlement?	Due to the offshore nature of the proposed project, these are not applicable.
2.6 How were a risk-averse and cautious approach applied in terms of socio-economic impacts?: 2.6.1 What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)? 2.6.2 What is the level of risk (note: related to inequality, social fabric, livelihoods, vulnerable communities, critical resources, economic vulnerability and sustainability) associated with the limits of current knowledge? 2.6.3 Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	Section 1.10
2.7 How will the socio-economic impacts resulting from this development impact on people's environmental right in terms following: 2.7.1 Negative impacts: e.g. health (e.g. HIV-Aids), safety, social ills, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts? 2.7.2 Positive impacts. What measures were taken to enhance positive impacts?	Section 7; and Appendix F.

Question		Refence in Report
2.8	Considering the linkages and dependencies between human wellbeing, livelihoods and ecosystem services, describe the linkages and dependencies applicable to the area in question and how the development's socio-economic impacts will result in ecological impacts (e.g. over utilisation of natural resources, etc.)?	Section 7; and Appendix F.
2.9	What measures were taken to pursue the selection of the "best practicable environmental option" in terms of socio-economic considerations?	Section 7; and Appendix F.
2.10	What measures were taken to pursue environmental justice so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons (who are the beneficiaries and is the development located appropriately)? Considering the need for social equity and justice, do the alternatives identified, allow the "best practicable environmental option" to be selected, or is there a need for other alternatives to be considered?	Due to the offshore nature of the proposed project, these are not applicable.
2.11	What measures were taken to pursue equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing, and what special measures were taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination?	Due to the offshore nature of the proposed project no such issues are deemed to be likely to arise as a result of the proposed Geophysical surveys and Drill/Bulk Sampling Activities.
2.12	What measures were taken to ensure that the responsibility for the environmental health and safety consequences of the development has been addressed throughout the development's life cycle?	Section 7; and Appendix F.
2.13	What measures were taken to: 2.13.1 Ensure the participation of all interested and affected parties; 2.13.2 Provide all people with an opportunity to develop the understanding; skills and capacity necessary for achieving equitable and effective participation; 2.13.3 Ensure participation by vulnerable and disadvantaged persons; 2.13.4 Promote community wellbeing and empowerment through environmental education; the raising of environmental awareness; the sharing of knowledge and experience and other appropriate means; 2.13.5 Ensure openness and transparency; and access to information in terms of the process; 2.13.6 Ensure that the interests; needs and values of all interested and affected parties were taken into account; and that adequate recognition were given to all forms of knowledge; including traditional and ordinary knowledge; and 2.13.7 Ensure that the vital role of women and youth in environmental management and development were recognised and their full participation therein were be promoted?	Section 3.3.
2.14	Considering the interests, needs and values of all the interested and affected parties, describe how the development will allow for opportunities for all the segments of the community (e.g. a mixture of low-, middle-, and high-income housing opportunities) that is consistent with the priority needs of the local area (or that is proportional to the needs of an area)?	Due to the offshore nature of the proposed project no such issues are deemed to be likely as a result of the proposed project.

Question		Refence in Report
2.15	What measures have been taken to ensure that current and/or future workers will be informed of work that potentially might be harmful to human health or the environment or of dangers associated with the work, and what measures have been taken to ensure that the right of workers to refuse such work will be respected and protected?	Project activities would comply with the Samara internal occupational health and safety policies and/or standards as well as national legislation.
2.16	Describe how the development will impact on job creation in terms of; amongst other aspects: 2.16.1 The number of temporary versus permanent jobs that will be created; 2.16.2 Whether the labour available in the area will be able to take up the job opportunities (i.e. do the required skills match the skills available in the area); 2.16.3 The distance from where labourers will have to travel; 2.16.4 The location of jobs opportunities versus the location of impacts (i.e. equitable distribution of costs and benefits); and 2.16.5 The opportunity costs in terms of job creation (e.g. a mine might create 100 jobs; but impact on 1000 agricultural jobs; etc.).	Section 4.7.
	What measures were taken to ensure: 2.17.1 That there were intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment; and 2.17.2 That actual or potential conflicts of interest between organs of state were resolved through conflict resolution procedures?	Section 4.7.
2.18	What measures were taken to ensure that the environment will be held in public trust for the people, that the beneficial use of environmental resources will serve the public interest, and that the environment will be protected as the people's common heritage?	Appendix F.
2.19	Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left?	Appendix F.
2.20	What measures were taken to ensure that the costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects will be paid for by those responsible for harming the environment?	Appendix F.
2.21	Considering the need to secure ecological integrity and a healthy bio-physical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the best practicable environmental option in terms of socio-economic considerations?	Section 4.7.
2.22	Describe the positive and negative cumulative socio-economic impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and other planned developments in the area?	See impact assessment included in Section 7.

4.8 Alternatives

Appendix 2 Section 2 (h)(i) of the EIA Regulations, 2014, requires that all S&EIR processes must identify and describe feasible and reasonable alternatives, including the option of not implementing the activity (No-Go Alternative). The EIA Regulations, 2014 require that all S&EIR processes must identify and describe “alternatives to the proposed activity that are feasible and reasonable”. Depending on the specific project circumstances the following alternatives may be considered:

- Site Alternatives;
- Design Alternatives;
- Land Use Alternatives;
- Process Alternatives; and
- The No-Go Alternative.

Not all categories of alternatives are applicable to all projects. Samara mining proposes to analyse existing data available for the Concession Area using recognised desktop analyses techniques and geophysical surveys and drill sampling to determine the areas where bulk sampling will be undertaken. It is neither feasible nor possible to meaningfully identify exploration development footprint alternatives.

With reference to the site plan provided as Appendix D and the location of the individual activities on site, provide details of the alternatives considered with respect to:

4.8.1 The Property on Which or Location Where it is Proposed to Undertake the Activity

Section 24 (4)(b)(i) of NEMA and Appendix 2 Section 2 (h)(i) of the EIA Regulations, 2014, require that all S&EIR processes must identify and describe alternatives to the proposed activity that are feasible and reasonable. Different types or categories of alternatives can be identified, e.g., location alternatives, type of activity, design or layout alternatives, technology alternatives and operational alternatives. The ‘No Go’ or ’No Project’ alternative must also be considered.

The proposed project site is preferred due to the history of rich diamond deposits in the area. The invasive prospecting phase will be dependent on the results of the preceding phase. The location and extent of the bulk sampling cannot be determined at this stage, therefore mapping of the specific prospecting activity site could not be undertaken at this stage. However, current mining technology mostly allows for economic recovery up to a maximum of 120 m water depth, therefore the prospecting programme will not be conducted in deeper water. For the purposes of this report, the overall prospecting site is presented in Figure 4-1.

4.8.2 The Type of Activity to be Undertaken

The application is for prospecting rights and no alternatives were considered.

4.8.3 The Design or Layout of the Activity

The location of the infrastructure will be determined based on the location of the prospecting activities, which will only be determined during Phase 1 of the Prospecting Works Programme, as well as the presence of sensitive environmental attributes such as sites of archaeological and palaeontological importance. All infrastructure will be temporary and/or mobile (Refer to Section 4.2 of this report). Due care will be applied in the execution schedule of the non-evasive geophysical surveys to not overlap with the migratory season of whales, thereby conducting geophysical survey work from June to November.

4.8.4 The Technology to be Used in the Activity

The proposed technologies have been chosen based on long term proven success in diamond prospecting.

4.8.5 The Operational Aspects of the Activity

Given the nature of the geophysical surveys, drill sampling and bulk sampling technologies, alternative physical prospecting technologies are not expected to have any meaningful implications for environmental impacts.

4.8.6 The Option of not Implementing the Activity (No-Go Alternative)

The option of not implementing the activity will result in a loss of valuable information regarding the mineral status (diamonds) on the affected areas. In addition to this, should economical reserves be present, and the applicant does not have the opportunity to prospect, the opportunity to exploit the reserves will be forgone.

Furthermore employment will increase incrementally as the project develops with the anticipated mining phase bringing substantial revenue to the local and national treasury.

It is noted that due care will be applied in the execution schedule of the non-invasive geophysical surveys not to overlap with the migratory season of whales, thereby conducting geophysical survey work from June to November.

4.9 Period for which the Environmental Authorisation is Required

The prospecting right has been applied for a period of five (5) years. The EA should therefore allow for 5 years of prospecting. According to the current PWP, the three phases of the prospecting will be finalised in 57 months.

4.10 Other Matters Required in terms of Sections 24(4)(a) and (b) of the Act

Section 2 of NEMA sets out a number of principles that are relevant to the:

- EIA process, e.g.:
  - Adopt a risk-averse and cautious approach;
  - Anticipate and prevent or minimise negative impacts;
  - Pursue integrated environmental management;
  - Involve stakeholders in the process; and
  - Consider the social, economic, and environmental impacts of activities; and
- Project, e.g.:
  - Place people and their needs at the forefront of concern and serve their needs equitably;
  - Ensure development is sustainable, minimises disturbance of ecosystems and landscapes, pollution and waste, achieves responsible use of non-renewable resources and sustainable exploitation of renewable resources;

- Assume responsibility for project impacts throughout its life cycle; and
- Polluter bears remediation costs.

This EIA process complies with the principles set out in Section 2 of NEMA through its adherence to the EIA Regulations, 2014, and associated guidelines, which set out clear requirements for, inter alia, impact assessment and stakeholder involvement, and through the assessment of impacts and identification of mitigation measures during the Impact Assessment Phase.

The potential social and environmental impacts of the project were identified, assessed, and evaluated using SRK's standard impact assessment methodology (Section 7.1) to understand the significance of each positive and negative impact.

An EMPr was compiled to ensure that potential environmental impacts are prevented or minimised.

Mitigation measures were recommended in the Impact Assessment Phase to allow for unavoidable impacts on the environment and people's environmental rights to be minimised and remedied.

Multiple opportunities for stakeholder engagement are allowed for in the EIA process.

The needs and interests of I&APs were and will be taken into account, with comments made by potentially affected property owners guiding the EIA process.

All relevant information was made available for public comment before submission to DMRE, as part of the stakeholder engagement process.

Intergovernmental coordination for the purposes of this project was facilitated by consultation with various government departments. Comments made by these departments informed the decisions taken by DMRE regarding Environmental Authorisation of the project.

5 Description of the Affected Environment

This chapter presents an overview of the biophysical and socio-economic environment in which the proposed project is located, to:

- Understand the general sensitivity of and pressures on the affected environment;
- Inform the identification of potential issues and impacts associated with the proposed project, which were assessed during the Impact Assessment Phase;
- Identify gaps in available information to inform specialist study requirements; and
- Start conceptualising practical mitigation measures.

The region has previously been studied to some extent and information is recorded in various sources. Consequently, this baseline description of the affected environment is based on literature review. The baseline is based on literature review and previous studies undertaken in the study area. Where appropriate, baseline information has been supplemented or generated by specialists appointed to undertake baseline and impact assessments for the proposed project.

The specialist baseline and impact studies undertaken for the EIA process are listed in Table 5-1.

Table 5-1: Specialist studies undertaken for the EIA.

Specialist Study	Specialists	Organisation
Fisheries Impact Assessment	Sarah Wilkenson	CapFish
Marine Ecology Impact Assessment	Naomi Richardson	Aquatic Ecosystem Services
Underwater Heritage Impact Assessment	John Gribble	ACO Associates

Final specialist baseline and impact assessment reports are attached as Appendix G_ 1, Appendix G_ 2, and Appendix G_ 3.

5.1 Biophysical Environment

The following chapter presents an overview of the biophysical and socio-economic environment in which the Offshore Concession Areas are located, to understand the general sensitivity of and pressures on the environment.

The region has previously been studied to some extent and information is recorded in various sources. Consequently, this baseline description of the affected environment is based on literature review.

5.1.1 Geographical

The project is located in Sea Concession Areas 4C and 5C (Figure 4-1), which are offshore areas located approximately from 10 to 195 km seaward of the West Coast shoreline of South Africa. The total Prospecting Right area is approximately 781 362 hectares (excluding Namaqua Fossil Forest MPA). The application area is approximately 12.5 km from Kleinsee and 60 km from Hondeklipbaai.

It is noted that the Prospecting Right excludes the Namaqua Fossil Forest MPA (as well as a 5 km buffer area around the area), located within the Offshore Concession Areas.

5.1.2 Geophysical Dynamics

Bathymetry

The continental shelf of the West Coast of South Africa is wide and deep, in contrast to the East Coast which is narrow and steep (Pulfrich, 2018). The nearshore is generally narrow and rocky, and slopes steeply until approximately 80m of depth. Thereafter the slope between the middle and outer shelf is gentle to the shelf break at a depth of approximately 300m depth (Pulfrich, 2018).

The Concession Area is found within the deep sub-photic zone (Figure 5-1), along the continental shelf. The continental shelf within this area includes the Orange Bank (Shelf or Cone), a shallow zone (150 - 200 m) that reaches a maximum width of 180 km offshore of the Orange River mouth and the Childs Bank (Pulfrich, 2018).

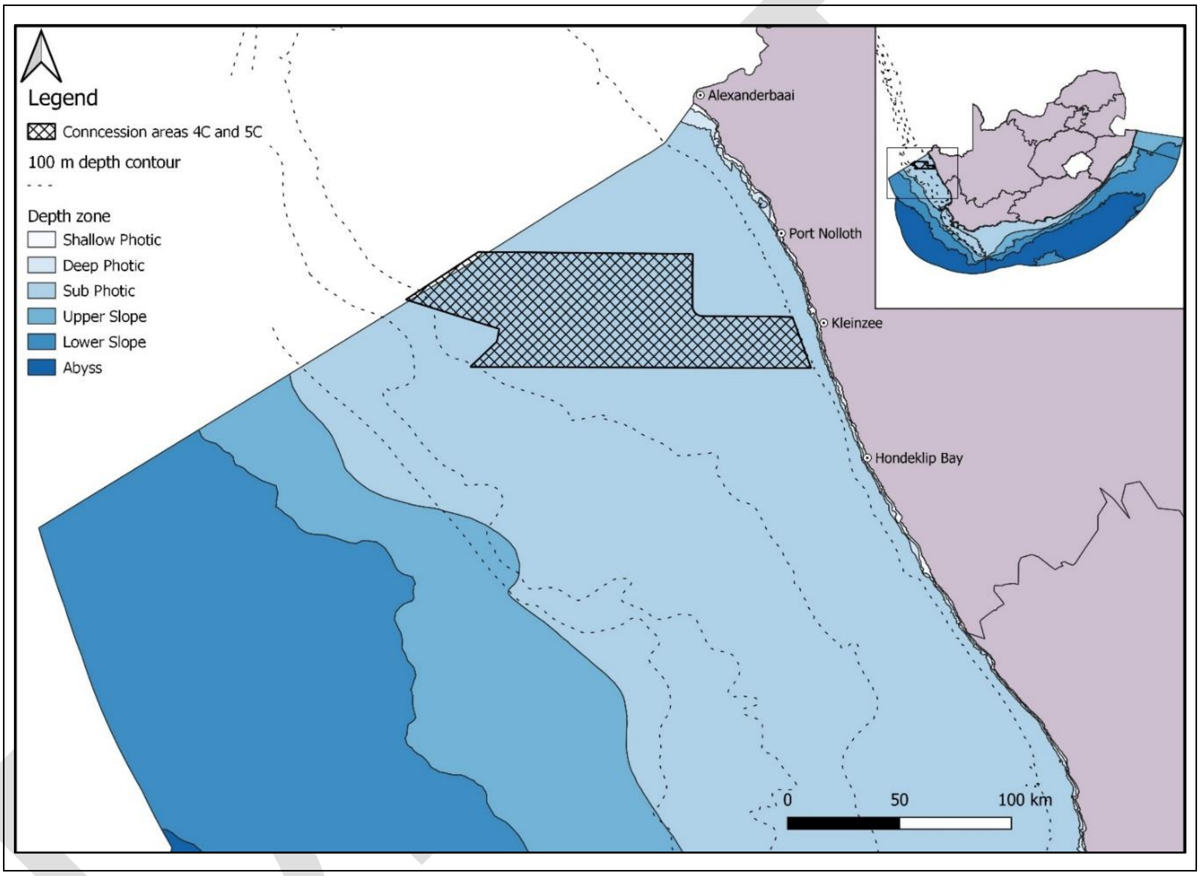


Figure 5-1: Oceanic depth zones and 100 m depth found in the vicinity of the Concession Area (Sink *et al*., 2019).

Seabed Geology and Sediment Types

The geological and sediment formations within the area of the Orange river mouth are thought to be related to a series of interglacial changes in sea level (Birch, 1976; Hoyt *et al.*, 1969; Bluck *et al.*, 2007). As sea levels dropped due to historic glacial formation in the Northern Hemisphere, coastal erosion processes formed terraces, gullies, potholes, and sea cliffs (Hoyt *et al.*, 1969). With each subsequent sea level retreat, these erosion-formed features were filled with coarse beach sediments due to wave action. Importantly, the lack of sediments both to the north and south away from the Orange river mouth, suggests that the sediments are derived from fluvial deposition (Hoyt *et al.*, 1969). While coarse sediments are generally deposited North of the Orange river mouth, muddy sediments are found west, north and south of the Orange river mouth, probably dispersed by slow-moving ocean scale currents (Bluck *et al.*, 2007). This dispersal system is thought to have been operating since the Eocene (56 – 33 Ma) (Bluck *et al.*, 2007).

The geology and seabed geomorphology of the coastal and inner continental shelf areas differ significantly. The inner shelf is composed of bedrock, while the middle and outer shelf areas consist of sediments (Birch, 1976; Hoyt *et al.*, 1969). However, due to erosion, sediment cover is thin, especially on the continental shelf. The sediments become finer as one moves further offshore, changing from sand on the inner and outer shelves to muddy sand and sandy mud in deeper water (Birch, 1976; Hoyt *et al.*, 1969). This general pattern has been modified by biological deposition, where large areas of shelf sediments contain high levels of calcium carbonate (Birch, 1976). A 500-km-long mud belt, up to 40 km wide and with an average thickness of 15 m, is located over the inner edge of the middle shelf between the Orange River and St Helena Bay (Bluck *et al.*, 2007). Offshore, sediment is dominated by muddy sands, sandy muds, mud, and some sand (Figure 5-2). The continental slope, seaward of the shelf break, has a smooth seafloor and is underlain by calcareous ooze (Birch, 1976).

5.1.3 Biophysical Dynamics

Wind-driven Circulation

The Benguela region's nearshore dynamics are primarily wind driven, both on a large scale, with winds driving south-westerly swells that impact the coast, and locally, with winds contributing to northward-flowing inshore currents, which in turn distribute sediments both in the marine environment and back on shore (Pulfrich, 2018). Seasonal changes in wind direction and intensity affect both upwelling dynamics, long shore current flow and therefore sedimentation rates (Bluck *et al.*, 2007; Shillington *et al.*, 2006).

Wind intensity and direction in the Benguela region are primarily influenced by the South Atlantic high-pressure cell and associated mid-latitude cyclones to the south of southern Africa, and seasonal atmospheric cut-off low pressures (Shillington *et al.*, 2006). The South Atlantic high pressure undergoes seasonal variations, being strongest during summer and weakening and migrating north-westwards in winter (Shillington *et al.*, 2006). Mid-latitude cyclones dominate during the winter months while cut-off lows developed during seasonal transitions in spring and autumn.

The differences between summer and winter wind patterns in the region change due to the migration of the southern hemisphere high-pressure system and the associated mid-latitude cyclones (Shillington *et al.*, 2006). The strongest and most continuous winds occur during the summer months in a south-easterly direction (Shillington *et al.*, 2006). Southerlies are the dominant winds, with an average speed of 20-30 kts, with gusts reaching over 100 km/h (60 kts) (Pulfrich, 2018). South-easterlies are almost as common, averaging 20-30 kts (Pulfrich, 2018). These winds, through Ekman transport, push surface water offshore, resulting in strong upwelling of bottom waters which are nutrient rich (Lutjeharms & Meeuwis, 1987).

During winter, winds are dominated by southerly to south-easterly winds, the arrival of winter mid-latitude cyclone systems, from the south, results in south-westerly to north-westerly winds (Pulfrich, 2018). This switch from the summer condition reduces upwelling intensity, resulting in the movement of warmer oceanic water inshore, reducing stratification (Hutchings *et al.*, 2009). Winter is generally characterized by more energetic swell conditions because the prevailing winds are from the same direction as the prevailing oceanic swells (Pulfrich, 2018). Despite this, winter conditions tend to also be calmer, with periods of little to no wind occurring more frequently (Lutjeharms & Meeuwis, 1987).

Oceanography

The Concession Area is located offshore, being mainly influenced by the Benguela Upwelling System (BUS). The BUS is one of the most productive upwelling driven eastern boundary currents globally (Carr, 2002), where the dominant south-easterly wind described above displaces warm nutrient poor surface water offshore during the summer months, causing cold nutrient rich water from a deeper origin to replace it (Lutjeharms & Meeuwis, 1987). The result is a cold northerly flowing eastern boundary current, rich in nutrients that supports phytoplankton growth in the presence of sunlight and therefore the base of the region's marine food web (Lutjeharms & Meeuwis, 1987).

Seawater temperatures on the continental shelf where the Concession Area is found can vary from 6°C to 16 °C, depending on depth (Dingle & Nelson, 1993). Thermal fronts that separate the upwelled water from the ocean's interior are well-defined (Lutjeharms & Meeuwis, 1987). These thermal fronts can generate upwelling filaments, which are surface streamers of cold water which cause localised expansion of the upwelling to relatively large distances offshore (Hagen *et al.*, 2001). These fronts generally last from a few days to a few weeks, and their filamentous mixing area can extend up to ~600 km offshore (Hagen *et al.*, 2001). The average water temperature during the summer upwelling season is ~ 11˚C but can increase during downwelling events when strong westerly winds dominate (Lutjeharms & Meeuwis, 1987). During Benguela Ninos when westerly winds dominate upwelling cells breakdown, and warm oceanic water moves inshore causing increases in surface water temperature (Imbol Koungue *et al.*, 2019).

The continental shelf waters of the Benguela system are characterised by low oxygen concentrations, particularly on the seabed, with a saturation value of approximately 80%, but lower oxygen concentrations (< 40% saturation) are frequently observed (Bailey *et al.*, 1985; Chapman & Shannon, 1985).

The peak nutrient concentrations can be modified by phytoplankton uptake, which varies according to phytoplankton biomass and production rate (Carr, 2002). As a result, the range of nutrient concentrations are variable, but concentrations are generally high in comparison to areas that experience less upwelling.

High nutrient concentrations can lead to periodic Harmful Algal Blooms, which are due to very high concentrations of dinoflagellate and ciliate blooms (Stephen & Hockey, 2007). These can result in large scale die-offs of various faunal species because certain dinoflagellate species are toxic (Pitcher & Calder, 2000). These blooms may also cause anoxic (low oxygen) conditions when they sink and decompose on the benthos, causing high biological oxygen demand, resulting in low oxygen conditions that may also result in faunal mass dies offs (Pitcher & Calder, 2000). Naturally occurring low oxygen levels in continental shelf waters can move up onto the inner shelf and into nearshore waters as a result of upwelling processes, also resulting in fish and invertebrate die offs (Pulfrich, 2018).

5.1.4 Biological Aspects of the Region

The Concession Area is situated in the cold temperate Namaqua Bioregion (Lombard *et al.*, 2004) (Figure 5-2). The marine ecology of the southern Benguela region is primarily shaped by the coastal, wind-induced upwelling that characterises the Northern Cape coastline described in the previous paragraphs. The Benguela system is known for its cold surface water, high biological productivity, and highly variable physical, chemical, and biological conditions (Hutchings *et al.*, 2009). Despite this, the West Coast is characterised by low marine species richness and low endemicity (Awad *et al.*, 2002).

Marine communities in the southern African West Coast region are generally abundant and specific only to substrate type or depth zone (Awad *et al.*, 2002). These communities often comprise of varying numbers of species that often display considerable spatio-temporal variability (Awad *et al.*, 2002). Within the broader Namaqua Bioregion, habitats comprise of both consolidated and unconsolidated sediments, hard reefs, and the pelagic water column (Pulfrich, 2018). The main faunal species found in these habitats are therefore described below so that the effects of the potential exploratory activity can be assessed correctly. The majority (85%) of the Concession Area lies between 150-200m, with 14% in 100-150m and less than 1% deeper than 200m.

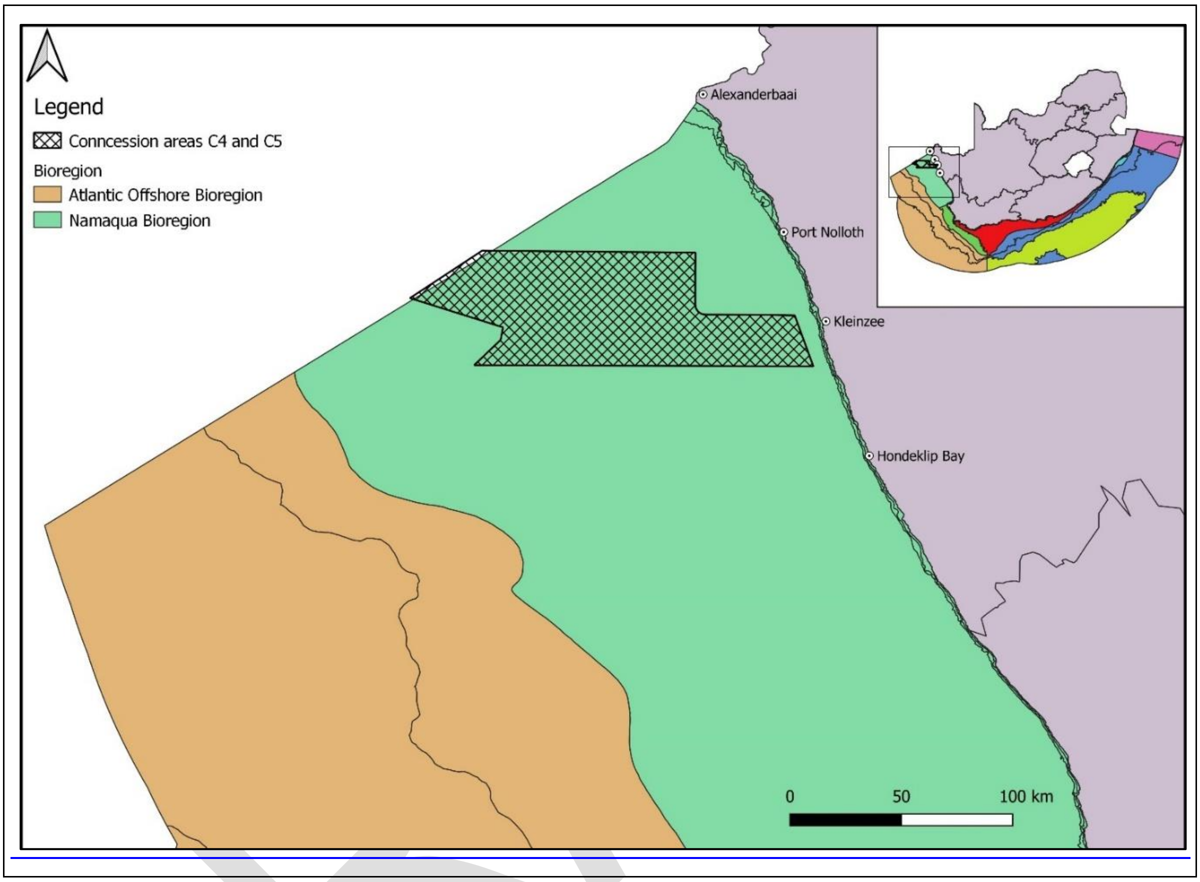


Figure 5-2: Marine bioregions found within the vicinity of the Concession Area (Sink *et al.*, 2019).

Biogeography

Based on Sink *et al*. (2019), the Concession Area is located within the Southern Benguela Ecoregion which extends from Cape Agulhas to Namibia, and falls within two broad ecosystem types (Figure 5-3):

1. Deep rocky shelf, found towards the Concession Area 's East (9 % of Concession Area); and
2. Deep soft shelf, found throughout the Concession Area unless otherwise stated. (91 % of the Concession Area).

The entire deep rocky shelf broad ecosystem within the Concession Area consists of Namaqua Muddy Mid Shelf Mosaic (NMMSM) (9 % of Concession Area) (Figure 5-4).

Three ecosystems are found over the deep soft shelf habitat (Figure 5-4):

- the Namaqua Sandy Mid Shelf (NSMS) (2 % of Concession Area);
- the Namaqua Muddy Sands (NMS) (53 % of Concession Area); and
- the Southern Benguela Sandy Outer Shelf (SBSOS) (36 % of Concession Area).

All four of these ecosystem types are considered to be of Least Concern with regards to ecosystem collapse risk potential by the International Union for Conservation of Nature and Natural Resources (IUCN) (www.iucnredlist.org; accessed 15/04/2023). Of these ecosystems the NMMSM, NSMS and SBSOS are all partially protected due to overlap with either the Namaqua Fossil Forest MPA or the Orange Shelf Edge MPA. Due to the NMS ecosystem not overlapping with any protected areas, this ecosystem is the only area of the Concession Area that does not receive any spatial protection from MPAs (Figure 5-5).

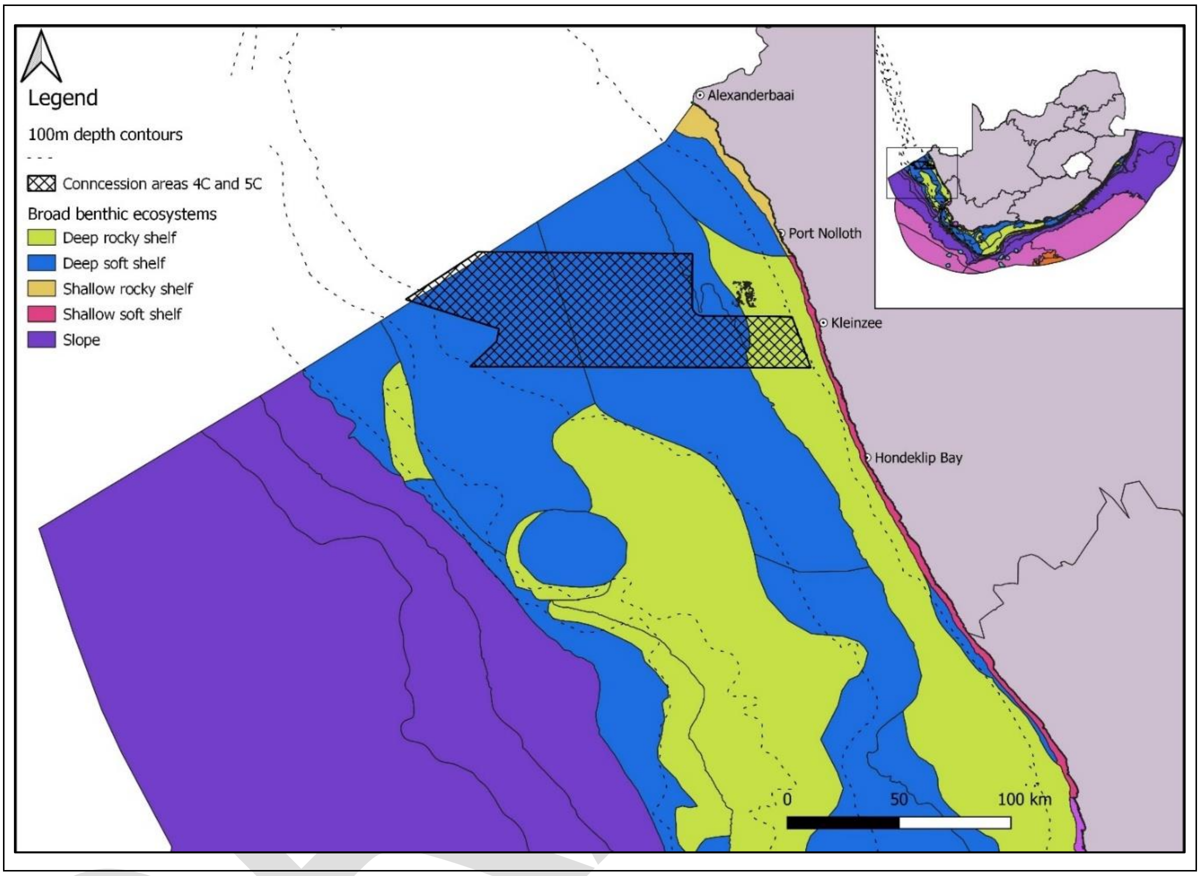


Figure 5-3: Broad benthic ecosystem types found within the vicinity of Concession Area.

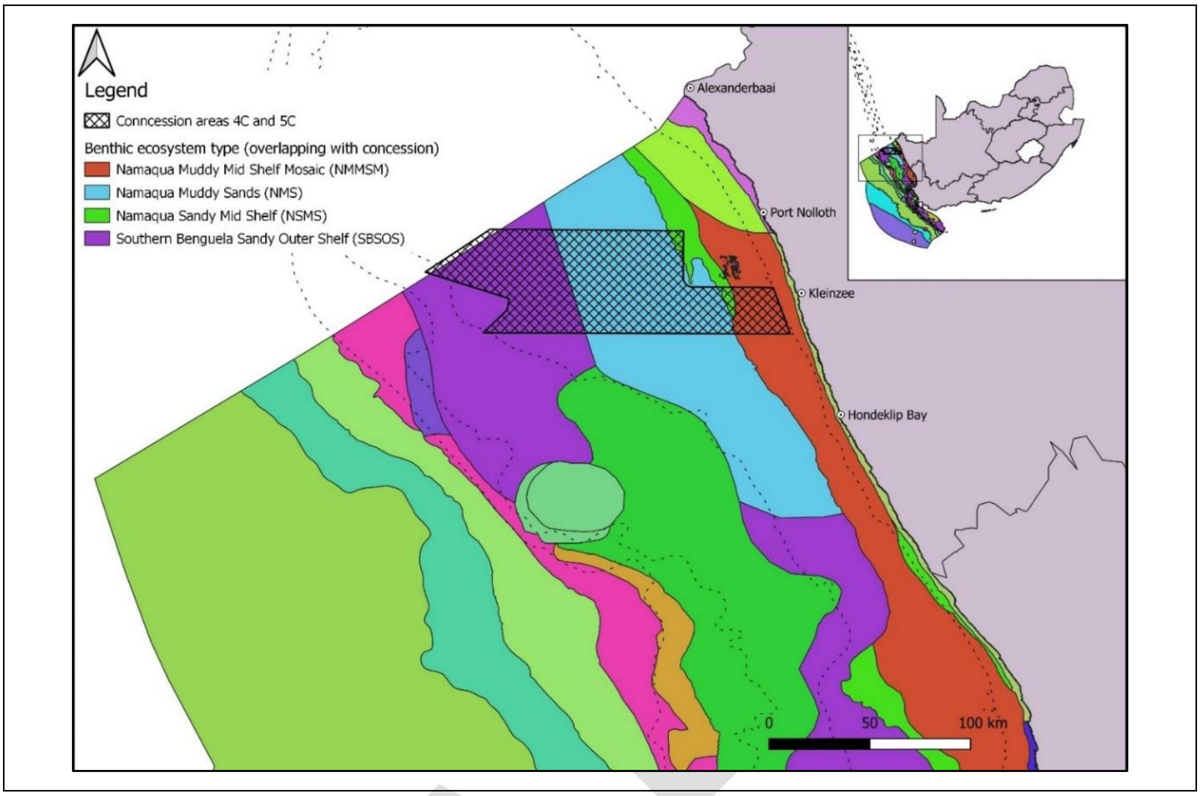


Figure 5-4: **Benthic ecosystem types found within the Concession Area.**

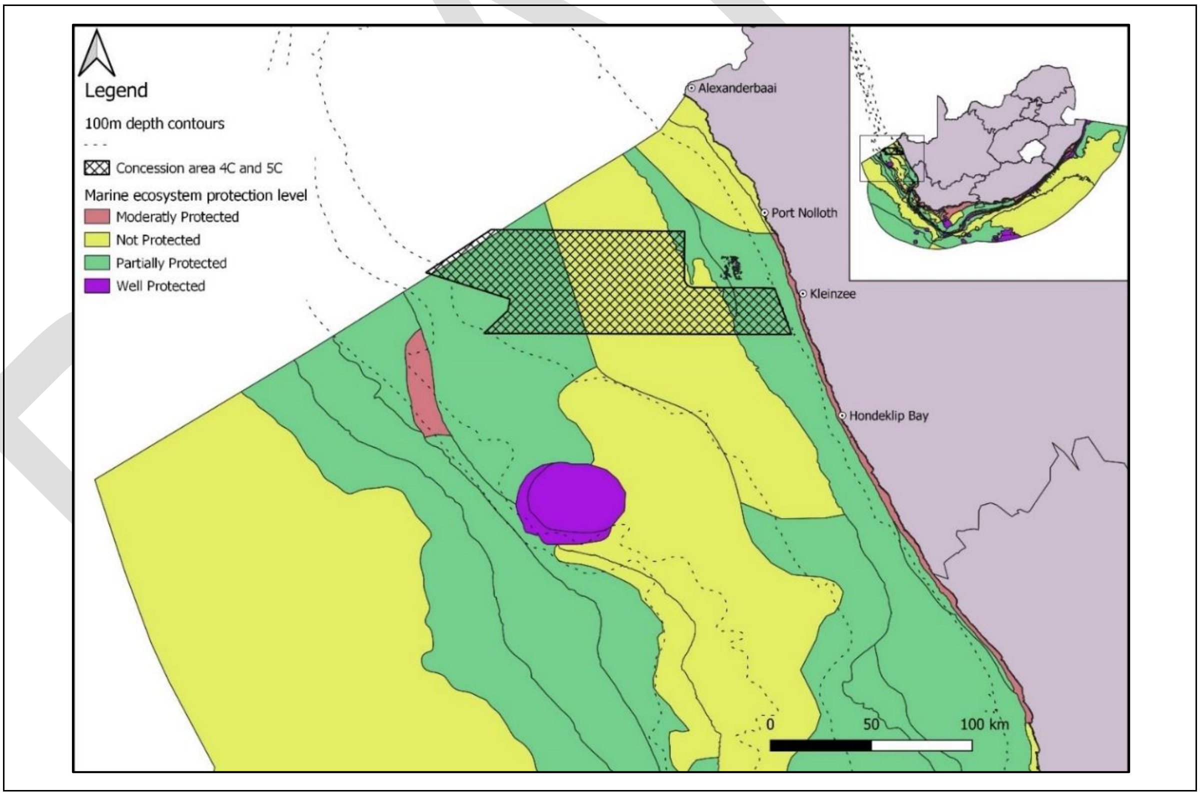


Figure 5-5: **Protection level of marine benthic ecosystem types within the Concession Area.**

5.1.5 Ecology

The biological productivity that results from the wind driven upwelling is the main characteristic of the ecology of the area. The unique combination of seasonal increases in surface water nutrient levels combined with biological communities that have adapted to take advantage of this phenomenon leads to a particular pelagic and benthic faunal community in the Concession Area comprising low diversity and low endemicity. This faunal assemblage represents both sedentary (resident) and transient (migratory) fauna that either utilise the area seasonally or are confined to the area during their life history. The Benguela system displays cold surface water, significant biological productivity, and notable fluctuations in physical, chemical, and biological conditions (Awad *et al.*, 2002).

Benthic Invertebrate Community

The benthic invertebrate faunal community is made up of epifauna and infauna, which are further divided into small meiofauna (< 1 mm) or larger macrofauna (> 1mm). The Concession Area holds two distinct mid-shelf communities with differing sediment types. The Namaqua muddy sands (52.8 % of concession) community comprises primarily of mud prawns, namely *Callianassa sp.* and *Calocaris barnardi,* which have a wide distribution throughout South Africa (Pulfrich, 2018). In contrast, the sandy sediment community is characterized by various cosmopolitan polychaetes, including deposit feeding species, in addition to crustaceans and molluscs, which collectively represent the majority of individuals, biomass, and species found within the area (Awad *et al.*, 2002). Species distribution within these communities is, however, erratic, influenced by both sediment type and other benthic species residing in the unconsolidated sediments (Awad *et al.*, 2002). According to the marine component of the 2018 National Biodiversity Assessment (Sink *et al*., 2019), parts of the outer continental shelf on the West Coast are deemed 'vulnerable' but do not fall within the Concession Area (Figure 5-6). Species richness tends to increase from the inner shelf to the mid-shelf and is influenced by sediment type (Awad *et al.*, 2002). The mid-shelf sandy sediments exhibit the highest total abundance and species diversity, while biomass is greatest in the inshore and decreases across the mid-shelf (Sink *et al.*, 2019).

Figure 5-6: Conservation status of the marine benthic ecosystem within the vicinity of the Concession Area.

Importantly, deep water benthic community structure is primarily influenced by a plethora of environmental factors. Depth and sediment type are considered to be the primary factors influencing benthic community structure off the west coast (Steffani 2007a; 2007b). Studies have however also identified water movement, oxygen concentration, sediment organic carbon and temperature as strong influences on benthic community structure (Pulfrich, 2018). Periodic low oxygen events have been identified as a major benthic community structuring feature (Monteiro & van der Plas, 2006; Pulfrich *et al.*, 2006). Community structure in these areas is characterised either by species that are able to tolerate low oxygen conditions or by fast growing organisms that are able to rapidly recruit into areas that have been affected by low oxygen levels (Pulfrich *et al.*, 2006).

Soft-bottom substrates are generally home to demersal epifaunal and bottom-dwelling invertebrate species. According to Lange's (2012) findings, between the depths of 100 m and 250 m, the presence of *Sympagurus dimorphus* and *Parapaguris pilosimanus* hermit crabs, *Funchalia woodwardi* prawns, and *Brisaster capensis* sea urchins form a single epifaunal community (Pulfrich, 2018). Atkinson (2009) also discovered numerous species of urchins and burrowing anemones beyond a depth of 300 m off the West Coast which falls out of the Concession Area (Pufrich, 2018).

Animal Forest Communities

The Concession Area is exclusively located within the sub-photic benthic zone, where due to the depth (> 100 m), sunlight fails to penetrate the water column leading to a lack of photosynthetic macrophyte algae common in shallower water depths. In the absence of this bottom flora, sessile corals and sponges proliferate, forming "animal forests" that are not reliant on the sun's energy but feed on suspended particles and organisms that are filtered from the water column (Samaai *et al.*, 2020). These animal forests are described by Samaai *et al*. (2020) to typically be composed of "assemblages of anthozoans or sponges forming the matrix for a diverse community of other benthic invertebrate taxa".

Sponges

Off the west coast of South Africa, within the Southern Benguela ecoregion, 194 different species of benthic sponges have been identified, with most of these organisms being found between 100 – 500 m of depth and dominated by a single taxon; *Suberites dandelenae*, where approximately 18 tonnes/km^2 have been collected during benthic trawl surveys (Samaai *et al.*, 2020). These sponge grounds have been described by Samaai *et al.* (2020) to "constitute an ecologically important habitat of great complexity for fishes and both motile and sessile invertebrates, and they may play an important role in the ecology and diversity of the west coast region". Due to these ecosystem services that these sponge grounds provide, Samaai *et al.* (2017) suggested that: "their presence could indicate a potential Vulnerable Marine Ecosystem or an Ecologically and Biologically Significant Area in the sense of their fragility and slow recovery". These sponges were included in the final delineation of the Namaqua Fossil Forest MPA designation in 2022 to ensure their protection.

Cold-water Corals (Scleractinia)

Cold-water stoney corals are usually found in deep water with little to no light and therefore lack symbiotic algae which is common in shallow water Scleractinian stoney corals (Samaai *et al.*, 2020). Furthermore, cold-water corals are slow growing, vulnerable, and extremely delicate (Freiwald *et al.*, 2004), and play an important role as habitat engineers enhancing benthic habitat complexity and conglomeration (Freiwald *et al.*, 2004). Due to these factors, it has been suggested they should be protected from bottom trawling and deep-sea mining damage in key areas. The majority of coldwater corals sampled from the west coast have been from a depth > 300 m (Samaai *et al.*, 2020). The Concession Area occurs in waters shallower than 300m, with less than 1% being greater than 200m in depth. Therefore, it is unlikely that these will be encountered and damaged during the exploration surveys.

Cnidarians (Anemones)

Sea anemones are the common name for cnidarians belong to the orders Actiniaria and Corallimorpharia. Of the 49 identified species of sea anemones found off the coast of South Africa 20 have been identified along the west coast (Laird, 2013). While anemones are found throughout the benthic habitat, Uriz (1988) reported that west coast soft sediments were characterized by a sizeable biomass of a sea anemones occurring at the 400–500 m depth range and therefore excludes the Concession Area.

Bryozoans

Bryozoans or "moss animals" are colonial epiphytic sessile organisms that are predominantly marine, occupying benthic habitats of the intertidal zone, continental shelf, deep ocean canyons and abyssal plains (Samaai *et al.*, 2020). They are known to attach to a diverse array of substrates from anthropogenic structures to large rocks, shells, algae, and even other bryozoans (Samaai *et al.*, 2020). Despite the ubiquitous occurrence of bryozoans off the South African coastline, few studies have been carried on South African bryozoan communities (Samaai *et al.*, 2020). Bryozoans of significant size frequently offer a dwelling place for varied associated groups, notably other bryozoans, molluscs, annelids, arthropods, cnidarians, sponges, echinoderms, and macroalgae (Wood *et al.*, 2012). Furthermore, bryozoa that form habitats also provide environmental benefits, such as stabilizing sediment, decreasing water flow within and around the thickets, creating three-dimensional attachment surfaces, and providing a source of sustenance, according to Anderson *et al.* (2019). One of the most beneficial characteristics of bryozoan communities is that they are significant habitat engineers, providing three-dimensional structures, forming thin or thick circular or irregular patches or erect and bushy tufts that resemble algae or hydroids, while others can form three-dimensional calcified coral-like structures. While little is known about South African Bryozoan communities, beds of bryozoans are known to occur on the continental shelf within the 200 – 500 m depth range along both the west and east coasts of South Africa (Samaai *et al.*, 2020), beyond the main depth zone of the Concession Area.

Ascidians

Ascidians more commonly known as sea squirts are the largest and most diverse group of Tunicata. There are approximately 3 000 species found within this group and are found in all marine habitats. In South Africa 145 species of Ascidians have been described (Parker-Nance & Atkinson, 2018) of which ~ 81 species (56%) are thought to be endemic to South Africa (Awad *et al.*, 2002), with ~ 30% found in deeper sub-photic waters (Monniot *et al.*, 2001). Along the South African west coast Parker-Nance and Atkinson (2018) list eight deep water species found on the continental shelf, shelf edge and slope while Uriz (1988) reported high densities of *Molgula scutate* being abundant between 400 and 500 m, which is beyond the depth range of the Concession Area.

Benthic Fish Community

Benthic fish or demersal fish are those fishes that are known to occupy the seabed. In excess of 110 species of fishes have been known to occur on the west coasts continental shelf (Roel, 1987). Of these, approximately 50 are commonly encountered during trawl surveys (Kirkman *et al*., 2013). Variation in fish communities occur with changes in depth and habitat, where the cape hake *Merluccius capensis*, jacopever *Helicolenus dactylopterus*, Izak catshark *Holohalaelurus regani*, soupfin shark *Galeorhinus galeus* and whitespotted houndshark *Mustelus palumbes* dominate depths < 400 m (Pulfrich, 2018). Below these depths (> 400 m) deepwater hake *Merluccius paradoxus*, monkfish *Lophius vomerinus*, kingklip *Genypterus capensis*, bronze whiptail *Lucigadus ori*, hairy conger *Bassanago albescens,* and various squalid shark species dominate (Pulfrich, 2018).

While an annotated checklist of non-cartilaginous fish is not explicitly available for the west coast of South Africa, Compagno *et al*. (1991) compiled such a list for cartilaginous species (elasmobranchs) which are likely to occur with the Concession Area (Table 5-2). Due to elasmobranchs exhibiting a variety of life history characteristics such as late maturity and low fecundity they are particularly susceptible to exploitation and habitat degradation (Jorgensen *et al.*, 2022). Understanding the benthic shark community within the Concession Area is therefore important and thus more detail has been provided on this species group. Of the 40 species of elasmobranchs that were documented by Compagno *et al.* (1991), one is classified as Data Deficient, 28 are Least Concern, two are Near

Threatened, five are Vulnerable, three are Endangered and one is Critically Endangered based on the IUCN redlist ratings (IUCN 2023) (Table 5-2).

Table 5-2: Elasmobranch species that are likely to occur within Concession Areas 4C and 5C, accompanied by their depth range and current IUCN red list status (adapted from Compagno *et al*., 1991). Entries in bold are likely to occur within the Concession Area.

Common Name	Scientific Name	Depth (m)	IUCN redlist
Short-tail lanternshark	*Etmopterus brachyurus*	450-900	DD
Brown lanternshark	*Etmopterus compagnoi*	450-925	LC
Southern lanternshark	*Etmopterus granulosus*	>700	LC
Smooth lanternshark	*Etmopterus pusillus*	400-500	LC
Shortnose spurdog	***Squalus megalops***	**75-460**	**LC**
Sixgill sawshark	***Pliotrema warreni***	**60-500**	**LC**
Goblin shark	*Mitsukurina owstoni*	270-960	LC
Smalleye catshark	*Apristurus microps*	700-1,000	LC
Saldanha catshark	*Apristurus saldanha*	450-765	LC
Izak catshark	***Holohalaelurus regani***	**100-500**	**LC**
Whitespotted houndshark	*Mustelus palumbes*	>350	LC
Great torpedo ray	***Torpedo nobiliana***	**120-450**	**LC**
Softnose skate	*Bathyraja smithii*	400-1,020	LC
Smoothnose pygmy skate	*Cruriraja durbanensis*	>1,000	LC
Triangular legskate	***Cruriraja parcomaculata***	**150-620**	**LC**
South African dwarf skate	*Neoraja stehmanni*	290-1,025	LC
Bigmouth skate	*Amblyraja robertsi*	>1,000	LC
Slime skate	***Dipturus pullopunctatus***	**15-460**	**LC**
Rough-belly skate	***Dipturus springeri***	**85-500**	**LC**
Roughskin skate	*Malacoraja spinacidermis*	1,000-1,350	LC
Munchkin skate	*Rajella caudaspinosa*	300-520	LC
Bigthorn skate	***Rajella confundens***	**100-800**	**LC**
Ghost skate	*Rajella dissimilis*	420-1,005	LC
Leopard skate	*Rajella leopardus*	300-1,000	LC
Smoothback skate	*Rajella ravidula*	500-1,000	LC
St Joseph	***Callorhinchus capensis***	**30-380**	**LC**
Cape chimaera	*Chimaera notafricana*	680-1,000	LC
Brown chimaera	*Chimaera carophila*	420-850	LC
Spearnose chimaera	*Rhinochimaera atlantica*	650-960	LC
Yellowspotted catshark	*Scyliorhinus capensis*	150-500	NT
Thornback skate	***Raja clavata***	**25-500**	**NT**
Spiny dogfish	*Squalus acanthias*	100-400	VU
Tiger catshark	*Halaelurus natalensis*	50-100	VU
Lesser guitarfish	*Rhinobatos annulatus*	<100	VU
Thorny skate	***Amblyraja radiata***	**50-600**	**VU**
Yellowspot skate	***Leucoraja wallacei***	**70-500**	**VU**
Shortspine spurdog	*Squalus mitsukurii*	150-600	EN
Houndshark	*Mustelus mustelus*	<100	EN
Spearnose skate	***Rostroraja alba***	**75-260**	**EN**
Soupfin shark/Vaalhaai	***Galeorhinus galeus***	**<10-300**	**CR**

Pelagic Fish Communities

Organisms that utilise the marine open water column are termed pelagic, and while they may also utilise the benthos, they are predominantly found within the water column. These communities are typically divided into plankton which forms the base of the food web followed by fish, marine mammals (seals, dolphins, and whales), seabirds and marine turtles.

Plankton

Plankton is particularly abundant over the continental shelf of the West Coast, being associated with the intense upwelling driven system. Plankton range from single-celled bacteria to jellyfish, and include bacterio-plankton, phytoplankton, zooplankton, and fish larvae. Given that the Benguela eastern boundary current is one of the most productive upwelling driven systems in the world (Carr, 2002), phytoplankton driven primary production is in excess of 2 g C/m^2/day (Figure 5-7). This phytoplanktonic driven primary production forms the base of the region's food web (Carr, 2002).

Both Copepods and euphausiids make up the majority of the meso- and macro- zooplanktonic community found within the region (Hutchins *et al.*, 2009). Typically, these species can be found in the upper mixed layer of the water column, which is rich in phytoplankton (Hutchins *et al.*, 2009). Planktonic abundance responds to seasonal changes in upwelling intensity, and seasonal minima exist during non-upwelling periods when primary production is lower (Carr, 2002). Zooplankton abundance also decrease during winter when predation by recruiting anchovy is high (James, 1987). Furthermore, immediately following intense upwellings, zooplankton concentrations decrease in response to low levels of phytoplankton which still need to colonise the new nutrient rich water. As the upwelled water ages phytoplankton colonises and zooplankton levels rise in response to increases in available phytoplankton (Hutchins *et al.*, 2009).

The Orange River Cone region, located immediately to the north of the Namaqua upwelling cell, offshore of the Orange river mouth, experiences significant turbulence and deep mixing in the water column, resulting in reduced phytoplankton biomass (Hutchins *et al.*, 2009). As a result, this area is considered an environmental obstacle to the transport of fish larvae from the southern to the northern Benguela upwelling ecosystems (Pulfrich, 2018). Important pelagic fish species, such as anchovy, redeye round herring, horse mackerel, and shallow-water hake, have been documented spawning on either side of the Orange River Cone region (Pulfrich, 2018). Consequently, phytoplankton, zooplankton, and ichthyoplankton abundances in the eastern parts of the Concession Area are anticipated to be relatively high in contrast to the offshore westerly component (Pulfrich, 2018). In the offshore areas of the Concession Area, the abundance of plankton is anticipated to be low (Pulfrich, 2018).

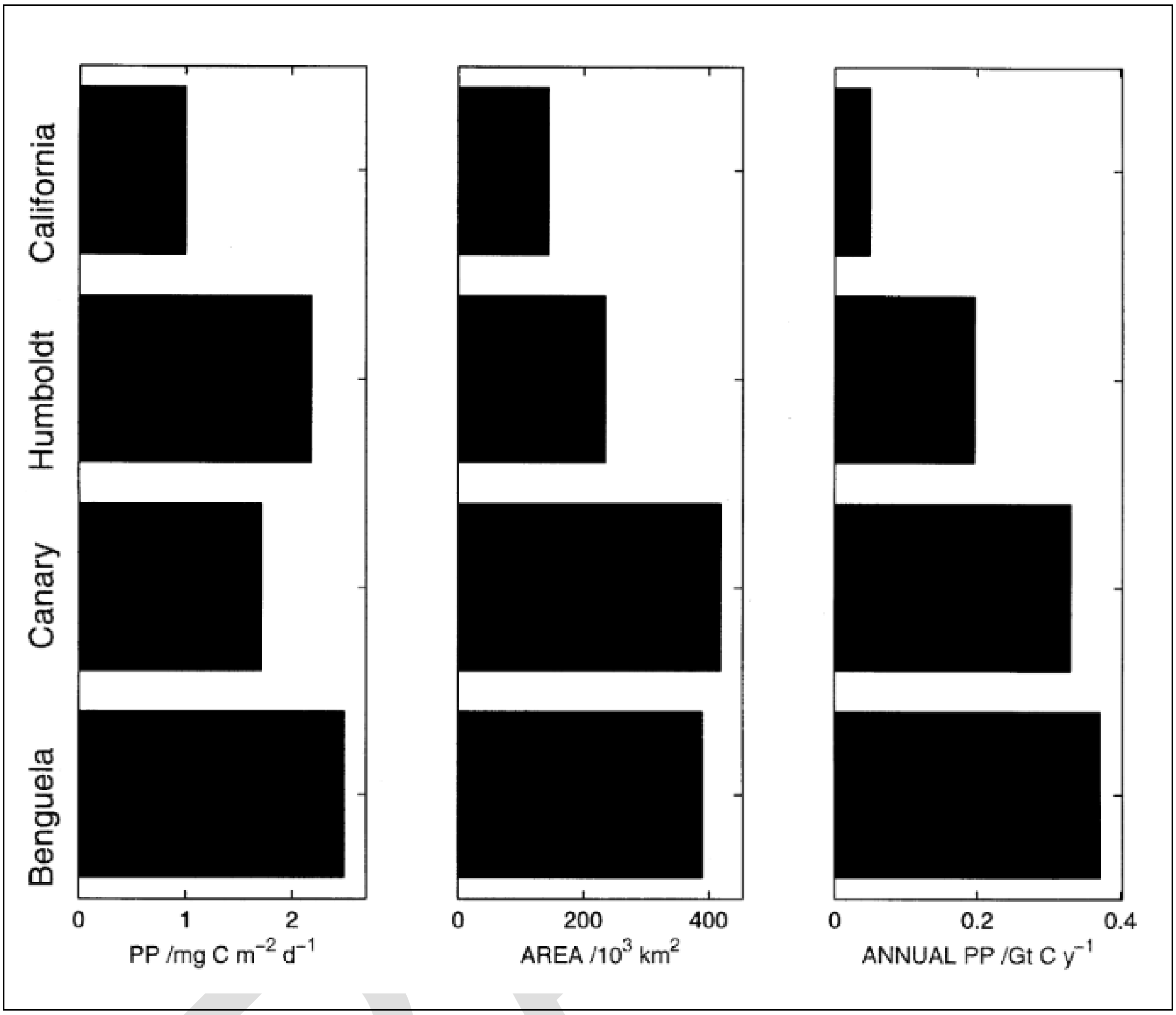


Figure 5-7: Regional comparison of primary production, area of activity and annual production (Carr, 2002).

Cephalopods

Loligo vulgaris, Todarodes angolensis, Todaropsis eblanae, Lycoteuthis diadema, Sepia australis and *Octopus* spp. represent the main cephalopod resources in the southern Benguela (Lipinski 1992); *Sepia australis* is one of most common species associated with the substrate at depths ranging from 60-190 m (Augustyn et al. 1995). *Loligo vulgaris* is distributed down to 350 m along the west coast, but limited by water temperatures below 8˚C and oxygen levels below 3.5 ml.l^{-1} (Augustyn 1991). All *Octopus spp.* (*O. vulgaris and O. magnificus*) found along the west coast are benthic, with *O. magnificus* being found at depths between 100 – 300 m (Oosthuizen 2003). All the above-mentioned species maybe found in the Concession Area, but none are of conservation concern.

Pelagic Fish

Pelagic fish in this region are categorised as either Small Pelagic Fishes (SPF) or Large Pelagic Fishes (LPF), with the former group being made up of small, large shoal forming, zooplankton feeding clupeids (sardine, anchovy, and round herring), scombrids (mackerel) and carangids (horse mackerel). The LPF are primarily composed of large predatory fish such as the tunas, billfish, and pelagic sharks. There are, however, fish species that straddle between the benthos and the pelagic ecosystem (termed benthopelagic fish), which often partake in diel vertical migrations. These include important fishery species such as the Cape snoek (*Thyrsites atun*) (McQueen 2002) and hake (*Merluccius spp.*) (Pillar and Barange 1995).

There are five main species of SPF that dominate the pelagic waters of the Benguela current, namely Clupeidae: sardines (*Sardinops sagax*), anchovies (*Engraulis encrasicolus*) and redeye round herring (*Etrumeus whiteheadi*); Scombridae: chub mackerel (*Scomber japonicus*) and Carangidae: Cape horse mackerel (*Trachurus capensis*). These species often form mixed shoals of different species but of similar size which is thought to be a consequence of similar feeding amongst species when at similar sizes. While all these species are known to partake in diel vertical migrations, this is more prominent in smaller size classed sardines (< 25 g wet weight) and anchovies, with peak feeding occurring close to the surface at night (James 1987, Louw et al. 1998). These migrations are thought to be in response to diel vertical migratory behaviour exhibited by this groups main zooplanktonic prey items. The main source of zooplankton consumed by sardines consists of small copepods (calanoid and cyclopoid), along with eggs and nauplii of anchovy and crustaceans. Anchovies however, primarily feed on larger zooplankton, particularly calanoid copepods and euphausiids. They primarily capture these larger prey items through selective feeding based on size, as described by James (1987). While both smaller sized chub mackerel and horse mackerel feed on similar planktonic prey items to the clupeids, as they grow bigger than the three clupeid species, they shift their diet onto larger pelagic invertebrates and fish.

As with the SPF species which follow their preferred zooplanktonic prey throughout the water column, LPF primarily feed off SPF (Smale 1992) in turn following them through the water column to feed. Five species of true tuna (Genus *Thunnus*) (longfin *Thunnus alalunga*, yellowfin *T. albacares*, bigeye *T. obesus*, southern bluefin *T. maccoyii*, northern bluefin *T. thunnus*) have been documented off the west coast, with higher abundances of longfin tuna (Talbot and Penrith 1968, as cited by Smale 1992). Two species of bonito have also been documented, namely skipjack (*Katsuwonus pelamis*) and Atlantic bonito (*Sarda sarda*). Two species of Marlin; Atlantic blue marlin (*Makaira nigricans*) and white marlin (*Tetrapturus albidus*) as well as broadbill swordfish (*Xiphias gladius*) are also known to occur within the region, with the marlins feeding primarily on tunas and *X. gladius* on cephalopods. The distribution of these species is dependent on food availability in the mixed boundary layer between the Benguela and warm central Atlantic waters. Concentrations of large pelagic species are also known to occur associated with underwater features such as canyons and seamounts as well as meteorologically induced oceanic fronts. The predominate species of pelagic shark species found in the area are blue shark (*Prionace glauca*), makos (*Isurus oxyrinchus*), threshers (*Alopias* spp.), bronze whalers (*Carcharhinus brachyurus),* soupfins (*Galeorhinus galeus*) and mackerel sharks (*Lamna nasus*) (Nepgen 1970, as cited by Smale 1992).

The two benthopelagic fish species found in the Concession Area are Cape snoek and hake. Both forage on the sea floor during the day and migrate into shallower pelagic waters at night (diel vertical migration) (McQueen 2002, Pillar et al. 1991) following pelagic prey species such as sardines (< 25 g wet weight) and anchovies which also conduct vertical diel migration foraging in pelagic surface waters at night (James 1987). These two important fisheries species are therefore highly associated with both the benthic and the pelagic environment. While snoek's diel vertical migrations have been discussed above, they also migrate into inshore regions from the deep (< 500 m) between spawning bouts to feed on pelagic fish found inshore before returning to depth to spawn (Griffiths 2002). The consequence of this is that negative effects on the offshore snoek will be manifested in the inshore region where they are fished.

Marine Turtles

Five species of marine turtle are known to occur within the BUS, of which one is Critically Endangered (hawksbill turtle; *Eretmochelys imbricata*), one is Endangered (green turtle; *Chelonia mydas*) and three are Vulnerable (olive ridley; *Lepidochelys olivacea*, loggerhead turtle; *Caretta caretta* and leatherback; *Dermochelys coriacea*) (IUCN 2023). All five turtle species are of conservation concern, a consequence of their life history where they are long-lived and have low reproductive capacity due to high juvenile mortality rates (Spotila 2004 as cited by Honig et al. 2008). The combination of these factors leaves them particularly susceptible to overexploitation and fishing pressure (Honing et al. 2008). While land-based threats such as egg and adult harvesting as well as nesting habitat alteration are a notable cause of their decline, incidental catch made by pelagic longline vessels has been identified as a significant contributor to their demise (Honig et al. 2008). Furthermore, by signing an International Memorandum of Understanding specifically focused on the conservation of marine turtles, South Africa, as a signatory of the Convention on Migratory Species, has demonstrated its commitment to protecting these species on a global scale (CMS 1999).

Seabirds

As with many of the BUS's marine predators, numerous seabird species forage on the abundance of small pelagic fishes. The BUS is utilised by 82 different seabird species, of which 66 are migrants, seven are endemic and 16 breed on terrestrial habitats found within the region (Makhado et al. 2021, Table 5-3). Eighteen of these species are considered common within the Benguela region. Pelagic foraging within the area primarily occurs off the shelf break (200 – 500 m depth), with maximum foraging occurring during the summer months (Pulfrich 2018). While most breeding seabirds forage within a range depending on their flight capabilities from the shore (Makhado et al. 2021), Cape gannets have been observed to venture between 70 – 130 km from their colonies (Cohen et al. 2014). Similarly, African penguins which are listed as critically endangered usually forage within 3km of the coast but can swim in excess of 50 km from their colonies, with individuals being spotted at far as 100 km offshore (Crawford and Whittington 2005).

Table 5-3: Marine bird species that have been recorded within the Benguela region, accompanied by their conservation status and population trend. Bolded entries denote species that are resident to the region and highly likely to be encountered. Asterix denote species that breed in the region (Adapted from Makhado *et al*. 2021).

Scientific Name	Common name	IUCN redlist	Population status
Aptenodytes patagonicus	King Penguin	Least Concern	Increasing
Ardenna carneipes	Flesh-footed Shearwater	Near Threatened	Decreasing
Ardenna gravis	Great Shearwater	Least Concern	Stable
Ardenna grisea	Sooty Shearwater	Near Threatened	Decreasing
Bulweria bulwerii	Bulwer's Petrel	Least Concern	Stable
Calonectris borealis	Cory's Shearwater	Least Concern	Unknown
Calonectris diomedea	**Scopoli's Shearwater**	**Least Concern**	**Decreasing**
Catharacta antarctica	**Brown (Subantarctic) Skua**	**Least Concern**	**Decreasing**
Catharacta maccormicki	South Polar Skua	Least Concern	Stable
Daption capense	**Cape (Pintado) Petrel**	**Least Concern**	**Stable**
Diomedea amsterdamensis	Amsterdam Albatross	Endangered	Increasing
Diomedea dabbenena	Tristan Albatross	Critically Endangered	Decreasing
Diomedea epomophora	Southern Royal Albatross	Vulnerable	Stable
Diomedea exulans	Wandering Albatross	Vulnerable	Decreasing
Diomedea sanfordi	Northern Royal Albatross	Endangered	Decreasing
Eudyptes chrysocome	Southern Rockhopper Penguin	Vulnerable	Decreasing
Eudyptes chrysolophus	Macaroni Penguin	Vulnerable	Decreasing
Eudyptes moseleyi	Northern Rockhopper Penguin	Endangered	Decreasing
Fregetta grallaria	White-bellied Storm-Petrel	Least Concern	Decreasing
Fregetta tropica	**Black-bellied Storm-Petrel**	**Least Concern**	**Decreasing**
Gelochelidon nilotica	Common Gull-billed Tern	Least Concern	Decreasing
Hydobates leucorous (Oceanodroma leucorhoa)	**Leach's Storm-Petrel**	**Vulnerable**	**Decreasing**
Hydrobates pelagicus	**European Storm-Petrel**	**Least Concern**	**Unknown**
Hydroprogne caspia*	**Caspian Tern**	**Least Concern**	**Increasing**
Larus cirrocephalus*	**Grey-headed Gull**	**Least Concern**	**Stable**
Larus dominicanus*	**vetula Kelp Gull**	**Least Concern**	**Increasing**
Larus hartlaubii*	**Hartlaub's Gull**	**Least Concern**	**Increasing**
Larus pipixcan	Franklin's Gull	Least Concern	Increasing
Larus ridibundus	Common Black-headed Gull	Least Concern	Unknown
Lugensa brevirostris	Kerguelen Petrel	Least Concern	Decreasing
Macronectes giganteus	**Southern Giant-Petrel**	**Least Concern**	**Increasing**
Macronectes halli	Northern Giant-Petrel	Least Concern	Increasing
Microcarbo coronatus*	**Crowned Cormorant**	**Near Threatened**	**Stable**
Morus capensis*	**Cape Gannet**	**Endangered**	**Decreasing**
Morus serrator	Australian Gannet	Least Concern	Increasing
Oceanites oceanicus	**Wilson's Storm-Petrel**	**Least Concern**	**Stable**
Onychoprion (Sterna)	fuscatus Sooty Tern	Least Concern	Unknown
Pachyptila belcheri	**Slender-billed Prion**	**Least Concern**	**Stable**
Pachyptila desolata	**Antarctic Prion**	**Least Concern**	**Decreasing**
Pachyptila salvini	**Salvin's Prion**	**Least Concern**	**Stable**
Pelagodroma marina	White-faced Storm-Petrel	Least Concern	Decreasing
Pelecanus onocrotalus*	**Great White Pelican**	**Least Concern**	**Unknown**
Phaethon aethereus	Red-billed Tropicbird	Least Concern	Decreasing
Phaethon lepturus	White-tailed Tropicbird	Least Concern	Decreasing
Phaethon rubricauda	Red-tailed Tropicbird	Least Concern	Stable
Phalacrocorax capensis*	**Cape Cormorant**	**Endangered**	**Decreasing**
Phalacrocorax lucidus*	**White-breasted Cormorant**	**Least Concern**	**Unknown**
Phalacrocorax neglectus*	**Bank Cormorant**	**Endangered**	**Decreasing**
Phalaropus fulicarius	Red (Grey) Phalarope	Least Concern	Unknown
Phalaropus lobatus	Red-necked Phalarope	Least Concern	Decreasing
Phoebetria fusca	Sooty Albatross	Endangered	Decreasing
Phoebetria palpebrata	Light-mantled Albatross	Near Threatened	Decreasing
Procellaria aequinoctialis	**White-chinned Petrel**	**Vulnerable**	**Decreasing**
Procellaria cinerea	Grey Petrel	Near Threatened	Decreasing
Procellaria conspicillata	Spectacled Petrel	Vulnerable	Increasing
Pterodroma incerta	Atlantic Petrel	Endangered	Decreasing
Pterodroma macroptera	**Great-winged Petrel**	**Least Concern**	**Decreasing**
Pterodroma mollis	**Soft-plumaged Petrel**	**Least Concern**	**Stable**
Puffinus assimilis	Little Shearwater	Least Concern	Decreasing
Puffinus puffinus	Manx Shearwater	Least Concern	Unknown
Spheniscus demersus*	**African Penguin**	**Endangered**	**Decreasing**
Stercorarius longicaudus	Long-tailed Jaeger	Least Concern	Stable
Stercorarius parasiticus	Arctic (Parasitic) Jaeger	Least Concern	Stable
Stercorarius pomarinus	Pomarine Jaeger	Least Concern	Stable
Sterna albifrons	Little Tern	Least Concern	Decreasing

Sterna dougallii	**Roseate Tern**	**Least Concern**	**Unknown**
Sterna hirundo	Common Tern	Least Concern	Unknown
Sterna paradisaea	Arctic Tern	Least Concern	Decreasing
Sterna vittata	Antarctic Tern	Least Concern	Unknown
Sternula balaenarum	**Damara Tern**	**Vulnerable**	**Decreasing**
Sula leucogaster	Brown Booby	Least Concern	Decreasing
Sula sula	Red-footed Booby	Least Concern	Decreasing
Thalassarche carteri	Indian Yellow-nosed Albatross	Endangered	Decreasing
Thalassarche cauta	**Shy Albatross**	**Near Threatened**	**Unknown**
Thalassarche chlororhynchos	**Atlantic Yellow-nosed Albatross**	**Endangered**	**Decreasing**
Thalassarche chrysostoma	Grey-headed Albatross	Endangered	Decreasing
Thalassarche melanophrys	**Black-browed Albatross**	**Least Concern**	**Increasing**
Thalassarche salvini	Salvin's Albatross	Vulnerable	Unknown
Thalasseus b. bergii	Greater Crested (Swift) Tern	Least Concern	Stable
Thalasseus maximus	Royal Tern	Least Concern	Stable
Thalasseus sandvicensis	Sandwich Tern	Least Concern	Stable
Xema (Larus) sabini	**Sabine's Gull**	**Least Concern**	**Stable**

Marine Mammals

Thirty-nine species of obligate marine mammals are known to occur within the Benguela Current marine region, comprised of thirty-four cetacean species and five species of seal (Table 5-3). The offshore regions of the west coast of southern Africa have been inadequately researched, and the majority of the data available on deeper waters (>200 m) are derived from historical whaling records before 1970. Presently, there is a dearth of knowledge concerning the distribution, population sizes and trends of most cetacean species inhabiting this region. The scarcity of information is especially pronounced for smaller cetaceans found in deeper waters, and therefore, the precautionary principle should be applied when anticipating potential interactions with cetaceans in this area. Due to the highly variable oceanographic nature of the Concession Area, particularly the offshore area (> 100 km offshore) which is influenced less by the upwelling cells, the area can at times exhibit species compositions more similar to temperate and tropical Atlantic waters.

The most common of the marine mammals found in the Benguela is undoubtably the Cape fur seal (*Arctocephalus pusillus pusillus*) which is the only eared seal species resident to the region (Kirkman et al. 2013). As with most marine predators in the region, the Cape fur seal primarily feeds off small pelagic fish such as sardines and anchovies. They are, however, quite opportunistic being known to feed on cephalopods (especially octopus), hake and even sea birds (Mecenero et al. 2005, 2006a, 2006b). Several colonies of Cape fur seals are present in the study area, including at Kleinzee (including Robeiland), Bucchu Twins near Alexander Bay, and Strandfontein Point (located south of Hondeklipbaai). Kleinzee colony boasts the largest seal population and produces the highest number of seal pups on the South African coast, according to Wickens (1995).

One other eared seal species (subantarctic fur seal) is found within the Benguela area but is considered a rare subantarctic visitor. Three other seals (eared seals) are also rarely found within the southern Benguela region (southern elephant seal, crab eater seal and the leopard seal) (Table 5-4). None of these seal species are of significant conservation concern.

Due to the unique oceanographic features found within this region, a fairly diverse array of cetaceans has been documented. These are often split into dolphins and porpoises, toothed whales, and baleen whales. Fourteen species of dolphins are known to occur in the area, which includes two small (< 1.5 m length) Benguela endemic inshore species (dusky and heaviside's dolphins), which almost exclusively utilise inshore areas (Findlay 1989). Only three other species (common bottle nose, common (short beaked) dolphin and long finned pilot whales) are likely to be encountered in both offshore or inshore environments. All of these species that may be commonly encountered are not of any conservation concern (IUCN 2023).

Of the ten species of larger, toothed whales that are likely to occur within the Concession Area, none are likely to be frequently encountered (Findlay 1989), and only one is listed as Vulnerable by the

IUCN red list (sperm whale) (IUCN 2023). The other nine species are considered to be rarely or occasionally encountered throughout their distribution including within the Benguela region.

The majority of the Baleen whales found in the region primarily feed in the cooler sub-Antarctic and Antarctic waters in the summer, with some species moving north into warmer sheltered coastal waters of South Africa to calf (southern right whales and humpback whales). Of the ten baleen whales known to occur within the region, three species are likely to be encountered (southern right whales, humpback whales and Antarctic minke whales) (Findlay 1989). Of these, only Antarctic minke whales are considered to be of conservation concern while southern right whales and humpback whales have very seasonal winter distributions in the area, which they either traverse to find suitable calving areas or for occasional foraging during the summer (IUCN 2023).

Table 5-4: Marine mammal species that are likely to occur within the Concession Area, with corresponding seasonality to the area, IUCN red list status (as of 2023) and the likelihood of encounter either inshore or offshore of the Concession Areas (Findlay, 1989 and the IUCN red list).

Common name	Group	Scientific name	Seasonality	IUCN Redlist Status	Likelihood of Encounter
Cape fur seal	Eared seal	Arctocephalus pusillus pusillus	All year	Least Concern	Daily (inshore)
Subantarctic fur seal	Eared seal	Arctocephalus tropicalis	Not Known	Least Concern	Rare
Southern elephant seal	Earless seal	Mirounga leonina	Not Known	Least Concern	Rare
Crab eater seal	Earless seal	Lobodon carcinophagus	Not Known	Least Concern	Rare
Leopard seal	Earless seal	Hydrurga leptonyx	Not Known	Least Concern	Rare
Dusky dolphin	Dolphin	Lagenorhynchus obscurus	All year	Least Concern	Daily (inshore)
Heaviside's dolphin	Dolphin	Cephalorhynchus heavisidii	All year	Near Threatened	Daily (inshore)
Common bottlenose dolphin	Dolphin	Tursiops truncatus	All year	Least Concern	Monthly (inshore and offshore)
Common (short beaked) dolphin	Dolphin	Delphinus delphis	All year	Least Concern	Monthly (inshore and offshore)
Southern right dolphin	Dolphin	Lissodelphis peronii	All year	Least Concern	Occationally (offshore)
Striped dolphin	Dolphin	Stenella coeruleoalba	Not Known	Least Concern	Rare
Pantropical spotted dolphin	Dolphin	Stenella attenuata	All year	Least Concern	Rare
Long-finned pilot whale	Dolphin	Globicephala melas	All year	Least Concern	Monthly (offshore)
Short-finned pilot whale	Dolphin	Globicephala macrorhynchus	Not Known	Least Concern	Rare
Rough-toothed dolphin	Dolphin	Steno bredanensis	Not Known	Least Concern	Rare
Killer whale	Dolphin	Orcinus orca	All year	Data Deficient	Occationally (inshore and offshore)
False killer whale	Dolphin	Pseudorca crassidens	All year	Near Threatened	Monthly (offshore)
Pygmy killer whale	Dolphin	Feresa attenuata	Not Known	Least Concern	Occationally (offshore)
Risso's dolphin	Dolphin	Grampus griseus	Not Known	Least Concern	Occationally (offshore)
Pygmy sperm whale	Toothed Whale	Kogia breviceps	All year	Least Concern	Occationally (offshore)
Dwarf sperm whale	Toothed Whale	Kogia sima	Not Known	Least Concern	Rare
Sperm whale	Toothed Whale	Physeter macrocephalus	All year	Vulnerable	Occationally (offshore)
Cuvier's beaked whale	Toothed Whale	Ziphius cavirostris	All year	Least Concern	Occationally (offshore)
Arnoux's beaked whale	Toothed Whale	Berardius arnouxii	All year	Least Concern	Occationally (offshore)
Southern bottlenose whale	Toothed Whale	Hyperoodon planifrons	All year	Least Concern	Occationally (offshore)
Strap-toothed whale	Toothed Whale	Mesoplodon layardii	All year	Least Concern	Occationally (offshore)
True's beaked whale	Toothed Whale	Mesoplodon mirus	All year	Least Concern	Occationally (offshore)
Gray's beaked whale	Toothed Whale	Mesoplodon grayi	All year	Least Concern	Occationally (offshore)
Blainville's beaked whale	Toothed Whale	Mesoplodon densirostris	All year	Least Concern	Occationally (offshore)
Antarctic minke whale	Baleen Whale	Balaenoptera bonaerensis	Winter	Near Threatened	Monthly (offshore)
Common minke whale	Baleen Whale	Balaenoptera acutorostrata	All year	Least Concern	Occationally (offshore)
Fin whale	Baleen Whale	Balaenoptera physalus	Winter	Vulnerable	Occationally (offshore)
Blue whale	Baleen Whale	Balaenoptera musculus	Not Known	Endangered	Occationally (offshore)
Sei whale	Baleen Whale	Balaenoptera borealis	Autumn	Endangered	Occationally (offshore)
Inshore Bryde's whale	Baleen Whale	Balaenoptera edeni edeni	All year	Least Concern	Occationally (inshore)
offshore Bryde's whale	Baleen Whale	Balaenoptera edeni brydei	All year	Not Assessed	Occationally (offshore)
Pygmy right whale	Baleen Whale	Caperea marginata	All year	Least Concern	Occationally (inshore)
Humpback whale	Baleen Whale	Megaptera novaeangliae	All year (higher in summer)	Least Concern	Daily (inshore)
Southern right whale	Baleen Whale	Eubalaena australis	All year (higher in Winter)	Least Concern	Daily(inshore)

5.1.6 Marine Protected Areas and Marine Spatial Planning

In 2019, a network of 20 new MPAs was gazetted in South Africa which increased the protection of the coastal waters within South Africa's EEZ to approximately 5.4%. The Namaqua Fossil Forest MPA is one of the recently proclaimed MPAs which is located adjacent to the Concession Areas 4C and 5C 17 km offshore of Port Nolloth within the 120 to 150m depth range and encompasses an area of approximately 875 km^2. The MPA was established due to the presence of a small rocky outcrop formed by fossilized yellowwood trees, including a species new to science (Bamford and Stevenson 2002; Stevenson and Bamford 2003). The outcrop formed by slabs of fossils trees has become colonised by sensitive cold water scleractinian corals (Sink et al. 2019). The MPA also incorporates unprotected mud habitat and a habitat forming sponge (Samaai et al. 2017). The primary ecosystem types of the MPA comprises:

- 4% Namaqua mid shelf fossils,
- 52% Namaqua muddy mid shelf mosaic,
- 29% Namaqua sandy mid shelf and
- 16% Namaqua muddy sands.

The Namaqua Fossil Forest MPA is surrounded by a 5km buffer, which extends by a further 8km on the southern boundary and is designated as an Ecological Support Area (see below) which provides further protection from direct impact on the ecosystem components it contains.

The Orange Shelf Edge MPA occurs approximately 7km to the west of the Concession Area at its closest point. The MPA contains Critically Endangered hard grounds and areas of sandy seabed in the southern Benguela that have never been trawled before (Sink et al 2019). Two other MPAs occur further afield from the Concession Area. The Childs Bank MPA is located approximately 85km to the south and the Namaqua MPA is inshore and to the east approximately 75km at its nearest point to the Concession Area. The latter two MPAs are sufficiently distanced from the Concession Area and are unlikely to experience any adverse effects from prospecting activities.

In addition to the network of MPAs, a National Coastal and Marine Spatial Biodiversity Plan (NCMSBP) has recently been completed and proclaimed (Harris et al. 2022, DFFE et al. 2022). The NCMSBP builds on the network of formal conservation areas protected in the MPA network by identifying additional areas of importance for safeguarding representative areas of marine biodiversity. The output of the process is a Critical Biodiversity Area (CBA) map which serves as a spatial plan to inform future marine spatial planning in support of sustainable development. The CBA maps are developed based on technical guidelines developed by the South African National Biodiversity Institute and include three categories of priority areas which collectively aim to ensure the long-term sustainability of ecosystems and species through protection of representative areas of ecosystem types and features. The three categories include MPAs, CBAs and ESAs. All three categories should be considered collectively when considering future activities, and each category has its own management objectives. MPAs are governed in terms of their gazetted management plans. The management objective for areas designated as CBAs is to maintain, or restore them to a near natural state, while for ESAs the objective is to prevent further deterioration in the ecological condition (Harris et al. 2022). In order to achieve the objectives of the CBAs and ESAs the NCMSBP developed a set of sea-use guidelines which set out which activities are compatible with each category given the management objectives.

A systematic spatial prioritisation exercise was undertaken using 437 biodiversity features including ecosystem types, distributions of key species, unique features, ecological infrastructure, and existing priority areas (DFFE et al. 2022). Design elements included 539 features incorporating alignment with existing planning initiatives, culturally important areas, ecological condition, and climate change adaption features. Targets were set for each feature to ensure representative areas were selected for inclusion into critical biodiversity areas and ongoing future conservation. As part of the spatial prioritisation process a cost layer was developed which incorporated data from 19 different sectors including mining and petroleum activities, several fisheries, aquaculture, and marine transport. The aim of the cost layer is to ensure areas of biodiversity importance which conflict least with activities are preferentially selected. The outputs from the process include CBA maps which highlight areas of importance for future marine spatial planning. The activities of the industries such as marine mining which utilise the marine ecosystem are taken into account in the design and preparation of the CBA maps. Thus, the NCMSBP has already considered multiple users and cumulative impacts on marine areas through lengthy stakeholder engagement and consultation with various experts, as well as affected communities and businesses.

The output of CBA maps from the NCMSBP identified a further 28.2% of the country's EEZ which was required to meet the biodiversity targets and ensure long-term sustainability (Harris et al. 2022, DFFE et al. 2022). Critical Biodiversity Areas accounted for 21.6% of the area identified and 6.6% was designated as ESAs. The CBAs were further split based on their ecological condition with 18% considered to be in a natural state (CBA-N) and 3.6 % as CBAs requiring restoration (CBA-R).

Conservation Importance of Habitats in the Concession Area

In terms of the current project, the Concession Area overlaps with both CBA and ESA areas. The CBA maps identify 32% of the Concession Area as CBA-N, 3% as ESA with < 0.001% considered as CBA-R (Figure 5-8). The remaining 65% of the Concession Area is unclassified in terms of the CBA maps. Based on this, activities within 35% of the Concession Area are to be informed by the sea-use guidelines in order to achieve the management objectives for sustainable use and development.

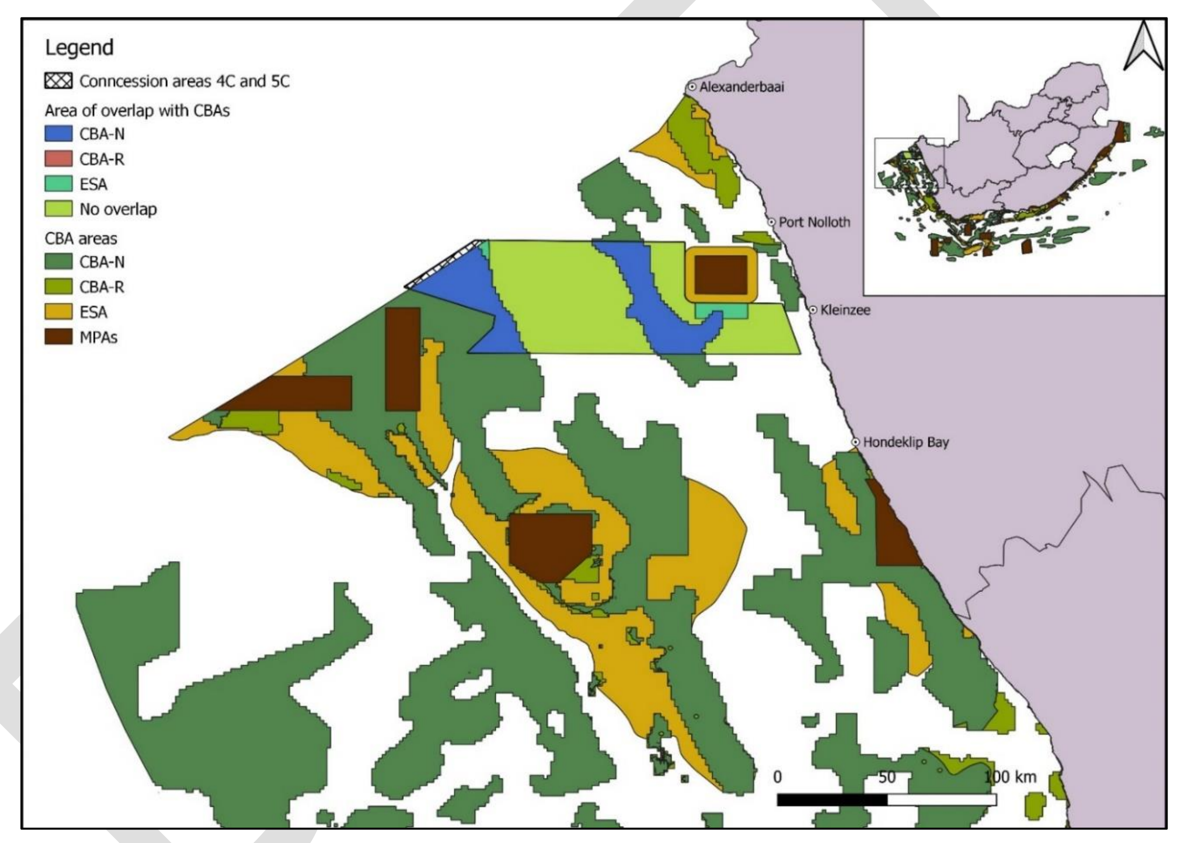


Figure 5-8: CBAs identified by Harris *et al.* (2022) found within the vicinity of the Concession Areas as well as where the Concession Areas overlap with the CBA areas.

The four main habitat types that occur in the Concession Area include Namaqua Muddy Mid Shelf Mosaic; Namaqua Muddy Sands, Namaqua Sandy Mid Shelf and Southern Benguela Sandy Outer Shelf. These habitats comprise between 2% and 31% of the Namaqua Ecoregion totalling 53% of the ecoregion's benthic habitat (Table 5-5).

Namaqua Muddy Sands are the dominant habitat in the Concession Area accounting for 53% of the overall area and 34% of the area available outside of the CBAs (Table 5-5). The amount of this habitat within the Concession Area is 33% of what is present within the ecoregion, 22% of which occurs outside of the CBAs. Currently only 1% of this habitat type is protected within the existing MPA network, with a further 31% in CBAs and 2% in ESAs.

Southern Benguela Sandy Outer Shelf is the next most abundant habitat type within the Concession Area accounting for 36% of the surface area and representing 8% of the habitat available within the ecoregion. The percentage of this habitat falling outside of CBAs within the Concession Area is 21% which equates to 5% of the available habitat type in the ecoregion. Currently 2% of this habitat is protected within MPAs with a further 40% and 11% included in CBAs and ESAs respectively.

Namaqua Muddy Mid Shelf Mosaic and Namaqua Sandy Mid Shelf comprise 9% and 2% of the available habitat within the Concession Area respectively, which represents 6% and 5% of the habitat type within the Ecoregion. The percentage of habitat within the Concession Area which is outside of CBAs is 8% and 1% respectively, which represents 5% and 4% of the available habitat. Currently 5% of both habitats is represented within the MPA network with 30-31% included in CBAs and 8-9% within ESAs.

To summarise three of the habitats within the Concession Area represent between 5-8% of the available habitat, which drops to 4-5% when the CBAs are taken into consideration. Namaqua Muddy Sands are the only habitat within the Concession Area which make up a substantial portion of the ecoregion's habitat accounting for 33%, but this drops to 22% when the CBAs within the Concession Area are taken into account.

Table 5-5: Relative proportion of the four main habitat types that occur in the Concession Area within the Ecoregion, within the Concession Area, within the Concession Area but excluding CBAs, proportion of each habitat type protected in an MPA, CBA and ESA (Sink *et al*., 2019).

Ecoregion Habitats within the Concession Area	Ecoregion		Concession Area			Concession Area excluding CBAs			MPAs		CBAs		ESAs	
	ha	% of Ecoregion Habitat	ha	% of Concession area	Concession as % of Ecoregion	ha	% Concession Area	% of Ecoregion	ha	% of Ecoregion	ha	% of Ecoregion	ha	% of Ecoregion
Namaqua Muddy Mid Shelf Mosaic	1 176 251	10%	66 474	9%	6%	62 633	8%	5%	63 061	5%	359 177	31%	109 977	9%
Namaqua Muddy Sands	1 216 895	10%	406 535	53%	33%	264 874	34%	22%	7 835	1%	373 017	31%	28 120	2%
Namaqua Sandy Mid Shelf	285 316	2%	15 435	2%	5%	10 256	1%	4%	14 575	5%	84 611	30%	21 691	8%
Southern Benguela Sandy Outer Shelf	3 605 707	31%	280 461	36%	8%	162 948	21%	5%	72 554	2%	1 442 155	40%	414 429	11%

Activity Guidelines

Within both CBA-N and ESA areas, various sea-use activities are either applicable, have restricted compatibility or are considered not compatible due to reasons stated in Table 5-6 (Harris *et al.*, 2022). Regarding, prospecting, and mining, only non-destructive prospecting is considered to have restricted compatibility within the CBA-N and ESA. While destructive prospecting such as bulk sampling is not considered to be compatible with CBA-N, restricted compatibility with the ESA area is possible (Table 5-7).

Allowance is made in the footnote to Table 5-7 for concessions that are found to have significant mineral resources following prospecting activities for the reclassification of CBA-N and CBA-R areas. Under such circumstances the affected parcels within the CBA-N and CBA-R would need to be reclassified and offsets to mitigate the loss would need to be identified that meet the targets required to replace those lost through the reclassification in the same area.

Table 5-6: Overview of the Biodiversity Zones in the national marine spatial plan, broad spatial regulations, and explanation (Harris *et al*., 2022).

Type of zone	Sub-category	Spatial regulations	Justification
Strict Biodiversity Conservation Zone	**Marine Protected Areas**	Marine Protected Areas (MPAs) declared under the National Environmental Management: Protected Areas Act (NEMPA) and managed as per their gazetted NEMPA MPA regulations. Activities that are not permitted in the regulations will not be allowed to take place in these areas.	In the Strict Biodiversity Conservation Zone, key biodiversity features will be maintained in a natural or near-natural state, or as near to this state as possible, through strict place-based conservation measures with associated regulation of human activities. These will include current designated MPAs regulated in terms of NEMPA, Biodiversity Conservation Areas, and Biodiversity Restoration Areas that require strict conservation management measures regulated in terms of the Marine Area Plan. Biodiversity Conservation Areas and Biodiversity Restoration Areas are controlled by the regulations as per the legally binding Marine Area Plans that are informed by the requirements to protect the features that underpin their original selection as CBAs. Additional areas for MPAs would be informed by the National Protected Areas Expansion Strategy (particularly the protection targets), MPA focus areas, Protected Area implementation feasibility, and alignment with other sectors. The MPA gazetting process requires additional consultation and public participation steps (beyond the MSP process) to meet the requirements of NEMPA.
	Biodiversity Conservation Areas	These are the areas identified as CBAs that will be managed by the Marine Area Plan and its regulations, informed by the rationale for their selection as CBAs. Activities that are not permitted in the regulations and/or marine area plan will not be allowed to take place in these areas.	
	Biodiversity Restoration Areas	These are areas identified as CBA Restore. These are areas of high biodiversity importance that are not in a natural or near-natural condition that will be managed by place-based regulations, informed by the reasons for their selection.	
Biodiversity Impact Management Zone		These are areas identified as Ecological Support Areas in the CBA Map. These areas will be managed by place-based regulations, informed by the reasons for their selection.	In the Biodiversity Impact Management Zone, negative impacts of human activities on key biodiversity features are managed and minimised to maintain the features in at least a functional, semi-natural state and/or to allow the area to improve in ecological condition.

Table 5-7: "Sea-use guidelines Version 1.2 (Released 12-04-2022). List of all sea-use activities, grouped by their broad sea use and Marine Spatial Planning (MSP) Zones, and categorised according to their compatibility with the management objective of Critical Biodiversity Areas (CBA-N = CBA Natural; CBA-R = CBA Restore) and ESAs. Activity compatibility is given as Y = yes, compatible, R = restricted compatibility, or N = not compatible. MPAs are managed according to their gazetted regulations." (Harris *et al*., 2022).

Broad sea use	Associated MSP Zones	Associated sea-use activities	MPA	CBA N	CBA-R	ESA
Conservation	Biodiversity Zones	Expansion of place-based conservation measures (e.g., MPA expansion)	Sea-use activities as per gazetted MPA regulations	Y	Y	Y
Recreation and tourism	Marine Tourism Zone	Beach recreation, non-motorised water sports		Y	Y	Y
		Ecotourism (e.g., shark cage diving, whale watching)		Y	Y	Y
		SCUBA diving		Y	Y	Y
		Motorised water sports (e.g., jet skis)		R	R	Y
		Recreational fishing (e.g., shore-based, boat-based and spearfishing)		N	R	Y
		Shark control: exclusion nets		Y	Y	Y
		Shark control: drumlines and gillnets		N	R	Y
Heritage	Heritage Conservation Zone	Protection of sites of heritage importance, including historical shipwrecks		Y	Y	Y
		Protection of sites of seascape value		Y	Y	Y
Fisheries	Commercial and Small-Scale Fishing Zones	Abalone harvesting		R	R	Y
		Linefishing		N	R	R
		Demersal shark longlining		N	R	Y
		Demersal hake longlining		N	R	R
		Midwater trawling		N	R	Y
		Pelagic longlining		R	R	Y
		Small pelagics fishing		N	R	Y
		South coast rock lobster harvesting		R	R	Y
		Squid harvesting		R	R	Y
		Tuna pole fishing		R	R	Y
		West coast rock lobster harvesting		R	R	Y
		Crustacean trawling		N	N	R
		Demersal hake trawling (inshore and offshore)		N	R	R
		Hake handlining		R	R	Y
		Seaweed harvesting		R	R	Y
		Commercial white mussel harvesting		R	R	Y
		Beach seining		R	R	Y
		Gillnetting		R	R	Y
		Kelp harvesting		R	R	Y
		Oyster harvesting		R	R	Y
		Small-scale fishing		R	R	Y
	Fisheries Resource Protection Zone	Resource protection		Y	Y	Y
Aquaculture	Aquaculture Zone	Sea-based aquaculture		N	R	R
Mining	Mining Zone	Mining: prospecting (non-destructive)		R	R	R
		Mining: prospecting (destructive, e.g., bulk sampling)		N	N	R
		Mining: mining construction and operations[1]		N	N	R
Petroleum	Petroleum Zone	Petroleum: exploration (non-invasive)		R	R	R
		Petroleum: exploration (invasive, e.g., exploration wells)		R	R	R
		Petroleum: production[1,2]		N	N	R
		Petroleum: oil and gas pipelines		N	N	R
Renewable Energy	Renewable Energy Zone	Renewable energy installations		N	R	R
Defence	Military Zone	Military training and practice areas		R	R	Y
		Missile testing grounds		R	R	Y
Transport	Maritime Transport Zone	Designated shipping lanes (including port approach zones)		R	R	Y
		Anchorage areas		R	R	Y
		Bunkering		N	N	R
		Ports and harbours (new)		N	N	R
		Dumping of dredged material		N	N	R

Infrastructure	Underwater Infrastructure Zone	Pipelines (excluding oil and gas)	N	R	Y
		Undersea cables (new installations)	N	R	Y
	Land-based Infrastructure Zone	Coastal development (new installations, including piers, breakwaters, and seawalls)[3]	N	N	R
Abstraction and Disposal	Disposal Zone	Waste-water (new installations)	N	R	Y
	Sea-water abstraction and disposal	Sea-water abstraction and disposal (e.g., desalination)	R	R	Y
		Sea-water abstraction and disposal (e.g., aquaculture disposal)	N	R	Y

[1] The activity should not be permitted to occur in CBAs because it is not compatible with the respective management objective. However, if significant mineral or petroleum resources are identified during prospecting/exploration, then the selection of the site as a CBA could be re-evaluated as part of compromises negotiations in current or future MSP processes. This would require alternative CBAs and/or biodiversity offsets to be identified. However, if it is not possible to identify alternative CBAs to meet targets for the same biodiversity features that are found at the site, it is recommended that the activity remains prohibited.

[2] The recommended prohibition of the activity in CBAs (because it is not compatible with the management objective) refers to the location of the biodiversity disturbance rather than the location of the petroleum resource. If petroleum production is possible using lateral drilling or other techniques that do not result in any impacts on biodiversity within the CBAs, then production may be treated as an activity with restricted compatibility (i.e., recommended to be a consent activity).

[3] New coastal development should not be permitted in CBA Restore sites unless it is part of rehabilitation and restoration activities to improve ecological condition.

5.1.7 Meteorology

The terrestrial climate along the West Coast of South Africa is considered moderate. Weather patterns along the West Coast are influenced largely by the mid-latitude cyclones that are generated to the southwest of the country, and the South Atlantic and Indian Ocean high pressure systems (CCA, 2011). The key weather patterns around southern Africa are illustrated in Figure 5-9.

Winds are one of the main physical drivers of the nearshore Benguela region, both on an oceanic scale, generating the heavy and consistent South-westerly swells that impact this coast, and locally, contributing to the northward-flowing longshore currents, and being the prime mover of sediments in the terrestrial environment. Consequently, physical processes are characterised by the average seasonal wind patterns, and substantial episodic changes in these wind patterns have strong effects on the entire Benguela region.

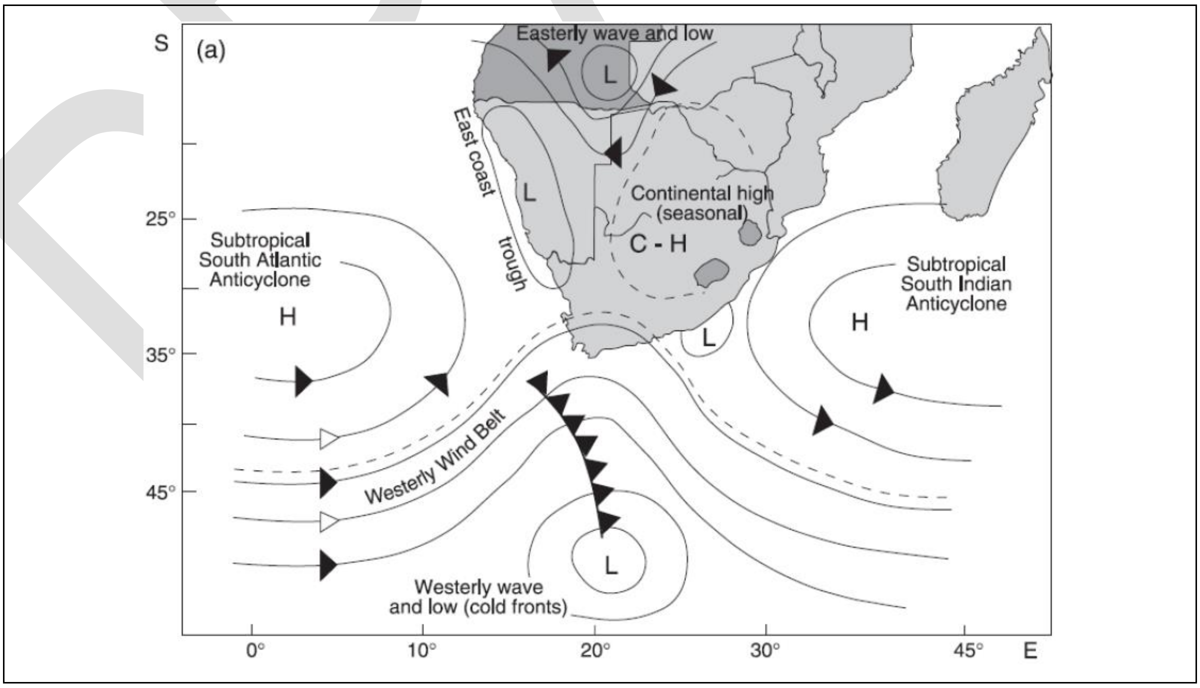


Figure 5-9: Key weather systems of southern Africa (Roberts, 2005).

These seasonal changes result in substantial differences between the typical summer and winter wind patterns in the region, as the southern hemisphere anti-cyclonic high-pressures system, and the associated series of cold fronts, moves northwards in winter, and southwards in summer. Virtually all winds in summer come from the South to South-Southeast. The combination of these southerly/South-easterly winds drives the massive offshore movements of surface water, and the resultant strong upwelling of nutrient-rich bottom waters, which characterise this region in summer.

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. This ‘reversal’ from the summer condition results in cessation of coastal upwelling, movement of warmer mid-Atlantic water shoreward and breakdown of the strong thermoclines, which typically develop over the shelf in summer.

5.1.8 Air Quality

There are no significant sources of air pollution in the area. It is therefore expected that air quality in the project area is good.

5.1.9 Noise

There are no significant sources of noise in the area, other than vessels.

5.1.10 Heritage

South Africa has a rich and diverse underwater cultural heritage. Strategically located on the historical trade route between Europe and the East, South Africa’s rugged and dangerous coastline has witnessed more than its fair share of shipwrecks and maritime dramas in the last 500 years. At least 2,800 vessels are known to have sunk, grounded, or been wrecked, abandoned, or scuttled in South African waters since the early 1500s. This doesn’t include the as yet unproven potential for shipwrecks and other sites that relate to pre-European, Indian Ocean maritime exploration, trade and interactions along the South African East coast, or the potential for wrecks of vessels which disappeared between Europe and the East to be present in our waters.

The record of South Africa’s long association with the sea is much broader that historical shipwrecks and extends far back into prehistory and is represented around the South African coast by thousands of pre-colonial shell middens and large numbers of tidal fish traps, which reflect prehistoric human exploitation of marine resources since the Middle Stone Age (MSA), more than 150 000 years ago. This element of our maritime heritage has a largely unexplored, but increasingly acknowledged manifestation in the submerged, offshore environment, consisting of pre-colonial terrestrial archaeological sites and palaeo-landscapes which are now inundated by the sea.

This assessment considers the potential for palaeontological resources, submerged prehistoric archaeological resources and historical shipwrecks in Concession Areas 4C and 5C.

Palaeontology

A review of recent palaeontological assessments in the vicinity of Concession Areas 4C and 5C (Pether, 2023) indicates that the following palaeontological resources could be present in Concession Area 6B:

Cretaceous fossil wood occurs primarily in the gravels on the flat middle shelf which directly overlie the source Cretaceous formations. Petrified wood is common and includes areas where petrified logs litter the seabed in “fossil forests”. An example of just such a forest occurs in the eastern half of Concession Area 4C.

Known as the Namaqua Fossil Forest, it is a small (2 km^2) seabed outcrop of fossilized yellowwood trees in the 136-140 m water depth range, approximately 30 km offshore, immediately South-West of Port Nolloth (Bamford & Stevenson, 2002). The fossilized tree trunks have been colonized by fragile, habitat-forming scleractinian corals. Based on interpretations of regional side scan sonar, the outcrop is believed to be unique to the area. Hard grounds have been reported North of the original fossil forest discovery that are believed to be part of this fossil forest.

Namaqua Fossil Forest is subject to a Marine Protected Area which, with a buffer of 5 km will be excluded from all prospecting activities.

In Concession 5B, inshore of 5C, (Bianucci *et al*., 2007) fossil wood is found on the Precambrian inner shelf as well as onshore in the Quaternary raised beaches, hinting that a source such as a remnant of a Cretaceous channel may be nearby (Pether, 2023).

Specimens of fossil wood from this area obtained via diamond exploration are providing valuable insights into the palaeo-climates of the Cretaceous West Coast, when wide, well-watered coastal plains were covered by forests of primitive yellow wood (podocarp) trees (Bamford & Corbett, 1994; Bamford & Stevenson, 2002; Stevenson & Bamford, 2003). Rounded cobbles and pebbles of petrified wood are sometimes noticed in gravels on the Precambrian inner-shelf bedrock to where they have been transported during rising sea levels but are quite rare and far from the source formation (Bamford & Stevenson, 2002).

Cenozoic shelly macrofauna comprises black phosphatic shell casts and more rarely partly intact shells of various ages, mainly of Eocene and early Miocene ages. During later Neogene and Quaternary times, the shelf was dominated by upwelling processes, with high organic productivity and authigenic mineralization of seabed rocks, clays, and biogenic particles by phosphatization and glauconization. Extensive cemented crusts or “hardgrounds” formed on formations exposed at the seabed. Sea level oscillated repeatedly, dropping to ice-age palaeo-shorelines as much as 140 m below present sea level. The hardgrounds were eroded during the ice-age/glacial shallowing episodes, releasing these fossils for incorporation into the Last Transgression Sequence gravels.

Fossil bones and teeth include the bones and teeth of sharks and other fishes, the skulls of extinct whale species and the occasional remains of land-living animals that roamed the ice-age exposed shelf are also phosphatized and reworked into the latest, loose Last Transgression Sequence sediments on the seabed. Samples of this reworked material turn up in bottom-trawl fishnets, scientific dredging and during diamond-mining operations and the specimens which have been donated to scientific institutions have been invaluable contributions (*e.g*., Bianucci *et al*., 2007). All such material should be collected.

Shells from the Last Transgression Sequence refers to the “subfossil” shells that occur abundantly in the sediments accumulated on the shelf during the last 20 thousand years as it was submerged to increasing depths. The marine shell fossils which occur in the LTS are predominantly the species expected on the West Coast Shelf, in a deepening-water faunal succession with littoral epifaunal species in the basal gravels, succeeded by infaunal bivalves in clean sands, succeeded by bivalves adapted to dwelling in the capping sulphidic muds.

However, unexpected species and “extralimitals” (species beyond their normal home range) are actually quite common. As an example, the Last Ice Age palaeoshoreline gravels are dominated by a “Venus shell” clam, *Tawera philomela*, a Subantarctic cold-water species, along with others, which reached the Cape coast from the mid-Atlantic islands of Tristan da Cunha and Gough, apparently thrived here and then became extinct locally during the last deglaciation (Pether, 1993). During the subsequent deglaciation/warming, several warm-water species from the South and East coasts “invaded” the western shelf temporarily which indicates a more marked influence of Agulhas water rounding the Cape and affecting the Benguela System during the global-warming steps of the last deglaciation (Pether, 1994). These Agulhas extralimitals have mainly been found during diamond exploration sampling off northern Namaqualand off Kleinsee in the inner part of Concession 5C.

Submerged Prehistory

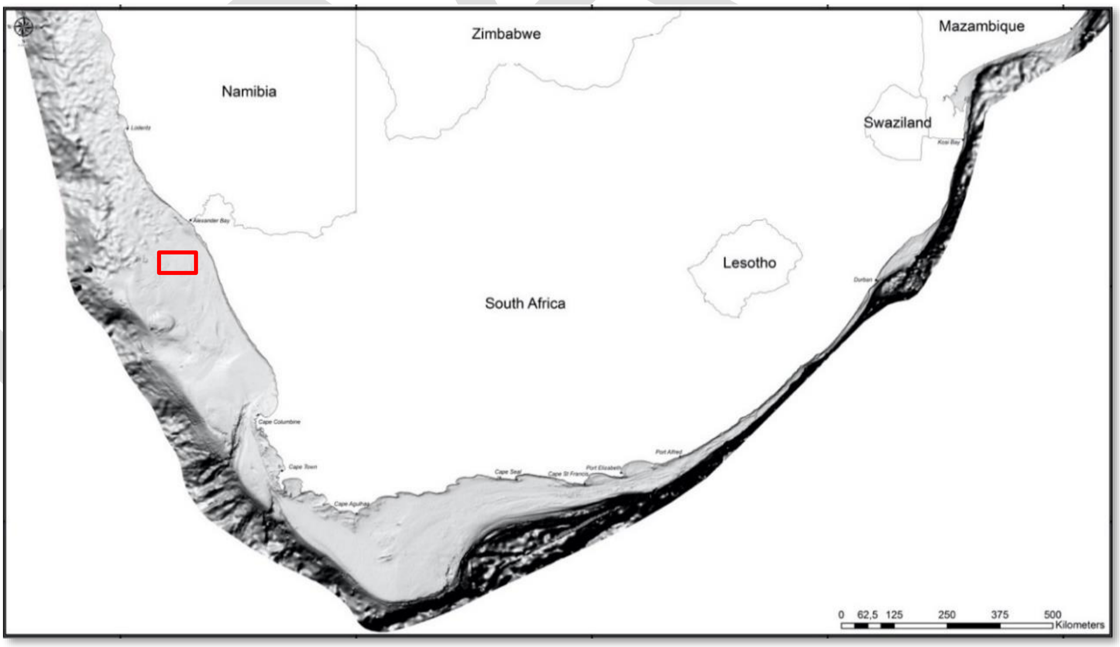
Since the start of the Quaternary, approximately 2.6 million years ago, the world has been subject to a series of cooling and warming climatic cycles in which sea level was mainly lower than it is today.

During the last 900 000 years, global sea levels have fluctuated substantially on at least three occasions, the result of increased and decreased polar glaciation. The falls in sea level were caused by the sequestering in the polar ice caps of huge quantities of seawater as global temperatures cooled.

The most extreme recent sea level drop occurred between circa 20 000 and 17 000 years ago when during Marine Isotope Stage 2 (MIS) at the height of the last glaciation, the sea was more than 120 m lower than it is today (Waelbroeck, 2002; Rohling, 2009).

As with the MIS 2 low sea level stand, those which corresponded with MIS 4 (~70 000 years ago), MIS 6 (~190 000 years ago), MIS 8 (~301 000 years ago) and MIS 12 (~478 000 years ago) would have "added a large coastal plain to the South African land mass" (Van Andel, 1989) where parts of the continental shelf were exposed as dry land (Cawthra, 2016) (Figure 5-10).

The exposure of the continental shelf would have been most pronounced on the wide Agulhas Bank off the southern Cape coast, and it is estimated that a new area of land, as much as 80 000 km^2 in extent, was exposed during the successive glacial maxima (Fisher, 2010) (see Figure 5-11). The exposed continental shelf was quickly populated by terrestrial flora and fauna, and also by our human ancestors who were dependant on these resources (Compton, 2011).



srk consulting	SAMARA CONCESSION EIAR Shaded Relief Map	Project No. 576461

Figure 5-10: Shaded relief map showing the entire extent of the South African continental shelf. The approximate location of Concession Areas 4C and 5C are marked by the red box (De Wet, 2012).

As a result, for periods numbering in the tens of thousands of years, on at least three occasions during the last 500 000 years, our ancestors inhabited areas of what is now seabed around the South African coast. This means that a large part of the archaeological record of the later Earlier, Middle, and early Late Stone Age is located on the continental shelf and is now "inundated and for all practical purposes absent from [that] record" (Van Ander, 1989).

Until relatively recently there was little or no access to the submerged prehistoric landscapes and sites on the continental shelf, although discoveries in various parts of the world of drowned, formerly terrestrial landscapes is providing increasing evidence for the survival of prehistoric archaeological sites on and within the current seabed.

Well-known example of such evidence include archaeological material and late Pleistocene faunal remains recovered in the nets of fishing trawlers in the North Sea between the United Kingdom and the Netherlands throughout the 20th century (Peeters, 2009; Peeters, 2011) and the University of Birmingham's recent archaeological interpretation of 3D seismic data, collected in the same area by the oil and gas industry, which has revealed well-preserved prehistoric landscape features across the southern North Sea (Fitch, 2005; Gaffney, 2007).

Closer to home, there is archaeological evidence for a prehistoric human presence in what is now Table Bay. In 1995 and 1996 during the excavation of two Dutch East India Company shipwrecks, the *Oosterland* and *Waddinxveen*, divers recovered three Early Stone Age handaxes from the seabed under the wrecks. The stone tools, which are between 300 000 and 1.4 million years old, were found at a depth of 7-8 m below mean sea level and were associated with Pleistocene sediments from an ancient submerged and infilled river channel (Figure 5-12). Their unrolled and unworn condition indicate that they had not been carried to their current position by the ancient river and suggests that they were found more or less where they were dropped ESA hominins more than 300,000 years ago (possibly during MIS 8 (~301 000 years ago) or MIS 12 (~478 000 years ago)), when the sea level was at least 10 m lower than it is today (Werz, 2001; Werz, 2014).

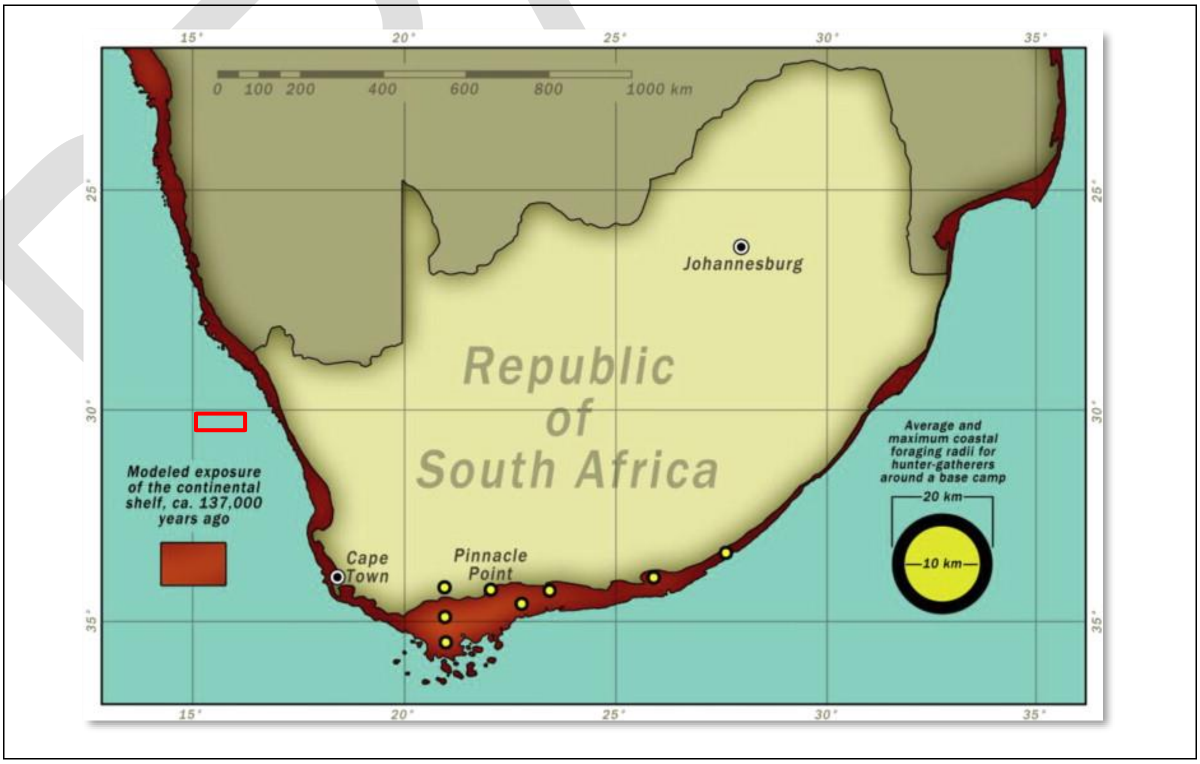


Figure 5-11: Possible extent of the South African continental shelf c.137 000 years ago. The approximate location of Concession Areas 4C and 5C are marked by the red box (Franklin, 2015).

Figure 5-12: Location of the find of Table Bay ESA handaxes (inset) off Milnerton (top arrow) overlain on magnetometer data which shows the submerged palaeo-channel (green) of the Salt River (bottom arrow).

Submerged Prehistory Potential of Concession Areas 4C and 5C

There have, to date, been no specific studies of the submerged prehistory of the West Coast, although the archaeological evidence for a hominin presence along the coast in the Earlier, Middle and Later Stone Age (LSA) is plentiful.

Diepkloof Rock Shelter, inland of Elands Bay for example, contains evidence of a nearly continuous human occupation for nearly 85 000 years (Parkington, 1987; Texier *et al*., 2010), while Elands Bay Cave, on the coast at the mouth of the Verloren Vlei, preserves archaeological evidence of the Pleistocene / Holocene transition during the LSA (Parkington, 1988).

At Hoedjiespunt in Saldanha Bay, South of the Concession Area, four hominid teeth, four or five small fragments of cranium, and two postcranial bones from one or two individuals have been found in an ancient hyena lair and are associated with uranium series dates on ostrich eggshell fragments which imply an ESA / MSA age of 130,000 to 180,000 years for the hominids (Berger, 1996).

Nearby, at Churchaven on the Langbaan Lagoon a set of fossilized human footprints were discovered in an aeolianite slab in 1995. They are thought to be those of a female human (hence their nickname "Eve's footprints") and have been dated to approximately 117 000 years ago, during the MSA and very close to the start of the last glaciation when sea levels would have been starting to drop (http://www.sawestcoast.com/fossileve.html).

As discussed in the previous section, the maximum sea level low stand during the Quaternary, when hominins would have been present in and on the South African landscape, was -120 m. Any areas of South Africa's current seabed shallower than -120 m thus have the potential to have been used by our ancestors and to preserve the archaeological evidence of that use.

Most of Concession Areas 4C and 5C lie below the -120 m contour and the seabed here will not contain submerged prehistoric archaeological remains. It is only within a relatively narrow band of a couple of kilometres just seaward of the eastern (landward) boundary of the Concession Areas, where the water is shallower than -120 m, that there is some potential for the presence of these remains.

Although no geophysical data were available for Concession Areas 4C and 5C for this assessment, seabed sediment mapping by (O'Shea, 1971) at Kleinsee indicates that a channel cut by the palaeo-Buffels River extends offshore to the West of Kleinsee. O'Shea's seabed seismic data is limited and only extends to the 80-foot (approximately 25m) depth contour, beyond which a gas-rich layer of sediment reflected and effectively blanked the sonar signal. While it is thus not clear whether the Buffels River channel extends into the Concession Areas, there is nevertheless a channel cut by the palaeo-Buffels River extends offshore to the West of Kleinsee (see Figure 5-13).

Further up the coast, "submerged fluvial channels extending seawards from Langklip Bay and between Hondeklipbaai and the Swartlintjies River are clearly indicated by the bathymetry" (Hattingh, 2015). These channels and their associated sediment bodies have the potential for associated, now submerged, archaeological material and palaeo-environmental evidence and are illustrative of the likely situation with many of the other major rivers that feed into the Atlantic along the West Coast, and which have submerged palaeo-channels extending offshore. These channels are also an important target for diamond mining as they are often the source of and contain diamondiferous gravel.

During times of lower sea level in the past, the palaeo-rivers along the West Coast would have flowed across the exposed continental shelf and these ancient river courses, whose channels are today buried under more recent seabed sediment, would have been an important focus for hominin activity on the exposed continental shelf.

As demonstrated in Table Bay, there is the potential for the occurrence of ancient, submerged archaeological material in association with palaeo-river channels. This may take the form of archaeological artefacts or, where ancient alluvial sediment within these channels has survived post-glacial marine transgressions, there is the potential to recover palaeo-environmental data (pollens, foraminifera, and diatoms, for example) which can contribute contextual information to our understanding of the ancient human occupation of South Africa.

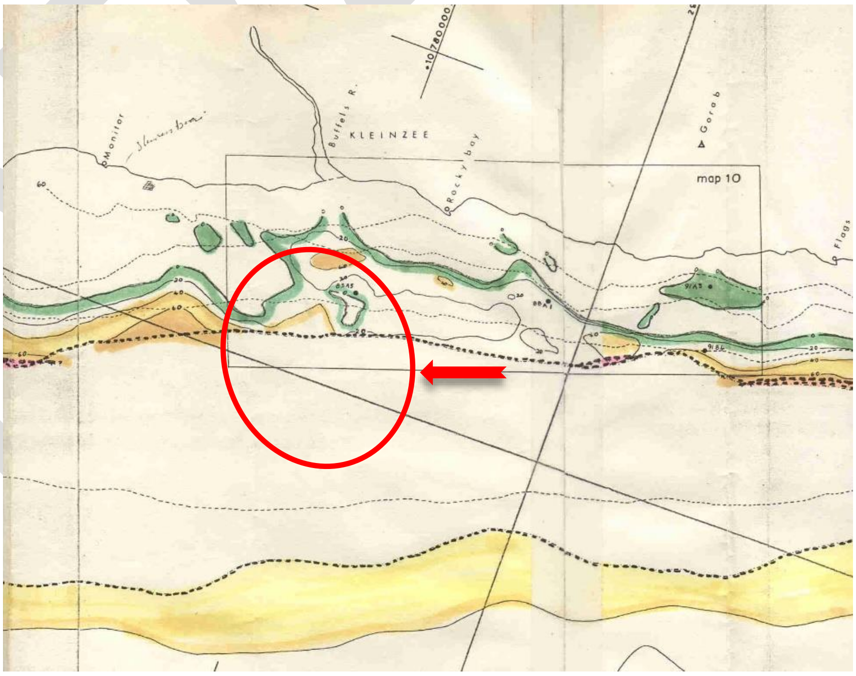


Figure 5-13: A sediment map of the seabed off of Kleinsee. The area circled in red shows the nearshore expression of the Buffels River palaeo-channel. The area between the dark hatched lines in the lower half of the image which truncates the palaeo-channel is the extent of the gas rich sediment which reflected the seismic signal and for which no sub-bottom data is thus available (O'Shea, 1971).

Maritime History of the South African Coast

In 1498 the Portuguese explorer Vasco da Gama finally pioneered the long-sought sea route around Africa from Europe to the East. Since then, the southern tip of the African continent has played a vital role in global economic and maritime affairs, and until the opening of the Suez Canal in 1869, represented the most viable route between Europe and the markets of the East (Axelson, 1973; Turner, 1988; Gribble, 2002; Cliff, 2012; Gribble, 2013).

The South African coast is rugged, and the long fetch and deep offshore waters mean that the force and size of seas around the South African coast are considerable, a situation exacerbated by prevailing seasonal winds.

The geographical position of the South African coast on the historical route to the East and the physical conditions mariners could expect to encounter in these waters have, in the last five centuries, been responsible for the large number of maritime casualties which today form the bulk of South Africa's maritime and underwater cultural heritage (Gribble, 2002).

At least 2,800 vessels are known to have sunk, grounded, or been wrecked, abandoned, or scuttled in South African waters since the early 1500s. SAHRA's comment on the Draft Scoping Report (23 September 2021) for this prospecting rights application suggests that this number may be closer to 2 800. More than 1 900 of these wrecks are more than 60 years old and are thus protected by the NHRA as archaeological resources. This list is by no means complete and does not include the as yet unproven potential for shipwrecks and other sites that relate to pre-European, Indian Ocean maritime exploration, trade and interactions along the South African East coast. It is thus anticipated that further research in local and foreign archives, together with physical surveys to locate the remains of historical shipwrecks will produce a final tally of more than 3 000.

For obvious historical reasons, the earliest known South African wrecks are Portuguese, dating to the sixteenth century when that country held sway over the route to the East. Due to the later, more prolonged ascendancy of first the Dutch and then the British in European trade with the East and control at the Cape, the majority of wrecks along the South African coast are Dutch and British. However, at least 36 other nationalities are represented amongst the other wrecks that litter the South African coast.

Da Gama's maritime incursion into the Indian Ocean laid the foundation for more than 500 years of subsequent European maritime activity in the waters off the South African coast (Cliff, 2012). The Portuguese and other European nations who followed their lead around the Cape and into the Indian Ocean, however, joined a maritime trade network that was thousands of years old and in which East and South-East Africa was an important partner.

This trade spanned the Indian Ocean and linked the Far East, South-East Asia, India, the Indian Ocean islands, and Africa. Archaeological evidence from Africa points to an ancient trade in African products – gold, skins, ivory, and slaves – in exchange for beads, cloth, porcelain, iron, and copper. The physical evidence for this trade includes Persian and Chinese ceramics excavated sites on African Iron Age like Khami, Mapungubwe and Great Zimbabwe (Garlake, 1968; Huffman, 1972; Chirikure, 2014) glass trade beads found in huge numbers on archaeological sites across eastern and southern Africa (Wood, 2012). There is shipwreck evidence on the East African coast for this pre-European Indian Ocean trade (see for example Pollard (2016)) and clear archaeological and documentary evidence that this trade network extended at least as far South as Maputo in Mozambique. This suggests that there is the potential for shipwrecks and other sites that relate to pre-European, Indian Ocean maritime exploration, trade, and interactions to exist along the South African East coast and offshore waters.

The more than 2 500 historical shipwrecks that make up the bulk of South Africa's underwater cultural heritage are a thus huge, cosmopolitan, repository of information about mainly global maritime trade during the last five centuries and potentially much further back into the past. These sites contain a wealth of cultural material associated with that trade and clues to the political, economic, social, and cultural changes that accompanied this trade, and which contributed to the creation of the modern world.

Maritime Heritage of the West Coast and Concession Areas 4C and 5C

The maritime history of the West Coast dates to almost the first days of the Dutch settlement in Table Bay. The Dutch settlers were quick to recognise and exploit the rich marine resources of the West Coast and fishing and sealing flourished, with the catches transported down the coast to supply Cape Town.

This industry led to the development of fishing villages at Saldanha Bay and Lamberts Bay, the former, together with places like Elands Bay, also later becoming ports for the export of grain and other produce from the Swartland and Cederberg (Ingpen, 1979).

During the early nineteenth century the West Coast islands became the focus of an international 'white gold' rush to exploit their rich guano resources (Watson, 1930; Snyders, 2011). The guano was soon depleted but the discovery of rich copper deposits in Namaqualand and the Richtersveld led to the use of Alexander Bay, Robbe Bay (now Port Nolloth) and Hondeklipbaai by the early 1850s and the development of local, coasting shipping services to support this new industry (Nautical Magazine and Naval Chronicle, 1855; Ingpen, 1979).

With the exception of Saldanha Bay, the West Coast historically lacked good harbours. Combined with the regular coastal fogs, a largely rocky shoreline, and dangerous inset currents this took its toll on shipping over the years.

According to SAHRA's Maritime and Underwater Cultural Heritage database, the national record of underwater cultural heritage curated on the South African Heritage Resources Information System (SAHRIS) (http://www.sahra.org.za/sahris), there are at least 68 wrecks recorded between the Oliphants and Orange Rivers, many of which were vessels involved in coastal trade and fishing.

Sixteen (16) of these shipwrecks are known to be on or close to the shore along the approximately 83 km stretch of coastline landward of the Concession Areas (i.e., the area between Port Nolloth in the North and Swartkop in the South) (Figure 5-14) and these wrecks will thus not interfere with or be impacted by the proposed prospecting.

There are no recorded wrecks within the area covered by the Concession Areas, but Maitland in the HIA produced in 2017 for portions of Concession Areas 4C and 5C suggests that five wrecks have the potential to be present within the Concession Area boundaries (Maitland, 2017).

Reviewing Maitland's list, this assessment believes that, with the exception of the *Eros* which on balance is more likely to be located near Lamberts Bay than in the vicinity of the Concession Areas, it is possible, but unlikely, that the remains of the *Haab*, *Jessie Smith*, *Ocean King* and *La Porte* lie within the Concession Areas.

Lastly, it must be stated that although unlikely, the possibility does exist for the remains of currently unknown and unrecorded wrecks to be present in the Concession Areas.

The historical records contain many references to vessels that were lost without trace between their points of departure and arrival. Where survivors of such events were subsequently rescued, the loss was recorded, but in many cases, vessels simply never arrived at their destination, and could thus lie anywhere along their intended route.

The potential for the occurrence of such unrecorded wrecks was illustrated in 2008 when a 16th century Portuguese wreck, since identified as the *Bom Jesus*, was unexpectedly found during the diamond mining South of Oranjemund in Namibia (Alves, 2011).

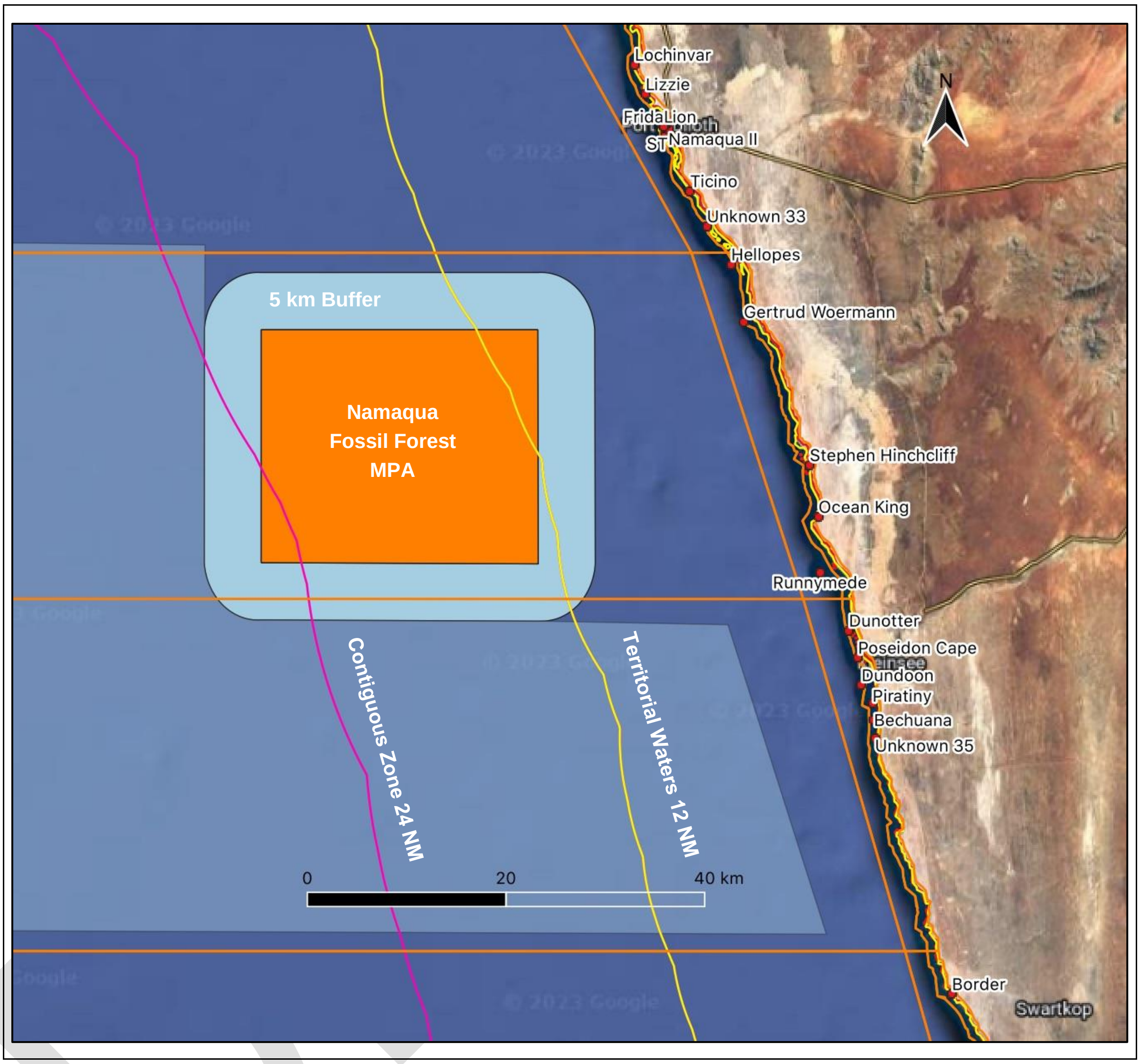


Figure 5-14: Known shipwrecks recorded on the coast in the area adjacent to Concession Areas 4C and 5C, between Port Nolloth and Swartkop (Google Earth).

5.1.11 Fisheries

South Africa has a coastline that spans two ecosystems[19] over a distance of 3 623 km, extending from the Orange River in the west on the border with Namibia, to Ponta do Ouro in the east on the Mozambique border. The western coastal shelf has highly productive commercial fisheries similar to other upwelling ecosystems around the world, while the East Coast is considerably less productive but has high species diversity, including both endemic and Indo-Pacific species. The Concession Area lies within the southern zone of the Benguela Current region characterised by the cool Benguela upwelling system. Massive offshore movement of surface water is driven by dominant southerly and south-easterly winds in summer. This results in strong upwelling of nutrient-rich bottom waters.

[19] The Benguela Current Large Marine Ecosystem off the west coast of the country is characterised by cold water currents which support high biomass of fish stocks, whereas the Agulhas Current Large Marine Ecosystem off the east coast is characterised by warm waters and high species diversity.

South Africa's fisheries are regulated and monitored by the DFFE. All fisheries in South Africa, as well as the processing, sale in and trade of almost all marine resources, are regulated under the MLRA.

Approximately 22 different fisheries sectors currently operate within South African waters. Table 5-8 lists these along with ports and regions of operation, catch landings and the number of active vessels and rights holders (2017). The proportional volume of catch and economic value of each of these sectors for 2017 is shown in Figure 5-15. The primary fisheries in terms of economic value and overall tonnage of landings are the demersal (bottom) trawl and long-linefisheries targeting the Cape hakes (*Merluccius paradoxus* and *M. capensis*) and the pelagic-directed purse-seine fishery targeting pilchard (*Sardinops sagax)*, anchovy (*Engraulis encrasicolus*) and red-eye round herring (*Etrumeus whitheadii*). Highly migratory tuna and tuna-like species are caught on the high seas and seasonally within the South African waters by the pelagic long-line and pole fisheries. Targeted species include albacore (*Thunnus alalunga*), bigeye tuna (*T. obesus*), yellowfin tuna (*T. albacares*) and swordfish (*Xiphias gladius*). The traditional linefishery targets a large assemblage of species close to shore including snoek (*Thyrsites atun*), Cape bream (*Pachymetopon blochii)*, geelbek (*Atractoscion aequidens)*, kob (*Argyrosomus japonicus)*, yellowtail (*Seriola lalandi)* and other reef fish. Crustacean fisheries comprise a trap and hoop netfishery targeting West Coast rock lobster (*Jasus lalandii*), a line trap fishery targeting the South Coast rock lobster (*Palinurus gilchristi*) and a trawl fishery based solely on the East Coast targeting penaeid prawns, langoustines (*Metanephrops andamanicus* and *Nephropsis stewarti*), deep-water rock lobster (*Palinurus delagoae*) and red crab (*Chaceon macphersoni*). Other fisheries include a mid-water trawl fishery targeting horse mackerel (*Trachurus trachurus capensis*) predominantly on the Agulhas Bank (South Coast) and a hand-jig fishery targeting chokka squid (*Loligo vulgaris reynaudii*) exclusively on the South Coast.

There are more than 230 small-scale fishing communities on the South African coastline (DFFE, 2020). Small-scale fisheries commonly use boats but occur mainly close to the shore. In addition to commercial and small-scale sectors, recreational fishing occurs along the coastline comprising. Recreational fisheries comprise shore-based, estuarine, and boat-based linefisheries as well as spearfishing and netfisheries, including cast, drag and hoop net techniques.

The commercial and recreational fisheries are reported to catch over 250 marine species, although fewer than 5% of these are actively targeted by commercial fisheries, which comprise 90% of the landed catch. Most commercial fish landings must take place at designated fishing harbours. For the larger industrial vessels targeting hake, only the major ports of Saldanha Bay, Cape Town, Mossel Bay and Port Elizabeth are used. On the West Coast, St. Helena Bay and Saldanha Bay are the main landing sites for the small pelagic fleets. These ports also have significant infrastructure for the processing of anchovy into fishmeal as well as the canning of sardine. Smaller fishing harbours on the West / South-West Coast include Port Nolloth, Hondeklip, Laaiplek, Hout Bay and Gansbaai harbours. On the East Coast, Durban and Richards Bay are deployment ports for the crustacean trawl and large pelagic longline sectors.

Seaweed is also regarded as a fishery, with harvesting of kelp (*Ecklonia maxima)* and (*Laminaria pallida)* in the Western and Northern Cape and hand-picking of *Gelidium* sp. in the Eastern Cape. The seaweed industry employs over 1700 people, most of whom are previously disadvantaged. *E. maxima* is primarily used by the abalone aquaculture industry as abalone feed.

Aquaculture in the marine environment ("mariculture" or "marine aquaculture") refers to the farming of marine plants and animals which is conducted in the open ocean, in enclosed sections of the ocean, or in tanks, ponds or raceways which are filled with seawater. This means that marine aquaculture sites are either directly located in the marine environment (sea-based marine aquaculture) or located on land, which abstract/utilise seawater to cultivate the produce in suitable facilities (land-based marine aquaculture). Marine aquaculture is still in its infancy in South Africa but has been identified by government as a growth industry worthy of support.

Table 5-8: South African offshore commercial fishing sectors: number of rights holders, landings, and wholesale value of production in 2017 (DEFF, 2019).

Sector	No. of Rights Holders (Vessels)	Catch (tons)	Landed Catch /sales (tons)	Wholesale Value of Production in 2017 (R'000)	% of Total Value
Small pelagic purse-seine	111 (101)	313476	313476	2164224	22.0
Demersal trawl (offshore)	50 (45)	163743	98200	3891978	39.5
Demersal trawl (inshore)	18 (31)	4452	2736	90104	0.9
Mid-water trawl	34 (6)	17545			
Demersal long-line	146 (64)	8113	8113	319228	3.2
Large pelagic long-line	30 (31)	2541	2541	154199	1.6
Tuna pole	170 (128)	2399	2399	97583	1.0
Linefish	422 (450)	4931	4931	122096	1.2
Longline shark demersal		72	72	1566	0.0
South coast rock lobster	13 (12)	699	451	*337912*	3.4
West coast rock lobster	240 (105)	1238	1238	*531659*	5.4
Crustacean trawl	6 (5)	310	310	32012	0.3
Squid jig	92 (138)	11578	11578	1099910	11.2
Miscellaneous nets	190 (N/a)	1502	1502	25589	0.3
Oysters	146 pickers	42	42	3300	0.0
Seaweeds	14 (N/a)	9877	6874	27095	0.3
Abalone	N/a (N/a)	86	86	*61920*	0.6
Aquaculture		3907	3907	881042	9.0
Total		528966	458456	9841417	100

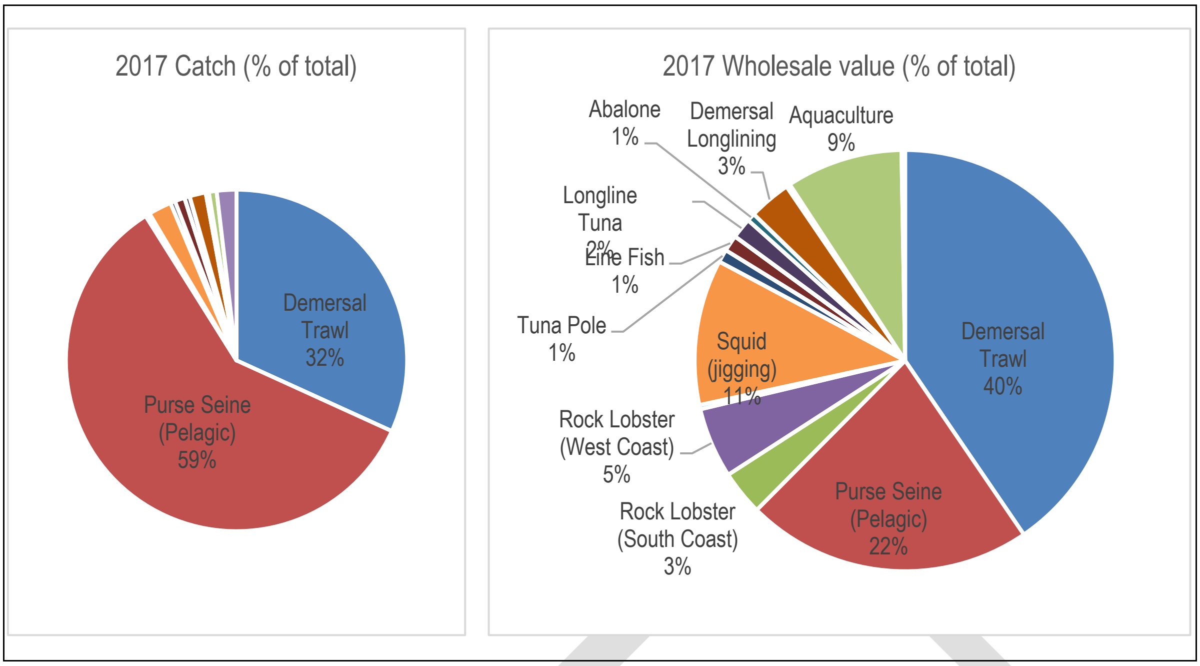


Figure 5-15: Pie chart showing percentage of landings by weight (left) and wholesale value (right) of each commercial fishery sector as a contribution to the total landings and value for all commercial fisheries sectors combined (2017) (DEFF, 2019).

Table 5-9: South African commercial fishing sectors that operate off the west coast, deployment ports and target species (DEFF, 2019).

Sector	Areas of Operation	Main Ports in Priority	Target Species
Small pelagic purse-seine	West, South Coast	St Helena Bay, Saldanha, Hout Bay, Gansbaai, Mossel Bay	Anchovy (Engraulis encrasicolus), sardine (Sardinops sagax), Redeye round herring (Etrumeus whiteheadi)
Demersal trawl (offshore)	West, South Coast	Cape Town, Saldanha, Mossel Bay, Port Elizabeth	Deepwater hake (Merluccius paradoxus), shallow-water hake (Merluccius capensis)
Mid-water trawl	West, South Coast	Cape Town, Port Elizabeth	Adult horse mackerel (Trachurus capensis)
Demersal long-line	West, South Coast	Cape Town, Saldanha, Mossel Bay, Port Elizabeth, Gansbaai	Shallow-water hake (Merluccius capensis)
Large pelagic long-line	West, South, East Coast	Cape Town, Durban, Richards Bay, Port Elizabeth	Yellowfin tuna (T. albacares), big eye tuna (T. obesus), Swordfish (Xiphius gladius), southern bluefin tuna (T. maccoyii)
Tuna pole	West, South Coast	Cape Town, Saldanha	Albacore tuna (T. alalunga)
Linefish	West, South, East Coast	All ports, harbours and beaches around the coast	Snoek (Thyrsites atun), Cape bream (Pachymetopon blochii), geelbek (Atractoscion aequidens), kob (Argyrosomus japonicus), yellowtail (Seriola lalandi), Sparidae, Serranidae, Carangidae, Scombridae, Sciaenidae
West coast rock lobster	West Coast	Hout Bay, Kalk Bay, St Helena	Jasus lalandii
Gillnet	West Coast	False Bay to Port Nolloth	Mullet / harders (Liza richardsonii)

Sector	Areas of Operation	Main Ports in Priority	Target Species
Beach seine	West, South, East Coast	Coastal	Mullet / harders (Liza richardsonii)
Seaweeds	West, South, East	Coastal	Beach-cast seaweeds (kelp, Gelidium spp. and Gracilaria spp.
Abalone	West Coast	Coastal	Haliotis midae

Spawning and Recruitment of Fish Stocks

Spawning is the process by which fish lay and fertilize eggs, which then develop into new individuals. This process is critical for maintaining and replenishing fish populations. In South Africa, the timing and location of spawning for many fish species is influenced by environmental factors such as water temperature, light levels, and ocean currents.

Recruitment, on the other hand, is the process by which juvenile fish grow and mature, and eventually join the adult population. This is an important stage in the life cycle of a fish, as the survival and growth of young fish can have a major impact on the overall health of the population.

The southern African coastline is characterized by strong ocean currents. On the eastern seaboard, the warm western boundary Agulhas Current flows close to the coast before moving away from the coast on the Agulhas Bank and eventually returning to the Indian Ocean. On the western seaboard, powerful jet currents form in the southern Benguela region due to the strong thermal differences caused by upwelling and the influence of the Agulhas Current and its eddies. Generally, the surface waters in the Benguela Current flow northward and are subject to strong losses off the coast near Lüderitz, where upwelling is particularly active.

There are several mechanisms that contribute to the dispersal and loss of productive shelf waters, such as eddies, filaments, retroflections, and offshore Ekman drift, which pose challenges for the successful retention of planktonic eggs and larvae from broadcast spawners. To overcome these challenges, most fish species in southern Africa have evolved selective reproductive patterns that ensure sufficient progeny are retained or reach the nursery grounds along the coastline. Three important and one minor reproductive habitat occur between Mozambique and Angola and are utilized by a wide range of pelagic, demersal, and inshore-dwelling fish species, comprising spawning areas, transport mechanisms, and nursery grounds. The three key nursery grounds for commercially important species can be identified in South African waters as a) the Natal Bight b) the Agulhas Bank and 3) the inshore Western Cape coasts. Each is linked to a spawning area, a transport and/or recirculation mechanism, a potential for deleterious offshore or alongshore transport and an enriched productive area of coastal or shelf-edge upwelling (Hutchings *et al.*, 2002). According to Hutchings (1992, 1994), despite the wide shelf and high primary productivity in southern Africa, fish yields are not particularly high. This suggest that the oceanographic climate is potentially restrictive to spawning success.

There are a number of factors that can negatively affect the success of recruitment in South Africa's marine fisheries, including overfishing, habitat destruction, pollution, and changes in ocean temperature and chemistry. In order to sustain healthy fish populations, it is important for management agencies to monitor and understand the factors that influence spawning and recruitment, and to implement measures to protect and conserve these processes. Most research on spawning and recruitment of commercially important species was completed in the 1990s to early 2000s, with no follow up to see if these patterns may have changed as a result of the negatively factors mentioned above.

The West Coast spawning ground

Hake, sardines, anchovy, and horse mackerel are broadcast spawners, producing large numbers of eggs that are widely dispersed in ocean currents (Hutchings *et al.*, 2002). These principal commercial fish species undergo a critical migration pattern in the Agulhas and Benguela ecosystems.

Many species of pelagic fish that are commonly found in the major upwelling systems in the region use the central or western Agulhas Bank as a spawning area. This area is known for its surface waters that flow towards the northwest and coastal upwelling that occurs during late summer. The convergent water mass formed by this process turns into a coastal jet current that moves along the west coast, including the highly active upwelling centres at Cape Town and Cape Columbine. This jet current plays a crucial role in transporting eggs and larvae to the west coast nursery grounds, where the young fish can grow and mature. At Cape Columbine, the jet current appears to diverge, with different components flowing offshore, alongshore, and inshore. As the eggs drift, hatching takes place followed by larval development. Settlement of larvae occurs in the inshore areas, in particular the bays that are used as nurseries. Refer to Figure 5-16 for an overview of the main fish spawning grounds and nursery areas off the West and South Coasts of South Africa.

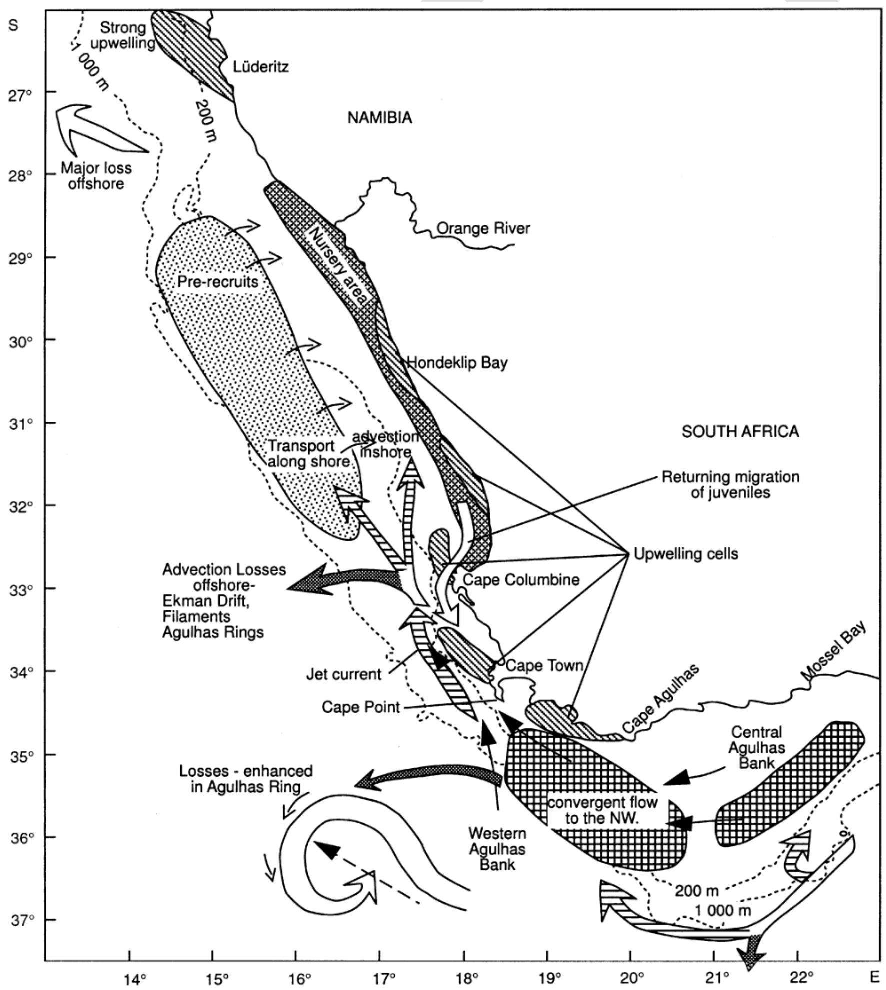


Figure 5-16: Generalised figure of the main fish recruiting process for species caught on the West Coast of South Africa (Hutchings *et al.*, 2002). Figure shows the West Coast nursery area and the western/central Agulhas Bank spawning grounds. Light stippled area on the West Coast marks the main recruiting area for the small pelagic fishery and dark stippled area on the Agulhas Bank marks the main spawning grounds for small pelagic fish.

Horse mackerel

Horse mackerel spawns in the east/central Agulhas Bank during the winter months and the young juveniles can be found close inshore along the southern Cape coastline (20–26°E) However, during the summer months, there is a significant overlap with the inshore west coast nursery habitat (Barange *et al.,* 1998). As the horse mackerel mature, they become more demersal and move offshore before migrating back to the Agulhas Bank as adults.

Anchovies

Anchovies spawn on the entire Agulhas Bank from October to March with the highest spawning activity occurring during mid-summer (November–December; van der Lingen and Huggett, 2003; see Figure 5-17). In some years, when the Agulhas Bank water strongly intrudes north of Cape Point, there is a shift in the anchovy spawning to the west coast (van der Lingen *et al.,* 2001). The bulk of the anchovy recruits can be found along the west coast, with less than 5% found on the inshore south coast (Hampton 1992; see Figure 5-18). Older anchovies tend to shift further east to the central and eastern parts of the Agulhas Bank and often spawn between the cool ridge and the Agulhas Current (Roel *et al.,* 1994). Since 1994, there has been a noticeable eastward shift in the anchovy spawning distribution to the east-central Agulhas Bank. While anchovies are known to spawn on the east coast shelf, the narrow shelf limits the population size of the spawners (Armstrong *et al.,* 1991; Beckley and Hewitson 1994).

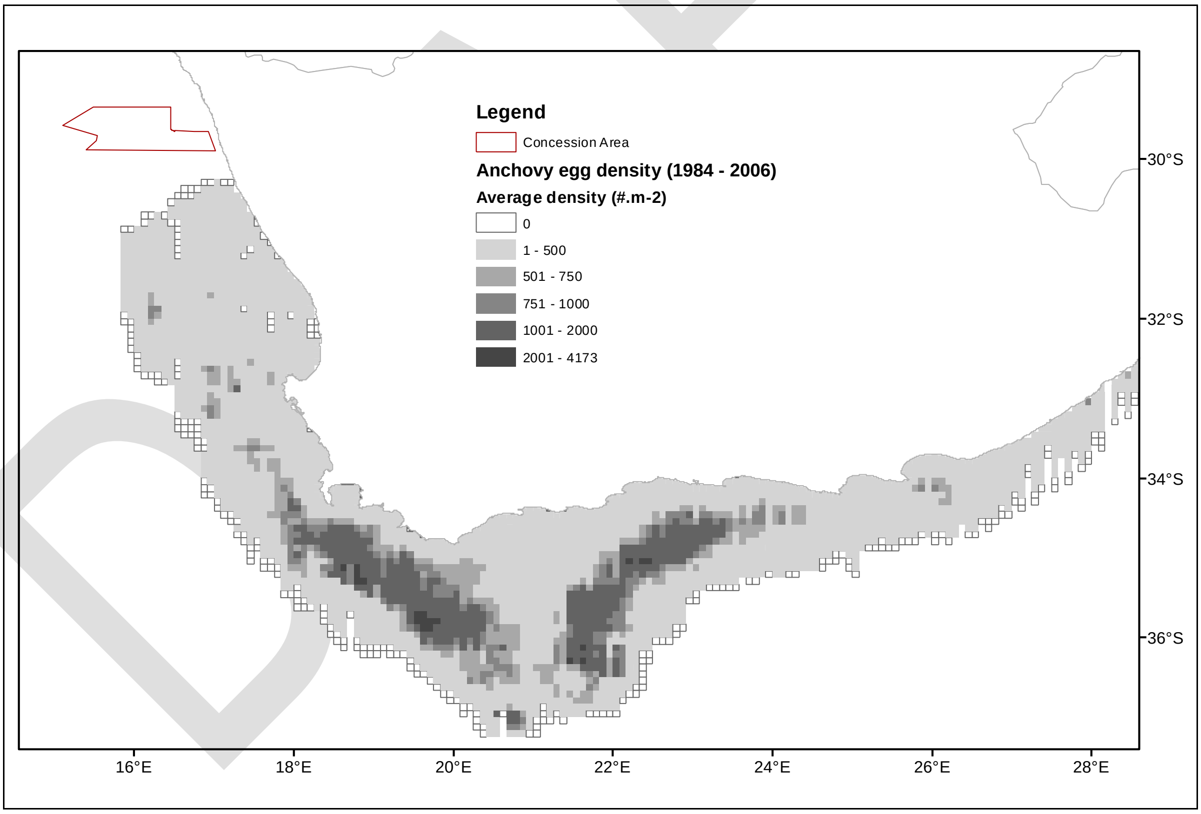


Figure 5-17: The Concession Area (red polygon) in relation to the distribution of anchovy spawning areas, as measured by egg densities (DFFE).

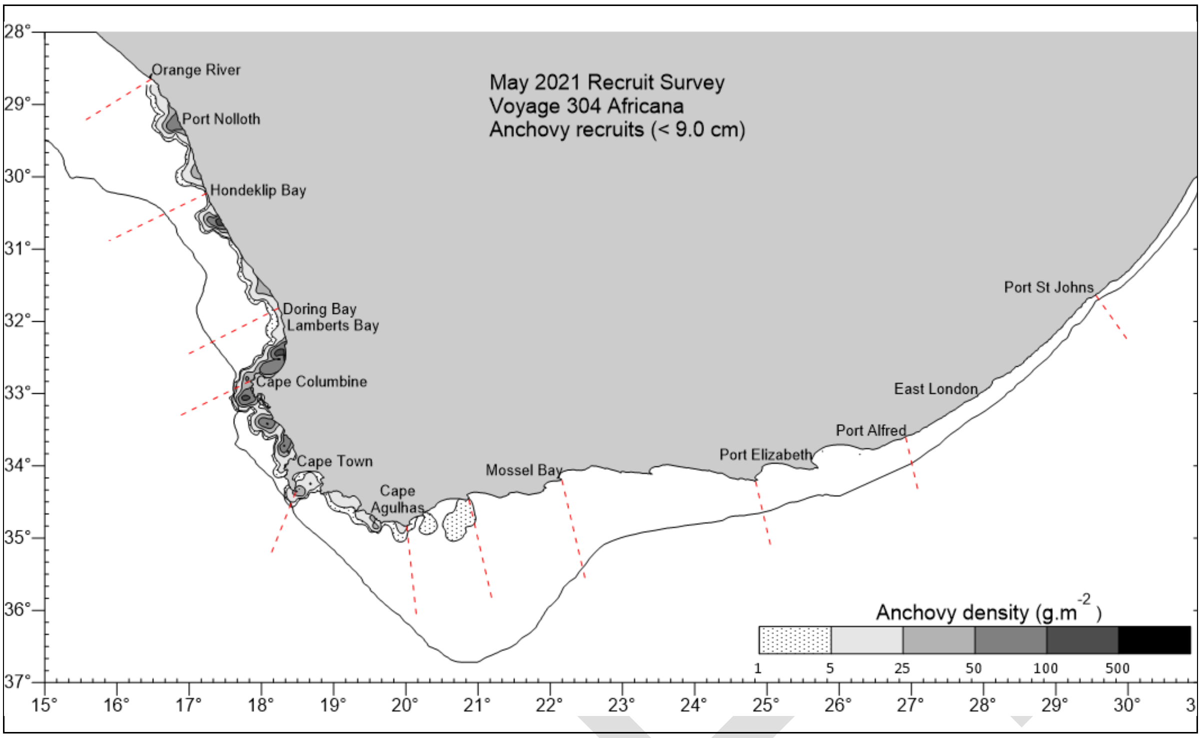


Figure 5-18: Distribution and relative abundance of anchovy recruits (< 9 cm) (Source: DFFE Small Pelagic Scientific Working Group FISHERIES/2021/JUL/SWG-PEL/51Draft

Sardines

There are two stocks of sardine off South Africa; the Cool Temperate Sardine (CTS) off the west coast and Warm Temperate Sardine (WTS) off the south coast, with some mixing (in both directions) between the two (Teske *et al.,* 2021; see Figure 5-19). In the West Coast Spawning Ground, the stock of interest is the CTS.

Sardines spawn in a similar area to anchovies during November and generally have two spawning peaks in early spring and autumn, which occur on either side of the peak anchovy spawning period. There has been a recent shift westward in the sardine spawning distribution in November, with the majority of spawning now occurring on the west coast between latitudes 31°S and 35°S, and to a lesser extent, off the central and eastern Agulhas Bank, concurrent with anchovy (Beckley and van der Lingen 1999; see Figure 5-20). Sardine spawning also occurs on the east coast and even off KwaZulu-Natal, where sardine eggs can be found from July to November. Importantly, the eggs of both anchovies and sardines are frequently found far offshore on the Agulhas Bank, sometimes extending over the shelf break, and they spawn in a narrow zone between the cool upwelling ridge and the rapidly flowing Agulhas Current.

On the western seaboard, the sardine eggs that are deposited in the peripheral shelf areas are susceptible to being moved away from the coast by powerful equatorial winds that cause Ekman drift. Additionally, the eggs and larvae can be caught up in filaments or Agulhas Rings and transported further out to sea. Sardines have a lengthy spawning season that spans from late winter to spring and from autumn, when the southern winds are not at their strongest. The majority of the new recruits on the west coast likely originate from eggs laid either before or after the summer southern wind peak (see Figure 5-21). Juveniles shoal and then begin a southward migration. It is at this stage that both anchovy and sardine are targeted by the small pelagic purse seine fishery.

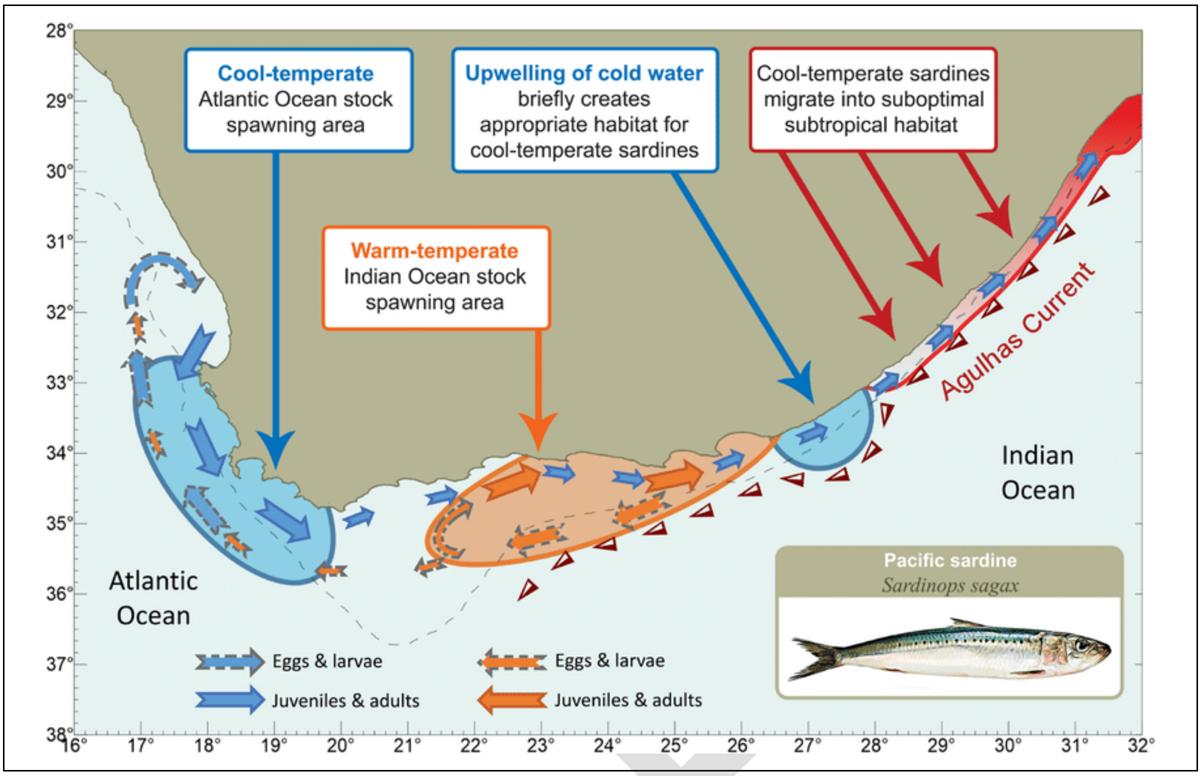


Figure 5-19: Stock structure of Pacific sardine, *S. sagax*, in South African waters. The spawning area in the Atlantic Ocean (blue) is numerically dominated by cool-temperate sardine, and the spawning area in the Indian Ocean (orange) is dominated by warm-temperate sardines (Teske *et al.*, 2021).

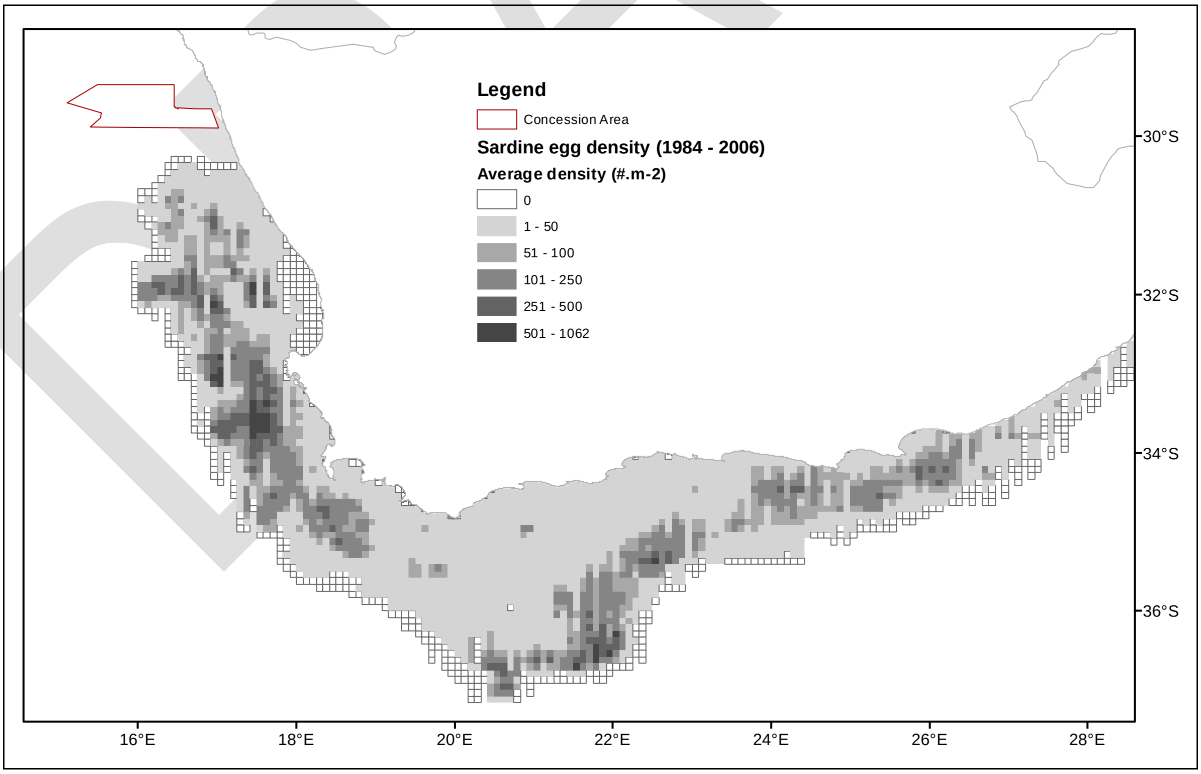


Figure 5-20: The Concession Area (red polygon) in relation to the distribution of sardine spawning areas, as measured by egg densities (collected during spawner biomass surveys by DFFE over the period 1984 to 2006).

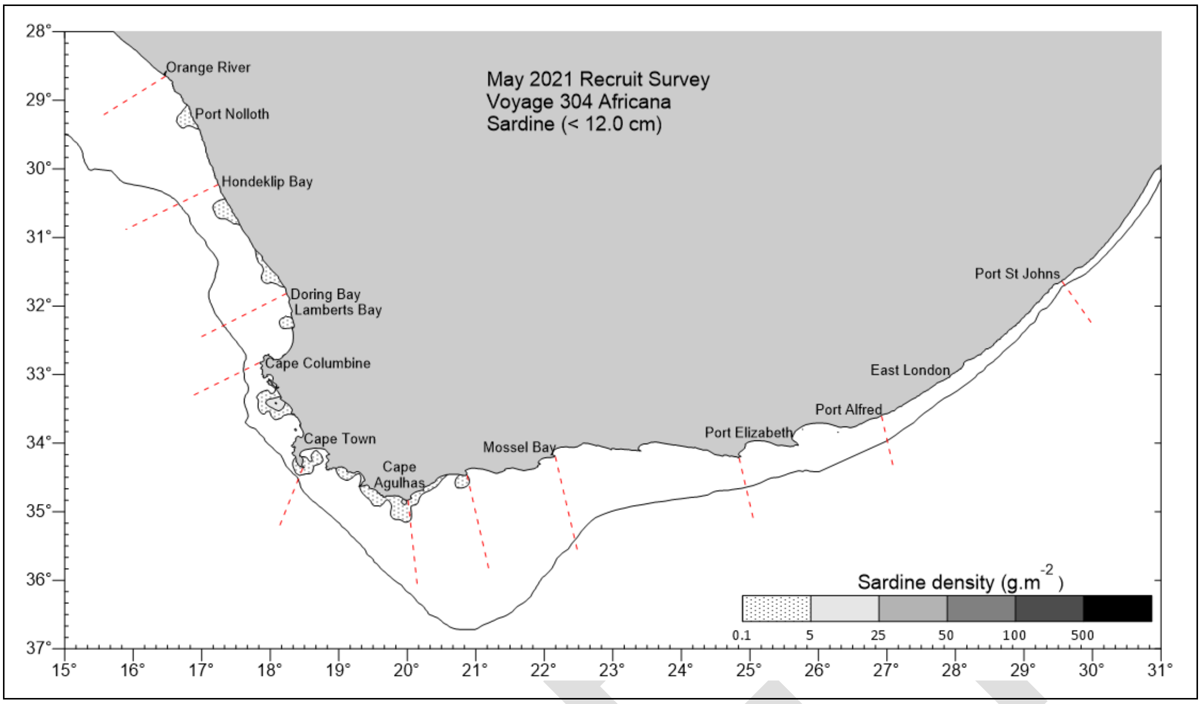


Figure 5-21: Distribution and relative abundance of sardine recruits (< 12 cm) (DFFE Small Pelagic Scientific Working Group FISHERIES/2021/JUL/SWG-PEL/51Draft).

Hake species

The two hake species, shallow-water hake (*M. capensis*) and deep-water hake (*M. paradoxus*), have different spawning patterns in terms of depth and timing. Hake spawn throughout the year, with peaks in October/November and March/April, and are serial spawners (Johann Augustyn, SADSTIA and Dave Japp, CapMarine pers com.). Although the Namibian spawning ground will be discussed separately it is important to note that deep-water hake (*M. paradoxus*) do not spawn in Namibian waters, but shallow-water hake (*M. capensis*) does. Adult hakes generally migrate offshore during June to August, and it is here that they are targeted by commercial fisheries. However, it's important to note that the timing and extent of adult hake movements can vary depending on factors such as water temperature, food availability, and environmental conditions.

Shallow-water hake spawn mainly over the shelf, at depths less than 200 m, while deep-water hake spawn in deeper waters beyond the shelf. Although both species spawn throughout their distributional range, high spawning concentrations occur mid-shelf off Cape Columbine and on the western Agulhas Bank, with peak spawning areas observed at 31.0°-32.5°S and 34.5°-36.0°S (Jansen *et al.*, 2015; Refer to Figure 5-22).

The depth at which the hake species spawn differs as well, with *M. paradoxus* spawning at bottom depths between 200 m and 650 m, and *M. capensis* spawning at an average depth of 180 m. The distribution of their eggs also varies, with *M. paradoxus* eggs distributed over greater bottom depths (340 m – 1500 m) than *M. capensis* eggs (120 m to 300 m) (Stenevik *et al.*, 2008; see Figure 5-23).

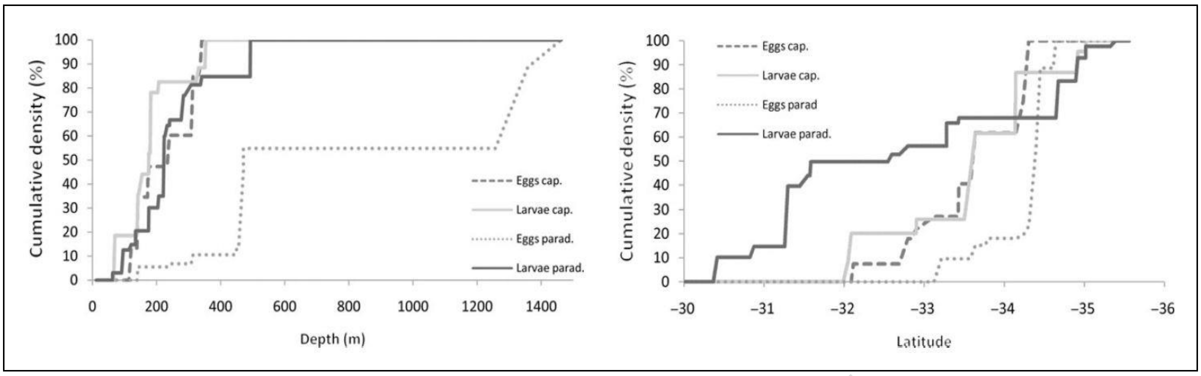


Figure 5-22: Cumulative density plots of Cape hake eggs and larvae sorted by (left panel) increasing seafloor depth and (right panel) increasing latitude (degrees south) (Stenevik *et al*., 2008).

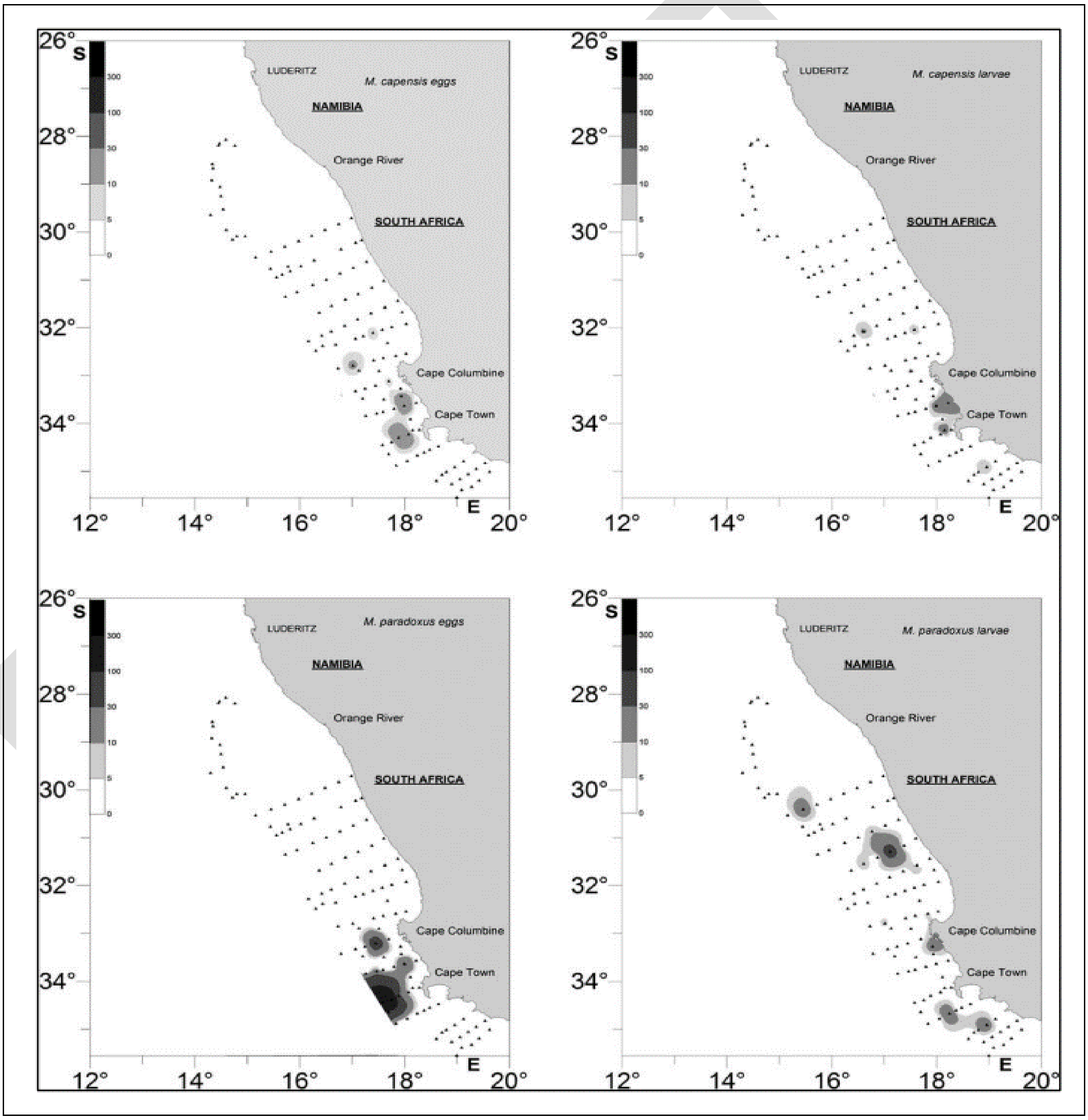


Figure 5-23: Station map showing the distribution of eggs (left) and larvae (right) of Cape hakes (*M. capensis* upper and *M. paradoxus* lower) during a research survey conducted between September and October 2005. Numbers per 10 m^2 (Stenevik *et al*., 2008).

Water currents play a crucial role in the transport of hake spawning products. The offshore drift route along the outer shelf carries the eggs and larvae of both species away from the coast and into the deep ocean, while inshore drift transports larvae along the west coast to the Orange Banks, with *M. paradoxus* mainly concentrated around the 100 m depth contour (Stromme *et al.*, 2015). Eggs spawned inshore are likely to be transported in the slower inshore branch of the current from the western Agulhas Bank to inshore areas farther north (Grote *et al.*, 2012 in Jansen *et al.*, 2015). The vertical distribution of hake eggs and larvae is between the surface and 200 m depth, with the highest concentrations in the 50 – 100 m depth range (Stenevik *et al.*, 2008). Compared to pelagic species, the eggs and larvae of hake are found deeper in the water column, making them less vulnerable to Ekman transport (Sundby *et al.*, 2001; Hutchings *et al.*, 2002 in Stenevik *et al.*, 2008).

Snoek

Snoek (*Thyrsites atun*) is a valuable commercial species and is targeted during their inshore migration period by the linefishery and small-scale fishers. It is also landed by the demersal trawl fishery as a by-catch species. Snoek is also a significant predator of small pelagic fish in the Benguela ecosystem. The South African population reaches 50% sexual maturity at a fork length of around 73 cm (3 years). Spawning takes place offshore during winter-spring (June to October) along the shelf break (150-400 m) of the western Agulhas Bank and the South African west coast. Eggs and larvae are transported by prevailing currents to a primary nursery ground located north of Cape Columbine and a secondary nursery area situated to the east of Danger Point, both shallower than 150 m (Figure 5-24). Juveniles grow between 33 and 44 cm in their first year (3.25 cm/month) and remain on the nursery grounds until maturity. Their onshore-offshore distribution between 5 and 150 m isobaths is determined primarily by prey availability and includes a seasonal inshore migration in autumn in response to clupeoid recruitment.

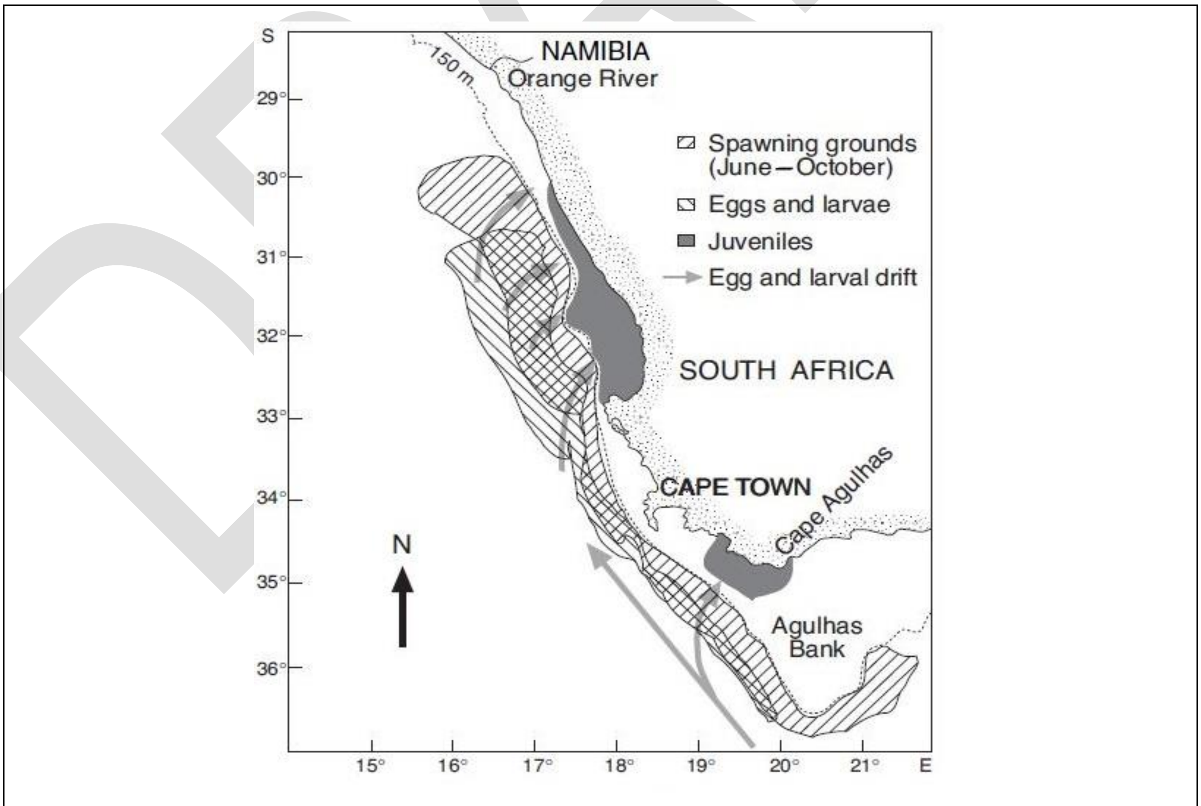


Figure 5-24: Conceptual model depicting the life history of snoek (Griffiths, 2002) in the southern Benguela ecosystem, including spawning grounds, distribution and transport of eggs and larvae, and the nursery areas.

Adults can be found throughout the distribution range of the species, and while they move offshore to spawn, there is a southward dispersion as the spawning season progresses. Their longshore movement is apparently random and without a seasonal basis. The relative condition of both sexes declines significantly during spawning, with females experiencing higher mesenteric fat loss despite consuming prey at a greater rate. Sex ratios and indices of prey consumption suggest that females on the west coast move inshore to feed between spawning events, while those found farther south along the western Agulhas Bank remain on the spawning ground throughout the season. This difference in behavior is attributed to the higher offshore abundance of clupeid prey on the western Agulhas Bank, as determined from diet and prey consumption rates (Griffiths, 2002).

Other Important Linefish

The inshore area of the Agulhas Bank, especially between the cool water ridge and the shore, serves as an important nursery area for numerous linefish species (e.g., elf *Pomatomus saltatrix*, leervis *Lichia amia*, geelbek *Atractoscion aequidens*, carpenter *Argyrozona argyrozona*) (Wallace *et al.,* 1984; Smale *et al.,* 1994). A significant proportion of these eggs and larvae originate from spawning grounds along the east coast, as adults undertake spawning migrations along the South Coast into KwaZulu-Natal waters (van der Elst 1976, 1981; Griffiths 1987; Garratt 1988; Beckley & van Ballegooyen 1992). The eggs and larvae are subsequently dispersed southwards by the Agulhas Current, with juveniles occurring on the inshore Agulhas Bank, using the area between the cold-water ridge and the shore as nursery grounds (van der Elst 1976, 1981; Garratt 1988). In the case of the carpenter, a high proportion of the reproductive output comes from the central Agulhas Bank and the Tsitsikamma MPA, and two separate nursery grounds exist, one near Gqeberha and a second off the deep reefs off Cape Agulhas, with older fish spreading eastwards and westwards (van der Lingen *et al.*, 2006).

For breeding season and locality of prominent commercial, recreational, and artisanal linefish species associated with the Western Cape please refer to the Table 5-10. Table 5-11 shows known spawning periods of key commercial species off the West Coast of South Africa.

Table 5-10: Summary breeding season and locality for important linefish species in Western Cape. Information adapted from Marine Linefish Species Profiles (Mann *et al.*, 2013).

Common Name	*Scientific Name*	*Concerned Fishery*	*Breeding/spawning Season*	*Breeding/spawning Locality*
Blue Hottentot	*Pachymetopon blochii*	Artisanal line fishery, Recreational shore anglers and ski-boat fishers, bycatch of the gill-net fishery.	Throughout the year, with peaks in winter and summer (Pulfrich and Griffiths1988)	Throughout its distribution range (Pulfrich and Griffiths 1988)
Carpenter	*Argyrozona argyrozona*	Commercial line fishery, bycatch in demersal trawl (Attwood et al. 2011)	Summer and autumn (Brouwer and Griffiths 2005)	Throughout its distribution range (Brouwer and Griffiths 2005)
Dusky Kob	*Argyrosomus japonicus*	Mostly recreational shore, estuarine and ski boat anglers but also a component of commercial and artisanal line fishery.	October to January in the Eastern and Western Cape (Griffiths 1996)	Inshore reefs, pinnacles and wrecks (mainly at night) in KZN, Transkei and EC (Griffiths 1996, Connell 2012)
Geelbek	*Atractoscion aequidens*	Boat-based commercial and recreational line fishery. To a lesser extent, artisanal line fishery. Bycatch of the inshore demersal trawl.	Aug-Nov with a peak in Sep-Oct (Garratt 1988, Griffiths and Hecht 1995b, Connell 2012)	KZN offshore reefs 40-60m (Griffiths and Hecht 1995b, Connell 2012)
Red Roman	*Chrysoblephus laticeps*	Commercial and recreational line fishery.	Oct-Jan (Buxton 1990) observed Nov-Feb in the Goukamma area, WC (Götz 2005)	Eastern and Western Cape
Silver Kob	*Argyrosomus inodorus*	Recreational and commercial line fishery in SA and Namibia, bycatch of inshore trawl, taken by artisanal beach seine fishery.	Throughout the year, mainly from Aug-Dec with a peak between Sep-Nov (Griffiths 1997)	Inshore throughout distribution (Griffiths 1997)
White stumpnose	*Rhabdosargus globiceps*	Commercial and Recreational line fishery, occasional bycatch to artisanal net fisheries.	Summer, Sep-Mar (Griffiths et al. 2002).	Throughout the distribution range (Griffiths et al. 2002)
Yellowtail	*Seriola lalandi*	Large component of commercial line fishery, recreational fishery and artisanal beach seine fishers off Simonstown.	November to February.	Southern KZN to Cape Point.

Table 5-11: Summary of known spawning periods for key commercial species off the West Coast of South Africa, which have been detailed in the Commercial Fishing Sectors Section.

Species	*Breeding/Spawning Season*	*Breeding/Spawning Locality*	*Recruits*
Horse mackerel	June to August	Central/ Eastern Agulhas Bank	Inshore southern Cape
Anchovy	October to March, peaks November to December	Agulhas Bank and West Coast nursery grounds	Inshore West Coast
Sardine	August to February	West Coast and Agulhas nursery grounds	Migrate South East back to Agulhas Bank
Hake spp.	Throughout the year, peaks in March/April and October/November	Throughout SA distribution, concentrated mid-shelf Cape Columbine and W Agulhas Bank	Inshore, migrate to depth as adults
Snoek	June to October	West Coast and Agulhas Bank	Cape Columbine and Danger Point nursery
Squid	Throughout the year with peaks in November and December	Nearshore Eastern Agulhas Bank	Offshore and Westward

Research Surveys

Swept-area trawl surveys of demersal fish resources are carried out twice a year by DFFE in order to assess stock abundance. Results from these surveys are used to set the annual total allowable catch (TAC) for demersal fisheries. First started in 1985, the West Coast survey extends from Cape Agulhas (20°E) to the Namibian maritime boarder and takes place over the duration of approximately one month between January and March. The survey of the Southeast coast (20°E – 27°E longitude) takes place in April/May. Following a stratified, random design, bottom trawls are conducted to assess the biomass, abundance and distribution of hake, horse mackerel, squid and other demersal trawl species on the shelf and upper slope of the South African coast. Trawl positions are randomly selected to cover specific depth strata that range from the coast to the 1 000 m isobath. Figure 5-25 shows the spatial distribution of research trawls in relation to the Concession Area. Over the period 2013 to 2021 an average of six trawls per survey were undertaken within the Concession Area at a depth range of 120 m to 200 m. Research activity within the area takes place during February/March.

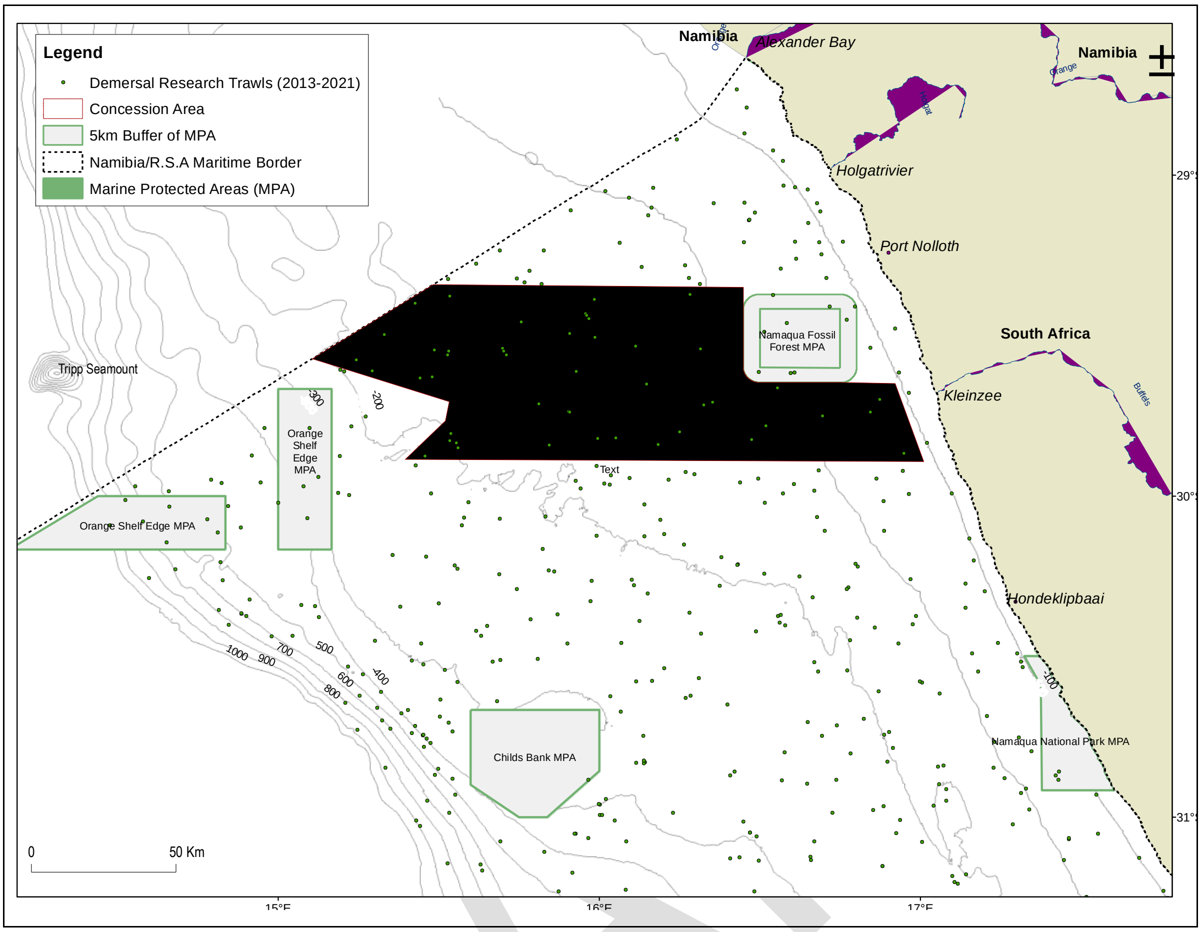


Figure 5-25: Spatial distribution of trawling effort expended by DFFE over the period 2013 to 2021 in assessing the biomass of demersal fish species.

The biomass of small pelagic species is assessed bi-annually by an acoustic survey. The first of these surveys is timed to commence in mid-May and runs until mid-June while the second starts in mid-October and runs until mid-December. The timing of the demersal and acoustic surveys is not flexible, due to restrictions with availability of the research vessel as well as scientific requirements. The surveys are designed to cover an extensive area from the Orange River on the West Coast to Port Alfred on the East Coast and the DFFE survey vessel progresses systematically from the Northern border Southwards, around Cape Agulhas and on towards the east. During these surveys the survey vessels travel pre-determined transects (perpendicular to bathymetric contours) running offshore from the coastline to approximately the 200 m isobath. There are a few occasions that the transects off Cape Point will just extend to about 1000 m, with the shelf being so narrow there and the offshore fish distribution being dictated by strong frontal features, there would be occasions where the survey would go even further offshore than the 1000 m. Figure 5-26 shows the abundance of anchovy recruits as measured in the most recent 2020 pelagic recruitment survey undertaken by DFFE. Figure 5-27 shows that up to five research survey transects are undertaken by DFFE within Sea Areas 4C and 5C.

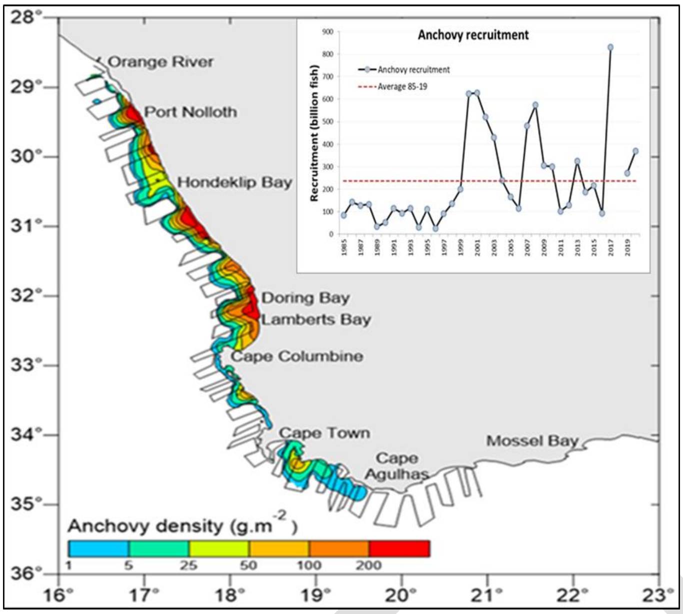


Figure 5-26: Recruitment survey results (May 2020) for anchovy and recruitment trend (inset). The red dotted line is the running average level of recruitment since 1985 and is used as one of the stock status indicators (information and figure provided by J. Coetzee and D. Merkel of DFFE).

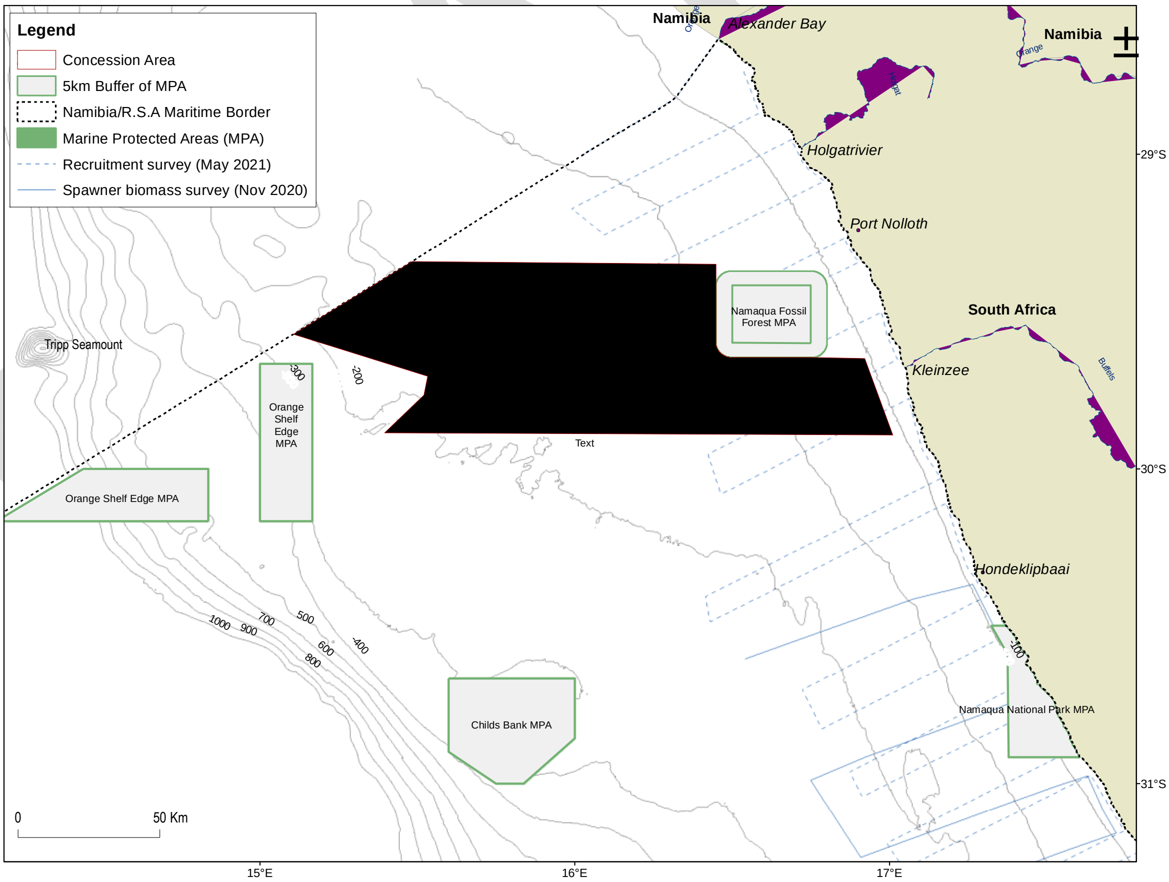


Figure 5-27: Spatial distribution of survey transects undertaken by DFFE during November 2020 and May 2021 during the research surveys of recruitment and spawner biomass of small pelagic species, respectively.

Commercial Fishing Sectors

Demersal Trawl

The primary fisheries in terms of highest economic value are the demersal (bottom) trawl and longlinefisheries targeting the Cape hakes (*Merluccius paradoxus* and *M. capensis*). Secondary species include a large assemblage of demersal fish of which monkfish (*Lophius vomerinus*), kingklip (*Genypterus capensis*) and snoek (*Thyrsites atun*) are the most commercially important. The demersal trawl fishery comprises an offshore (deep-sea) and inshore fleet, which differ primarily in terms of vessel capacity and the areas in which they operate. The wholesale value of catch landed by the inshore and offshore demersal trawl sectors, combined, during 2017 was R3.982 billion, or 40.5% of the total value of all fisheries combined.

The 2022 TAC for hake is set at 132 154 tons, of which 84% and 6% is allocated to the offshore and inshore trawl sectors, respectively. (The remaining 10% is allocated to the hake demersal longline sector – refer to the Demersal Longline Section).

The annual TAC limits and landings of hake (both species) by the trawl and longline sectors is listed in Table 5-12. A time-series of total hake catch as well as hake catch by sector is shown in Figure 5-28.

Table 5-12: Annual TAC limits and catches (tons) of the two species of hake by the hake-directed fisheries on the West (WC) and South (SC) coasts (DEFF, 2020[20]).

		M. paradoxus						*M. capensis*						TOTAL both species
Year	**TAC**	**Deep-sea**		**Longline**		**TOTAL**		**Deep-sea**		**Inshore**	**Longline**		**TOTAL**	
		WC	SC	WC	SC			WC	SC	SC	WC	SC		
2010	119831	69709	15457	2394	1527	89087		10186	4055	5472	3086	3024	26098	115185
2011	131780	76576	17904	2522	140	97142		15673	4086	6013	3521	3047	35525	129667
2012	144671	81411	16542	4358	306	102616		12928	4584	3223	2570	1737	25050	127666
2013	156075	74341	28859	6056	60	109316		8761	4475	2920	2606	1308	20071	129387
2014	155280	73252	41156	6879	8	121295		9671	6286	2965	2123	315	21361	142656
2015	147500	77521	31745	4001	18	113286		12727	4085	3077	2325	53	22217	135503
2016	147500	93173	18968	2806	1	114948		14744	2810	3973	4360	2	25889	140837
2017	140125	72326	30961	5288	25	108600		15273	4466	2812	2807	126	25488	134088
2018	133119	64252	29218	5217	90	98777		12689	12863	3983	2615	481	32668	131370
2019	146431	70608	22201	5328	34	98171		14193	9454	4149	3623	299	31718	129898
2020	146400	97093	10061	5847	47	113048		18115	3500	4536	2348	321	28820	141872
2021	139109	102865	15597	5892	18	124372		15585	2937	4517	2932	194	26165	150537
2022	132154													

[20] FISHERIES/2022/OCT/SWG-DEM/35rev: Ross-Gillespie (2022). Update to the hake Reference Case Operating Model with corrected longline data, and 2021 commercial and 2022 survey data. Marine Resource Assessment and Management Group, University of Cape Town, Rondebosch, 7701

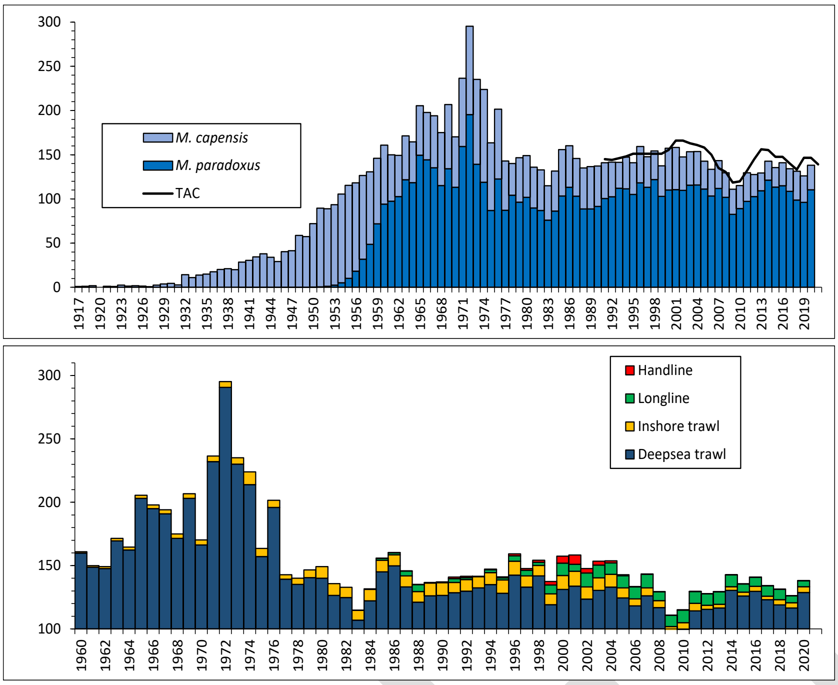


Figure 5-28: (Upper) Total catches ('000 t) of Cape hakes split by species over the period 1917–2020 and the TAC set each year since the 1991. (Lower) Catches of Cape hakes per fishing sector for the period 1960–2020. Prior to 1960, all catches are attributed to the deep-sea trawl sector (DFFE, 2022).

The offshore fishery comprises 45 vessels that operate from most major harbours on both the West and South Coasts. On the West and South-West Coasts, these grounds extend in a continuous band along the shelf edge between the 200 m and 1 000 m bathymetric contours although most effort is in the 300 m to 600 m depth range. Monkfish-directed trawlers tend to fish shallower waters than hake-directed vessels on mostly muddy substrates. The deep-sea sector is prohibited from operating in waters shallower than 110 m or within five nautical miles of the coastline.

The inshore fishery consists of 31 vessels, which operate on the South Coast mainly from the harbours of Mossel Bay and Gqeberha. Inshore grounds are located on the Agulhas Bank and extend towards the Great Kei River in the east. Vessels also target sole close inshore between Struisbaai and Mossel Bay, between the 50 m and 80 m isobaths. Hake is targeted further offshore in traditional grounds between 100 m and 200 m depth in fishing grounds known as *the Blues* located on the Agulhas Bank.

The SADSTIA has implemented a self-imposed restriction which confines fishing effort to a designated area (the historical footprint of the fishery). This spatial restriction is also written into the permit conditions for the fishery. Demersal trawling is centred along the 500 m bathymetric contour but ranges to 300 m and to 200 m in places. Figure 5-29 shows an overview of the spatial distribution of fishing activity within the EEZ and in relation to Sea Areas 4C and 5C. Figure 5-30 shows the demersal trawling activity in the vicinity of the Concession Area. Over the period 2017 to 2021, there has been no fishing effort reported within the Concession Area; however, trawling activity may be expected offshore of the prospecting application area in waters deeper than 200 m on both the Namibian and South African sides of the maritime border. The Concession Area coincides with recruitment areas for hake and other demersal species (see Figure 5-16).

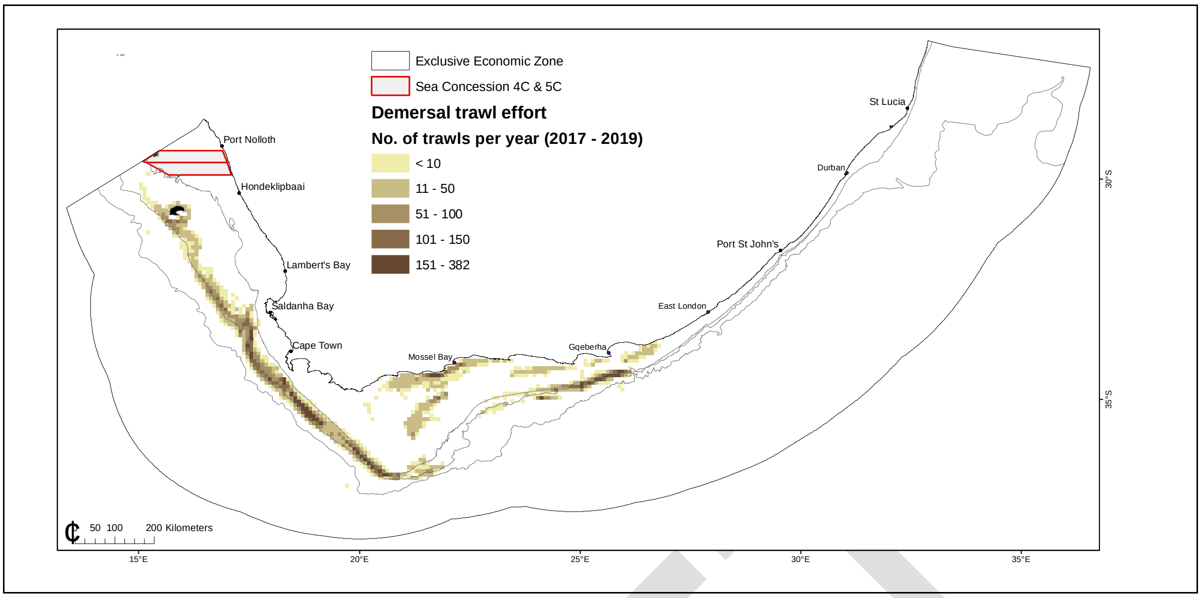


Figure 5-29: Overview of the spatial distribution of fishing effort expended by the demersal trawl sector within the South African EEZ and in relation to Sea Areas 4C and 5C.

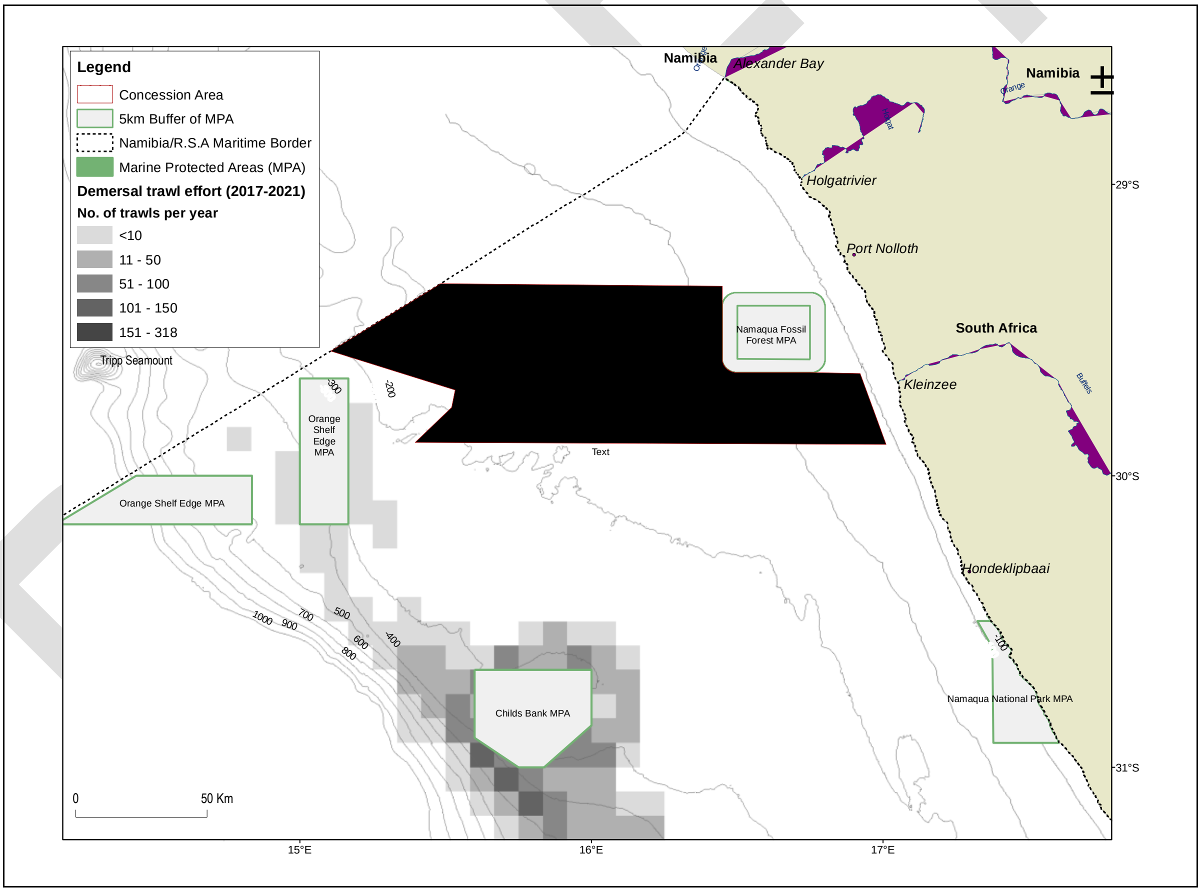


Figure 5-30: Spatial distribution of fishing effort expended by the demersal trawl sector in relation to the Concession Area (2017 – 2021).

Demersal Longline

Like the demersal trawl fishery, the target species of the longlinefishery is the Cape hakes, with a small non-targeted commercial by-catch that includes kingklip. In 2017, 8113 tons of catch was landed with a wholesale value of R319.2 million, or 3.2% of the total value of all fisheries combined. Landings of

8563 tons of hake were reported for the longline sector in 2020 and 9036 tons in 2021. Refer to Table 5-12 for the landings of hake by the demersal longlinefishery over the period 2010 to 2021.

A demersal longline vessel may deploy either a double or single line which is weighted along its length to keep it close to the seafloor. Steel anchors, of 40 kg to 60 kg, are placed at the ends of each line to anchor it and are marked with an array of floats. If a double line system is used, top and bottom lines are connected by means of dropper lines. Since the top-line (polyethylene, 10 – 16 mm diameter) is more buoyant than the bottom line, it is raised off the seafloor and minimizes the risk of snagging or fouling. The purpose of the top-line is to aid in gear retrieval if the bottom-line breaks at any point along the length of the line. Lines are typically between 10 km and 20 km in length, carrying between 6 900 and 15 600 hooks each. Baited hooks are attached to the bottom line at regular intervals (1 to 1.5 m) by means of a snood. Gear is usually set at night at a speed of between five and nine knots. Once deployed the line is left to soak for up to eight hours before it is retrieved. A line hauler is used to retrieve gear (at a speed of approximately one knot) and can take six to ten hours to complete. A schematic representation of the gear configuration used by the demersal longline fleet is shown in Figure 5-32.

Currently 64 hake-directed vessels are active within the fishery, most of which operate from the harbours of Cape Town and Hout Bay. Fishing grounds are similar to those targeted by the hake-directed trawl fleet. The hake longline footprint extends down the west coast from approximately 150 km offshore of Port Nolloth (15°E, 29°S). It lies inshore to the south of St Helena Bay moving offshore once again as it skirts the Agulhas Bank to the south of the country (21°E, 37°S). Along the South Coast the footprint moves inshore again towards Mossel Bay. The eastern extent of the footprint lies at approximately (26°E, 34.5°S). Lines are set parallel to bathymetric contours, along the shelf edge up to the 1 000 m depth contour in places. The patchier nature of effort in the north-western extents of the footprint and the eastern edge of the Agulhas Bank may be attributed to proximity to fishing harbours. Figure 5-18 shows the spatial extent of demersal longline grounds within the South African EEZ.

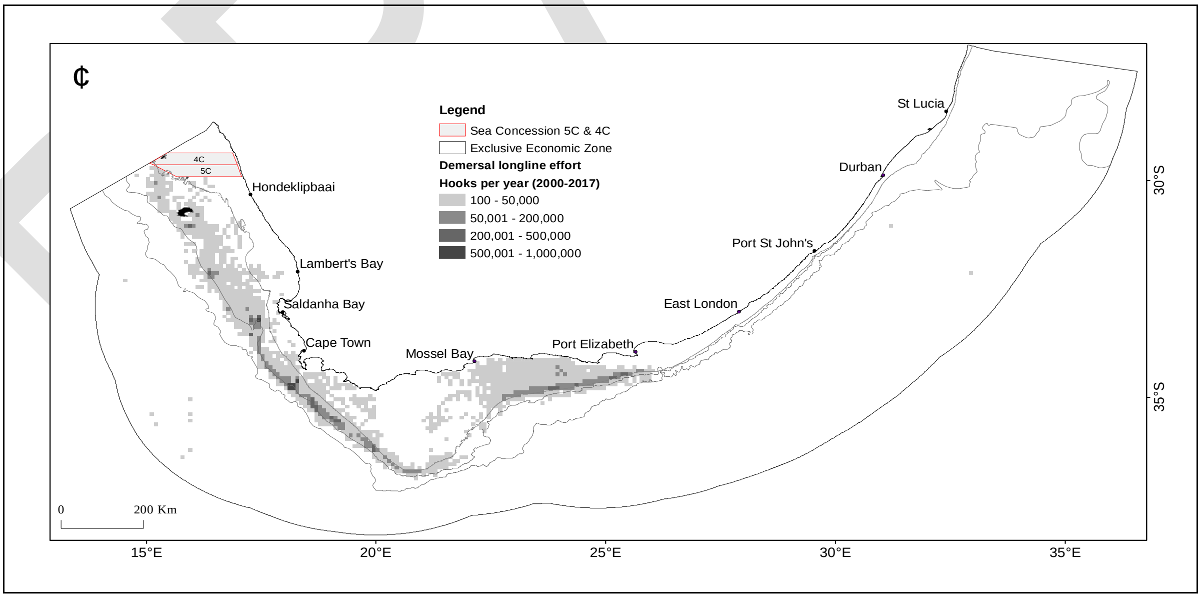


Figure 5-31: An overview of the spatial distribution of fishing effort expended by the demersal longline sector within the South African EEZ and in relation to Sea Areas 4C/ 5C.

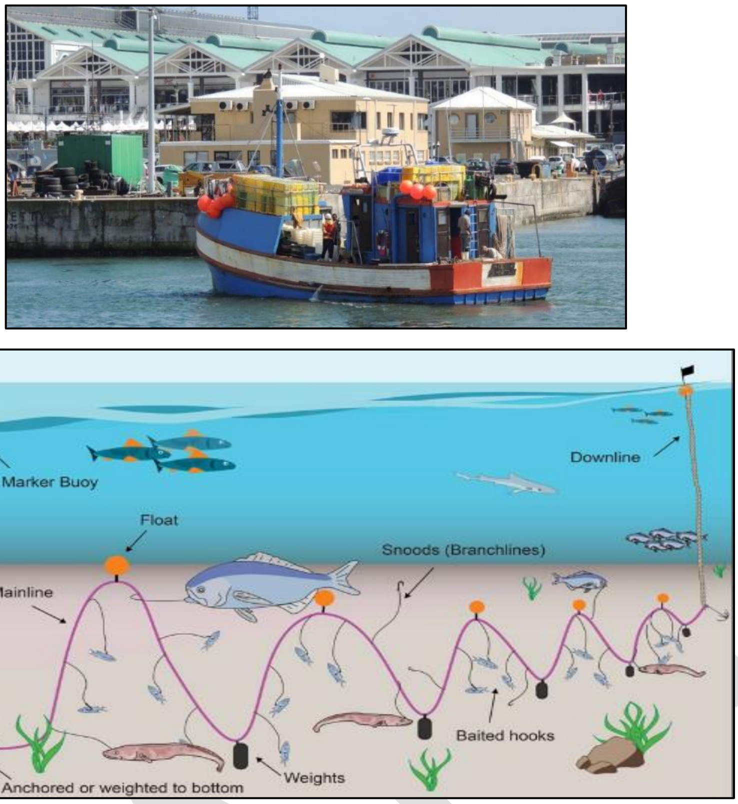


Figure 5-32: Photograph of a registered hake longlinefishing vessel (above) and typical configuration of demersal longline gear used in the South African hake-directed fishery (below: http://www.afma.gov.au/portfolio-item/longlining).

Figure 5-33 shows the spatial distribution of demersal longlinefishing areas in Namibian and South African waters in the vicinity of the Concession Area. A Namibian-registered fleet of demersal longline vessels operate on the Namibian side of the maritime border at a depth range of 200 m to about 500 m. As such, fishing activity can be expected along the boundary of Sea Area 4C which runs along the maritime border with Namibia. The South African fleet of demersal longline vessels also operate at a similar depth range and therefore only minimal amounts of fishing activity were reported within the prospecting application area, which falls inshore of the main fishing grounds.

Over the period 2018 to 2020, an average of 128 000 hooks per year were set within the deep-water portion of the Concession Area yielding 21.9 tonnes of hake. This is equivalent to 0.47% of the overall effort and 0.47% of the overall catch reported nationally by the sector.

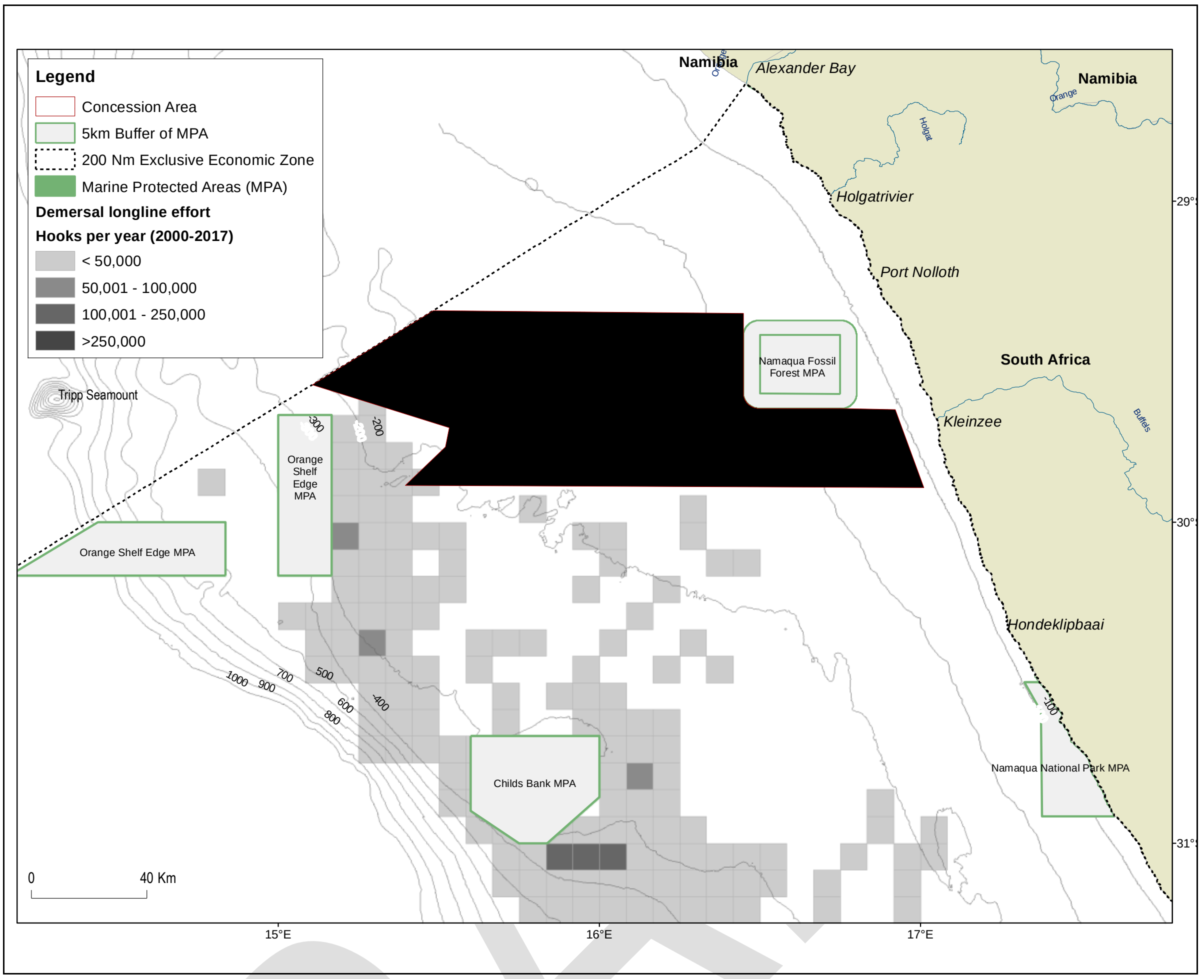


Figure 5-33: Spatial distribution of fishing effort expended by the longline sector targeting demersal fish species in the vicinity of the Concession Area.

Mid-Water Trawl

This sector included six vessels and 34 rights holders which target adult horse mackerel (*Trachurus capensis*) of which a total catch of 19 710 tons were landed in 2020. Mid-water trawl is defined in the MLRA as any net which can be dragged by a fishing vessel along any depth between the seabed and the surface of the sea without continuously touching the bottom. In practice, mid-water trawl gear does occasionally come into contact with the seafloor. Mid-water trawling gear configuration is similar to that of demersal trawlers, except that the net is manoeuvred vertically through the water column (refer to Figure 5-34 for a schematic diagram of gear configuration). Several demersal trawlers are able to undertake mid-water trawling by switching gear and operating under dual rights, but currently the FMV *Desert Diamond* is the only dedicated mid-water trawler and is the largest registered South African commercial fishing vessel. The *Desert Diamond* is 120 m in length and has a Gross Registered Tonnage of 8 000 t. The towed gear may extend up to 1 km astern of the vessel and comprises trawl warps, net, and cod end. Trawl warps are between 32 mm and 38 mm in diameter. The trawl doors (3.5 t each) maintain the net opening which ranges from 120 to 130 m in width and from 40 m to 80 m in height. Weights in front of, and along the ground-rope provide for vertical opening of the trawl. The cable transmitting acoustic signal from the net sounder might also provide a lifting force that maximizes the vertical trawl opening. To reduce the resistance of the gear and achieve a large opening, the front part of the trawls is usually made from very large rhombic or hexagonal meshes. The use of nearly parallel ropes instead of meshes in the front part is also a common design. Once the gear is deployed, the net is towed for several hours at a speed of 4.8 to 6.8 knots predominantly parallel with the shelf break.

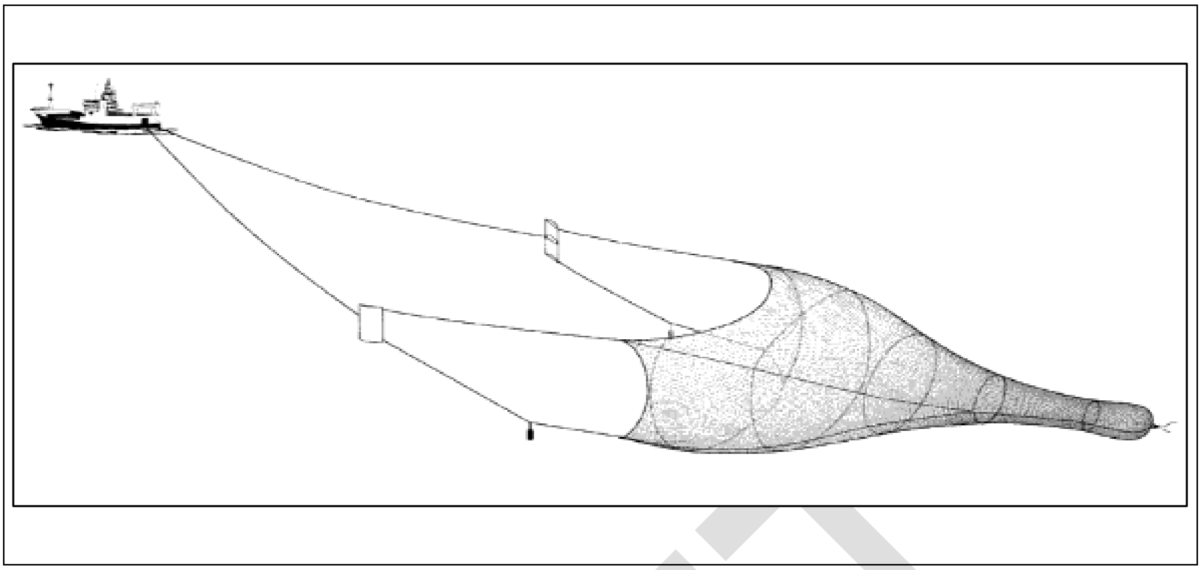


Figure 5-34: Schematic diagram showing the typical gear configuration of a mid-water trawler.

The fishery operates predominantly on the edge of the Agulhas Bank, where shoals are found in commercial abundance. Fishing grounds off the South Coast are situated along the shelf break and three dominant areas can be defined. The first lies between 22 °E and 23 °E at a distance of approximately 70 nm offshore from Mossel Bay and the second extends from 24 °E to 27 °E at a distance of approximately 30 nm offshore. The third area lies to the south of the Agulhas Bank 21 °E and 22 °E. These grounds range in depth from 100 m to 400 m and isolated trawls are occasionally recorded up to 650 m. From 2017, DFFE has permitted experimental fishing to take place westward of 20°E. Figure 5-35 shows the spatial extent of grounds fished by mid-water trawlers within the EEZ and in relation to Sea Areas 4C/5C. The Concession Area is situated approximately 330 km from grounds fished by the sector and there is no expected overlap of project activities with these grounds.

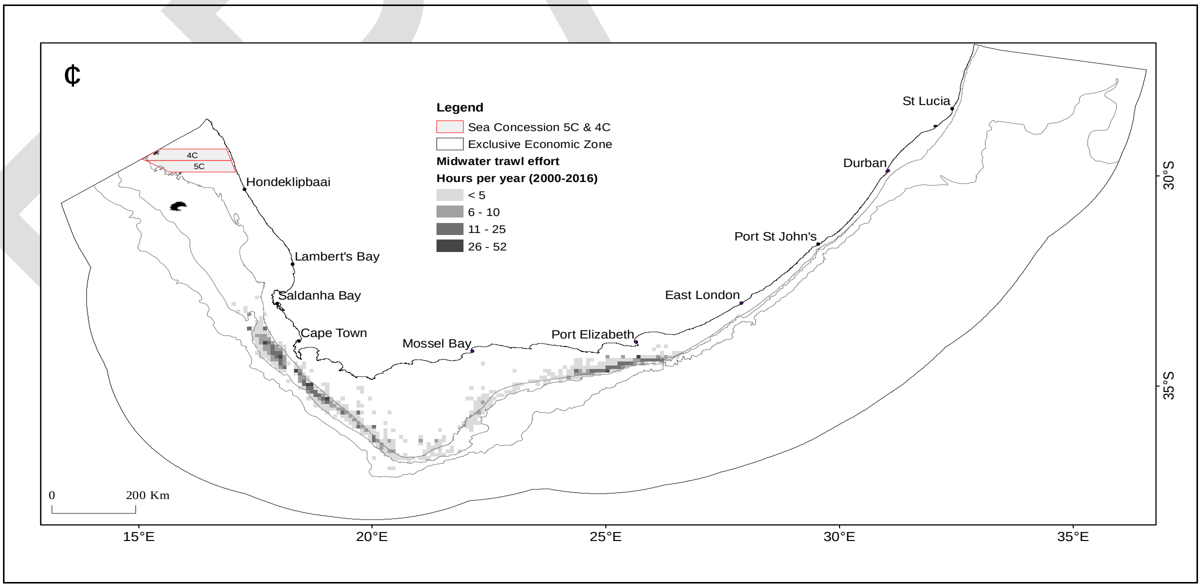


Figure 5-35: Overview of the spatial distribution of fishing effort expended by the mid-water trawl sector targeting horse mackerel within the South African EEZ and in relation to Sea Areas 4C and 5C.

Small Pelagic Purse-Seine

The pelagic-directed purse-seine fishery targets adult sardine (*Sardinops sagax)* and anchovy (*Engraulis encrasicolus*). Right Holders may also target round herring (*Etrumeus whitheadi*) and meso pelagic species (Lantern and Lightfish combined) which have industry precautionary upper catch limits (PUCLs) – currently set at 100 000 t for round herring and 50 000 t for Lantern and Lightfish (combined). Bycatch species are mainly juvenile sardine, horse mackerel and chub mackerel. It is the largest South African fishery by volume (tons landed) and the second most important in terms of economic value. The wholesale value of catch landed by the sector during 2017 was R2.164 billion, or 22% of the total value of all fisheries combined.

The total combined catch of anchovy, sardine and round herring landed by the pelagic fishery has decreased by 38% from 395 000 t in 2016 to just 243 000 t in 2021 (Figure 5-36). This is below both long-term (338 000 t) and short-term (294 000 t) averages. In 2019 and 2020, both the sardine and anchovy management procedures required "exceptional circumstances" due the low abundance levels. Refer to Figure 5-37 for the time-series of biomass estimates for anchovy, sardine, and round herring from 1984 to 2020 (Coetzee *et al*., 2020).

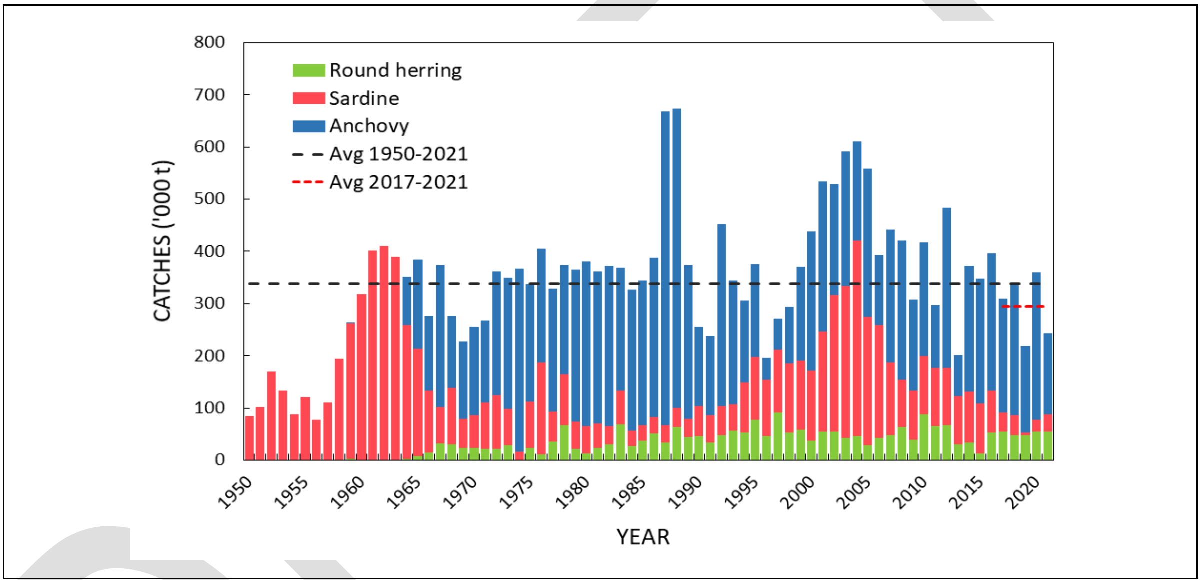


Figure 5-36: The annual combined catch of anchovy, sardine, and round herring. Also shown is the average combined catch since the start of the fishery (1950-2021; black dashed line) and for the past five years (red solid line) (DFFE, 2022).

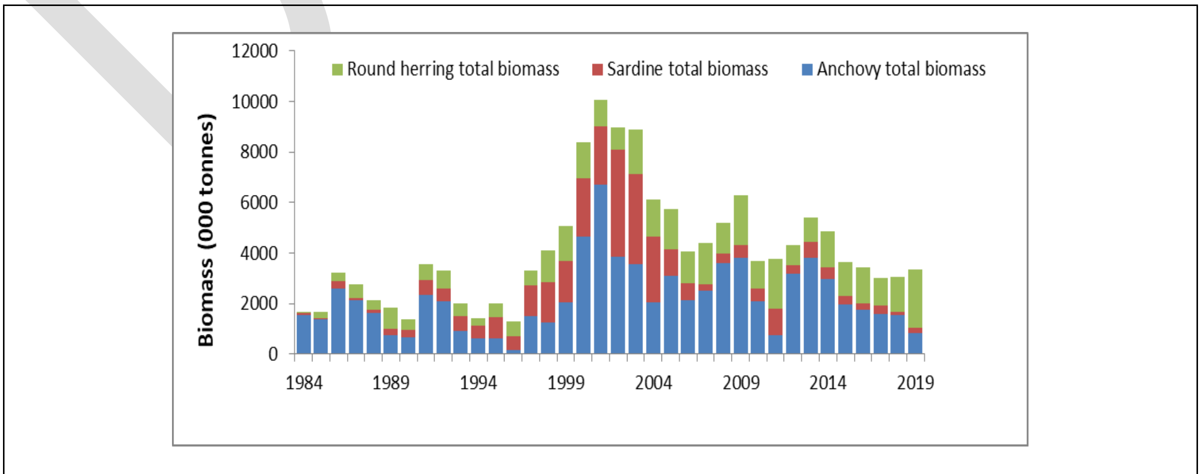


Figure 5-37: Biomass estimates of anchovy, sardine, and round herring from the DFFE recruitment surveys from 1984 to 2020 (Source: Coetzee *et al*., 2020).

The abundance and distribution of these small pelagic species fluctuates in accordance with the upwelling ecosystem in which they exist. Fish are targeted in inshore waters, primarily along the West and South Coasts of the Western Cape and the Eastern Cape coast, up to a maximum offshore distance of about 100 km. The majority of the fleet operate from St Helena Bay, Laaiplek, Saldanha Bay and Hout Bay with fewer vessels operating on the South Coast from the harbours of Gansbaai, Mossel Bay and Port Elizabeth. Ports of deployment correspond to the location of canning factories and fish reduction plants along the coast.

The geographical distribution and intensity of the fishery is largely dependent on the seasonal fluctuation and distribution of the targeted species. The sardine-directed fleet concentrates effort in a broad area extending from Lambert's Bay, southwards past Saldanha and Cape Town towards Cape Point and then eastwards along the coast to Mossel Bay and Port Elizabeth. The anchovy-directed fishery takes place predominantly on the South-West Coast from Lambert's Bay to Kleinbaai (19.5°E) and similarly the intensity of this fishery is dependent on fish availability and is most active in the period from March to September. Red-eye round herring (non-quota species) is targeted when available and specifically in the early part of the year (January to March) and is distributed from Lambert's Bay to south of Cape Point. This fishery may extend further offshore than the sardine and anchovy-directed fisheries.

The fishery operates throughout the year with a short seasonal break from mid-December to mid-January. Figure 5-38 shows the species composition by month of landings over the period 2000 to 2016, as well as the average fishing effort by month.

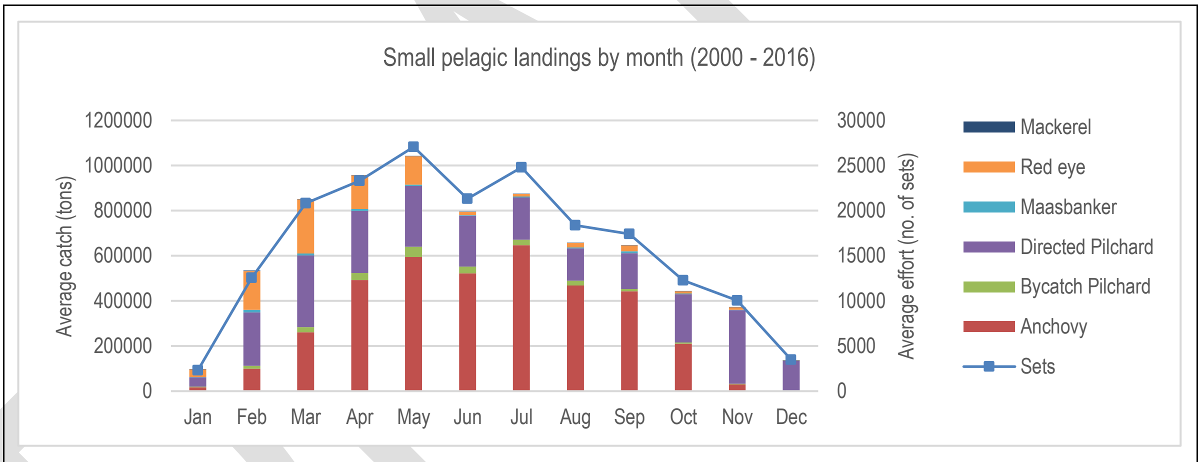


Figure 5-38: Graph showing average monthly catch (tons) and effort (number of sets) reported for the small purse-seine fleet over the period 2000 to 2016.

The fleet consists of approximately 64 wooden, glass-reinforced plastic and steel-hulled vessels ranging in length from 11 m to 48 m (J. de Goede, pers. comm, 2023). The targeted species are surface-shoaling and once a shoal has been located the vessel will steam around it and encircle it with a large net, extending to a depth of 60 m to 90 m (refer to Figure 5-39). Netting walls surround aggregated fish, preventing them from diving downwards. These are surface nets framed by lines: a float line on top and lead line at the bottom. Once the shoal has been encircled the net is pursed, hauled in and the fish pumped on board into the hold of the vessel. it is important to note that after the net is deployed, the vessel has no ability to manoeuvre until the net has been fully recovered on board and this may take up to 1.5 hours. Vessels usually operate overnight and return to offload their catch the following day.

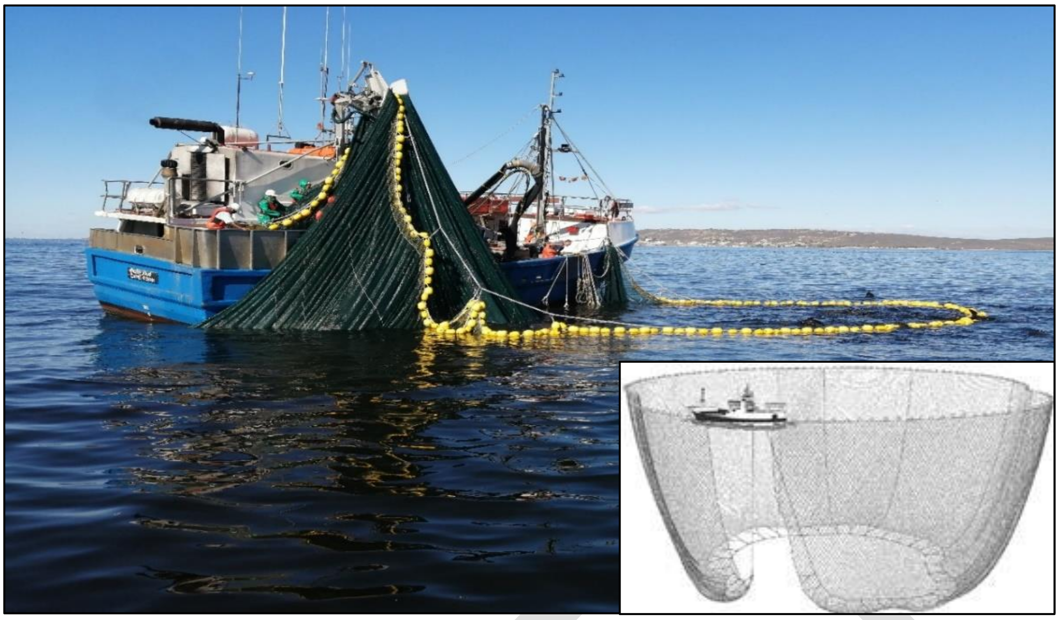


Figure 5-39: Photograph of a purse-seine vessel registered to fish for small pelagic species. Inset shows schematic diagram of typical configuration and deployment of a small pelagic purse-seine for targeting anchovy and sardine as used in South African waters.

Figure 5-40 shows the spatial extent of fishing grounds within the South African EEZ and Figure 5-41 shows grounds in relation to the Concession Area. The main fishing areas are situated at least 150 km south of the Concession Area and there is no spatial overlap with the expected fishing activity of the small pelagic purse-seine sector.

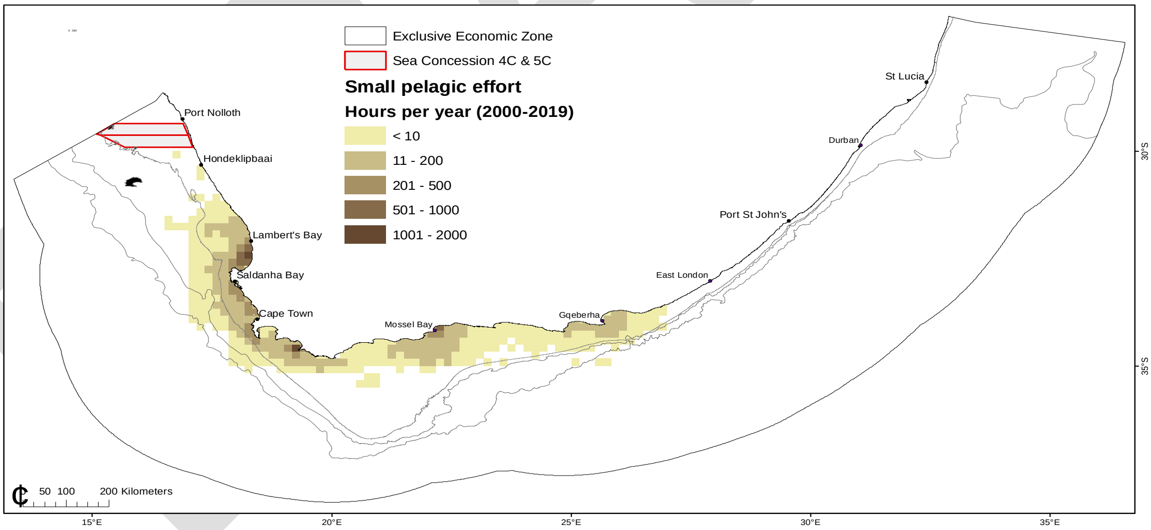


Figure 5-40: An overview of the spatial distribution of fishing effort reported by the purse-seine sector targeting small pelagic species over the period 2000 to 2019 within the South African EEZ and in relation to Sea Areas 4C and 5C.

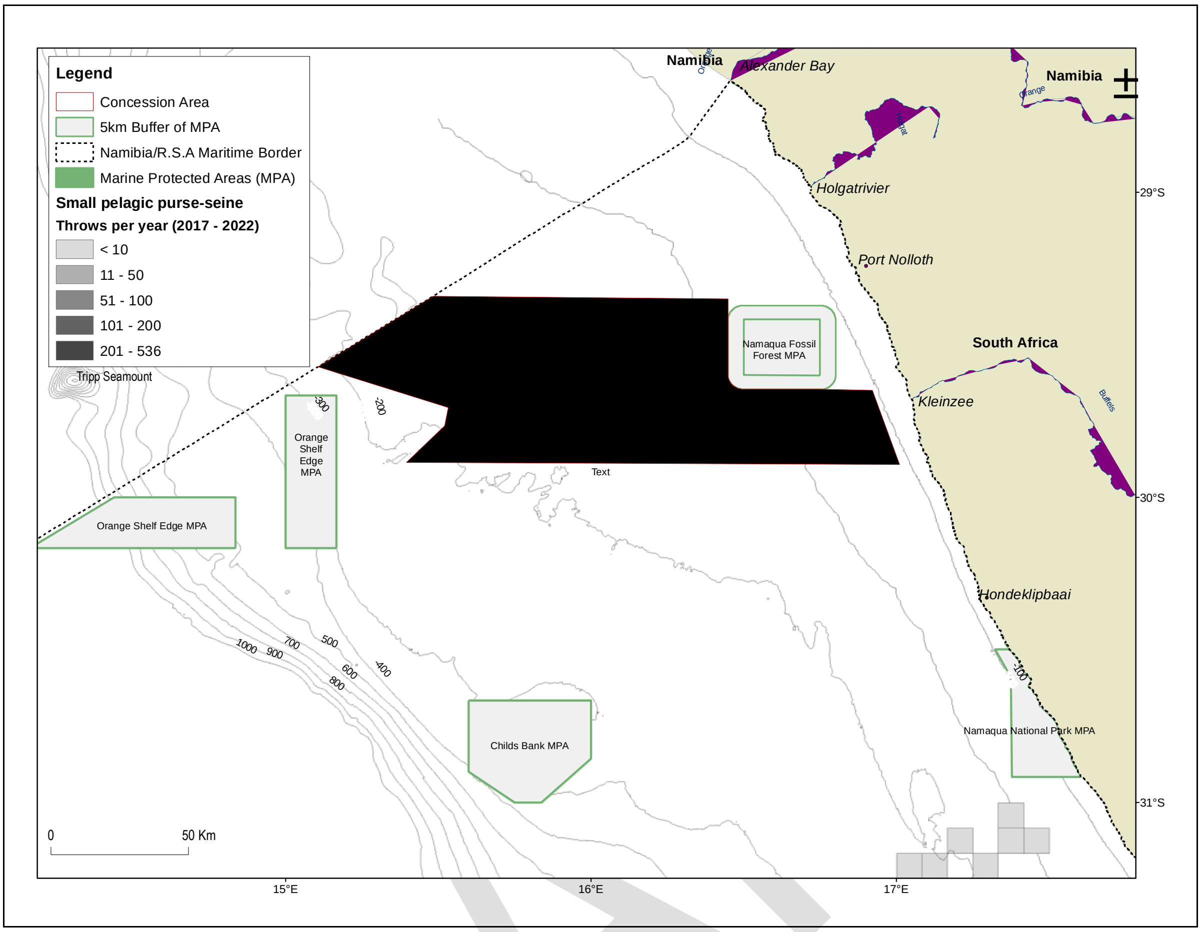


Figure 5-41: Spatial distribution of fishing grounds of the small pelagic purse-seine sector in relation to the Concession Area. Fishing activity is reported by 10 x 10 nautical minute grid block and average annual effort is shown for the period 2017 to 2022.

Large Pelagic Longline

Highly migratory tuna and tuna-like species are caught on the high seas and seasonally within the South African EEZ by the pelagic longline and pole fisheries. Targeted species include albacore (*Thunnus alalunga*), bigeye tuna (*T. obesus*), yellowfin tuna (*T. albacares*) and swordfish (*Xiphias gladius*). The wholesale value of catch landed by the sector during 2017 was R154.2 million, or 1.6% of the total value of all fisheries combined, with landings of 2541 tonnes (2017) and 2815 tonnes (2018). Tuna, tuna-like species and billfishes are migratory stocks and are therefore managed as a “shared resource” amongst various countries under the jurisdiction of the International Commission for the Conservation of Atlantic Tunas (ICCAT) and the Indian Ocean Tuna Commission (IOTC). In the 1970s to mid-1990s the fishery was exclusively operated by Asian fleets (up to 130 vessels) under bilateral agreements with South Africa. From the early 1990s these vessels were banned from South African waters and South Africa went through a period of low fishing activity as fishing rights issues were resolved. Thereafter a domestic fishery developed, and 50 fishing rights were allocated to South Africans only. These rights holders now include a fleet of local long-liners and several Japanese vessels fishing in joint ventures with South African companies. In 2017, 60 fishing rights were allocated for a period of 15 years. The total number of active long-line vessels within South African waters is 22, 18 of which fished in the Atlantic (West of 20°E) during 2017. These were exclusively domestic vessels, with three Japanese vessels fishing exclusively in the Indian Ocean (East of 20°E) during 2017 (DAFF, 2018).

Gear consists of monofilament mainlines of between 25 km and 100 km in length which are suspended from surface buoys and marked at each end. As gear floats close to the water surface it would present a potential obstruction to surface navigation as well as a snagging risk to the gear array towed by the geophysical survey vessel. The main fishing line is suspended about 20 m below the water surface via dropper lines connecting it to surface buoys at regular intervals. Up to 3 500 baited hooks are attached to the mainline via 20 m long trace lines, targeting fish at a depth of 40 m below the surface. Various types of buoys are used in combinations to keep the mainline near the surface and locate it should the line be cut or break for any reason. Each end of the line is marked by a Dahn Buoy and radar reflector, which marks the line position for later retrieval. Typical configuration of set gear is shown in Figure 5-42 below.

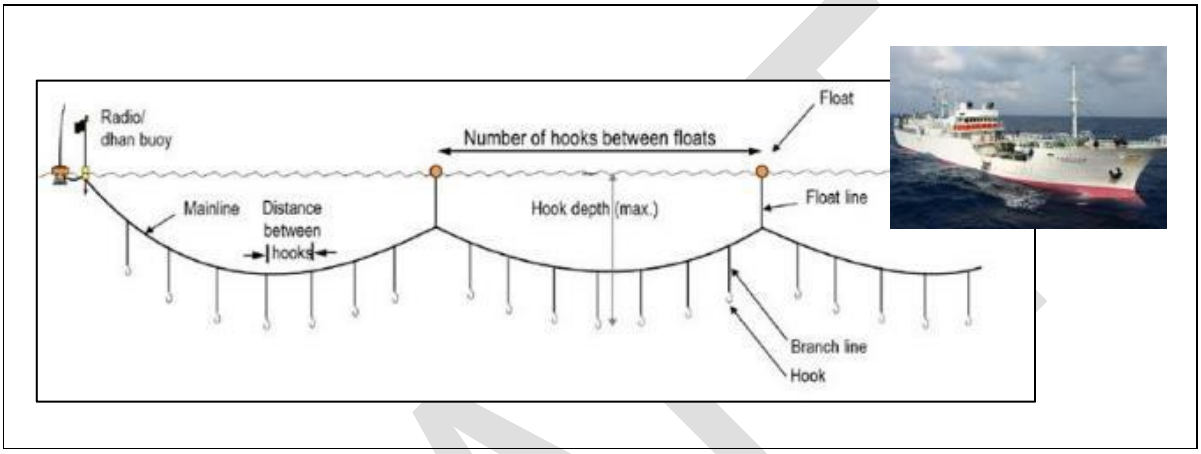


Figure 5-42: Schematic diagram showing typical configuration of longline gear targeting pelagic species (left), and photograph of typical high seas longline vessel (upper right).

Lines are usually set at night and may be left drifting for a considerable length of time before retrieval, which is done by means of a powered hauler at a speed of approximately one knot. During hauling, vessel manoeuvrability is severely restricted. In the event of an emergency, the line may be dropped and hauled in at a later stage.

The fishery operates year-round with a relative increase in effort during winter and spring. CPUE variations are driven both by the spatial and temporal distribution of the target species and by fishing gear specifications. Variability in environmental factors such as oceanic thermal structure and dissolved oxygen can lead to behavioural changes in the target species, which may in turn influence CPUE (Punsly and Nakano, 1992). During the period 2000 to 2016, the sector landed an average catch of 4 527 tonnes and set 3.55 million hooks per year. Total catch and effort figures reported by the fishery for the years 2000 to 2018 are shown in Figure 5-43. Catches landed by the South African fleet operating in the ICCAT region (i.e., off the West Coast) from 1998 – 2020 are shown in Figure 5-44. Eighteen vessels were active in 2018.

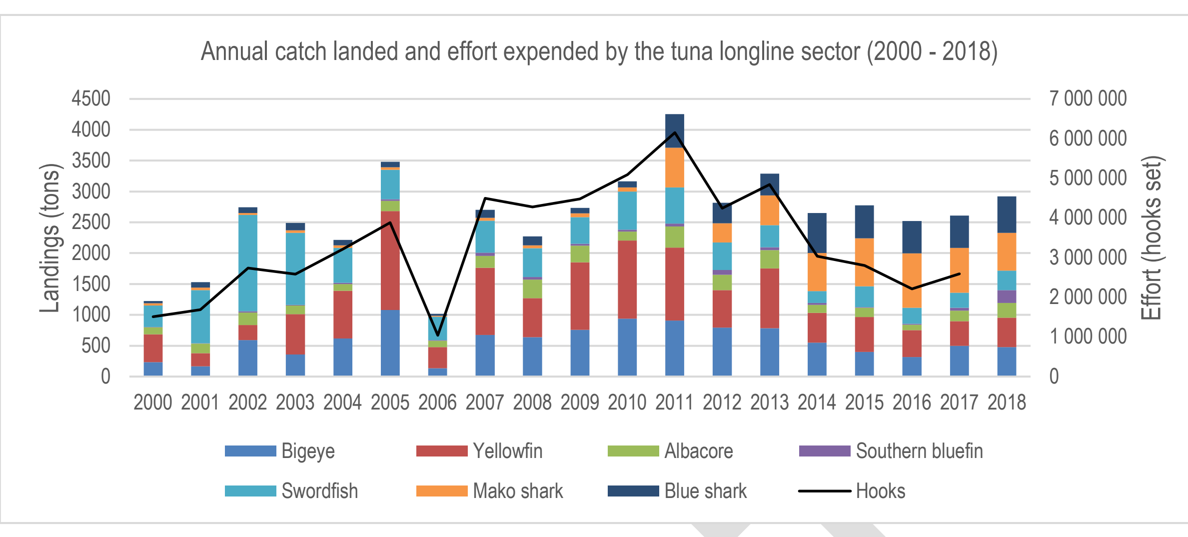


Figure 5-43: Inter-annual variation of catch landed, and effort expended by the large pelagic longline sector in South African waters as reported to the two regional management organisations, ICCAT and IOTC (2000 – 2018).

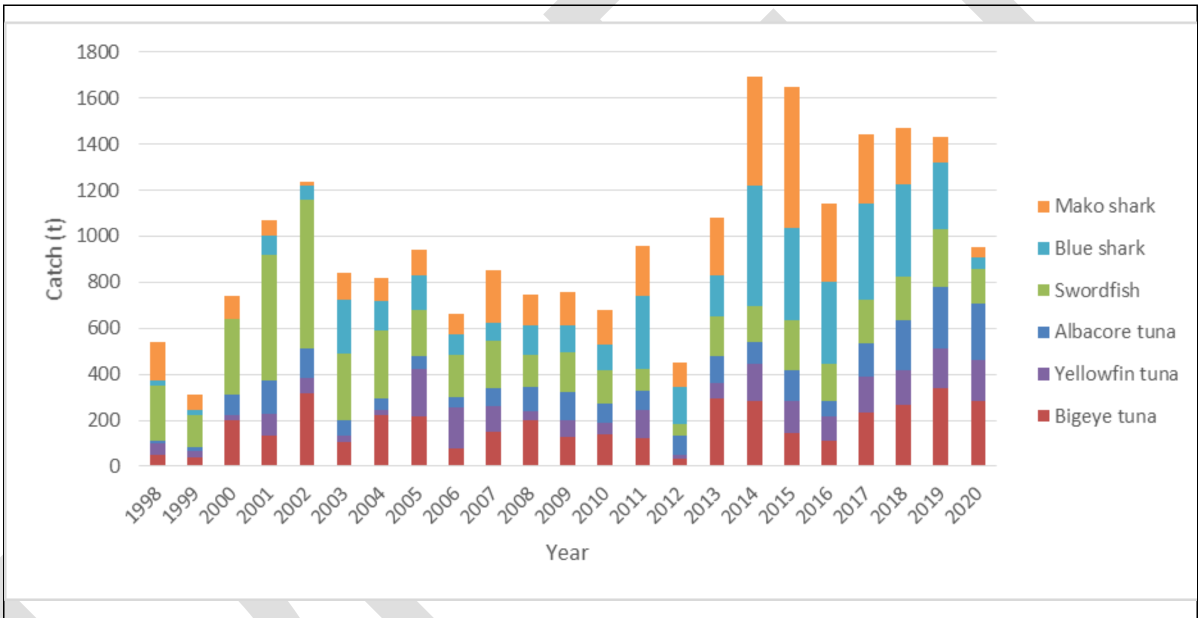


Figure 5-44: Inter-annual variation of catch landed by the large pelagic longline sector operating in the ICCAT region of South African waters (i.e., West of 20°E from 1998 – 2020).

Rights Holders in the large pelagic longlinefishery are required to complete daily logs of catches, specifying catch locations, number of hooks, time of setting and hauling, bait used, number and estimated weight of retained species, and data on bycatch. The fishery operates extensively within the South African EEZ, primarily along the continental shelf break and further offshore (see Figure 5-45). Over the period 2000 to 2019, no fishing activity was reported within the Concession Area and targeted areas were situated at least 50 km from the prospecting application area offshore of the 500 m bathymetric contour. The Namibian fleet of large pelagic longline vessels are permitted to target pelagic shark species in addition to tuna and therefore also operate inshore of the shelf break. The Namibian fleet would be expected to operate offshore of the 200 m depth contour adjacent to the South African maritime border and Sea Area 4C.

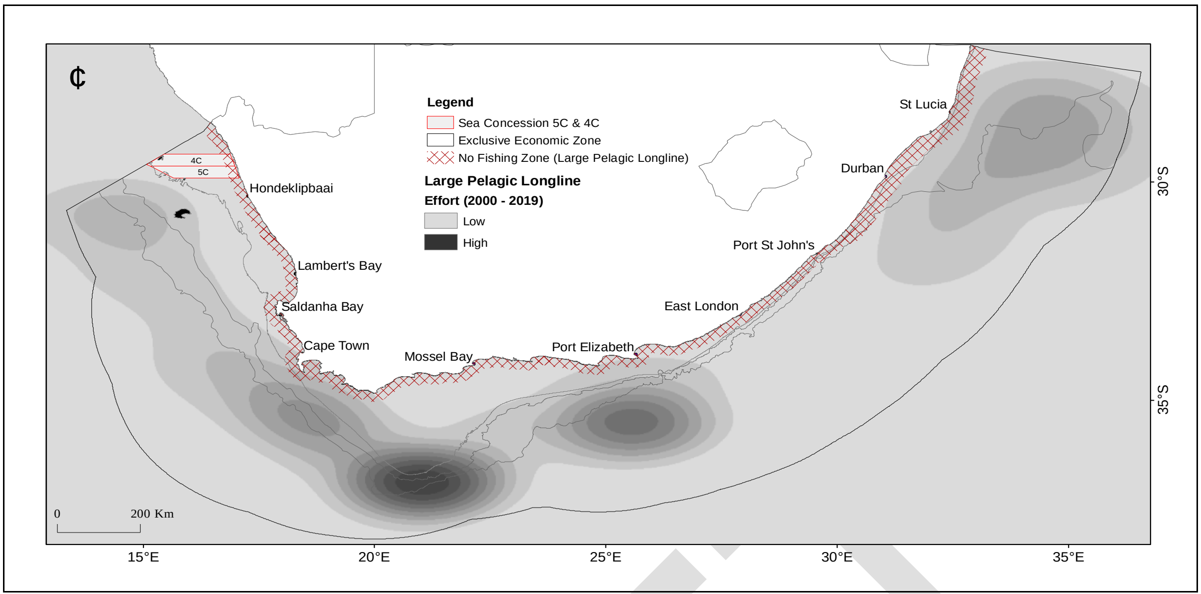


Figure 5-45: An overview of the spatial distribution of fishing effort expended by the longline sector targeting large pelagic fish species in the South African EEZ.

The spatial distribution of catch by both the Namibian and South African pelagic longline fleets is shown in Figure 5-46. Catch by reported fishing position is shown in the vicinity of the Concession Area at a grid resolution of 10 by 10 nautical miles.

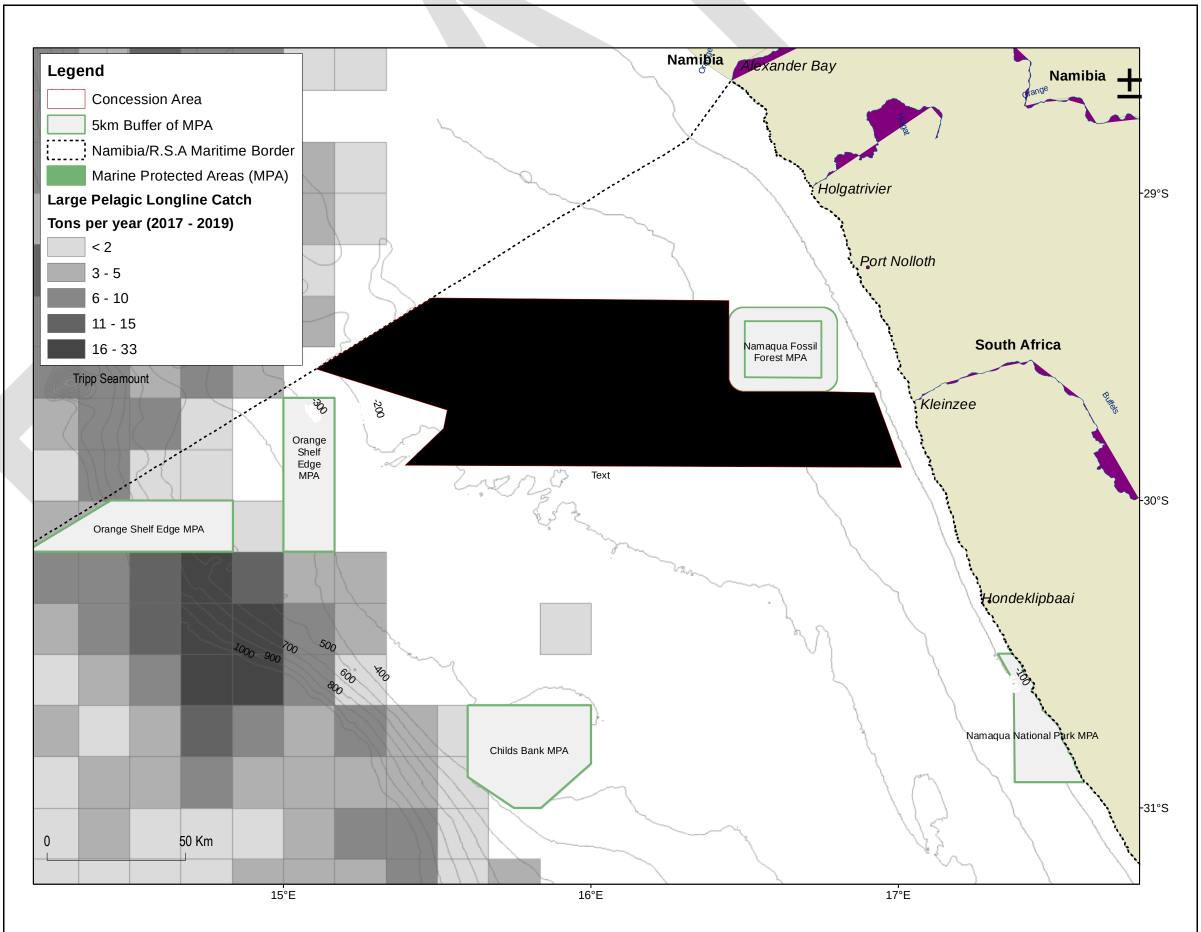


Figure 5-46: Spatial distribution of catch reported by the Namibian and South African longline sectors targeting large pelagic fish species in relation to the Concession Area.

Tuna Pole-and-Line

Poling for tuna is predominantly based on the southern Atlantic longfin tuna stock also referred to as albacore (*T. alalunga*). Other catch species include yellowfin tuna, bigeye tuna, and skipjack tuna (*Katsuwonus pelamis*). The fishery is seasonal with vessels active predominantly between November and May and peak catches recorded from November to January. Due to the seasonality of tuna in South Africa's waters the tuna pole fishery is also allowed access to snoek (*Thyrsites atun*) and yellowtail (*Seriola lalandi*). Snoek-directed fishing activity (commercial) is seasonal, taking place in coastal areas during the period March to July, with a peak in activity during the months of April and May. Access to these additional species has caused conflict with the traditional linefish sector.

The reported wholesale value of the fishery in 2018 was R124 Million in 2018, or 1.2% of the total value of all fisheries combined. Landings of albacore in 2020 amounted to 3941 tons. A historical time series of catch and effort reported by the South African sector operating within the Atlantic region is shown in Table 5-13 and Figure 5-47. The total effort of 4131 catch days within the ICCAT convention area in 2019 represents an increase in effort of 9% compared to 2018.

Table 5-13: Total number of fishing days (effort), active vessels and total catch (t) of the main species caught by tuna pole vessels in the ICCAT region (West of 20E), 2010 – 2020 (ICCAT, 2022).

Total Effort			Catch (t)			
Year	**Fishing days**	**Active vessels**	**Albacore**	**Yellowfin tuna**	**Bigeye tuna**	**Skipjack tuna**
2010	4408	116	4087	177	8	1
2011	5001	118	3166	629	15	5
2012	5157	123	3483	162	12	8
2013	4114	107	3492	374	142	3
2014	4416	95	3620	1351	50	5
2015	4738	91	3898	885	57	2
2016	4908	98	2001	599	10	2
2017	3062	92	1640	235	22	7
2018	3751	92	2353	242	14	2
2019	4131	91	2190	378	91	2
2020	3975	97	3941	534	71	1

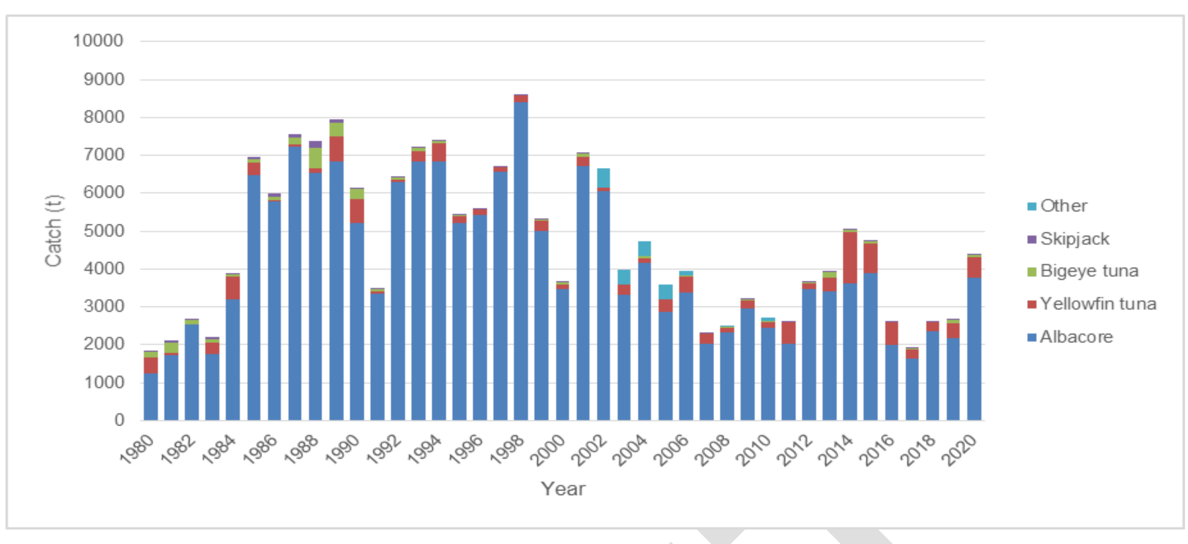


Figure 5-47: Catches (tons) of pelagic species by the South Africa pole-line ("Baitboat") fleet between 1980 and 2020 (ICCAT, 2022).

The active fleet consists of approximately 92 pole-and-line vessels (also referred to as "baitboat"), which are based at the ports of Cape Town, Hout Bay and Saldanha Bay. Vessels normally operate within a 100 nm (185 km) radius of these locations with effort concentrated in the Cape Canyon area (South-West of Cape Point), and up the West Coast to the Namibian border with South Africa.

Vessels are typically small (an average length of 16 m but ranging up to 25 m). Catch is stored on ice, refrigerated sea water or frozen at sea and the storage method often determines the range of the vessel. Trip durations average between four and five days, depending on catch rates and the distance of the fishing grounds from port. Vessels drift whilst attracting and catching shoals of pelagic tunas. Sonars and echo sounders are used to locate schools of tuna. Once a school is located, water is sprayed outwards from high-pressure nozzles to simulate small baitfish aggregating near the water surface. Live bait is then used to entice the tuna to the surface (chumming). Tuna swimming near the surface is caught with hand-held fishing poles. The ends of the poles are fitted with a short length of fishing line leading to a hook. In order to land heavier fish, lines may be strung from the ends of the poles to overhead blocks to increase lifting power (see Figure 5-48).

Figure 5-48: Schematic diagram of pole and line operation (http://www.afma.gov.au/portfolio-item/minor-lines).

The nature of the fishery and communication between vessels often results in a large number of vessels operating in close proximity to each other at a time. The vessels fish predominantly during daylight hours and are highly manoeuvrable. However, at night in fair weather conditions the fleet of vessels may drift or deploy drogues to remain within an area and would be less responsive during these periods.

Fishing activity for tuna occurs along the entire West Coast beyond the 200 m bathymetric contour, along the shelf break with favoured fishing grounds including areas north of Cape Columbine and between 60 km and 120 km offshore of Saldanha Bay. Snoek-directed fishing activity is coastal and seasonal in nature – taking place inshore of the 100 m depth contour during the period March to July.

Figure 5-49 shows the location of fishing activity within the South African EEZ and in relation to Sea Areas 4c and 5c. Fishing records received from DFFE over the reporting period 2007 to 2019 indicate that tuna-directed fishing takes place offshore of the Concession Area whereas snoek-directed fishing activity takes place inshore of the Concession Area but that there is no evidence of catch taken within the Concession Area (see Figure 5-50).

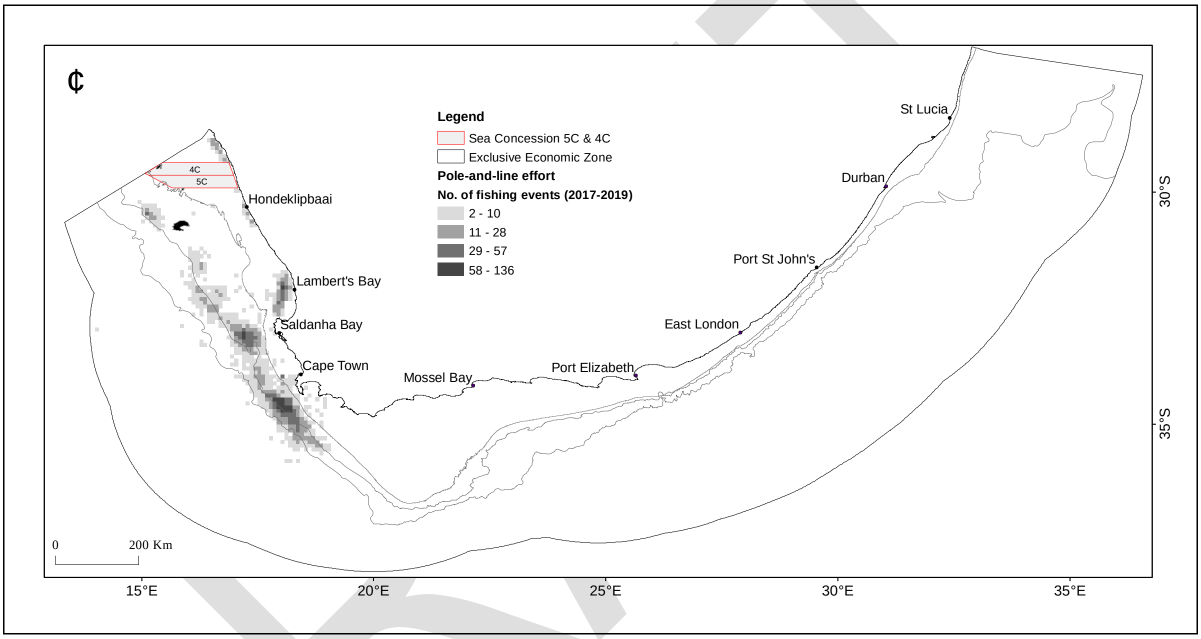


Figure 5-49: An overview of the spatial distribution of fishing effort expended by the pole-and-line sector targeting pelagic tuna and snoek within the South African EEZ and in relation to Sea Areas 4C and 5C.

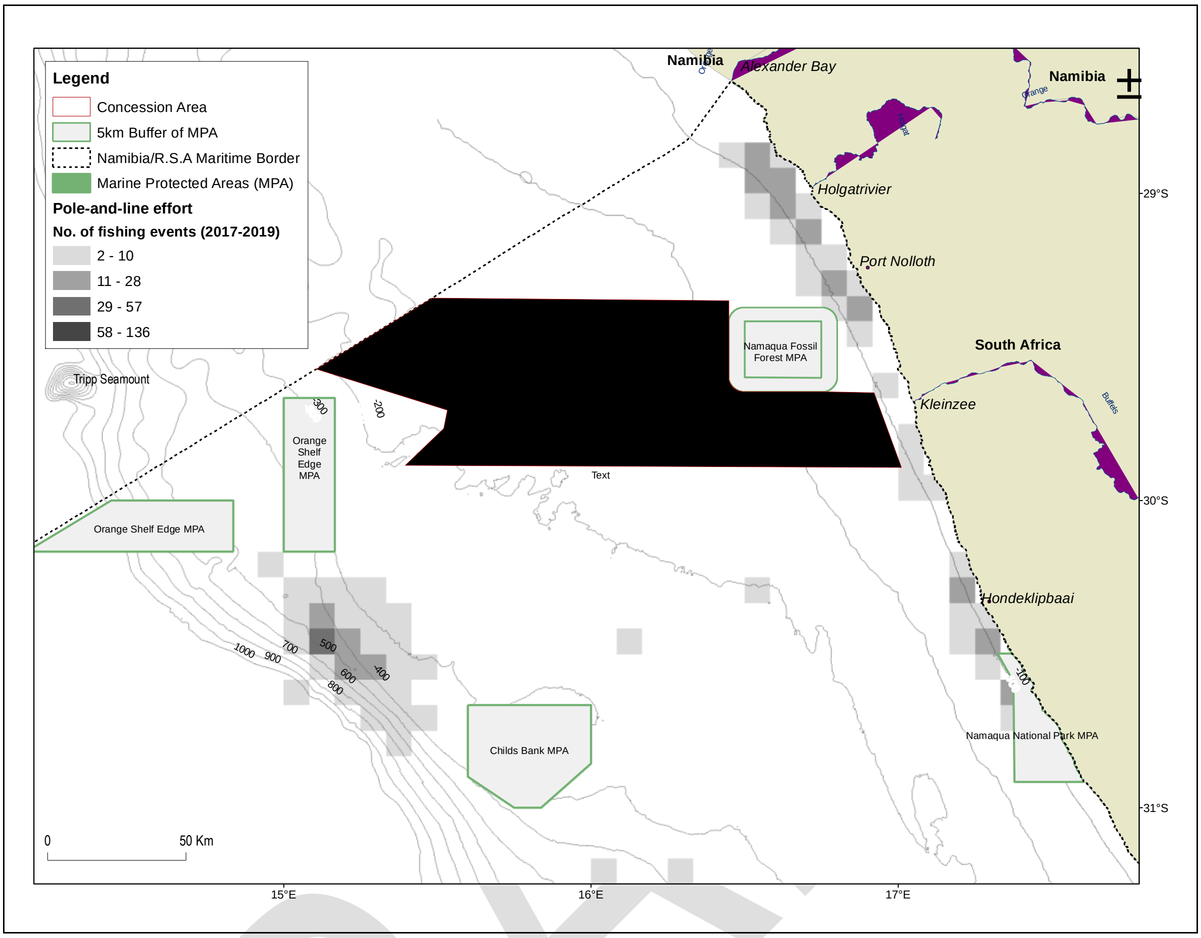


Figure 5-50: An overview of the spatial distribution of fishing effort expended by the pole-and-line sector targeting pelagic tuna and snoek in relation to the Concession Area.

Commercial or Traditional Linefish

The commercial linefish sector is one of the oldest fisheries in South Africa and has its origins from the recreational sector. Essentially recreational linefishers commercialised resulting in a systematic decline in the "linefish" stocks. The Minister of Fisheries in the 1980's reformed the sector. This was done by creating a smaller commercial linefish sector, as well as introducing a moratorium on the exploitation of many species that were collapsed or near collapse. The commercial linefish sector now only allows a limited number of key species to be exploited using hook and line but excludes the use of longlines[21]. Target species of the line fishery include temperate, reef-associated seabreams (e.g., carpenter, hottentot, santer and slinger), coastal migrants (e.g., geelbek and dusky kob) and nomads (e.g., snoek and yellowtail). More than 90% of the current linefish catch is derived from the aforementioned eight species and almost all of the traditional linefish catch is consumed locally. Table 5-14 lists the catch of important linefish species for the years 2010 to 2021.

[21] To distinguish between linefishing and long-lining, linefishers are restricted to a maximum of 10 hooks per line.

Table 5-14: Annual catch (t) of the eight most important linefish species for the period 2010 to 2021 (DFFE, 2022).

Year	Snoek	Yellowtail	Kob	Carpenter	Slinger	Hottentot seabream	Geelbek	Santer	Total catch
2010	6360	171	419	263	180	144	408	69	13688
2011	6205	204	312	363	214	216	286	62	12530
2012	6809	382	221	300	240	160	337	82	11855
2013	6690	712	157	481	200	173	263	84	9142
2014	3863	986	144	522	201	192	212	74	6849
2015	2045	594	121	519	175	142	238	68	4421
2016	1643	474	133	690	211	209	246	65	4289
2017	2055	377	111	844	218	204	158	74	4391
2018	2089	654	213	723	173	213	214	68	5304
2019	1879	439	454	604	215	188	132	78	N/A*
2020	2356	548	635	533	183	222	158	66	N/A*
2021	2747	239	352	441	186	151	88	64	N/A*

Figure 5-51 shows the variability in catches of the eight most importance species by the linefish sector over the period 1985 to 2021. In the Western Cape the predominant catch species is snoek (*Thyrsites atun*) while other species such as Cape bream (hottentot) (*Pachymetopon blochii)*, geelbek (*Atractoscion aequidens)*, kob (*Argyrosomus japonicus)* and yellowtail (*Seriola lalandi)* are also important. Towards the East Coast the number of catch species increases and includes resident reef fish (Sparidae and Serranidae), pelagic migrants (Carangidae and Scombridae) and demersal migrants (Sciaenidae and Sparidae).

Of all South African marine fisheries, the linefishery is the most vulnerable to external impacts. Linefish resources are at risk of overcapacity as they are directly or indirectly exploited by other sectors, including the recreational, small-scale linefishery, inshore and offshore trawl fisheries, tuna pole-linefishery, the inshore netfishery and the demersal shark longlinefishery (DEFF, 2020). The increased expectation of commercial access to linefish resources combined with the localised anticipation of community ownership by small-scale fishers may impact linefish stocks.

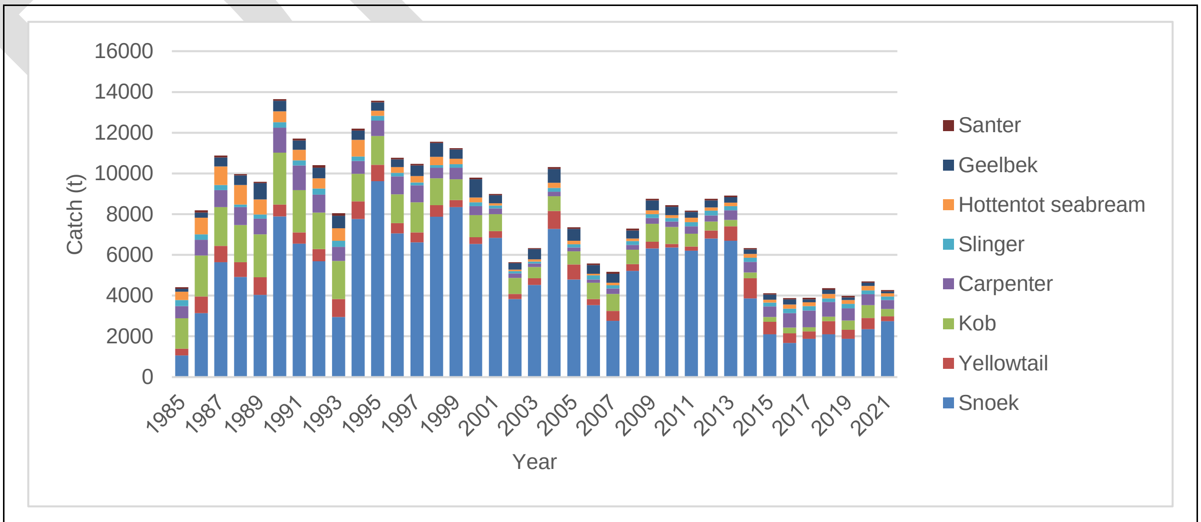


Figure 5-51: Annual catch (t) of the eight most important linefish species for the period 1985-2021 (DFFE, 2022).

Figure 5-52: Fishermen landing snoek on board a vessel operating in the traditional linefishery (photo credit Jaco Barendse).

The traditional commercial linefishery is a relatively low-cost and labour-intensive industry, and important from an employment and human livelihood point of view. Although the commercial linefishery has the largest fleet, it contributes only 6% of the total estimated value of all South African marine fisheries (DFFE, 2020). In 2017, the wholesale value of catch was reported as R122.1 million. Annual catches prior to the reduction of the commercial effort were estimated at 16 000 tons for the traditional commercial linefishery. The fishery is widespread along the country’s shoreline from Port Nolloth on the West Coast to Cape Vidal on the East Coast. Most of the catch (up to 95%) is landed by the Cape commercial fishery, which operates on the continental shelf from the Namibian border on the West Coast to the Kei River in the Eastern Cape. Effort is managed geographically with the spatial effort divided into three zones. Zone A extends from Port Nolloth to Cape Infanta, Zone B extends from Cape Infanta to Port St Johns and Zone C covers the KwaZulu-Natal region. Sea Areas 4C and 5C fall within Zone A.

The commercial linefishery is a nearshore boat-based activity which is currently managed through a total allowable effort (TAE) allocation, based on boat and crew numbers. The number of rights holders[22] is currently 425. For the 2021/2022 fishing season, 325 vessels were apportioned to

[22] The Traditional Linefish sector was allocated 7-year rights during Fishing Rights Allocations Process (FRAP) in 2013. These were due to expire during 2020; however the Deputy Director-General exempted the current Right Holders from Section 18 of the Marine Living Resources Act, 1998 (Act no 18 of 1998), by granting them extensions of their current fishing rights until 31 December 2021. This extension was granted while the DFFE would conclude a FRAP in terms of Section 18 of the MLRA. At the time of this report the FRAP is still underway. Having regard for the decline in the resources caught in this fishery and the need to apportion these among this and the emerging Small-Scale fishery, fishing rights in the Commercial Traditional Linefish Sector will be granted for a period of 7 years, commencing on 1 March 2022 and terminating on 28 February 2029, whereafter they shall automatically terminate and revert back to the State.

commercial fishing, whilst 122 vessels apportioned to small-scale fishing[23] (refer to the Small-Scale Fisheries Section).

A standard vessel is defined as a vessel that can carry a crew of 7. Vessels with a maximum length overall of 10 m and a maximum crewing capacity of 12, including the skipper. The maximum standard vessel allocation for the commercial linefishery within the three management Zones (2021/2022) is 340 vessels for Zone A (Port Nolloth to Cape Infanta), 64 vessels for Zone B (Cape Infanta to Port St Johns) and 51 vessels for Zone C (KwaZulu-Natal). Table 5-8 lists the annual TAE and activated effort per linefish management zone from 2007 to 2019.

[23] DFFE increased the apportionment of TAE to small-scale fishing from 13% in 2019/20 to 26% in 2021/22 in order to boost economic possibilities for coastal communities.

Table 5-15: Annual TAE and activated commercial linefish effort per management zone from 2010 to 2019 (DEFF, 2020).

Total TAE boats (fishers). Upper limit: 455 boats or 3450 crew			Zone A: Port Nolloth to Cape Infanta		Zone B: Cape Infanta to Port St Johns		Zone C: KwaZulu-Natal	
Allocation	**455 (3182)**		**301 (2136)**		**103 (692)**		**51 (354)**	
Year	**Allocated**	**Activated**	**Allocated**	**Activated**	**Allocated**	**Activated**	**Allocated**	**Activated**
2010	455	335	298	210	105	82	51	43
2011	455	328	298	207	105	75	51	46
2012	455	296	298	192	105	62	51	42
2013	455	289	301	189	103	62	51	38
2014**	455	399	340	293	64	58	51	48
2015**	455	356	340	291	64	61	51	45
2016**	455	278	340	274	64	59	51	45
2017**	455	329	340	232	64	60	51	37
2018**	455	324	340	232	64	50	51	42
2019**	455	306	340	218	64	50	51	38

** In the finalisation of the 2013 commercial Traditional Linefish appeals, the effort apportioned for the small-scale fisheries sector was allocated to the commercial sector. All the small-scale Rights were considered to be activated on allocation

Fishing takes place throughout the year but there is some seasonality in catches. Vessels range in length between 4.5 m and 11 m and the offshore operational range is restricted by vessel category. Operating ranges vary but most of the activity is conducted within 15 km of a launch site.

This fishery's operational footprint may at times be limited by operating costs and is sensitive to local reports of fish availability. Figure 5-53 shows the spatial extent of traditional linefish grounds at a national scale and Figure 5-54 shows catch in relation to the Concession Area. Vessels operate from Port Nolloth, Doring Bay and Hondeklipbaai and fishing activity is directed in waters shallower than 100 m and in proximity to these launch sites. Records over the period 2017 to 2019 show that fishing activity within this area is seasonal – March to September – and that catches are exclusively snoek[24].

Due to the largely informal nature of the snoek fishery, a TAE approach has been used to manage the sector, which places constraints on the maximum level of fishing effort that can be applied to a fish stock during a specific period through limitations on the total number of vessels permitted in the sector, size of the vessel (maximum length 10 m), number of crew members per vessel, and geographic zone(s) which can be fished. In 2019, 340 rights were allocated for the area Port Nolloth to Cape Infanta with 218 rights activated. Besides the economic importance of direct landings to fishing communities, snoek provides indirect benefits through a combined formal and informal value chain, where snoek is processed and sold in different forms. Snoek reaches consumers through retail outlets supplied by large hawkers and processors or directly through small hawkers.

Fishing effort has not been reported inshore of the Concession Area but no within the area itself. Approximately 57.8 tonnes per year were reported in the vicinity of Doring Bay and Port Nolloth combined and 0.7 tonnes per year off Hondeklipbaai. Note that the spatial mapping of effort and catches in the linefishery is less accurate than in other sectors because of the reporting structure implemented by DFFE. Fishing locations are described by skippers in relation to numbered sections along the coast and estimated distance offshore. No bearings are given, and no GPS data are recorded. Furthermore, due to the large number of vessels, reporting complexities and also the unwillingness of local fisherman to share fishing locations, inaccuracies in the spatial representation are to be expected. Although there is no evidence from the DFFE dataset of fishing having taken place within the prospecting application area, vessels could be expected to range to a distance of 15 km from the launch sites of Doring Bay, Port Nolloth and Hondeklipbaai and fishing activity within the inshore portions of the prospecting application area is possible.

[24] Snoek are regarded as mesopelagic predators and are found from the surface to depths of ~550m. In southern Africa, snoek has been known to occur from northern Angola to Algoa Bay but is mostly concentrated along the West Coast within the Benguela Ecosystem (Isaacs 2013). Snoek is the main predator for anchovy and sardine, placing direct top-down control on prey species and indirectly on populations which anchovy and sardine feed upon (mainly zooplankton), and forms a vital fishery sector in South Africa. Therefore, they are important from both an ecological and fisheries perspective. The spatial distribution of snoek is highly variable with fish moving between the inshore and offshore, depending on the season, spawning characteristics and availability of prey items. It is widely accepted that snoek populations within the Benguela ecosystem comprise a single population and undergo a seasonal longshore migration, moving southwards to South Africa from southern Angola waters to spawn before returning north (Isaacs 2013). Spawning occurs during winter when most exploitation within fisheries occurs, and populations return to southern Angola in Spring. However, work by Griffiths (2002) has shown that adult snoek is targeted by commercial linefishermen throughout the year, and instead availability of snoek in trawling grounds is seasonal as a result of spawning migrations. Therefore, the results of Griffiths (2002) suggest that snoek comprises two subpopulations, with limited interaction and exchange. Additionally, the results from ovarian analysis and migration patterns show that snoek spawn between 150- and 400-m isobaths of the western Agulhas Bank. The northward flow of the Benguela current acts as a transport vector for epipelagic snoek eggs and larvae from spawning grounds to nursery areas north of Cape Columbine and to the east of Danger Point, where juveniles remain until mature (growing between 33 and 44 cm). The distribution of juveniles within nursery areas is largely determined by prey availability, with a seasonal inshore migration in autumn due to the recruitment of clupeoid. Although longshore movement has been noted to occur during spawning season, there is no evidence connecting the movement to seasonal components and is thought to be random.

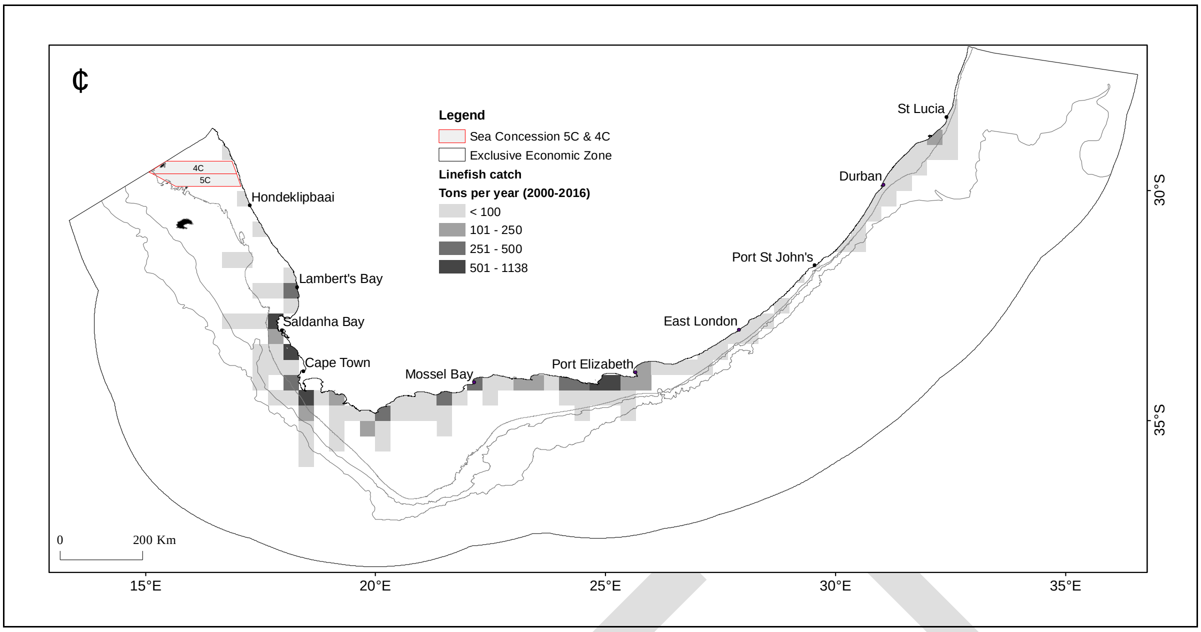


Figure 5-53: An overview of the spatial distribution of catch taken by the traditional linefish sector in the South African EEZ and in relation to Sea Areas 4C and 5C.

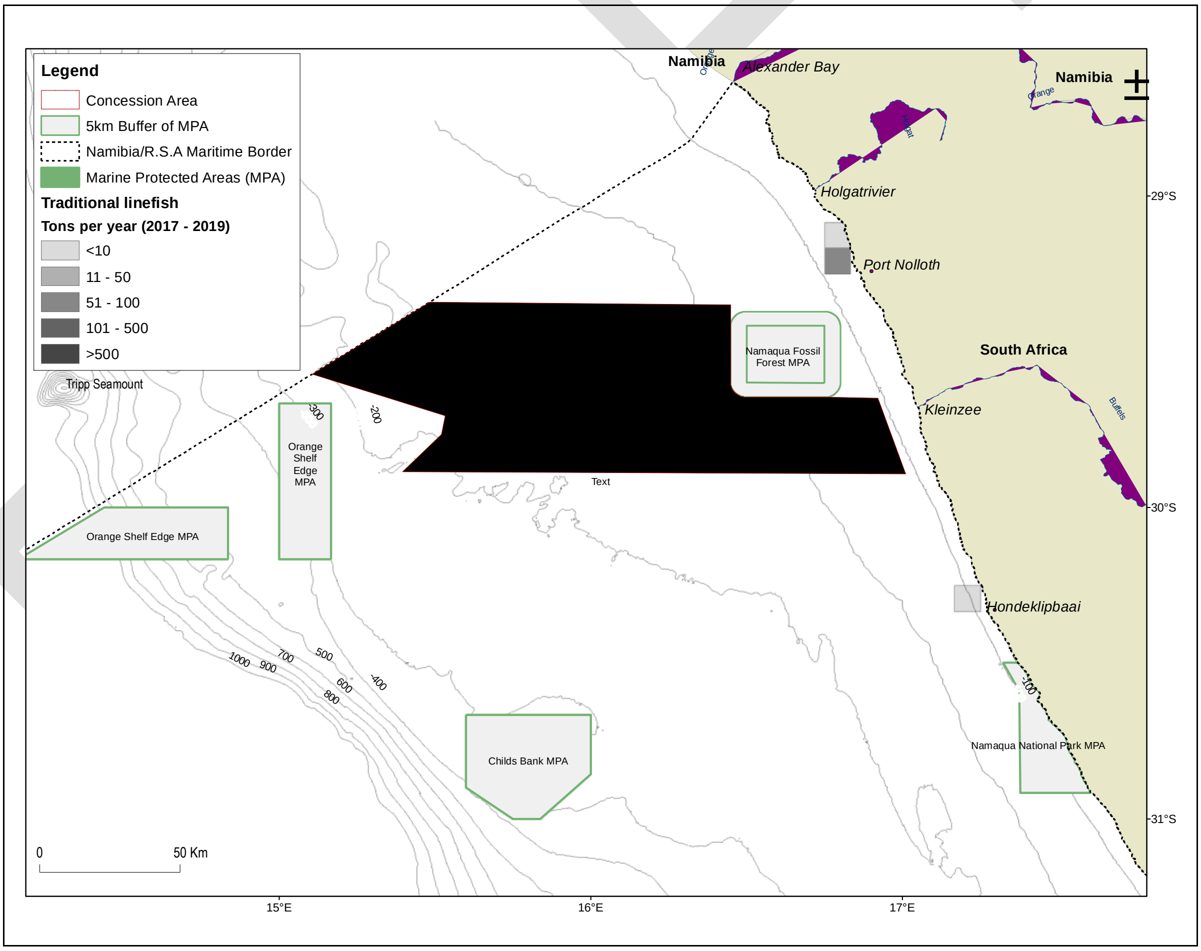


Figure 5-54: Spatial distribution of catch taken by the linefish sector in relation to the Concession Area.

West Coast Rock Lobster

The West Coast rock lobster (*Jasus lalandi*) is a valuable resource of the South African West Coast and consequently an important income source for West Coast fishermen. The resource occurs inside the 200 m depth contour along the West Coast from Namibia to East London on the East Coast of South Africa. Fishing grounds stretch from the Orange River mouth to east of Cape Hangklip in the South-Eastern Cape.

The fishery Is comprised of four sub-sectors – commercial offshore, commercial nearshore, small-scale, and recreational, all of which have to share from the same national TAC. The 2021/22 TAC was set at 600 tonnes and apportionment of TAC by sub-sector is listed in Table 5-16. The TAC for the 2021/2022 fishing season was reduced by 28% from the previous fishing season (2020/2021). The updated stock assessment for the resource has indicated that it is further depleted than was thought to be the case two years ago, and poaching[25] is one of the major contributors to the recently exacerbated depleted status of the resource. The resource has over recent decades been at about 2.5% of the pristine level, but that over the last few years this had dropped to about 1.5%. Annual TAC and average monthly landings over the period 2006 to 2020 are shown in Figure 5-55 and Figure 5-56, respectively. A historical time-series of TACs and landings is listed in Table 5-17.

Table 5-16: Apportionment of TAC of rock lobster by sub-sector (DEFF, 2021).

Description	2019/2020 TAC (t)	2020/2021 TAC (t)	2021/2022 (t)
Commercial fishing (offshore)	563.91	435.88	301.28
Commercial fishing (nearshore)	170.25	131.03	100.92
Recreational fishing	38.76	30.08	21.57
Subsistence (interim relief measure) fishing	170.25	131.03	100.92
Small-scale fishing sector (nearshore)			
Small-scale fishing sector (offshore)	140.83	108.97	75.32
Total	1084	837.0	600

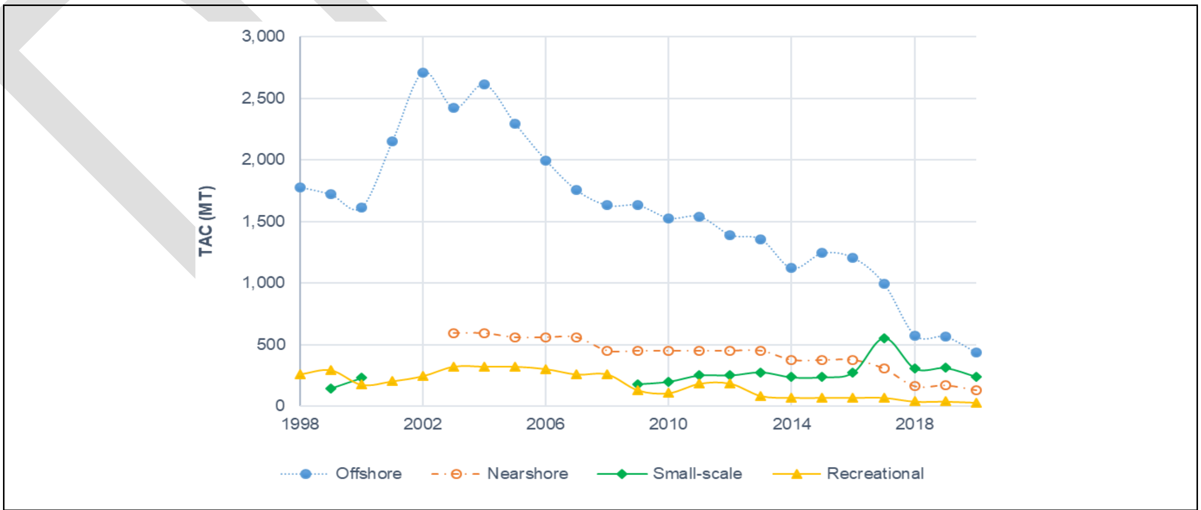


Figure 5-55: Graph showing the TAC of west coast rock lobster.

[25] In 2017, the poached rock lobster was estimated at 2 747 tonnes.

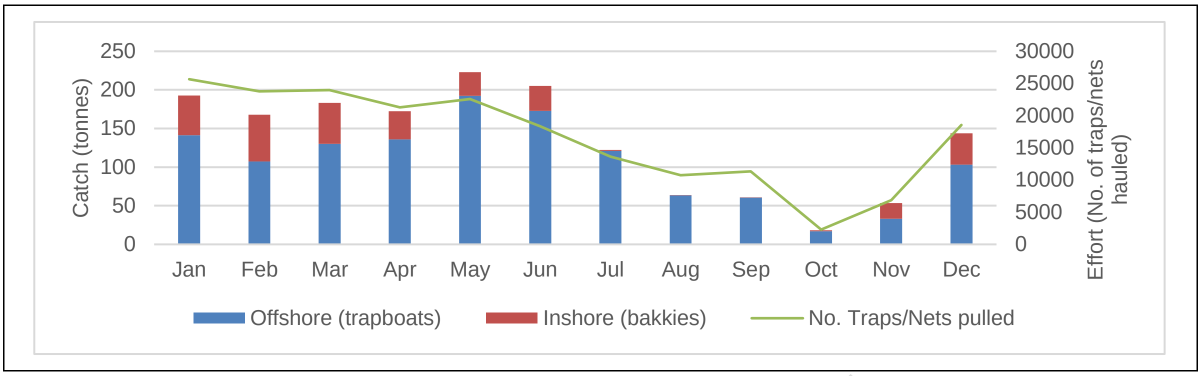


Figure 5-56: Graph showing the average monthly catch (tonnes) and effort (number of traps hauled) reported by the offshore (trapboat) and inshore (bakkie) rock lobster sectors over the period 2006 to 2020.

Table 5-17: Total allowable catch, fishing sector landings and total landings for West Coast rock lobster (DEFF, 2020).

TAC (t)						
Season	**Global TAC**	**Offshore allocation**	**Nearshore allocation**	**Interim Relief**	**Recreational**	**Total catch**
1999/00	2 156	1720		145	291	2152
2000/01	2 018	1614		230	174	2154
2001/02	2 353	2151		[1]	202	2410
2002/03	2 957	2713		[1]	244	2706
2003/04	3 336	2422	594	[1]	320	3258
2004/05	3 527	2614	593	[1]	320	3222
2005/06	3 174	2294	560	[1]	320	2291
2006/07	2 857	1997	560	[2]	300	3366
2007/08	2 571	1754	560	[2]	257	2298
2008/09	2 340	1632	451	[2]	257	2483
2009/10	2 393	1632	451	180	129	2519
2010/11	2 286	1528	451	200	107	2208
2011/12	2 426	1541	451	251	183	2275
2012/13	2 276	1391	451	251	183	2308
2013/14	2 167	1356	451	276	83	1891
2014/15	1 800	1120	376	235	69	1688
2015/16	1 924	1243	376	235	69	1524
2016/17	1 924	1204	376	274	69	1564
2017/18	1 924	994	305	554	69	1355
2018/19	1 084	564	170	170	39	
2019/20	1 084	564	170	170	39	
2020/21	837	436	131	131	30	
2021/22	600	301	101	101	22	

[1] No Interim Relief allocated / [2] Interim Relief accommodated under Recreational allocation

The resource is managed geographically, with TACs set annually for different management areas. The commercial and small-scale fishing sectors are authorised to undertake fishing for four months in each management zone therefore closed seasons are applicable to different management zones. The start and end dates for the 2021/22 fishing season per sector and zone are shown in Table 5-18.

Table 5-18: Start and end dates for the fishing season 2021/22 by management zone. Special Project Report on the review of the TAC for West Coast Rock Lobster for the 2021/22 fishing season by the Consultative Advisory Forum for Marine Living Resources.

Area	Catch period	
	Commercial nearshore, interim relief, small-scale: nearshore	Commercial offshore, small-scale: offshore
Area 1 + 2	15 Oct, Nov, Dec, Jan, 15 Feb	
Area 3 + 4	15 Nov, Dec, Jan, Feb, 15 Mar	15 Nov, Dec, Jan, Feb, 15 Mar
Area 5 + 6	15 Nov, Dec, Jan, Feb, 15 Mar	
Area 7		Dec, Jan, Feb, Mar
Areas 8 and 11	15 Nov, Dec, Jan, Feb, 15 Mar	Jan, Mar, Apr, May
Area 8 (deep water)		Jun, Jul
Areas 12, 13 and 14	15 Nov, Dec, Jan, Feb, 15 Mar	

The commercial offshore sector operates at a depth range of approximately 30 m to 100 m, making use of traps consisting of rectangular metal frames covered by netting. These traps are set at dusk and retrieved during the early morning. Approximately 138 vessels participate in the offshore sector. The commercial nearshore sector makes use of hoop nets to target lobster at discrete suitable reef areas along the shore at a water depth of up to 30 m. These are deployed from a fleet of small dinghies/bakkies which operate from the shore and coastal harbours. Approximately 653 boats participate in the sector.

The delineation of management zones is shown in Figure 5-57. The five super-areas are: areas 1–2, corresponding to zone A; areas 3–4, to zone B; areas 5–6, to zone C; area 7, being the northernmost area within zone D; and area 8+, comprising area 8 of zone D as well as zones E and F.

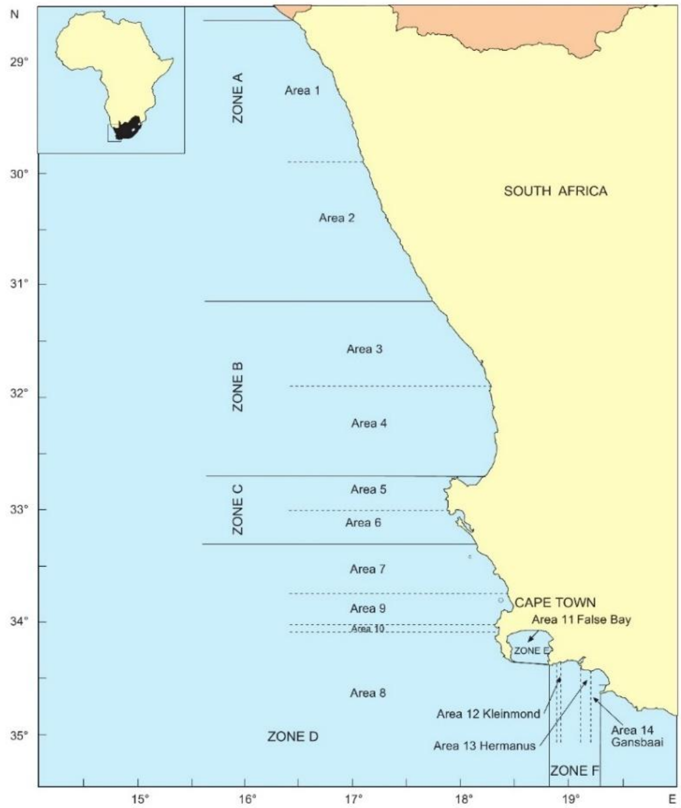


Figure 5-57: West Coast rock lobster fishing zones and areas. The five super-areas are: areas 1–2, corresponding to zone A; areas 3–4, to zone B; areas 5–6, to zone C; area 7, being the northernmost area within zone D; and area 8+, comprising area 8 of zone D as well as zones E and F.

As there is currently no commercial offshore fishing permitted within Management Areas 1 and 2, the proposed project activities would not coincide with areas targeted by the offshore commercial sub-sector.

Figure 5-58 shows the spatial distribution of fishing effort expended by the nearshore commercial sub-sector in the vicinity of the prospecting application area over the period 2016 to 2020. The Concession Area is situated offshore of rock lobster management zone 1 (Port Nolloth) and management zone 2 (Hondeklipbaai). Over the period 2005 to 2016, the nearshore sector reported an annual average of 742 nets set and 2.7 tonnes of lobster caught within the management areas adjacent to the prospecting application area. The amount of catch and effort reported within the area amounted to 0.7% and 1.4%, respectively, of the total national landings and overall effort expended by the nearshore sub-sector. A fleet of small dinghies/bakkies target lobster at discrete suitable reef areas along the shore at a water depth of up to 15 m. Fishing activity is expected to only be outside of the Concession Area. Management zones 1 and 2 have a seasonal operational window from 15 October to 15 February.

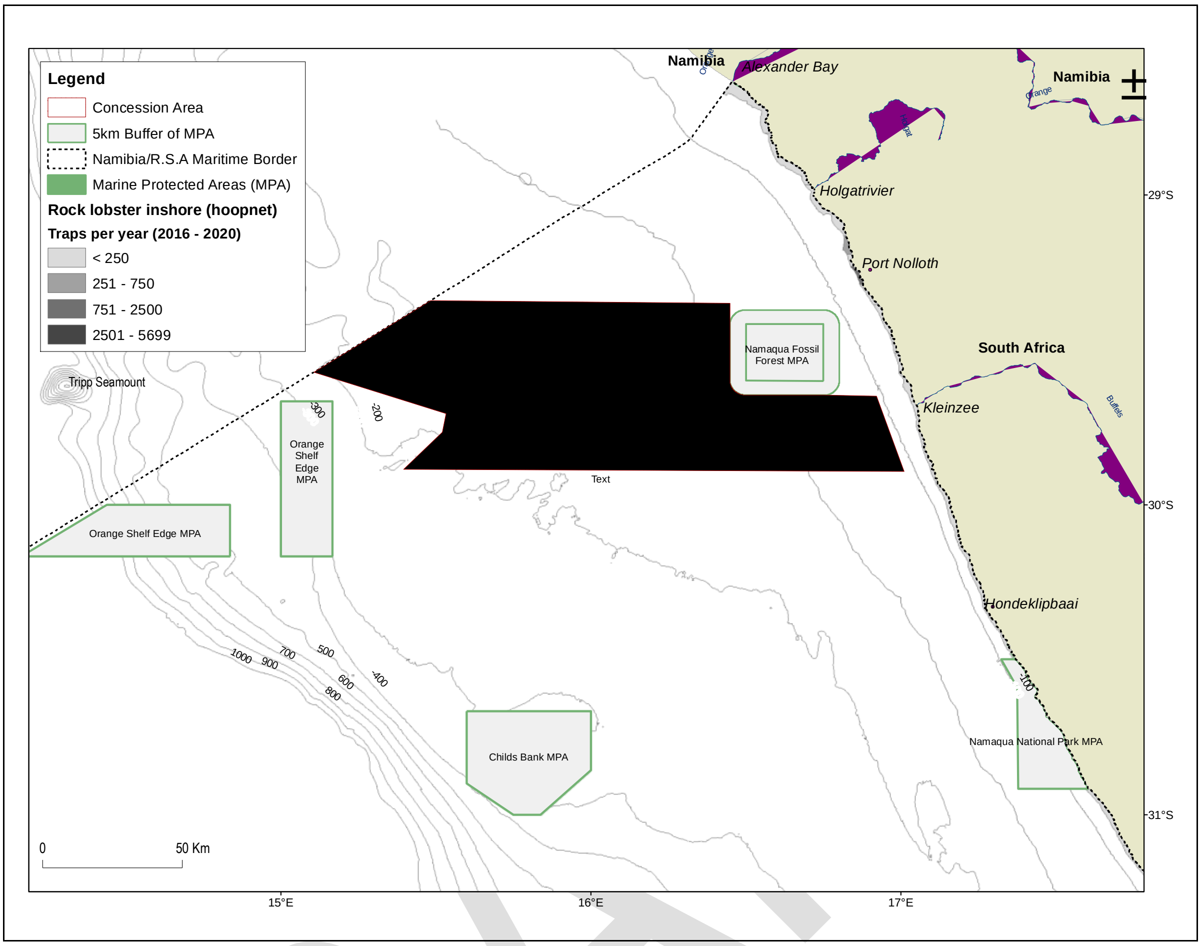


Figure 5-58: Spatial distribution of fishing effort expended by the west coast rock lobster inshore (bakkies/hoopnets) sector in relation to Sea Areas 4C and 5C. Lobster management zones are demarcated and labelled. Bathymetric contours shown are 50 m, 100 m and 150 m.

Abalone Ranching

The Abalone *Haliotus midae*, is endemic to South Africa and referred to locally as “perlemoen”. The natural population extends along 1500 km of coastline east from St Helena Bay in the Western Cape to Port St Johns on the east coast (Branch *et al*. 2010; Troell et al 2006). *H. midae* inhabits intertidal and subtidal rocky reefs, with the highest densities found in kelp forests (Branch *et al.*, 2010). Kelp forests are a key habitat for abalone, as they provide a source of food and ideal ecosystem for abalone’s life cycle (Branch *et al.*, 2010). Light is a limiting factor for kelp beds, which are therefore limited to depths of 10m on the Namaqualand coast (Anchor Environmental, 2012). Habitat preferences change as abalone develop. Larvae settle on encrusted coralline substrate and feed on benthic diatoms and bacteria (Shepherd and Turner, 1985). Juveniles of 3-10 mm are almost entirely dependent on sea urchins for their survival, beneath which they conceal themselves from predators such as the West Coast rock lobster (Sweijd, 2008; Tarr *et al.*, 1996). Juveniles may remain under sea urchins until they reach 21-35 mm in size, after which they move to rocky crevices in the reef. Adult abalone remain concealed in crevices, emerging nocturnally to feed on kelp fronds and red algae (Branch *et al.*, 2010). In the wild, abalone may take 30 years to reach full size of 200 mm, but farmed abalone attain 100 mm in only 5 years, which is the maximum harvest size (Sales & Britz, 2001).

The commercial (diver) fishery for abalone started in the late 1940s and catches were initially unregulated, reaching a peak of close to 3 000 tonnes in 1965. By 1970, catches had declined rapidly, although the fishery remained stable, with a total annual catch of around 700 tonnes, until the mid-1990s, after which there were continuous declines in commercial catches (DAFF, 2016). The continued high levels of illegal fishing and declines in the resource led to the introduction of diving prohibitions in selected areas and the closure of the commercial fishery in 2008. The fishery was subsequently reopened in 2010, with TAC allocations of 150 tonnes. Latest published figures of abalone landings are 89.6 tonnes (2016/17). Historically, the resource was most abundant in the region between Cape Columbine and Quoin Point (refer to Figure 5-59). Along the East Coast, the resource was considered to be discontinuous and sparsely distributed and as a result no commercial fishery for abalone was implemented there.

Figure 5-59: Distribution of abalone (insert) and abalone fishing Zones A–G (DAFF, 2016).

South Africa is the largest producer of abalone outside of Asia (Troell *et al.*, 2006). For example, in 2001, 12 abalone farms existed, generating US$12 million at volumes of 500-800 tonnes per annum (Sales & Britz, 2001). By 2006, this number had almost doubled, with 22 permits granted and 5 more being scheduled for development (Troell *et al.*, 2006). Until recently, abalone cultivation has been primarily onshore, but abalone ranching provides more cost-effective opportunities for production (Anchor Environmental, 2012). Bannister (1991) defines marine ranching (reseeding) as “Identifiable stock released with the intention of being harvested by the releasing agency” (Government Gazette, 2010 No. 33470). Translocation is “where hatchery-produced seed are stocked into kelp beds outside the natural distribution” (Troell *et al.*, 2006). Translocation of abalone occurs along roughly 50 km of the Namaqualand coast in the Northern Cape due to the seeding of areas using cultured spat specifically for seeding of abalone in designated areas (ranching) (Anchor Environmental, 2012). The potential to increase this to seeded area to 175 km has been made possible through the issuing of “Abalone Ranching Rights” (Government Gazette, 20 August 2010 No. 729) in four concession zones for abalone ranching between Alexander Bay and Hondeklipbaai (Diamond Coast Abalone 2016).

Abalone ranching was pioneered by Port Nolloth Sea Farms who were experimentally seeding kelp beds in Port Nolloth by 2000. Abalone ranching expanded in the area in 2013 when DFFE issued rights for each of four Concession Area Zones (refer to Figure 5-60).

Abalone ranching includes the spawning, larval development, seeding and harvest. An onshore hatchery supports the ranching in the adjacent sea (Anchor Environmental, 2012). Two hatcheries exist in Port Nolloth producing up to 250 000 spat. To date, there has been no seeding in Zones 1 or 2. Seeding has taken place in Zones 3 and 4. Sea Area 4C coincides with Zone 2 and Sea Area 5C coincides with Zone 3. As the maximum depth of seeding is considered to be approximately 10 m, which this lies inshore of the Concession Area, the proposed area of operations would not coincide with abalone seeding areas.

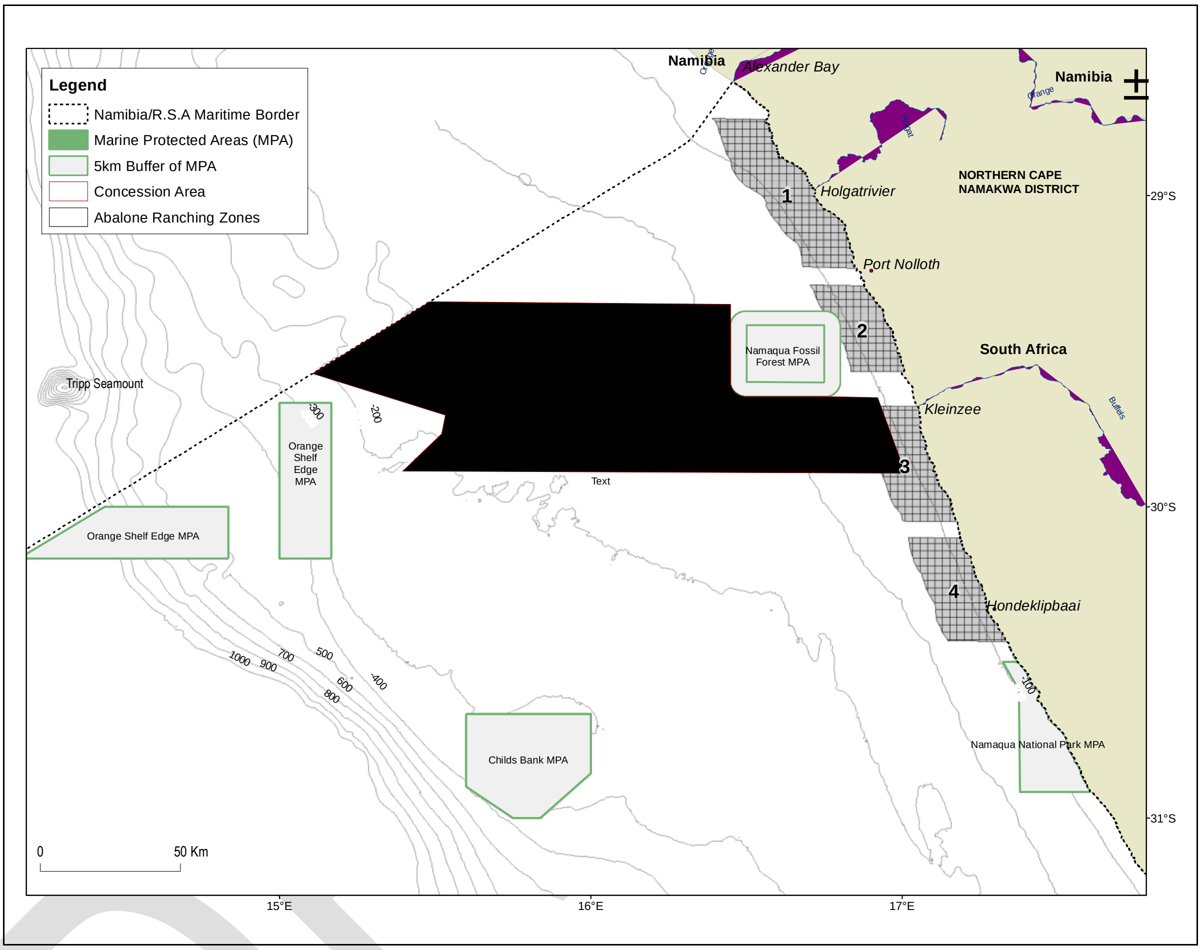


Figure 5-60: An overview of the spatial distribution of abalone ranching Concession Areas in relation to the Concession Area.

Beach Seine and Gillnet Fisheries (Netfish)

There are a number of active beach-seine and gillnet operators throughout South Africa (collectively referred to as the "netfish" sector). Initial estimates indicate that there are at least 7 000 fishermen active in fisheries using beach-seine and gillnets, mostly (86%) along the West and South coasts. These fishermen utilize 1 373 registered and 458 illegal nets and report an average catch of about 1 600 tons annually, constituting 60% harders (also known as mullet, *Liza richardsonii*), 10% St Joseph shark (*Callorhinchus capensis*) and 30% "bycatc" species such as galjoen (*Dichistius capensis*), yellowtail (*Seriola149alandii*) and white steenbras (*Lithognathus lithognathus*). Catch-per-unit-effort declines eastwards from 294 and 115 kg·net-day^{-1} for the beach-seine and gillnetfisheries respectively off the West Coast to 48 and 5 kg·net-day^{-1} off KwaZulu-Natal. Consequently, the fishery changes in nature from a largely commercial venture on the West Coast to an artisanal/subsistence fishery on the East Coast (Lamberth *et al*., 1997).

The fishery is managed on a TAE basis with a fixed number of operators in each of 15 defined areas (see Table 5-19 for the number of rights issued and Figure 5-61 for the fishing areas). The number of Rights Holders for 2014 was listed as 28 for beach-seine and 162 for gillnet (DAFF, 2014a). Permits are issued solely for the capture of harders, St Joseph and species that appear on the ‘bait list’. The exception is False Bay, where Right Holders are allowed to target linefish species that they traditionally exploited.

Table 5-19: Recommended Total Allowable Effort (TAE, number of rights and exemption holders) and rights allocated in 2016-17 for each netfish area. Levels of effort are based on the number of fishers who could maintain a viable income in each area (DAFF 2017).

Area	Locality	Beach-seine	Gillnet/driftnet	Total	Rights allocated
A	Port Nolloth	3	4	7	4
B	Hondeklipbaai	0	2	2	0
C	Olifantsriviermond-Wadrifsoutpansmond	2	8	10	4
D	Wadrifsoutpansmond-Elandsbaai-Draaihoek	3	6	9	6
E	Draaihoek, (Rochepan)-Cape Columbine, including Paternoster	4	80	84	84
F	Saldhana Bay	1	5	6	5
G	Langebaan Lagoon	0	10	10	10
H	Yzerfontein	2	2	4	1
I	Bokpunt (Melkbos)-Milnerton	3	0	3	1
J	Houtbay beach	2	0	2	0
K	Longbeach-Scarborough	3	0	3	1
L	Smitswinkel Bay, Simonstown, Fishoek	2	0	2	2
M	Muizenberg-Strandfontein	2	0	2	2
N	Macassar*	0	0	0	(1)
OE	Olifants River Estuary	0	45	45	45

The beach-seine fishery operates primarily on the West Coast of South Africa between False Bay and Port Nolloth (Lamberth 2006) with a few permit holders in KwaZulu-Natal targeting mixed shoaling fish during the annual winter migration of sardine (Fréon *et al*., 2010). Beach-seining is an active form of fishing in which woven nylon nets are rowed out into the surf zone to encircle a shoal of fish. They are then hauled shorewards by a crew of 6–30 persons, depending on the size of the net and length of the haul. Nets range in length from 120 m to 275 m. Fishing effort is coastal and net depth may not exceed 10 m (DAFF 2014b). There are currently three rights issued for Area A (Port Nolloth) and no rights issued for Area B (Hondeklipbaai).

The gillnetfishery operates from Yzerfontein to Port Nolloth on the West Coast. Surface-set gillnets (targeting mullet) are restricted in size to 75 m x 5 m and bottom-set gillnets (targeting St Joseph shark) are restricted to 75 m x 2.5 m (da Silva *et al*., 2015) and are set in waters shallower than 50 m. The spatial distribution of effort is represented as the annual number of nets per kilometre of coastline and ranges up to a maximum of 15 off St Helena Bay. Of a total of 162 right holders, four operate within Area A (Port Nolloth) and two operate within Area B (Hondeklipbaai).

Sea Area 5C is situated offshore of management area B, however the range of gillnets (50 m) and that of beach-seine activity (20 m) is not likely to directly overlap with the prospecting application area which is situated in waters deeper than 50 m. Figure 5-62 shows the expected range of gillnet and beach-seine fishing activity in relation to the prospecting application area.

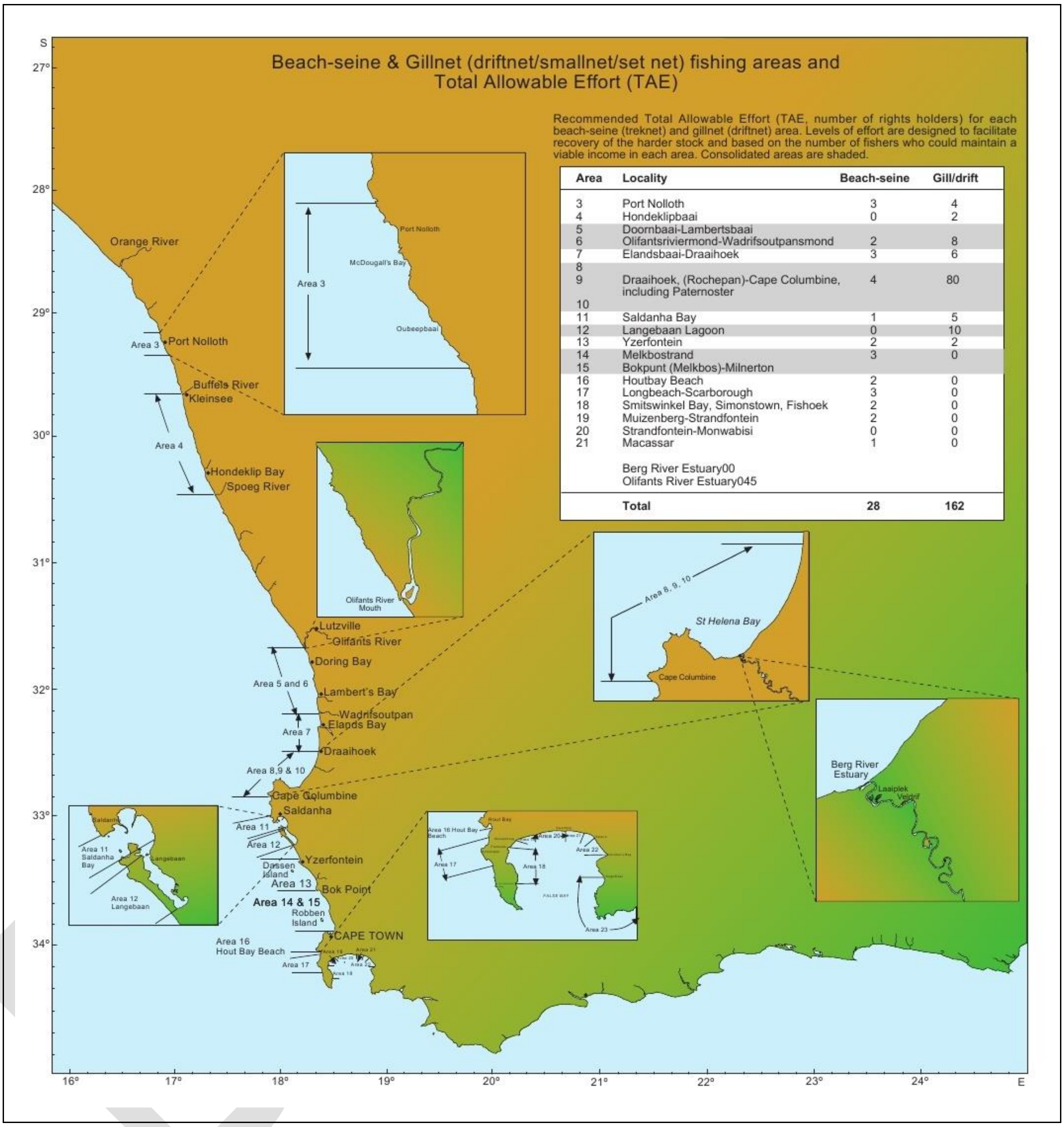


Figure 5-61: Beach-seine and gillnetfishing areas and TAE (DAFF, 2014)

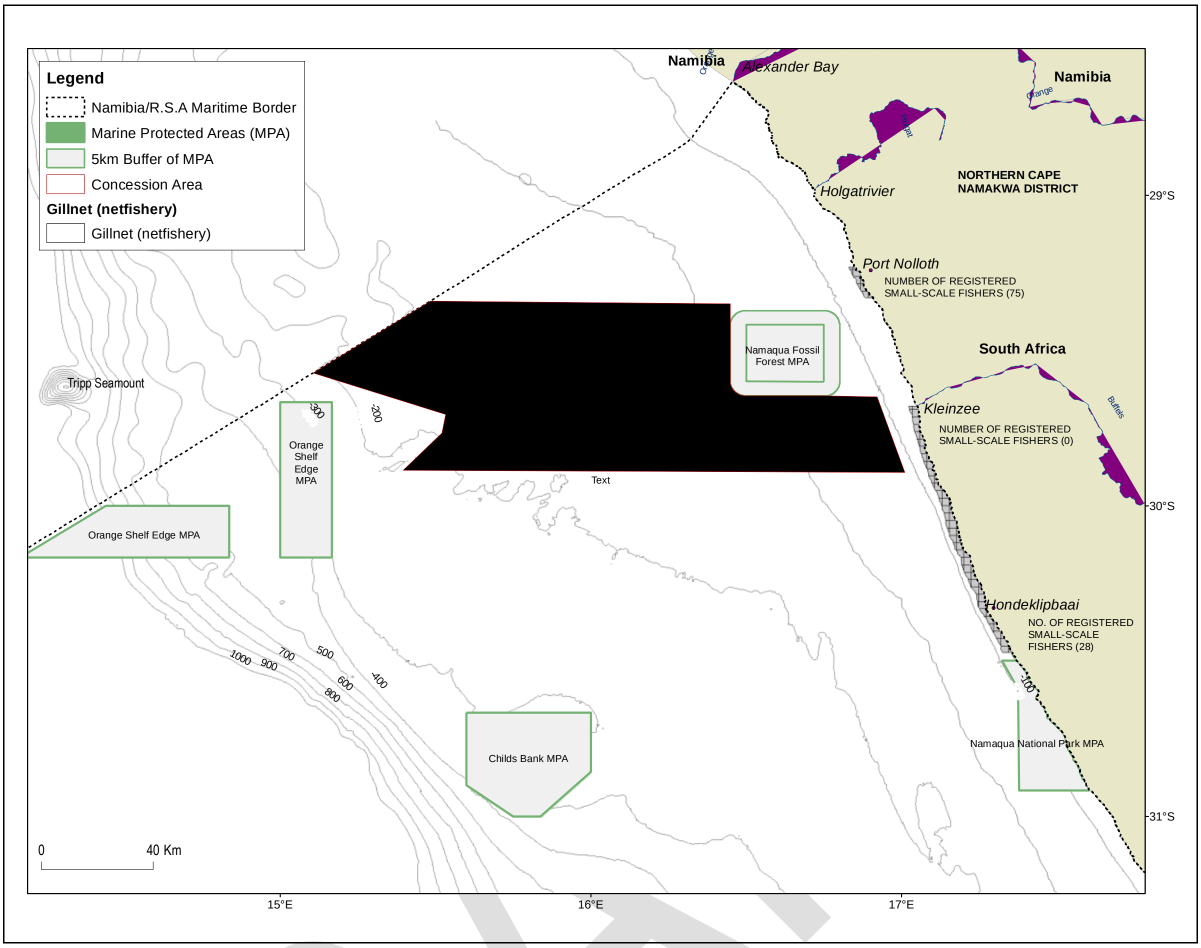


Figure 5-62: Number of rights issued for gillnetfishing areas A (Port Nolloth) and B (Hondeklipbaai) to a maximum fishing depth of 50 m (DAFF, 2016/17) in relation to the Concession Area.

Small-Scale Fisheries

The concept of Small-Scale Fisheries (SSF) is a relatively new addition to the fisheries complexity in South Africa. The concept has its origin in a global initiative supported by the Food and Agricultural Organisation of the United Nations (FAO). In South Africa, there is a long history of coastal communities utilizing marine resources for various purposes. Many of these communities have been marginalized through apartheid practices and previous fisheries management systems. In 2007 government was compelled through an equality court order to redress the inequalities suffered by these traditional fishers. The development of a SSF sector aims in part to compensate previously disadvantaged fishing communities that have been displaced either politically, economically or by the development of large-scale commercial fisheries. This led to the development of the Small-Scale Fisheries Policy (SSFP), the aim of which is to redress and provide recognition of the rights of small-scale fishers (DAFF, 2015). The SSFP was gazetted in May 2019 under the Marine Living Resources Act, 1998 (Act No. 18 of 1998). It is only now (2021/2022) in an advanced process of implementation. It is a challenging process that has been exacerbated by the conflict and overlap with another fisheries-related process of fishing rights allocations (known as Fishery Rights Allocation Process or “FRAP”). As of August 2022, neither process has been concluded and the issues at stake are highly politicised. The SSF overlaps other historical fisheries in South Africa, leading to legal challenges where the SSF rights allocations are in conflict with other established commercial fishing sectors, most notably the commercial squid fishing sector. SSF is defined as a fishery although specific operations and dynamics are not yet fully defined as they are subject to an ongoing process by DFFE. The SSF regulations

(DAFF, 2016) do however define the fishing area for SSF as "near-shore", meaning "the region of sea (including seabed) within close proximity to the shoreline". The regulations further specify under Schedule 5 *Small-scale fishing areas and zones* in which "5. (1) In order to facilitate the establishment of areas where small-scale fishers may fish, the Department must set up a procedure to engage and consult with the small-scale fishing community in proposing demarcated areas that may be established as areas where small-scale fishers may fish and which under Section 5 (2)b. "*take into account the mobility of each species in the allocated basket of species with sessile species requiring smaller fishing areas while nomadic and migratory species requiring larger area.*

Small-scale fishers fish to meet food and basic livelihood needs, but may also directly be involved in fishing for commercial purposes[26]. These fishers traditionally operate on nearshore fishing grounds to harvest marine living resources on a full-time, part-time, or seasonal basis. Fishing trips are usually of short-duration and fishing/harvesting techniques are labour intensive[27].

Small-scale fishers are an integral part of the rural and coastal communities in which they reside, and this is reflected in the socio-economic profile of such communities. In the Eastern Cape, KwaZulu-Natal and the Northern Cape, small scale fishers live predominantly in rural areas while those in the Western Cape live mainly in urban areas (Sunde & Pedersen C., 2007; Sunde, 2016).

Many communities living along the coast has, over time, developed local systems of rules to guide their use of coastal lands, forests and waters. These local rules are part of their systems of customary law. Rights to access, use, and own different natural resources arise from local customary systems of law. These systems of law are not written down as in Western law, but are passed down from generation to generation through practice (https://www.masifundise.org/wp-content/uploads/2011/06/vissernet-eng-news-3-final.pdf). South Africa's Constitution recognises customary law together with common law and state law. Section 39 (3) makes provision for a community that has a system of customary rights arising from customary law to be recognised as long as these rights comply with the Bill or Rights. In line with this, the SSFP also recognises rights arising in terms of customary law. Customary fishers are normally associated with discrete groups (tribes or communities with unique identities and associations with the sea) who may be defined by traditions and beliefs (see also Pretorius, 2022). These traditions are increasingly being challenged as stocks and marine resources have been depleted. This would include, for example, intertidal harvesting of seaweed, mussels, oysters, cephalopods and virtually any species available to these communities. These fishers are generally localised and do not range far beyond the areas in which they live[28].

SSF resources are managed in terms of a community-based co-management approach that aims to ensure that harvesting and utilisation of the resource occurs in a sustainable manner in line with the ecosystems approach. The SSF is to be implemented along the coast in series of community co-

[26] There is no formal designation of artisanal (or traditional/subsistence) fishing in South Africa, which is generally considered as fishing or resource extraction for own use. As fisheries have evolved and the commercial benefit realised, subsistence fishers have increasingly moved to commercialisation aimed at supporting their livelihoods. This group can now, therefore, also include shore and boat-based anglers and spear-fishers who target a wide range of linefish species, some of which are also targeted by commercial operations, skin divers who collect rock lobsters and other subtidal invertebrates, bait collectors (mussels, limpets, red bait) and non-subsistence collectors of intertidal organisms. The high value of many intertidal and subtidal resources (e.g., rock lobster, abalone, and mussels) has resulted in an increase in their production through aquaculture and small-scale harvesting in recent years (Clark, et al., 2010).

[27] The equipment used by small scale fishers includes rowing boats in some areas, motorized boats on the south and west coast and simple fishing gear including hands, feet, screw drivers, hand lines, prawn pumps, rods with reels, gaffs, hoop nets, gill nets, seine/trek nets and semi-permanently fixed kraal traps.

[28] It can include foot-fishers, but also boat fishers who may have difficult or restricted options for launching sites. Note that in some areas fishers are increasingly using more sophisticated technology such as fish finders and larger motorised boats. This ability means their activities may be increasingly commercialised and may overlap with more established commercial fishery sectors.

operatives. Only a co-operative is deemed to be a suitable legal entity for the allocation of small-scale fishing rights[29]. These community co-operatives will be given 15-year small-scale fishing Rights. The criteria to be applied in determining whether a person is a small-scale fisher are that the person must (a) be a South African citizen who associates with or resides in the relevant small-scale fishing community; (b) be at least 18 years of age; (c) historically have been involved in traditional fishing operations, which include catching, processing or marketing of fish for a cumulative period of at least 10 years; and (d) derive the major part of his or her livelihood from traditional fishing operations and be able to show historical dependence on fish, either directly or in a household context, to meet food and basic livelihoods needs..

More than 270 communities have registered an Expressions of Interest (EOI) with the Department and approximately 10 000 small-scale fishers have been identified around the coast. DFFE has split SFF by communities into district municipalities and local municipalities. These fishers are generally localised and do not range far beyond the areas in which they live. Port Nolloth and Hondeklipbaai being the closest communities to the Concession Area.

In the Northern Cape, there are 103 fishers registered in the Namaqua district, comprising the Richtersveld and Kamiesberg local municipalities. Western Cape districts include 1) West Coast (Berg River, Saldanha Bay, Cederberg, Matzikama and Swartland local municipalities; 2) Cape Metro; 3) Overberg (Overstrand and Cape Agulhas); and 4) Eden (Knysna, Bitou and Hessequa). In total there are 2748 fishers registered in the Western Cape. In the Eastern Cape, the communities are again split up, broadly as 1) Nelson Mandela Bay, 2) Sarah Baartman, 3) Buffalo City, 4) Amathole, 5) O.R. Tambo and 6) Alfred Nzo. There are 5154 fishers registered in the province. KwaZulu-Natal has 2008 registered small-scale fishers divided by district into 1) Ugu, 2) Ethekwini Metropolitan, 3) Ilembe, 4) King Shwetshayo/Uthungula, and 5) Umkhanyakude.

The SSFP requires a multi-species approach to allocating rights, which entails the allocation of rights for a basket of species that may be harvested or caught within particular designated areas[30]. Section 6 of the regulations covers access *Management of the rights of access*. Co-operatives can only request access to species found in their local vicinity. DFFE recommends five basket areas: 1. Basket Area A – The Namibian border to Cape of Good Hope – 57 different resources 2. Basket Area B – Cape of Good Hope to Cape Infanta – 109 different resources 3. Basket Area C – Cape Infanta to Tsitsikamma – 107 different resources 4. Basket Area D – Tsitsikamma to the Pondoland MPA – 138 different resources 5. Basket Area E – Pondoland MPA to the Mozambican border – 127 different resources.

The mix of species to be utilised by small-scale fishers includes species that are exploited by existing commercial sectors viz; traditional linefish, west coast rock lobster, squid, hake handline[31], abalone, KZN beach seine, netfish (gillnet and beach-seine), seaweed and white mussel. An apportionment of TAE/TACs for these species will be transferred from existing commercial rights to SSF[32], whereas white mussels will become the exclusive domain of SSF. Species nominated for commercial use will

[29] A co-operative is jointly owned and democratically controlled by small-scale fishers.

[30] Under the SSF regulations the species that may be included in the "basket" are provided in Annexures 2, 3 & 4 that includes fish species that are listed on the non-saleable list, and those that 2 shall only be caught for own consumption within the corresponding limits.

[31] Hake handline is a small subsector of the hake fishery and requires a fishing right apportionment. The fishery has in recent years not been active because of resource availability. It is perceived as having potential for allocation as part of the SSF and as part of their "basket".

[32] DFFE proposes that 50% of the overall TAE and TAC for the traditional linefish and abalone sectors, respectively, will be apportioned to small-scale fishing whereas 25% of the overall TAE for squid will be apportioned to small-scale fishing (DEFF 2020).

be subject to TAE and/or TAC allocation. Species nominated for own use will be available to all members of a particular co-operative, but subject to output controls.

The small-scale fishery rights cover the nearshore area (defined in Section 19 of the MLRA as being within close proximity of shoreline). Small-scale fishermen along the Northern Cape and Western Cape coastlines are typically involved in the traditional line, west coast rock lobster and abalone fisheries, whereas communities on the South Coast would be involved in traditional line, squid jig and oyster harvesting. The small-scale communities on the West Coast, with long family histories of subsistence fishing, prioritise the harvest of nearshore resources (using boats) over the intertidal and subtidal resources. An example of such boats is shown in Figure 5-63.

Figure 5-63: Fishing boats outside the Hondeklipbaai small-scale community co-operative (photo credit Carika van Zyl).

Snoek (*Thyrsites atun*), Cape bream / hottentot (*Pachymetopon blochii*) and yellowtail (*Seriola lalandi*) are important linefish species that are targeted by small-scale fishers operating nearshore along the West and South-West Coast of South Africa.

Snoek is targeted by small-scale fishers during the snoek seasonal migration between April and June, during which time they shoal nearshore and are therefore available to handlinefishermen[33]. Snoek availability coincides with peaks in the availability of other small pelagic species, notably anchovy and sardine (Nepgen, 1979). As shown by Crawford *et al.,* (1987) [34][35] snoek stays inshore on their southward migration (i.e., April through to June) and then move offshore into deeper waters to spawn[36]

[33] Snoek is known to undertake migrations in a southward direction from the waters of the northern Benguela into the southern Benguela towards the cape west and southern coasts. These migrations have certainly been long taken advantage of by fishers, including traditional linefishers and communities along the west coast. Commercial fishers as well as the Small-Scale Fishery (SSF) sector capitalise on the inshore availability, but this opportunity is lost once the snoek move offshore in mid-winter and start their northward migration. Snoek is primarily a “winter” fish, moving systematically southwards in autumn and commercial linefish, recreational, and community-based boats exploit this shoaling species mostly in the nearshore. Snoek is also caught by the hake trawl fleets in significant numbers at times as snoek may undertake diurnal migrations feeding or spawning in deeper waters (and are not accessible to surface linefishers at these times). There is however no definitive description of snoek migrations with regard to their exact spatial and temporal movements.

[34] The Benguela ecosystem: Part IV. pgs 438

[35] See also Nepgen (1979) in Fish. Bull. S Afr. 12:35-43

[36] Snoek spawning occurs offshore during winter-spring, along the shelf break (150-400 m) of the western Agulhas Bank and the South African west coast. Prevailing currents transport eggs and larvae to a primary nursery ground north of Cape Columbine and to a secondary nursery area to the east of Danger Point; both shallower than 150 m. Juveniles remain on the nursery grounds until maturity, growing to between 33 and 44 cm in the first year (3.25 cm/month). Onshore-offshore distribution

in July and August (and are not available to linefishers during these times as the fish are beyond the depth range of surface linefishers).

Small-scale fishers also target west coast rock lobster (*Jasus156alandii*) using hoopnets set by small “bakkies” on at a water depth of less than 30 m. Fishing activity may range up to 100 m water depth by the larger vessels that participate in the offshore commercial rock lobster trap sector.

The small-scale fishery rights cover the nearshore area (defined in Section 19 of the MLRA as being within close proximity of shoreline). These in reality are unlikely to extend beyond 3 nm from the coast. Small-scale fishermen along the Northern Cape coast are typically involved in the traditional line, west coast rock lobster and netfisheries (refer to the Commercial or Traditional Linefish, West Coast Rock Lobster, and Beach Seine and Gillnet Fisheries (Netfish) Sections).

<u>Seaweed</u>

Seaweed is also regarded as a fishery, with harvesting of kelp (*Ecklonia maxima*) and (*Laminaria pallida*) in the Western and Northern Cape and hand-picking of *Gelidium* sp. in the Eastern Cape. The seaweed industry employs over 1 700 people, most of whom are previously disadvantaged. Although both species are harvested, *E. maxima* are most in demand and constitute most of the biomass, which is primarily used by the abalone aquaculture industry as abalone feed. However, the demand placed on the resource outweighs what is available for harvest, particularly in areas close to abalone farms. Seaweed harvesting is highly regulated in South Africa and is managed in the form of Concession Areas. Each Concession Area is awarded to a rights holder with a limit set for that particular area on the amount (biomass) of kelp that can be legally harvested. Seaweed is either harvested in situ or from beaches in the form of kelp-wrack. Kelp-wrack consists of kelps dislodged from the substratum during times of high wave energy and are transported by ocean currents towards the coast, eventually depositing on beaches. The quality of in situ kelp is considered higher than that of kelp-wrack; therefore, in situ kelp is the preferred option; however, kelp-wrack is targeted when in situ harvesting is not possible. Kelp can also be harvested by the general public by hand from beaches and shorelines, provided they have the appropriate permit.

The biogeographical distribution of kelps is limited by several environmental factors, with seawater temperature being the main limitation. Due to this limiting factor, the two main species of kelp in South Africa, *Ecklonia maxima* and *Laminaria pallida*, are distributed along the south coast from De Hoop, extending westward around the Cape Peninsula and further extending north into Namibia (Molloy and Bolton, 1996; Stegenga, 1997). Temperature around the coastline varies as one moves from Namibia towards the Cape Peninsula and De Hoop, where coastal temperature increases. False Bay is a region of warmer temperatures where *E. maxima* and *L. pallida* have extended their distribution eastwards in recent years (Bolton *et al.*, 2012), which has thought to be related to climate change effects (Bolton *et al.*, 2012). Upwelling is an essential oceanographic process in the marine environment, which supplies cool, nutrient-rich water from the deep ocean into coastal regions (Rouault *et al.*, 2010). The increased frequency of upwelling along the coastline, as a result of climate change, has created a temperature environment suitable for kelp populations (Bolton *et al.*, 2012). The extension of kelp species has these endemic species in a unique position relative to other kelp species worldwide, where populations have declined significantly (Krumhansl *et al.*, 2016). The expansion of kelp biomass along the coastline

(between 5- and 150-m isobaths) of juveniles is determined largely by prey availability and includes a seasonal inshore migration in autumn in response to clupeoid recruitment. Adults are found throughout the distribution range of the species, and although they move offshore to spawn - there is some southward dispersion as the spawning season progresses - longshore movement is apparently random and without a seasonal basis (Griffiths, 2002).

provides the opportunity for further exploitation and harvesting activities. Also, it expands the habitat for economically important species, such as abalone and West Coast rock lobster.

Although both species (*E. maxima* and *L. pallida*) occur together for most of the coastline, their resource needs vary. Generally, E. maxima occur between depths of 4-10 m deep and extend to the surface to form a canopy, while L. pallida occupy depths greater than 10 m and do not extend to the surface but instead form a subsurface canopy (Coppin et at. 2020). In general, kelp species are known for their resilience to environmental changes and are able to adapt rapidly to changing environmental conditions. Rapid adaptation is achieved through developing morphological characteristics which reduce drag forces, and ultimately, the probability of dislodgement (Coppin *et at.* 2020). In high wave energy environments, kelps take on morphological characteristics that either increase strength of attachment to the substrate or reduce drag forces on structural components (Coppin *et at*. 2020). The reduction of surface area (drag reducing trait) comes at a physiological cost which in turn reduces the amount of light and nutrients which can be absorbed. Therefore, kelps must balance their photosynthetic need with that of reducing probability of dislodgment (Coppin et at. 2020). Warmer temperatures affect important kelp physiological processes such as photosynthesis and respiration which influences growth and productivity (Bearham *et al*., 2013; Gao *et al*., 2013). Although kelps are highly resilient species, there is a threshold beyond which kelps will no longer be able to adapt (Coppin *et at*. 2020).

The larger species, *E. maxima*, is a conspicuous organism along the coastline and dominates the biomass of the nearshore, while *L. pallida* are limited to the sub-surface for most of the coastline. Towards the north along the west coast, from approximately Hondeklipbaai, *L. pallida* replaces *E. maxima* as the dominant kelp species (Velimirov *et al*., 1977; Stegenga, 1997) and occupy increasingly shallow subtidal regions. The northern populations also exhibit an increase in stipe hollowness compared to the solid stipe morphs in the species' southern distributions (Molloy and Bolton, 1996). This variation in morphology was thought to represent two distinct species, with the northern populations formerly described as Laminaria schinzii Foslie (Molloy and Bolton, 1996). Genetic work has subsequently shown that the two morphs are, in fact, the same species (Rothman *et al.*, 2017b). Although the mechanism which influences morphology between populations of *L. pallida* has not been empirically established, it has been suggested that the distinct morphology and replacement of *E. maxima* further north of the coast is a result of turbidity (Rothman *et al.*, 2017a). Light is a significant influencer of kelp populations, with *E. maxima* requiring more light than *L. pallida* which can exploit low-light habitats (Rothman *et al.*, 2017a). The lower light requirement of *L. pallida* allows this species to outcompete *E. maxima* along the west coast and ultimately dominate the biomass of the coastline further North and into Namibia.

The biggest threat to kelp forests is temperature and wave exposure which may thin populations over time. Warmer temperatures (rising ocean temperatures and marine heatwaves) cause physiological stress to individuals, and high wave energy (storms) dislodges kelps from the substrate (Graham, 2004; Byrnes *et al.,* 2011). Kelps with air-filled structures, which allow them to remain upright within the water column, may float to the surface once dislodged and are transported via ocean currents to near and distant offshore areas and coastlines (Smith, 2002). The dispersion of kelp to near and distant ecosystems has been recognised as an important organic subsidy that many organisms rely on (Bustamante and Branch, 1996; Krumhansl and Scheibling, 2012). Along with the organic subsidy, kelps also provide a vital economic resource for coastal populations (Troell *et al.*, 2016).

Much of the harvest is sun-dried, milled and exported for the extraction of alginate. Fresh kelp is also harvested in large quantities in the Western Cape as feed for farmed abalone. This resource, with a market value of about R6 million is critically important to local abalone farmers. Fresh kelp is also harvested for high-value plant-growth stimulants that are marketed locally and internationally.

Harvesting rights are issued by management area. Whilst the Minister annually sets both a TAC and TAE for the sector, the principal management tool is effort control and the number of right holders in each seaweed harvesting area is restricted. Fourteen commercial seaweed harvesting rights are currently allocated and each Concession Area is limited to one right-holder for each functional group of seaweed (e.g., kelps, *Gelidium* spp. and Gracilarioids). In certain areas there are also limitations placed on the amounts that may be harvested.

Table 5-20 lists the annual yields of commercial seaweeds in South Africa between 2003 and 2018. The South African coastline is divided between the Orange River and Port St Johns into 23 seaweed Rights areas (Figure 5-64). Table 5-21 lists the yield of kelp by area for the 2018 season. Permit conditions stipulate that beach cast kelp may be collected by hand within these management areas and that kelp may be harvested using a diver deployed from a boat or the shore.

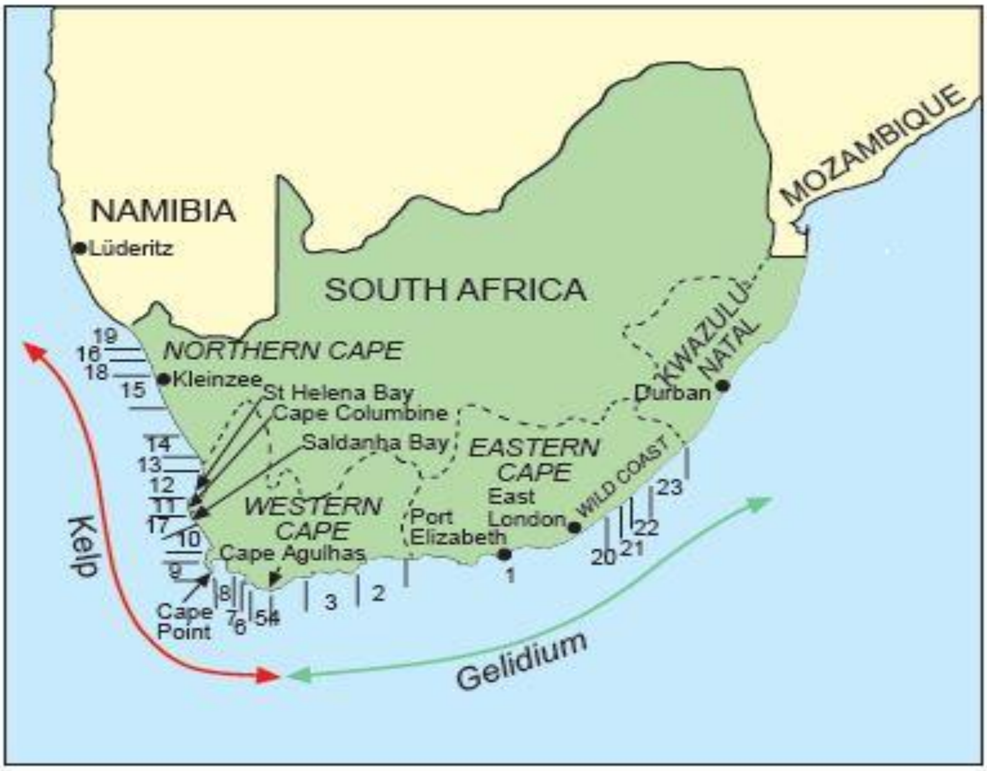


Figure 5-64: Map of seaweed rights areas in South Africa (DEFF, 2020).

Table 5-20: Annual yields of commercial seaweeds in South Africa (2003 – 2018). "Kelp beach cast' refers to material that is collected in a semi-dry state, whereas 'kelp fresh beach cast' refers to clean, wet kelp fronds that, together with 'kelp fronds harvest', are supplied as abalone feed (DEFF, 2020).

Year	*Gelidium* (kg dry weight)	Gracilarioids (kg dry weight)	Kelp beach cast (kg dry weight)	Kelp fronds harvest (kg fresh weight)	Kelp fresh beach cast (kg fresh weight)	Kelpak (kg fresh weight)
2003	113 869	92 215	1 102 384	4 050 654	1 866 344	957 063
2004	119 143	157 161	1 874 654	3 119 579	1 235 153	1 168 703
2005	84 885	19 382	590 691	3 508 269	126 894	1 089 565
2006	104 456	50 370	440 632	3 602 410	242 798	918 365
2007	95 606	600	580 806	4 795 381	510 326	1 224 310
2008	120 247	0	550 496	5 060 148	369 131	809 862
2009	115 502	0	606 709	4 762 626	346 685	1 232 760
2010	103 903	0	696 811	5 336 503	205 707	1 264 739
2011	102 240	0	435 768	6 023 935	249 651	1 617 915
2012	108 060	0	1 063 233	6 092 258	1 396 227	1 788 881
2013	106 182	0	564 919	5 584 856	253 033	2 127 659
2014	75 900	0	775 625	4 555 704	244 262	1 610 023
2015	95 200	0	389 202	3 974 100	249 014	1 930 654
2016	102 500	0	411 820	4 044 759	100 018	2 166 293
2017	102 802	0	482 082	3 254 561	63 276	3 001 611
2018	89 253	0	540 498	4 803 358	552 691	1 886 691

Table 5-21: Maximum sustainable yield of harvested kelp for all areas for the 2018 season (1 March 2018 – 28 February 2019) (DFFE, 2020).

Area Number	Whole kelp (t fresh weight)	Kelp fronds (t fresh weight)
5	0	2 625
6	174	4 679
7	1 421	710
8	2 048	1 024
9	2 060	2 080
10	188	94
11	3 085	1 543
12	50	25
13	113	57
14	620	310
15	2 200	1 100
16	620	310
18	2 928	1 464
19	765	383
Total	**18 371**	**16 404**

Figure 5-65 shows Sea Areas 4C and 5C in relation to management areas 16 and 15, situated offshore of Port Nolloth and Hondeklipbaai, respectively.

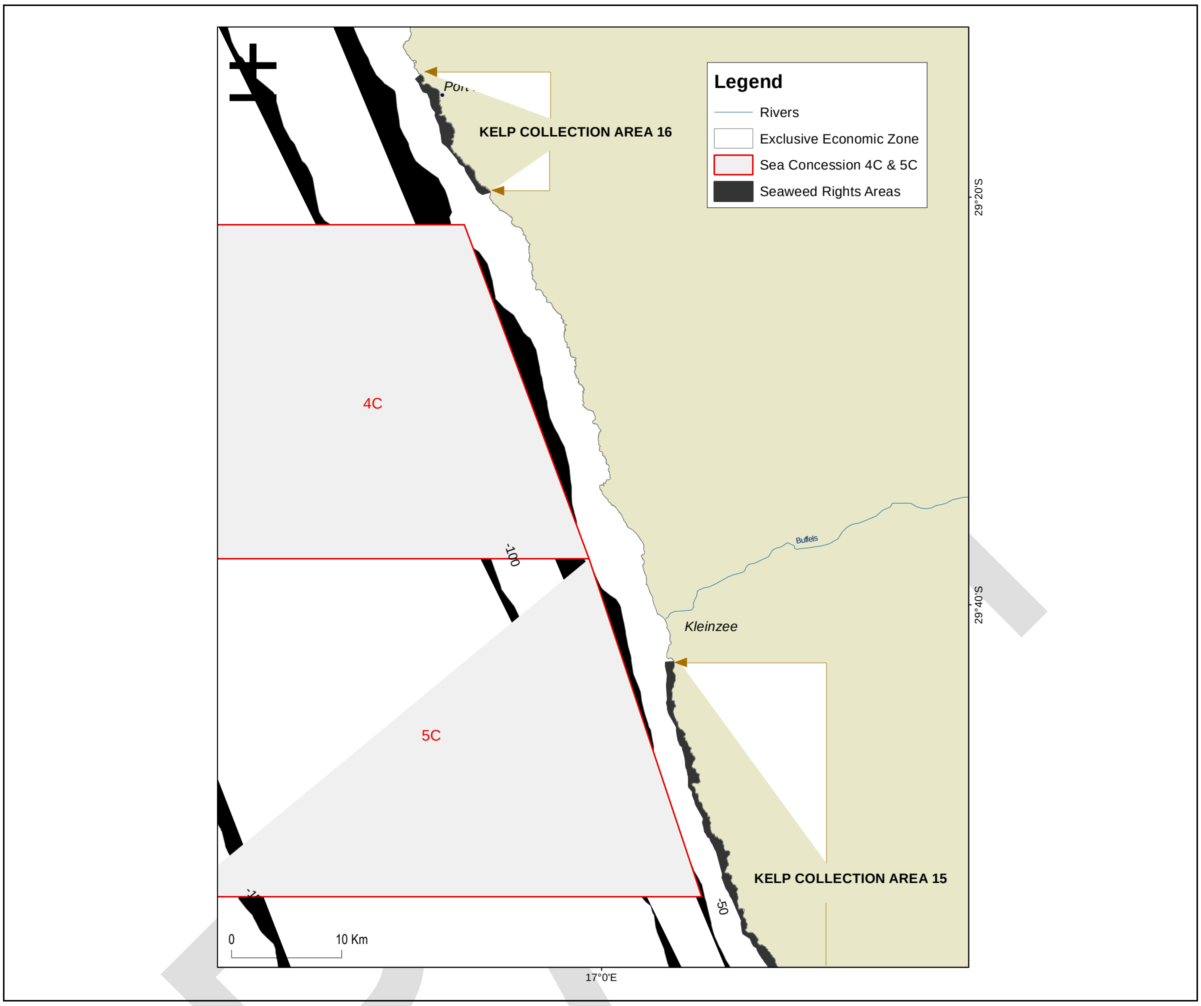


Figure 5-65: Location of seaweed rights areas in relation to Sea Areas 4C and 5C.

Permit conditions stipulate that beach cast kelp may be collected by hand within these management areas and that kelp may be harvested using a diver deployed from a boat or the shore. Over the period 2000 to 2017, an average of 40.33 tonnes per annum of dry harvested kelp (beach cast) and 34.67 tonnes per annum of wet harvested kelp were reported within collection area 15. An average of 37 tonnes per annum of dry harvested kelp and 37.33 tonnes of wet harvested kelp were reported within collection area 16. Amounts harvested within these collection areas amounts to approximately 16.3% of the total kelp harvests, nationally. The harvesting areas are not expected to coincide with the prospecting application area, which lies beyond the depth range at which divers could harvest kelp.

Summary of Fisheries Seasonality

The seasonality of each of the fishing sectors that operate in the vicinity of the Concession Area is indicated in Table 5-22 – also presented is the relative intensity of fishing effort on a month-by-month basis.

Table 5-22: Summary table showing seasonal variation in fishing effort expended by each of the main commercial fishery sectors in the vicinity of Sea Areas 4C and 5C.

Sector	Fishing Intensity by Month in the Vicinity of Sea Areas 4C and 5C H = high; M = Low to Moderate; N = None											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Demersal Trawl	H	H	H	H	H	H	H	H	H	H	H	H
Demersal Longline	M	H	H	H	H	M	H	H	H	H	H	H
Large Pelagic Longline	M	M	M	M	H	H	H	H	H	H	H	M
Pole-and-line (tuna pole)	N	N	M	M	M	M	M	N	N	N	N	N
Traditional Linefish	N	N	M	M	M	M	M	M	M	N	N	N
West Coast Rock Lobster (nearshore)	M	M	N	N	N	N	N	N	N	M	M	M
Small-scale (linefish & rock lobster nearshore sectors)	M	M	M	M	M	M	M	M	M	M	M	M
Research survey (trawl)	M	M	N	N	N	N	N	N	N	N	N	N
Research survey (acoustic)	N	N	N	N	M	M	N	N	N	N	M	N

5.1.12 Diamond Prospecting and Mining

Offshore Namaqualand, marine diamond prospecting and mining is conducted in the nearshore surfzone, A-Concession (up to 1 km offshore), B-Concession (1 to 5 km offshore) and C-Concession (5 km up to 200 m isobath) areas. Work in the surfzone area is conducted by divers using suction hoses operating directly from the shore. A- and B-Concession areas use small vessels (up to est. 30 m length) with diver assist suction hoses for mining. These vessels are small enough to operate from the small harbours of Alexander Bay and Port Nolloth. C-Concession areas require larger vessels and remotely operated equipment. These larger vessels cannot use the small local harbours and have to return to Cape Town for maintenance.

5.1.13 Oil and Gas Exploration and Production

Exploration for oil and gas is currently undertaken in a number of licence blocks off the West Coast of South Africa. Although now development or production from the South African West Coast offshore, exploration for oil and gas is being undertaken in the area.

5.1.14 Anthropogenic Structures

Human intervention in the marine environment has introduced certain hazards on the seafloor. The Annual Summary of South African Notices to Mariners and charts from the South African Navy or Hydrographic Office provides detailed information on the location of different underwater hazards along the West Coast. These include undersea cables and archaeological sites.

5.1.15 Undersea Cables

There are a number of submarine telecommunications cable systems across the Atlantic and the Indian Ocean as depicted in Figure 5-66, including the WACS and ACE cables. The SAT3/SAFE cables (SAT-1 [abandoned], SAT-2 and SAT-3) are laid on the seafloor approximately on the 3 000 m isobaths, running up the Cape Canyon to land at Melkbosstrand.

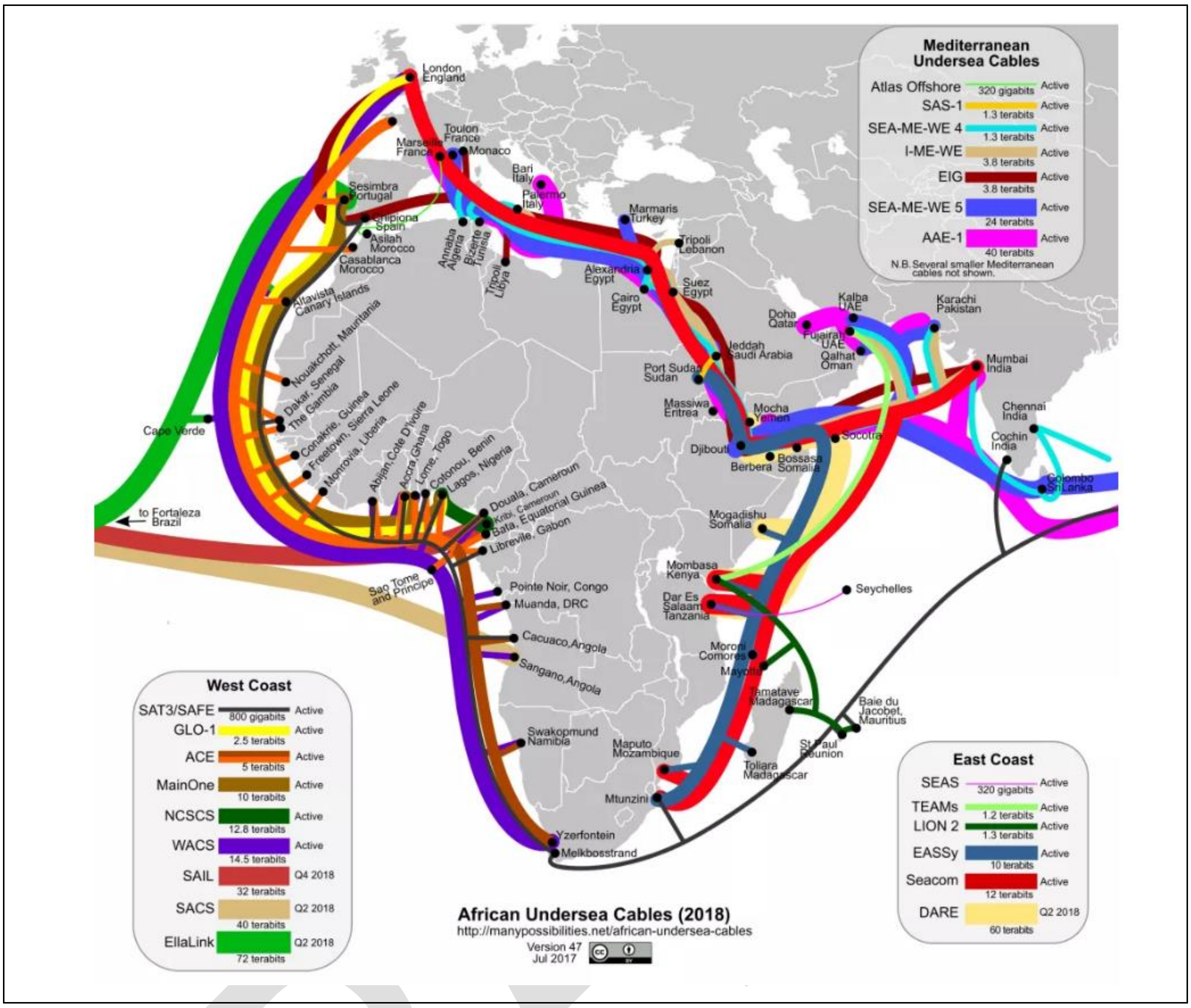


Figure 5-66: African undersea cables (www.manypoibilities.net, 2017).

5.1.16 Marine Archaeological Sites

More than 2 800 shipwrecks are present along the South African coastline. The majority of known wrecks along the West Coast are located in relatively shallow water close inshore (within the 100 m isobath). All wrecks and associated artefacts older than 60 years are considered archaeological and are therefore provided protection under Section 2 and 35 of the NHRA.

According to SAHRA, a HIA for sea concession 4C, 5C, and 6C was conducted in 2017. The HIA found that at least five vessels wrecked in sea Concession Areas 4C, 5C, and 6C and that a further 28 vessels might have wrecked somewhere in the area. It is unlikely that any shipwrecks exist beyond the shallow inshore region.

5.1.17 Socio-Economic

This section provides and overview of the socio-economic environment for the study area from publicly available sources (e.g. the Namaqua District Municipality IDP 2020-21).

The Namaqua District Municipality is situated in the north-western corner of South Africa and borders the Atlantic Ocean to the west and Namibia to the north. It is also bordered by the ZF Mgcawu and Pixley ka Seme Districts of the Northern Cape Province to the North-East and East, respectively. It is borders by the Western Cape Province to the South (the West Coast, Cape Winelands and Central Karoo District Municipalities). The district is one of five districts in the Northern Cape Province and situated in the western part of the province. The Namaqua District is the largest district geographically in South Africa (NDM, 2021).

Table 5-23 summarises information on the local municipalities which are located adjacent to the application area.

Table 5-23: Namaqua Local Municipality Descriptions (NDM, 2021)

Municipality	Description
Richtersveld Municipality (NC061)	Richtersveld Municipality is one of six Category B Local Municipalities. The municipality is named after Reverend W Richter, a Dutch missionary of the 20th century who opened a mission station in Kuboes. The Richtersveld is a unique landscape surrounded by a variety of contrasts. In Port Nolloth is the ocean, at Alexander Bay there is the Orange River, and at Lekkersing and Eksteensfontein there is underground water that is a little brackish. The Richtersveld Municipal Area are earmarked for a massive harbour development to be located at Boegoebaai on the arid Namaqua coastline. This project is currently in its initial phase and it is envisage that this development will serves as an enabler of further development in the Northern Cape.
Nama Khoi Municipality (NC062)	The Nama Khoi Municipal area is situated in the north-western part of the Northern Cape Province. It forms part of the Namaqua District Municipality with the town of Springbok as the administrative centre. This region is known as the land of the Nama people, the domain of the indigenous Khoi-San. The mighty Orange River provides, not only solace to the soul of the avid nature-lover, but also watersports such as river rafting for the more adventurous. Tourism has become an economic pillar, relieving hardships and serving as a reminder of the rich cultural heritage buried in the plains of Namaqua. Currently Kangnas Wind Farm Project is located 46 km outside of Springbok in the Nama Khoi Municipality. The Wind Farm project started construction during June 2018. Kangnas Wind Farm will generate clean renewable energy, once operational and is an indication of the huge renewable energy potential of the District.
Kamiesberg Municipality (NC064)	The Kamiesberg Municipality serves a geographical area of 11 742 km² and is divided into four municipal wards. Its total population is estimated at just above 10 000, the majority of whom are not economically active. The nearest business centre is Springbok, about 120 km away. The municipality provides electricity to 86 farms within its area. Hondeklipbaai is a seaside town and has a harbour, which serves fishing and diamond-mining boats. It is also a mariculture (i.e. crayfish) and tourist centre (i.e. scenic drives and 4 x 4 routes). Garies and Kamieskroon situated along the N7 Highway are known for their abundance of spring wildflowers. Koiingnaas is a mining town for alluvial diamonds. Several mining activities are presently in different phases in this area.

Demographic Profile

The Namaqua District is the District in the Northern Cape Province with the lowest population in 2016 namely 115 488. This is a slight decline from the 2011 census figure of 115 842 and is the least populated district in the Province (and Country, although geographically the largest) with a population comprising 10% of the Provincial total population.

Between 2008 and 2018 the population growth averaged 0.93% per annum which is about half than the growth rate of South Africa as a whole (1.57%). Compared to Northern Cape's average annual growth rate (1.66%), the growth rate in Namaqua's population at 0.93% was about half than that of the province.

Based on the present age-gender structure and the present fertility, mortality and migration rates, Namaqua's population is projected to grow at an average annual rate of 1.1% from 132 000 in 2018 to 139 000 in 2023.

The population pyramid reflects a projected change in the structure of the population from 2018 and 2023. The differences can be explained as follows:

- In 2018, there is a significantly larger share of young working age people between 20 and 34 (23.1%), compared to what is estimated in 2023 (21.7%). This age category of young working age population will decrease over time;
- The fertility rate in 2023 is estimated to be very similar compared to that experienced in 2018;
- The share of children between the ages of 0 to 14 years is projected to be significant smaller (19.4%) in 2023 when compared to 2018 (20.6%); and
- In 2018, the female population for the 20 to 34 years age group amounts to 11.7% of the total female population while the male population group for the same age amounts to 11.4% of the total male population. In 2023, the male working age population at 10.8% does not exceed that of the female population working age population at 11.0%, although both are at a lower level compared to 2018.

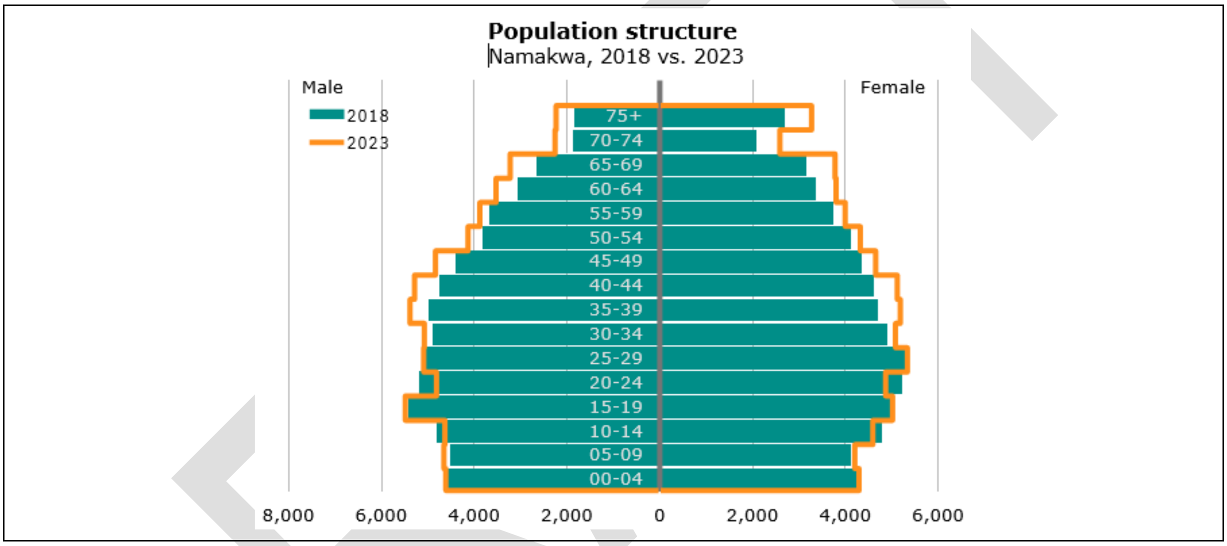


Figure 5-67: Population Pyramid for the Namaqua District Municipality, 2018 versus 2023 (IDP, 2021).

Namaqua District Municipality's male/female split in population was 98.6 males per 100 females in 2018. The Namaqua District Municipality appears to be a fairly stable population with the share of female population (50.36%) being very similar to the national average of (51.04%). In total there were 66 500 (50.36%) females and 65 600 (49.64%) males.

In 2018, the Namaqua District Municipality comprised of 39 400 households. This equates to an average annual growth rate of 1.17% in the number of households from 2008 to 2018. With an average annual growth rate of 0.93% in the total population, the average household size in the Namaqua District Municipality is by implication decreasing. This is confirmed by the data where the average household size in 2008 decreased from approximately 3.4 individuals per household to 3.3 persons per household in 2018.

Employment

The working age population in Namaqua in 2018 was 90 600, increasing at an average annual rate of 1.23% since 2008. For the same period the working age population for Northern Cape Province increased at 1.68% annually, while that of South Africa increased at 1.50% annually. The economically active population is a good indicator of how many of the total working age population are in reality participating in the labour market of a region Namaqua District Municipality's conomically active population was 48 000 in 2018, which is 36.33% of its total population of 132 000, and roughly 10.65% of the total conomically active population of the Northern Cape Province. From 2008 to 2018, the average annual increase in the conomically active population in the Namaqua District Municipality was 0.72%, which is 0.785 percentage points lower than the growth in the conomically active population of Northern Cape's for the same period.

The labour force participation rate LFPR is the conomically active population expressed as a percentage of the total working age population. The following is the labour participation rate of the Namaqua, Northern Cape and National Total as a whole. The Namaqua District Municipality's labour force participation rate decreased from 55.68% to 52.98% which is a decrease of -2.7 percentage points.

Employment data is a key element in the estimation of unemployment. In addition, trends in employment within different sectors and industries normally indicate significant structural changes in the economy. Employment data is also used in the calculation of productivity, earnings per worker, and other economic indicators. Total employment consists of two parts: employment in the formal sector, and employment in the informal sector. In 2018, Namaqua employed 36 200 people which is 11.15% of the total employment in Northern Cape Province (325 000), 0.23% of total employment in South Africa (16.1 million). Employment within Namaqua increased annually at an average rate of 0.39% from 2008 to 2018.

In Namaqua District Municipality the economic sectors that recorded the largest number of employment in 2018 were the community services sector with a total of 9 780 employed people or 27.0% of total employment in the district municipality. The trade sector with a total of 6 200 (17.1%) employs the second highest number of people relative to the rest of the sectors. The electricity sector with 472 (1.3%) is the sector that employs the least number of people in Namaqua District Municipality, followed by the transport sector with 1 360 (3.7%) people employed.

Total employment can be broken down into formal and informal sector employment. Formal sector employment is measured from the formal business side, and the informal employment is measured from the household side where formal businesses have not been established. The number of formally employed people in Namaqua District Municipality counted 31 400 in 2018, which is about 86.74% of total employment, while the number of people employed in the informal sector counted 4 800 or 13.26% of the total employment. Informal employment in Namaqua increased from 3 420 in 2008 to an estimated 4 800 in 2018.

Mining industry, due to well-regulated mining safety policies, and the strict registration of a mine, has little or no informal employment. The Electricity sector is also well regulated, making it difficult to get information on informal employment. Domestic Workers and employment in the Agriculture sector is typically counted under a separate heading. In 2018 the Trade sector recorded the highest number of informally employed, with a total of 1 740 employees or 36.23% of the total informal employment. This can be expected as the barriers to enter the Trade sector in terms of capital and skills required is less than with most of the other sectors. The Transport sector has the lowest informal employment with 235 and only contributes 4.90% to total informal employment.

Table 5-24: Formal and Informal Employment by Broad Economic Sector – Namaqua District Municipality (2018) (NDM, 2021)

Sector	Formal Employment	Informal Employment
Agriculture	5 600	N/A
Mining	3 380	N/A
Manufacturing	1 030	368
Electricity	472	N/A
Construction	2 450	675
Trade	4 460	1 740
Transport	1 120	235
Finance	1 890	573
Community Services	8 570	1 210
Households	2 450	N/A

In 2018, there were a total number of 12 000 people unemployed in Namaqua, which is an increase of 1 760 from 10 200 in 2008. The total number of unemployed people within Namaqua constitutes 9.36% of the total number of unemployed people in Northern Cape Province. The Namaqua District Municipality experienced an average annual increase of 1.60% in the number of unemployed people, which is better than that of the Northern Cape Province which had an average annual increase in unemployment of 2.14%.

In 2018, there were 51 100 people living in poverty, using the upper poverty line definition, across Namaqua District Municipality - this is 13.13% lower than the 58 800 in 2008. The percentage of people living in poverty has decreased from 49.05% in 2008 to 39.26% in 2018, which indicates a decrease of 9.79 percentage points.

Education

Within Namaqua District Municipality, the number of people without any schooling decreased from 2008 to 2018 with an average annual rate of -2.09%, while the number of people within the 'matric only' category, increased from 14,400 to 19,800. The number of people with 'matric and a certificate/diploma' increased with an average annual rate of 2.78%, with the number of people with a 'matric and a Bachelor's' degree increasing with an average annual rate of 3.55%. Overall improvement in the level of education is visible with an increase in the number of people with 'matric' or higher education.

6 Impact Identification

6.1 Environmental Impacts Identified

The impacts of a project are mostly linked to the sensitivity of the receiving environment and proximity of receptors, the extent or footprint and nature of the development, expected discharges and stakeholders’ perceptions.

Based on the above considerations as well as the professional experience of the Environmental Assessment Practitioners and input from specialists, the following key environmental issues – potential negative impacts and potential benefits of the project in its proposed setting are summarised below:

- **Marine ecology** - Potential impact on marine biota and resources, including the seabed;
- **Underwater heritage** – Potential impacts on sites of archaeological or palaeontological significance;
- **Marine transport routes** – Potential impact on marine transport routes a result of the statutory safety zone requirements around prospecting vessels;
- **Fishing**: Potential impact on fishing resulting in economic loss; and
- **Socio-economic** – Benefits of employment opportunities and local investment opportunities. Potential impact on other marine prospecting/mining and exploration operations.

Certain impacts, while important, are considered likely to be less significant, including air quality, traffic and visual (or sense of place) aspects. A summary of the impacts is provided in Table 6-1.

Table 6-1: Potential impacts of the proposed project without mitigation.

Activities	Aspect	Potential Impact	Nature of Impact
Geophysical surveying; Drill sampling activities; and Bulk sampling activities.	Marine Ecology	ME1: Noise pollution.	Negative (-ve)
		ME2: Vessel strikes on marine mammals.	Negative (-ve)
		ME3: Drill/Bulk sampling impacts on benthic fauna.	Negative (-ve)
		ME4: Crushing of epifaunal community by crawler tracks.	Negative (-ve)
		ME5: Increased turbidity in the water column due to the suspension of fine sediments during drill sampling/bulk sampling.	Negative (-ve)
		ME6: Sedimentation impacts on benthic communities due to coarse tailings.	Negative (-ve)
		ME7: Marine pollution originating from operational discharges during vessel operations.	Negative (-ve)
	Fisheries	F1: Impact of multi-bean and sub-bottom profiling sonar on fisheries.	Negative (-ve)
		F2: Impact of temporary exclusion of fishing operations during survey and sampling operations.	Negative (-ve)
		F3: Impact of ambient noise from sampling/trenching operations on fisheries.	Negative (-ve)

Activities	Aspect	Potential Impact	Nature of Impact
		F4: Impact of sediment plumes on fish stock recruitment.	Negative (-ve)
	Archaeology/Palaeontology	H1: Damage to or loss of palaeontological materials.	Negative (-ve)
		H2: Damage to or loss of submerged prehistoric archaeological sites or materials.	Negative (-ve)
	Marine Prospecting/Exploration/Mining	MP1: The presence of survey and support vessels may have an impact due to the legislative requirement of a 500 m safety zone around these vessels.	Negative (-ve)
	Marine Transport Routes	MTR1: The presence of survey and support vessels may have an impact due to the legislative requirement of a 500 m safety zone around these vessels.	Negative (-ve)
	Socio-Economic	SE1: Creation of employment opportunities and revenues in local areas.	Positive (+ve)

6.2 Description of Aspects Assessed by Specialists

A number of specialist studies were undertaken in the Impact Assessment Phase to investigate the key potential direct, indirect and cumulative impacts (negative and positive) identified during Scoping. These specialist impact studies are as follows:

- Underwater Heritage Impact Assessment;
- Marine Ecology Impact Assessment; and
- Fisheries Impact Assessment.

The Terms of Reference (ToR) used for each of the specialist studies is provided in Table 6-2.

Table 6-2: Specialist terms of reference.

Study	Terms of Reference for Specialist Studies
Underwater heritage impact assessment (ACO Associates)	• Undertake a desktop study of the database of known and suspected wrecks in the area ascertained through the study of available written and oral resources; • Identify potential Maritime and Underwater Cultural Heritage sites within the designated area; and • Recommend management measures for sites before and during development.
Marine ecology assessment (Aquatic Ecosystem Services)	• Provide a general description of the local marine fauna (including cetaceans, seals, turtles, seabirds, fish, invertebrates and plankton species) within the Offshore Concession Areas and greater West Coast. The description to be based on, inter alia, a review of existing information and data from the international scientific literature, the Generic EMPr prepared for marine diamond mining off the West Coast of South Africa and information sourced from the internet; • Identify, describe and assess the significance of potential impacts of the proposed operations on the local marine fauna, including but not limited to: o physiological injury;

Study	Terms of Reference for Specialist Studies
	○ physical damage to the seabed, alteration of sediment structure, alteration in benthic fauna community composition and potential reduction in benthic biodiversity due to prospecting activities; ○ impacts on benthic fauna due to the discharge of processed sediments, including direct mortality, smothering of relatively immobile or sedentary species and biochemical effects (e.g., direct toxicity and bioaccumulation); ○ behavioural avoidance of the prospecting area; ○ masking of environmental sounds and communication; and ○ indirect impacts due to effects on prey. • Identify practicable mitigation measures to avoid/reduce any negative impacts and indicate how these could be implemented in the start-up and management of the proposed project.
Fisheries impact assessment (CapFish)	• Provide a general description of the fishing activities expected in the Offshore Concession Areas and along the greater West Coast; • Undertake a spatial and temporal assessment of expected fishing effort and catch in the Offshore Concession Areas for each sector identified; • Assess the impact of the operations on the different fishing sectors; • Assess the impact of the proposed exclusion zones around the prospecting vessels and potential disturbance of fish on the fishing activities based on the estimated percentage loss of catch and effort; and • Make recommendations for mitigation measures that could be implemented to minimise or eliminate negative impacts on and enhance any benefits to the fishing industry.

7 Environmental Impact Assessment

7.1 Environmental Impact Assessment Methodology

The anticipated impacts associated with the proposed project were assessed according to SRK's standardised impact assessment methodology, which is presented below. This methodology has been utilised for the assessment of environmental impacts where the consequence (extent, intensity, and duration of the impact) and probability of the impact have been considered in parallel to provide an impact rating and hence an interpretation in terms of the level of environmental management required for each impact as follows:

The **significance** of an impact is defined as a combination of the **consequence** of the impact occurring, including possible irreversibility of impacts and/or loss of irreplaceable resources, and the **probability** that the impact will occur.

The criteria used to determine impact consequence are presented in the Table 7-1.

Table 7-1: Criteria used to determine the consequence of the impact.

Rating	Definition of Rating	Score
A. *Extent*– *the area over which the impact will be experienced*		
Local	Confined to project or study area or part thereof (e.g., site)	1
Regional	The region, which may be defined in various ways, e.g., cadastral, catchment, topographic	2
(Inter) national	Nationally or beyond	3
B. *Intensity*– *the magnitude of the impact in relation to the sensitivity of the receiving environment, taking into account the degree to which the impact may cause irreplaceable loss of resources*		
Low	Site-specific and wider natural and/or social functions and processes are negligibly altered	1
Medium	Site-specific and wider natural and/or social functions and processes continue albeit in a modified way	2
High	Site-specific and wider natural and/or social functions or processes are severely altered and/or irreplaceable resources[37] are lost	3
C. *Duration*– *the timeframe over which the impact will be reversed*		
Short-term	Up to 2 years	1
Medium-term	2 to 15 years	2
Long-term	More than 15 years or irreversible	3

The combined score of these three criteria corresponds to a **Consequence Rating**, as illustrated in Table 7-2

Table 7-2: Method used to determine the consequence score.

Combined Score (A+B+C)	3 – 4	5	6	7	8 – 9
Consequence Rating	Very low	Low	Medium	High	Very high

Once the consequence is derived, the probability of the impact occurring is considered using the probability classifications presented in Table 7-3.

[37] Defined as important cultural or biological resource which occur nowhere else, and for which there are no substitutes.

Table 7-3: Probability classification.

Probability– *the likelihood of the impact occurring*	
Improbable	< 40% chance of occurring
Possible	40% - 70% chance of occurring
Probable	> 70% - 90% chance of occurring
Definite	> 90% chance of occurring

The overall **significance** of impacts is then determined by considering consequence and probability using the rating system prescribed in Table 7-4.

Table 7-4: Impact significance ratings.

		Probability			
		Improbable	Possible	Probable	Definite
Consequence	Very Low	**INSIGNIFICANT**	**INSIGNIFICANT**	**VERY LOW**	**VERY LOW**
	Low	**VERY LOW**	**VERY LOW**	**LOW**	**LOW**
	Medium	**LOW**	**LOW**	**MEDIUM**	**MEDIUM**
	High	**MEDIUM**	**MEDIUM**	**HIGH**	**HIGH**
	Very High	**HIGH**	**HIGH**	**VERY HIGH**	**VERY HIGH**

Finally, the impacts are also considered in terms of their status (positive or negative impact) and the confidence in the ascribed impact significance rating. The prescribed system for considering impacts status and confidence (in assessment) is laid out in the Table 7-5.

Table 7-5: Impact status and confidence classification.

Status of impact	
Indication whether the impact is adverse (negative) or beneficial (positive).	+ ve (positive – a 'benefit')
	– ve (negative – a 'cost')
Confidence of assessment	
The degree of confidence in predictions based on available information, SRK's judgment and/or specialist knowledge.	Low
	Medium
	High

SRK recommends that the impact significance rating should be considered by authorities in their decision-making process based on the implications of ratings ascribed below:

1. **INSIGNIFICANT**: the potential impact is negligible and will not have an influence on the decision regarding the proposed activity/development.
2. **VERY LOW**: the potential impact is very small and should not have any meaningful influence on the decision regarding the proposed activity/development.
3. **LOW**: the potential impact may not have any meaningful influence on the decision regarding the proposed activity/development.
4. **MEDIUM**: the potential impact should influence the decision regarding the proposed activity/development.
5. **HIGH**: the potential impact will affect the decision regarding the proposed activity/development.
6. **VERY HIGH**: The proposed activity should only be approved under special circumstances.

In the report, practicable mitigation and optimisation measures are recommended and impacts rated in the prescribed way both without and with the assumed effective implementation of essential mitigation and optimisation measures. Mitigation and optimisation measures are either:

1. **Essential**: best practice measures which must be implemented and are non-negotiable; and
2. **Best Practice**: recommended to comply with best practice, with adoption dependent on the proponent's risk profile and commitment to adhere to best practice, and which must be shown to have been considered and sound reasons provided by the applicant if not implemented.

7.2 Impact Description and Risk Assessment Results

Identified impacts are described in this section, followed by a risk assessment of each impact. The impact description, risk assessment (findings), and mitigation measures (recommendations) were based on specialist reports where applicable.

7.2.1 Potential Marine Ecology Impacts

This impact has been assessed by SRK specialists based on previous studies undertaken in the area and using SRK's standard Impact Assessment rating methodology.

Assessment of Impacts

The following potential direct impacts on marine ecology was identified:

- ME1: Potential Noise pollution.
- ME2: Potential vessel strikes on marine mammals.
- ME3: Potential impact of drill/bulk sampling activities on benthic fauna.
- ME4: Crushing of epifaunal community by crawler tracks.
- ME5: Increased turbidity in the water column due to the suspension of fine sediments during Drill/Bulk sampling activities.
- ME6: Sedimentation impacts on benthic communities due to coarse tailings.
- ME7: Marine pollution originating from operational discharges during vessel operations.

Potential Impact ME1: Potential Noise pollution

The proposed diamond prospecting project will generate noise in the marine environment in two main forms:

1. Noise from geophysical survey equipment; and
2. Operational noise from ship, sampling drill and subsea crawler activity.

The geophysical survey will initially take place over a two-month period during the reconnaissance survey and for a second two-month period during the infill geophysical survey. During this period of time two main forms of survey equipment will be used which will generate noise impacts within the Concession Area, namely:

1. Swath beam bathymetric surveys; and
2. Seismic sub-bottom profiler surveys.

Swath beam bathymetric surveys make use of multi-beam sonar technology to collect multiple depth readings perpendicular to the path of the vessel's movement. This allows for high resolution depth data to be obtained beneath and adjacent to the vessel path as a swath of depth readings. Water depth plays an important role in the width of the sonar swath and needs to be taken into account when designing the bathymetric mapping surveys. Survey grids are generally designed based on the water depth so that swaths from parallel paths overlap creating a dataset with 100% cover of the target area. These surveys produce a high-resolution digital terrain model of the sea floor and can be used to identify key physical features on and within the seabed. Bathymetric mapping sonars use frequencies ranging from 12 kHz for deep-water systems to 70-100 kHz or higher for shallow-water mapping systems (Hildebrand, 2009; Harding & Cousins, 2022). A suitable multibeam echosounder Samara intends to use will be in the frequency range of 40 to 100 kHz. Multibeam sonars have high source sound levels ranging from 220 to 235 dB re 1 µPa (Koper & Plön, 2012) but have highly directional beams which are focussed downwards (Hildebrand 2009). Furthermore, the sonars have high frequencies which attenuate rapidly thereby reducing the field of exposure and creating a localised impact on marine fauna (Hildebrand, 2009).

Sub-bottom profilers are used to generate data on the composition of the seafloor sediment layers and potential objects within the sediments down to hard bedrock. Sub-bottom profilers produce a mid-frequency (3 to 7 kHz) and have a high sound source level (213-230 dB re 1 µPa @ 1 m) in order to penetrate deep into the sediment layers (Hildebrand, 2009; Le Gall, 2016; Hardings & Cousins *et al.*, 2022). A suitable sub-bottom profiler Samara intends to use is technology that emits two frequency ranges as a sweep to provide good resolution combined with penetration to bedrock. The two frequency ranges are typically 35 to 45 kHz and 1 to 10 kHz. The sound emission is targeted in a downward direction and assessment of the potential for physiological impact on marine mammals has been shown to be inconsequential (within 45m for a 10-minute exposure duration) (Le Gall, 2016).

In addition to the noise created by the geophysical sonic equipment, the operation of the vessel, the sampling drill vessel and seabed crawler for dredging will also generate noise which may affect marine fauna. Small vessels have sound source levels of 130-160 dB re 1 µPa with large ships between 130 and 200 dB re 1 µPa or higher (Koper & Plön, 2012; Harding & Cousins, 2022). Ambient shipping noise has also been reported in the range of 97 to 131 dB re 1 µPa (Reine *et al.*, 2012a; 2012b; Suedel *et al.*, 2019) while noise generated by dredging varies from 100 to 190 dB re 1 µPa at 1 m (Dickerson *et al.*, 2001; Thomsen *et al.*, 2009; Koper & Plön, 2012; Suedel *et al.*, 2019). It has been reported that dredging noise can be heard up to 20-25km away (Greene & Moore, 1995; in Koper & Plön, 2012).

There is growing body of evidence suggesting that anthropogenic noise can affect marine fauna (Figure 7-1) (Duarte *et al.*, 2021). Noise pollution generated by the survey vessel's operations, as well as the use of sonic surveying equipment have been suggested to impact a variety of marine fauna (Duarte *et al.*, 2021). Direct effects on specifically sensitive fauna include death, physical injury, stress, and behavioural change (Duarte *et al.*, 2021). Indirect effects include changes in predator prey relationships, changes in energy budgets due to behavioural change (van der Knaap *et al.*, 2021). It must, however, be noted that research into both the direct and indirect effects of noise pollution on marine fauna is still in its infancy with the majority of the work done being on marine mammal megafauna (Duarte *et al.*, 2021).

Various factors influence the severity of noise pollution impacts, from the intensity and wavelength of the noise to the distance between the noise source and the affected organism. The affected organism's mobility can also be a factor in understanding how the stressor will influence an organism.

The impacts of noise pollution derived from the ship's operations and use of the seabed crawler, as well as from geophysical survey derived noise in Concession Area has been evaluated separately on organisms that are known to be sensitive to sound: being invertebrates, fish, and marine mammals.

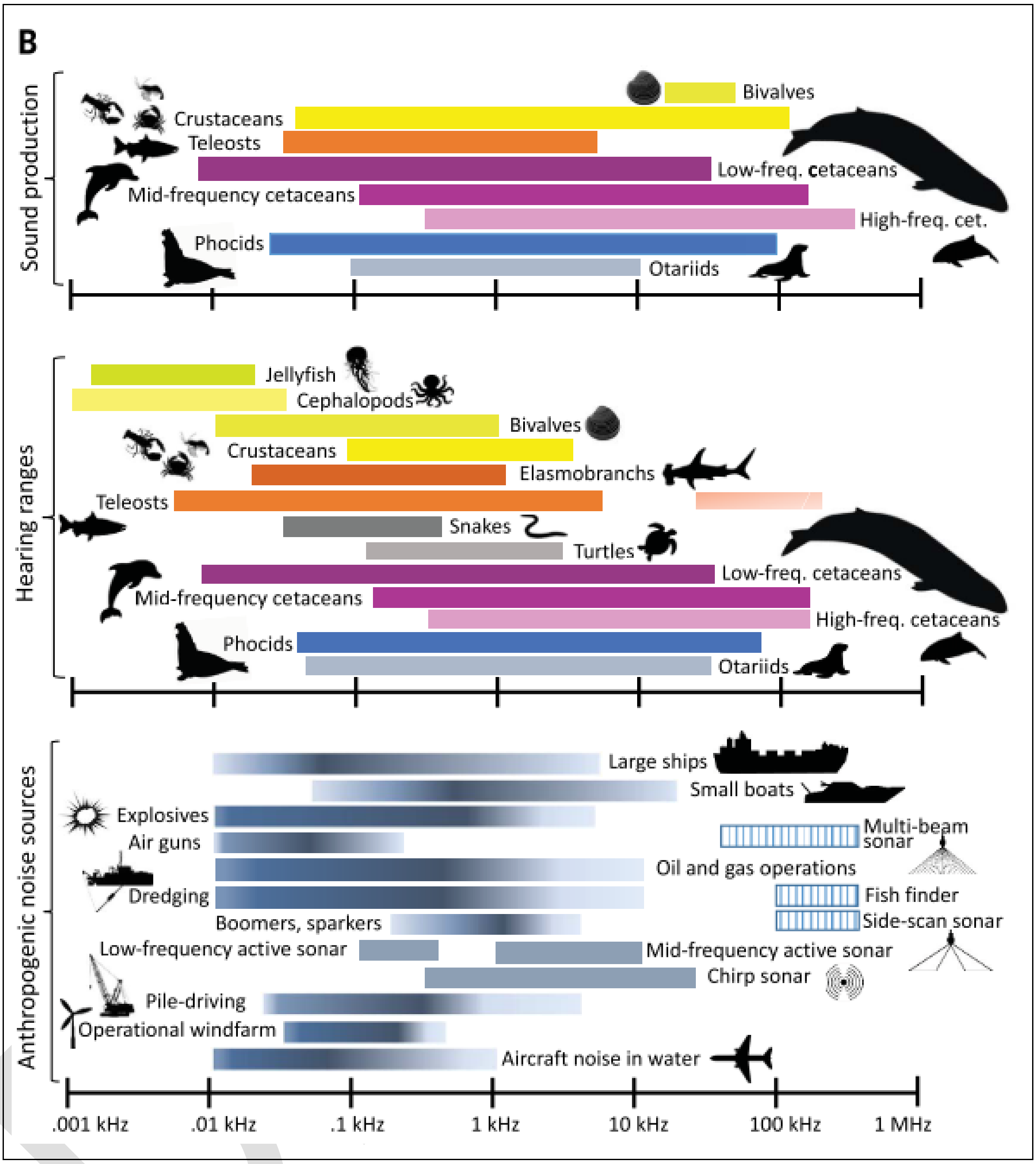


Figure 7-1: Approximate sound production and hearing ranges of marine taxa and frequency ranges of selected anthropogenic sound sources. These ranges represent the acoustic energy over the dominant frequency range of the sound source, and colour shading roughly corresponds to the dominant energy band of each source. Dashed lines represent sonars to depict the multifrequency nature of these sounds (Duarte *et al.,* 2021).

Invertebrates

Most invertebrates do not have dedicated hearing organs, but sensory organs such as hairs or papilla that are capable of sensing changes in water pressure. Given that sound travels through water as pressure waves, it is likely that the primitive tactile sensory organs that invertebrates possess are able to detect sound. While there is very little published information on the effects of sound on invertebrates, recent research has shown that low frequency sound can affect the burrowing behaviour of a benthic amphipod (*Corophium volutator*), while little effect was found on a benthic polycheate (*Arenicola marina*) or bivalve (*Limecola balthica*) (Wang *et al.*, 2022). Furthermore, Olivier *et al.* (2023) found little sustained effect of low frequency noise on the survival rates of bivalve larvae. Given these findings, the impact of noise from operations during prospecting within the Concession Area will be limited in extent and of short duration and will therefore likely have limited impact on invertebrates. Noise impacts will definitely occur but will be of very low significance to invertebrates. As a result, no mitigation is required.

The impact is assessed to be of very low significance and does not require mitigation (Table 7-6).

Table 7-6: Significance of noise pollution impacts on invertebrates.

Without Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Local	Medium	Short-term	Very low	Definite	**VERY LOW**	– ve	Low
1	2	1	4				
With Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Local	Medium	Short-term	Very low	Definite	**VERY LOW**	– ve	Low
1	2	1	4				
Degree to which impact can be reversed				The impact can be reversed to some extent.			
Degree to which impact may cause irreplaceable loss				This impact can cause some irreplaceable loss.			
Degree to which impact can be mitigated				The impact can be mitigated to some extent. Mitigation measures are presented directly after this table and in Section 7.4.			
Mitigated outcome				A less severe impact on and confusion of invertebrates.			

<u>Fish</u>

Sound production in fish is well developed and often plays an important role in certain fish species' reproduction, particularly those that known to be soniferous (Amorim *et al.*, 2013). While almost no research has been conducted on the effects of sound on Southern African marine fishes, there is a growing body of research on other fish species that function in a similar nature to Southern African marine fishes (De Jong *et al.*, 2020). While most fish have the ability to detect anthropogenic sound (Duarte *et al.*, 2021) deliberation amongst research suggests soniferous fish maybe more intensely affected due to sublethal effects in communication between individuals at key life history phases (De Jong *et al.*, 2020). It is also thought that the effects of sound on fish may be increased during spawning bouts, if fish gather in dense localised spawning aggregations (Portner & Farrel, 2008). Physical damage such as barotrauma or death can result from exposure to intense sounds (Slabbekoorn *et al.*, 2010). Physical damage is most likely to occur when species are in close proximity to the sound source (ship). This impact can be mitigated by implementing "soft starts". This involves releasing low level sounds at the start of the survey so that species are able to move away from the ship before it emits more intense sounds.

One of the more recent notable indirect effects of anthropogenic sound on fish was conducted by van der Knaap *et al.* (2021). Where it was found that high intensity seismic surveys disrupted cod diel foraging behaviour and therefore could have energetic implications on the population. Given that snoek and hake both undertake diel vertical foraging movements (McQueen, 2002; Pillar *et al.*, 1991), anthropogenic sound from the geophysical surveying may disrupt their behaviours, having consequences on their energetics if specific mitigation measures are not implemented. The likelihood of this impact is unknown and would require more in-depth research into snoek and hake behaviour. However, in light of the history of the broader area, which has been subject to exploration activities using acoustic sampling methods in the past without any reported significant impact on hake or snoek populations this is unlikely to be a major concern. Furthermore, sampling typically will take place over a relatively short period of time (several weeks); and exploration will take place over a relatively small portion of snoek and hake grounds (they occur throughout the West Coast); and it is likely that the fish will move from the affected area (which is likely to be a 20km radius around the ship (Green Jnr & Moore, 1995; in Koper & Plön, 2012)) temporarily during prospecting activities. Given these considerations, this impact is unlikely to have significant implications for snoek and hake populations.

The following best practice guidelines are suggested as mitigation measures to lower risks associated with this impact:

- Implement "soft starts" for the surveys for sound levels > 210 dB re 1 µPa at 1 m over a period of 20 minutes to give sensitive species an opportunity to move away from the sampling area, particularly if large aggregations of fish are observed on the ship's sonar.

The impact is assessed to be of very low significance before mitigation and very low (but with a lower overall score) once mitigated (Table 7-7).

Table 7-7: Significance of noise pollution impacts on fish.

Without Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Local	Medium	Short-term	Very low	Definite	**VERY LOW**	– ve	High
1	2	1	4				
With Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Local	Low	Short-term	Very low	Definite	**VERY LOW**	– ve	High
1	1	1	3				
Degree to which impact can be reversed				The impact can be reversed to some extent.			
Degree to which impact may cause irreplaceable loss				This impact can cause some irreplaceable loss.			
Degree to which impact can be mitigated				The impact can be mitigated to some extent. Mitigation measures are presented directly after this table and in Section 7.4.			
Mitigated outcome				A less severe impact on and confusion of fish.			

Mitigation measures for the potential impact include the following:

- Implement "soft starts" for the surveys for sound levels > 210 dB re 1 µPa at 1 m over a period of 20 minutes to give sensitive species an opportunity to move away from the sampling area, particularly if large aggregations of fish are observed on the ship's sonar.

Marine Mammals

Cetacean are known to use sound extensively, from using sound to find prey, avoid obstructions to communication between individuals. Due to this obligate use of sound by marine mammals Findlay (1996) conducted a study to assess the potential impact of vessel-based diamond mining on the marine mammal community off the southern African West Coast. The study found that any impact is likely to be insignificant because the area of influence of the elevated noise level was estimated to be restricted to approximately 20 km around the mining vessel. While the noise from sampling operations may cause localized behavioural changes in some marine mammals, these changes are unlikely to have a significant impact on the broader ecosystem, as demonstrated by Perry (1998). Given these findings, the impact of noise on marine mammals is likely to be low. Nonetheless, a study compiled by the International Council for the Exploration of the Sea in 2005 and later guidelines developed by the Joint Nature Conservation Committee in 2017, adapted for South African conditions by Pulfrich (2018) have provided the following guidelines to ensure that risks to marine mammals and cetaceans particularly are minimised.

- Undertake a visual scan of the area 15 minutes prior to the commencement of surveying activities and soft starts. Visual scans should be undertaken by a trained Marine Mammal Observer (MMO).
- Implement "soft starts" for the surveys for sound levels > 210 dB re 1 µPa at 1 m over a period of 20 minutes to give sensitive species an opportunity to move away from the sampling area.
- Cease survey activities if abnormal behaviour in marine mammals is observed until the animal has moved away from the area.
- Avoid surveys during known periods of cetacean migration into the area for feeding (beginning of June to the end of November) and ensure that cetaceans are able to move around sonar operations.
- Implement Passive Acoustic Monitoring (PAM) on board survey ships, with a view to
    - Detect the range and frequencies of marine mammal vocalisations expected to be present in the survey area.
    - Detect and identify vocalising marine mammals and establish bearing and range in a reasonable period of time.
    - Ensure real time relaying of the recordings to the PAM operator to allow for immediate mitigation activities to be implemented.

The impact is assessed to be of very low significance before mitigation and remains very low (but with a lower overall score) once mitigated (Table 7-8).

Table 7-8: Significance of noise pollution impacts on marine mammals.

Without Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Local	Medium	Short-term	Very low	Definite	**VERY LOW**	– ve	High
1	2	1	4				
With Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Local	Low	Short-term	Very low	Definite	**VERY LOW**	– ve	High
1	1	1	3				
Degree to which impact can be reversed				The impact can be reversed to some extent.			
Degree to which impact may cause irreplaceable loss				This impact can cause some irreplaceable loss.			
Degree to which impact can be mitigated				The impact can be mitigated to some extent. Mitigation measures are presented directly after this table and in Section 7.4.			
Mitigated outcome				A less severe impact on and confusion of marine mammals.			

Mitigation measures for the potential impact include the following:

- Undertake a visual scan of the area 15 minutes prior to the commencement of surveying activities and soft starts. Visual scans should be undertaken by a trained MMO;
- Implement "soft starts" for the surveys for sound levels > 210 dB re 1 μPa at 1 m over a period of 20 minutes to give sensitive species an opportunity to move away from the sampling area;
- Cease survey activities if abnormal behaviour in marine mammals is observed until the animal has moved away from the area;
- Avoid surveys during known periods of cetacean migration into the area for feeding (beginning of June to the end of November) and ensure that cetaceans are able to move around sonar operations;
- Implement PAM on board survey ships, with a view to:
    - Detect the range and frequencies of marine mammal vocalisations expected to be present in the survey area;
    - Detect and identify vocalising marine mammals and establish bearing and range in a reasonable period of time; and
    - Ensure real time relaying of the recordings to the PAM operator to allow for immediate mitigation activities to be implemented.

Potential Impact ME2: Potential Vessel Strikes on Marine Mammals

The increasing use of the world's oceans by commercial and recreational vessels is the main source of concerns regarding the impact of collisions on marine animals globally and in South Africa (Schoeman *et al.*, 2020). The extent of the issue was highlighted by the formation of the International Whaling Commission Conservation Committee who established the Ship Strike Working Group in 2005. Most of the available research on the topic is on Northern right whales, fin whales, blue whales, humpback whales, sperm whales and manatees (Schoeman *et al.*, 2020). Given the areas importance to whales and cetaceans, mitigation to avoid vessel strike are considered necessary.

While there are a variety of mitigation measures available to reduce vessel strikes, (see: Schoeman *et al.* (2020) for an in-depth review), the most prominent measure is speed reduction, where vessel strikes can be reduced by up to 50 % if speed is reduced to below 10 knots when ships are operating in areas where marine mammals are active (Conn & Silber, 2013). Schoeman *et al.* (2020) suggest that both speed reduction and re-routing of vessels around prominent marine mammal hot spots are likely to be the two biggest mitigation actors that will reduce marine mammal vessel strikes.

Geophysical surveys will be undertaken in the Concession Area for a period of 4 months over the project duration (60 months). During this period the survey vessel will travel across a series of grids to obtain the bathymetric and stratigraphic data. The vessel is yet to be decided but survey work is generally conducted below 10-12 knots. The low survey speed and short duration of geophysical period reduce the risk of this impact occurring. The impact of vessel strikes will be localised to the Concession Area and will be limited in duration to the periods of the geophysical (4 months) and bulk sampling programme (2 months). Due to the severity of the impact which may cause serious injury or death the intensity has been rated as high. (Table 7-9).

The mitigation measure suggested are simple to implement in order to reduce the risks to marine mammals to an acceptable level.

Table 7-9: Significance of potential vessel strikes on marine mammals.

Without Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Local	High	Short-term	Low	Improbable	**VERY LOW**	– ve	High
1	3	1	5				
With Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Local	Low	Short-term	Very low	Improbable	**INSIGNIFICANT**	– ve	High
1	1	1	3				
Degree to which impact can be reversed				The impact is not likely to be reversed.			
Degree to which impact may cause irreplaceable loss				This impact can cause some irreplaceable loss.			
Degree to which impact can be mitigated				The impact can be mitigated to some extent. Mitigation measures are presented directly after this table and in Section 7.4.			
Mitigated outcome				A less significant impact on marine mammals.			

Mitigation measures for the potential impact include the following:

- Marine Mammal Observer to be onboard the survey vessel at all times;
- Reduce vessel speed to < 10 knots during the geophysical surveys;
- Avoid known areas of high marine mammal activity; and
- Where possible avoid periods of high marine mammal activity within the Concession Area (June-November).

Potential Impact ME3: Potential Impact of Drill/Bulk Sampling Activities on Benthic Fauna

Bulk sampling is likely to be the most severe and direct ecological impact on the marine environment. During bulk sampling, 20 trenches that are 20 m wide, 2 m deep (average) and 240 m in length will be excavated, removing approximately 192000 m3 of benthic over burden in total and 48000 m3 of ore in total, essentially removing 240000 m3 of benthic sediment. The excavation of the trenches will directly affect a surface area of 96000 m2 (9.6 ha) of benthic surface habitat. This equates to approximately 0.001% of the Concession Area which will be subject to invasive prospecting operations through trenching. Given that benthic fauna primarily exists in the upper 20-30 cm of sediment, sampling would inevitably eradicate the benthic infaunal and epifaunal biota located within the excavation footprints due to 4 m deep excavations (maximum depth). Differing communities of benthic fauna will be affected depending on in which of the four benthic ecosystem types trenching occurs (see Section 5.1.4 in the baseline assessment). The Concession Area comprises 53% muddy sands, 36% sandy outer shelf habitats, 9% muddy mid shelf mosaic and 2% sandy mid shelf habitats (Table 7-10).

However, parts of the Concession Area have been identified as Critical Biodiversity Areas (CBAs) through the National Marine and Coastal Spatial Biodiversity Plan (NMCSBP) (Harris et al. 2022). Overall, 245 672 ha have been identified as CBAs representing 32% of the Concession Area footprint with a further 21 640 ha, representing 2.8% of the Concession Area, identified as ESAs. The sea-use guidelines developed with the NMCSBP CBA maps indicate that bulk sampling activities are not compatible with CBAs while restricted activities may occur in ESAs. Non-invasive sampling may occur in the CBAs and the sea-use guidelines make provisions for re-evaluation of CBAs should significant mineral resources be identified through non-invasive methods. This would require discussion and negotiation with the relevant authorities and the following would need to be undertaken:

- More detailed in situ studies to obtain more precise information on the biological characteristics of the areas of interest and determine whether invasive sampling should be permitted;
- A recategorization of the area would be required, to declassify it as a CBA, and suitable alternative areas in the same region, with the same or better conservation value would need to be identified and classified as a CBA to replace the areas lost; and
- Invasive sampling in ESAs should be supported by convincing evidence of mineral potential prior to sampling and may require additional in situ studies that demonstrate that the areas to be disturbed are not of significant conservation value. This evidence should be submitted as part of an updated prospecting work programme to the Department of Mineral Resources and Energy and to the Provincial Department of Environmental Affairs (Northern Cape Department: Agriculture, Environmental Affairs, Rural Development and Land Reform) prior to the commencement of invasive sampling activities.

As this is beyond the scope of this desktop assessment the impact has been assessed on a reduced footprint assuming that destructive bulk sampling will not be permitted within the CBAs and ESAs. The footprint available for bulk sampling outside of CBAs is reduced by 34.8% to 500 710 ha. The remaining benthic habitat type within the Concession Area that is not classified as a CBA or ESA (65.2%), consists of:

- 13% Namaqua Muddy Mid Shelf Mosaic;
- 53% Namaqua Muddy Sands;
- 2% Namaqua Sandy Mid Shelf; and

- 33% Southern Benguela Sandy Outer Shelf.

At present the areas to be sampled are unknown, so the calculations indicating % habitat loss in Table 7-10 show the maximum and worst-case scenario for habitat loss (i.e., assuming 9.6ha of sampling within each habitat type). Under this worst-case scenario, the % loss of habitat within the remainder of the Concession Area (reduced footprint) is 0.1% or lower across habitat types (Table 7-10). This implies an extremely low spatial impact of physical disturbance to the benthic habitats within the Concession Area.

In considering the impacts to the benthic environment it should be recognised that sensitive habitats within the west coast mining area have been formally protected through the declaration of several MPAs. The two MPAs adjacent to the Concession Area provide protection for cold water corals, fossilised trees and sponge gardens within the Namaqua Fossil Forest MPA and the Orange Shelf Edge MPA protects previously undisturbed habitats of critically endangered hard grounds and areas of sandy seabed in the southern Benguela (Sink *et al*., 2019).

Table 7-10: Estimate of percentage loss of individual habitats assuming all sampling occurs only in one habitat (worst case scenario).

Habitat type	Concession Area		Critical Biodiversity Areas category								Remainder not within CBAs		Max % Benthic Loss based on 9.6 ha trenching
			All CBAs		CBA-N		CBA-R		ESA				
	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%	
Namaqua Muddy Mid Shelf Mosaic	66 474	8.6%	3 567	5.4%	2	0.0%		0.0%	3 564	5.4%	62 633	94%	0.02%
Namaqua Muddy Sands	406 535	52.9%	141 310	34.8%	131 829	32.4%	1	0.0%	9 479	2.3%	264 874	65%	0.00%
Namaqua Sandy Mid Shelf	15 435	2.0%	5 013	32.5%		0.0%		0.0%	5 013	32.5%	10 256	66%	0.10%
Southern Benguela Sandy Outer Shelf	280 461	36.5%	117 423	41.9%	113 839	40.6%		0.0%	3 584	1.3%	162 948	58%	0.01%
TOTAL Concession Area (ha)	**768 904**		**267 312**	**34.8%**	**245 671**	**32.0%**	**1**	**0.0%**	**21 640**		**500 710**	**65%**	**0.00%**

While the recovery disturbed benthic ecosystems does occur, the rate and success of the recovery depends on a variety of factors (Currie, 2021). Generally speaking, shallower areas in moderate energy environments generally recover sooner than those in deeper low energy environments. Importantly an interplay between hydrodynamics and sediment particle size plays a large role in determining ecosystem recovery rates. For example, Boyd *et al*. (2005) found that areas dredged at a depth of 22 m and in a moderately energetic environment displayed notable dissimilarities from non-dredged reference sites after a six-year recuperation period. Based on this observation, the researchers concluded that it would probably take numerous years, possibly decades, to restore benthic assemblages in low-energy environments (Currie, 2021). Importantly the destructive sampling procedure in this project will be undertaken is waters between 100 m and 200m in depth in in low energy habitats that are not adapted to frequent disturbances such as those in higher energy shallow environments. The infilling of the excavated trenches is therefore likely to take many years if not decades (Currie, 2021). The removal of overburden will also likely change the benthic surface sediment characteristics, resulting in a community shift to pioneer species (species that are adapted to attaching or burrowing into the new sediment types (Currie, 2021)).

In order to minimise bulk sampling impacts on benthic infauna in these areas, the proponent will not excavate trenches adjacent or close to each other. Allowance will be made to leave vast undisturbed areas intact between excavation pits. While the effect of the distance between excavated tracks has not been thoroughly investigated, this mitigation action may reduce the recolonisation time of the affected areas.

Continuous monitoring of incoming sediments on deck should be implemented to check for evidence of biologically sensitive environments. If fragments of corals or fossil fragments are observed coming into the sieving area, operations should be stopped, and the location should be marked on the ships

GPS. This area should be reported on the sampling log as an area of biological importance and should be investigated by a suitable specialist before further bulk sampling can take place at this location.

Impacts on CBAs and ESAs have not been assessed since they both require further negotiation with relevant authorities and in situ studies prior to being eligible for invasive sampling. The impact of bulk sampling on benthic fauna is localised, high intensity and short-term duration, resulting in a low impact significance, which can be mitigated to a very low significance (Table 7-11).

Table 7-11: Significance of drill/bulk sampling impacts on benthic fauna.

Without Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Local	High	Short-term	Low	Definite	**LOW**	– ve	High
1	3	1	5				
With Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Local	Medium	Short-term	Very low	Definite	**VERY LOW**	– ve	High
1	2	1	4				
Degree to which impact can be reversed				The impact can be reversed to some extent.			
Degree to which impact may cause irreplaceable loss				This impact can cause some irreplaceable loss.			
Degree to which impact can be mitigated				The impact can be mitigated to some extent. Mitigation measures are presented directly after this table and in Section 7.4.			
Mitigated outcome				A less significant impact on benthic fauna.			

Mitigation measures for the potential impact include the following:

- Exclude CBA and ESA areas from drill sampling/bulk sampling activities unless significant mineral resources can be demonstrated through non-invasive techniques;
- Additional in situ assessment will be required for any invasive sampling within CBA areas;
- Leave undisturbed areas between excavated pits to enhance recolonisation opportunities; and
- Monitor incoming benthic sediment for coral or fossil fragments, if observed halt sampling and mark the location.

Potential Impact ME4: Crushing of Epifaunal Community by Crawler Tracks

Other than the direct impacts on the benthic community caused by the excavation of bulk sampling trenches, the tracks which the crawler uses to navigate on the seafloor can also be a potential source of benthic disturbance. The crawler deployment will be very close to the area of interest and no unnecessary crawling along the seabed will be done. The crawler track mostly coincide with area of excavation. Unlike the excavation of trenches which removes large volumes of sediment, the crushing footprint of the crawlers tracks only affects the benthic surface epifaunal and in faunal communities. The crushing will likely only affect soft bodied organisms as harder bodied crustaceans and molluscs may be more resilient to direct downward pressure. The impacts of such a disturbance would therefore be of low intensity, at a localised level and recovery would most probably be rapid with organisms recruiting quickly from adjacent undisturbed habitats. Given the localised scale, low intensity, and quick recovery times likely to be associated with this disturbance, and difficulty associated with finding feasible mitigation measures, no mitigation is required. It must however be noted that this rating assumes that the CBA and ESA zones are excluded from any sampling in accordance with the mitigations raised in the previous impact.

The impact is assessed to be of very low significance before mitigation and does not require mitigating (Table 7-12).

Table 7-12: Significance of crushing epifaunal community by crawler tracks.

Without Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Local	Low	Short-term	Very low	Definite	**VERY LOW**	– ve	High
1	1	1	3				
With Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Local	Low	Short-term	Very low	Definite	**VERY LOW**	– ve	High
1	1	1	3				
Degree to which impact can be reversed				The impact cannot be reversed to some extent.			
Degree to which impact may cause irreplaceable loss				This impact can cause some irreplaceable loss.			
Degree to which impact can be mitigated				The impact can be mitigated to some extent. Mitigation measures are presented directly after this table and in Section 7.4.			
Mitigated outcome				A less significant impact on epifaunal communities by crawler tracks.			

Potential Impact ME5: Increased Turbidity in the Water Column due to the Suspension of Fine Sediments during Drill/Bulk Sampling

During the bulk sampling operation, seabed sediments will be excavated and pumped into classifiers aboard the ship which sort the sediments into different size and weight classes. Gravels, in which diamonds are likely to occur, will be used to grade the ore. The finer tailings are washed off the gravels of interest immediately and discarded overboard resulting in sediment plume immediately downstream of the ship. The distribution and resettlement of the fine sediment plume is affected by a combination of factors such as local oceanography, sediment characteristics and the way in which they are released into the water column. The resultant fine sediment plume can change the immediate area's water quality and chemical composition. It will affect light attenuation into the water column, which is needed by photosynthetic phytoplankton and affects the foraging efficiencies of local pelagic species. Contaminant resuspension is a low risk in this case since the Concession Area is far offshore and therefore away from terrestrial anthropogenic contamination sources.

Previous research conducted by Carter (2008) who conducted water sampling for De Beers Marine in the MPT 25/2011 area confirmed that the suspended sediments in plumes settle quite quickly. Additionally, the results showed that the contaminant levels in the plumes are well below the water quality guideline levels. Based on these findings it is suggested that the effect of the sediment plume will be at a local scale, over a short time period and be of low intensity. It must, however, be noted that the dumping of dredge spoils is not compatible with the CBA guidelines for CBA-N and CBA-R areas (32% of the concession).

The impact is assessed to be of very low significance before mitigation and does not require mitigating (Table 7-13), assuming that the CBA areas are excluded from the bulk sampling area.

Table 7-13: Significance of increased turbidity in the water column due to suspension of fine sediments during drill/bulk sampling.

Without Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Local	Low	Short-term	Very low	Definite	**VERY LOW**	– ve	Medium
1	1	1	3				
With Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Local	Low	Short-term	Very low	Definite	**VERY LOW**	– ve	Medium
1	1	1	3				
Degree to which impact can be reversed				The impact can be reversed to some extent.			
Degree to which impact may cause irreplaceable loss				This impact can cause some irreplaceable loss.			
Degree to which impact can be mitigated				The impact can be mitigated to some extent. Mitigation measures are presented directly after this table and in Section 7.4.			
Mitigated outcome				A less significant impact on marine fauna and flora due to the suspension of fine sediments.			

Potential Impact ME6: Sedimentation Impacts on Benthic Communities due to Coarse Tailings

Along with fine sediment dumping, coarse tailings such as oversized gravel and rocks are also discarded overboard to settle back on the benthos beneath vessel. The sinking of this material will therefore cover and smother sessile and sensitive benthic fauna, either immediately crushing organisms or smothering live organisms that may be deprived of oxygen or be unable to filter particles from the water column. The effects of re-deposited tailings on benthic fauna are dependent on the mobility of the fauna being affected, where sessile epifaunal communities will be affected the most, while mobile epifaunal organisms are able to migrate vertically through the deposited substrate back to the surface.

The effect on mobile benthic fish and cephalopods is thought to be limited as they are able to escape localised redeposition of coarse sediments because they are capable of rapid movement. In contrast, immobile sedentary faunal groups are unable to move and will therefore be affected, particularly those that attach to hard substrate types such as sponges and cold-water coral species (Mortensen *et al*., 2001). The Concession Area comprises 62% muddy shelf and 38% sandy shelf substratum which is further divided into primary ecosystem types which comprises 9% Namaqua Muddy Mid Shelf Mosaic, 53% Namaqua Muddy Sands, 2% Namaqua Sandy Mid Shelf and 36% Southern Benguela Sandy Outer Shelf. The distribution of hard substrates is therefore likely limited in extent (approximately 9% in total for mosaic habitat) to the inshore section of the Concession Area where the shelf mosaic habitats occur. Deposition of coarse tailings over harder substrates that are dominated by epiphytic sponges and cold-water corals is of greater concern but known areas of rock outcrop containing sensitive cold-water corals and sponges have been formally protected in the Namaqua Fossil Forest MPA, which is also bounded by a 5km buffer. These areas make a significant contribution to the protection of known sensitive areas within the broader region within and adjacent to the Concession Area.

The effects of coarse tailings deposits over soft mud and sands sediments are likely to be negligible at a local scale with rapid recolonisation of mobile faunal groups up though the deposits. Due to the limited and isolated distribution of hard substrates within the Concession Area the impact on fauna within this habitat is likely limited based on the scale of the proposed bulk sampling activities (Table 7-14). It must, however, be noted that the dumping of tailings is not compatible with the CBA guidelines for CBA-N and CBA-R areas (32% of the concession).

This impact is rated as low significance before mitigating and can be mitigated to insignificant (Table 7-14).

Table 7-14: Sedimentation impacts on benthic communities due to coarse tailings.

Without Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Local	High	Short-term	Low	Probable	**LOW**	– ve	Medium
1	3	1	5				
With Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Local	Low	Short-term	Very low	Improbable	**INSIGNIFICANT**	– ve	Medium
1	1	1	3				
Degree to which impact can be reversed				The impact can be reversed to some extent.			
Degree to which impact may cause irreplaceable loss				This impact can cause some irreplaceable loss.			
Degree to which impact can be mitigated				The impact can be mitigated to some extent. Mitigation measures are presented directly after this table and in Section 7.4.			
Mitigated outcome				A less significant impact on benthic communities due to coarse tailings.			

Mitigation measures for the potential impact include the following:

- No discharge of tailings to be undertaken within the CBA areas; and
- Non-invasive geophysical survey data should be used to identify hard substrate and these areas should be avoided when discharging coarse tailings.

Potential Impact ME7: Marine Pollution originating from Operational Discharges during Vessel Operations

During all vessel operations at sea, vessel discharges into the marine environment occur on a daily basis, from deck and machinery washing, grey water discharges, detergents, cooling water and food wastes. There are industry standards that regulate and govern how waste is discharged off vessels (MARPOL). This agreement regulates the discharge of oil pollution, noxious chemicals, packaging, sewage, garbage, and air pollution. It is therefore assumed that the operating vessel is compliant with

MARPOL meaning that marine pollution originating from the vessel will be negligible or at a scale that will negligibly affect the local environment.

The impact is assessed to be of very low significance before mitigation and insignificant once mitigated (assuming standard MARPOL operating rules are adhered to) (Table 7-15).

Table 7-15: Significance of pollution originating from operational discharges during vessel operations.

Without Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Local	Medium	Short-term	Very low	Definite	**VERY LOW**	– ve	High
1	2	1	4				
With Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Local	Low	Short-term	Very low	Improbable	**INSIGNIFICANT**	– ve	High
1	1	1	3				
Degree to which impact can be reversed				The impact can be reversed to some extent.			
Degree to which impact may cause irreplaceable loss				This impact can cause some irreplaceable loss.			
Degree to which impact can be mitigated				The impact can be mitigated to some extent. Mitigation measures are presented directly after this table and in Section 7.4.			
Mitigated outcome				A less significant impact on marine fauna and flora due to pollution discharges.			

Mitigation measures for the potential impact include the following:

- Implement MARPOL regulations to manage ship effluent and discharges.

7.2.2 Potential Fisheries Impacts

This impact has been assessed by SRK specialists based on previous studies undertaken in the area and using SRK's standard Impact Assessment rating methodology.

Assessment of Impacts

The following potential direct impacts on fisheries were identified:

- F1: Increase in ambient noise from the geophysical survey phase.
- F2: Temporary exclusion of fishing operations from the geophysical survey phase.
- F3: Increase in ambient noise from the exploration sampling phase.
- F4: Discharge of sediment from the exploration sampling phase.
- F5: Temporary exclusion of fishing operations from the exploration sampling phase.

Potential Impact F1: Increase in Ambient Noise from the Geophysical Survey Phase

The presence and operation of the survey vessel will introduce a range of underwater noises into the surrounding water column that may potentially contribute to and/or exceed ambient noise levels in the area. The survey vessel would be equipped with a medium- to high-frequency multi-beam echo sounder (MBES), medium- to high-frequency sub-bottom profiler and medium- to high-frequency side scan sonar. The likely geophysical survey equipment and its source frequencies, source noise levels and soft start capabilities are provided in Table 7-16.

Table 7-16: Specifications of acoustic equipment that may be used in the proposed geophysical surveys.

	Sound type	Frequency	Source level	Soft Start Capability
1	Multibeam Echo Sounder	40 - 100 kHz	BS = -20 dB NL = 45 dB	Yes
2	Sub Bottom Profiler – Chirp/Parametric	The two frequency ranges are typically 35 - 45 kHz and 1 to 10 kHz	>206 dB/1 µPa at 1m Dynamic range >110 dB	No

The ocean is a naturally noisy place and marine animals are continually subjected to both physically produced sounds from sources such as wind, rainfall, breaking waves, and natural seismic noise, or biologically produced sounds generated during reproductive displays, territorial defence, feeding, or in echolocation (see references in McCauley 1994). Of all human-generated sound sources, the most persistent in the ocean is the noise of shipping. Depending on size and speed, the sound levels radiating from vessels range from 160 to 220 dB re 1 µPa at 1 m (NRC 2003). Especially at low frequencies between 5 to 100 Hz, vessel traffic is a major contributor to noise in the world's oceans, and under the right conditions, these sounds can propagate 100s of kilometres thereby affecting very large geographic areas (Coley 1994, 1995; NRC 2003; Pidcock *et al.* 2003). Other forms of anthropogenic noise include aircraft flyovers, multi-beam sonar systems, seismic acquisition, hydrocarbon and mineral exploration/prospecting and recovery and noise associated with underwater blasting, pile driving, and construction (Figure 7-2).

Elevated noise levels could impact marine fauna by:

- Causing direct physical injury to hearing or other organs, including permanent (PTS) or temporary threshold shifts (TTS) in hearing;
- Masking or interfering with other biologically important sounds (e.g., communication, echolocation, signals, and sounds produced by predators or prey); and
- Causing disturbance to the receptor resulting in behavioural changes or displacement from important feeding or breeding areas.

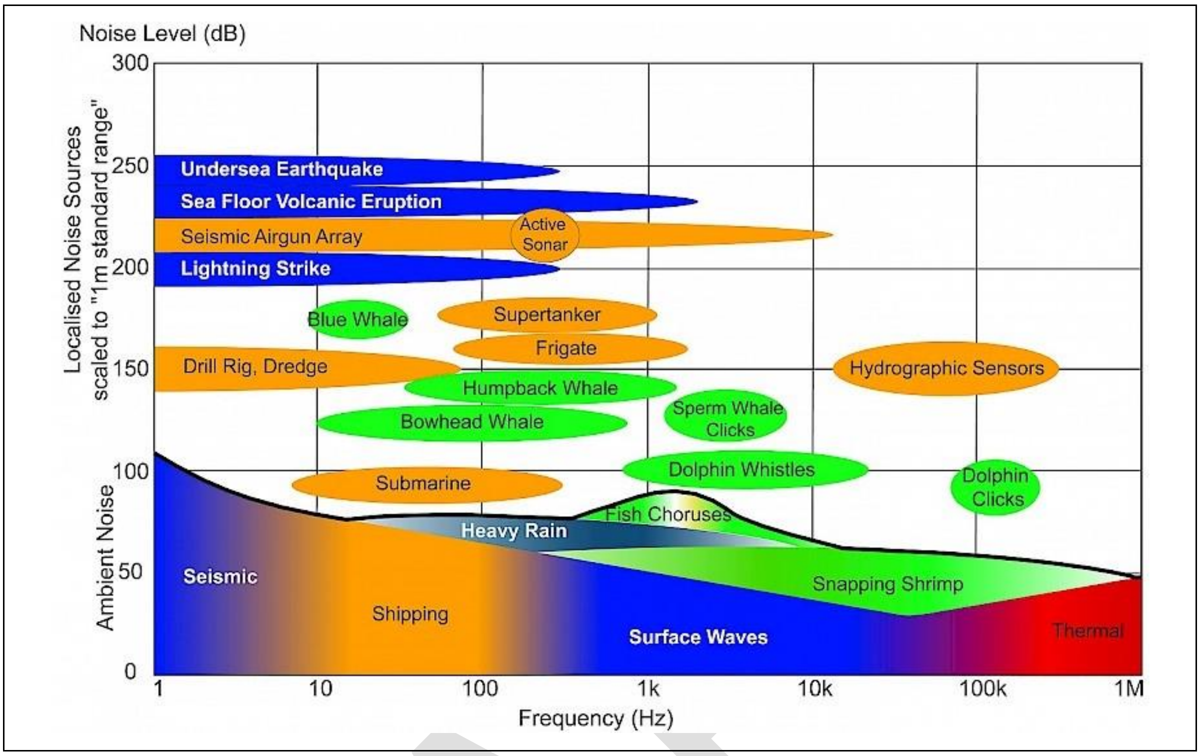


Figure 7-2: Comparison of noise sources in the ocean (Goold & Coates 2001).

A review of the literature and guidance on appropriate thresholds for assessment of underwater noise impacts are provided in the 2014 Acoustical Society of America (ASA) Technical Report *Sound Exposure Guidelines for Fishes and Sea Turtles* (ASA, 2014)[38]. The ASA Technical Report includes noise thresholds for mortality (or potentially mortal injury) as well as degrees of impairment such as TTS or PTS. Separate thresholds are defined for peak noise and cumulative impacts (due to continuous or repeated noise events) and for different noise sources (e.g., explosives, seismic airguns, pile driving, low- and mid-frequency sonar). As surveys using the MBES, sub-bottom profiling and side scan sonar sources have much lower noise emissions compared with seismic airgun sources, no specific considerations have been put in place in developing assessment criteria for these.

Whereas experiments have been carried out to define the levels of sound that cause mortality, injury, or hearing damage; it is more difficult to determine the threshold levels that cause behavioural effects, which are likely to take place over wider areas. Reactions of fish to different types of anthropogenic sounds have been reviewed by Hawkins *et al.* (2015), who concluded that more information is required on the effects of man-made sounds on the distribution of fishes and their capture by different fishing gears as effects differ across species, fishing ground and habitat type.

Due to the more deleterious effects of loud, low frequency sounds such as those emitted in seismic surveys, research has focused on these effects. Due to the paucity of research into the effects of geophysical survey tools on fish and crustaceans and their related fisheries, effects are inferred by comparing the sounds that these organisms produce and are capable of detecting, and evidence of noise thresholds that can cause them harm or disturbance such that their fishery might be affected.

In general terms, sound sources that have high sound pressure and low frequency will travel the greatest distances in the marine environment. Conversely, sources that have high frequency will tend to have greater attenuation over distance due to interference and scattering effects (Anon 2007). It is

[38] See also: Hawkins, A.D., Pembroke, A.E. and A.N. Popper. 2014. Information gaps in understanding the effects of noise on fishes and invertebrates. Rev Fish Biol Fisheries (2015) 25:39-64

for this reason that the acoustic footprint of sonar survey tools is considered to be much lower than that of deeper penetration low frequency seismic surveys that are used for petroleum exploration and in addition have lower sound pressure levels. The proposed multibeam survey produces frequencies between 40 kHz and 100 kHz (ultrasonic), with source sound levels ranging between 190 – 232 dB re 1 µPa at 1m and is capable of soft starts. Research into the effects of these multibeam swath bathymetry on fish and other fisheries-relevant organisms is lacking. However, as the frequencies produced fall well outside of the range of hearing of most marine fish, it is assumed to have little impact on fisheries. Furthermore, the intensity of such high-frequency sound attenuates rapidly, meaning that any potential effects of the sound will be localised to near their source. The soft start capacity of this technology may encourage animals capable of detecting high frequencies to move out of the range of the sound.

Urchins exposed to three hours of one-second sweeps of 100 – 200kHz at 145 and 160 dB re 1µPa (within the range of multibeam echosounders) showed signs of physiological stress (Vazzana et al 2020.) This suggests that invertebrates may be sensitive to high frequency sound, which might cause ecosystem effects on fisheries. However, urchins are less mobile than fish and crustaceans, which may be able to avoid noise disturbance, especially if soft starts are used.

Sub-bottom profilers include a variety of survey techniques that produce sound ranging from low frequencies (boomer, sparker, and sleeve-gun systems) to medium frequencies (chirp and IXSEA) and ultrasonic frequencies (Innomar and Parametric systems). The low frequency techniques are capable of soft starts. Lower frequencies have the potential to travel large distances underwater and may interfere directly with fish and crustacean sound detection. The survey equipment proposed for use by Samara in the prospecting activities is considered to be medium- to high- frequency.

Marine organisms tend to be able to detect sounds that fall within the range produced by their species, prey or predators. High frequency, ultrasonic sound (>20kHz) sound is less commonly produced by marine animals. Some cetaceans and mantis shrimps produce ultrasonic sound and there is evidence that some fish species are capable of detecting it.

The sub-bottom profiling equipment that has been proposed for the current project may produce an acoustic signal that would coincide with the hearing range of fish and crustaceans (refer to Table 7-17). At a frequency range of 200 Hz to 3 kHz (noted that two frequency ranges to be used by Samara typically range between 35 -45 kHz and 1 to 10 kHz) and source levels of up to 229 dB re 1 Pa at 1m, the parametric method of sub-bottom profiling that would produce an acoustic signal that would be detectable by crustaceans and fish. The proposed multibeam survey produces frequencies between 40 kHz and 100 kHz (ultrasonic), with source sound levels ranging between 140 – 221dB re 1 µPa at 1m. These frequencies fall well outside of the range of hearing of most marine fish; however, members of the genera Alosa and Brevoortia (shads and menhadens) have shown specialisations that enable them to detect ultrasound. The American shad (Alosa sapidissima) is an example of a clupeoid species that shows a behavioural response to ultrasonic frequencies. American shad have been reported to respond with changes in schooling behaviour at 200-800Hz and 25-150 kHz (Velez, 2015). Behavioural responses have also been shown by blueback herring (Alosa aestivalis) at a sonar frequency range of 110 kHz to 140 kHz at sound levels above 180 dB re 1 Pa (peak) (Nestler *et al.*, 1992, in Popper *et al.*, 2014).

Table 7-17: Known hearing frequency and sound production ranges of various fish taxa (Pulfrich 2020 adapted from Koper & Plön 2012; Southall *et al.*, 2019).

Taxa	Order	Hearing frequency (kHz)	Sound production (kHz)
Shellfish	Crustaceans	0.1 – 3	
Snapping shrimp	*Alpheus/ Synalpheus* spp.		0.1 - >200
Ghost crabs	*Ocypode* spp.		0.15 – 0.8
Fish	Teleosts		0.4 – 4
Hearing specialists		0.03 - >3	
Hearing generalists		0.03 – 1	
Sharks and skates	Elasmobranchs	0.1 – 1.5	Unknown

The noise generated by the acoustic equipment utilized during geophysical surveys falls within the hearing range of most fish, and at sound levels of between 190 to 232 dB re 1 μPa at 1 m, will be audible for considerable distances (in the order of tens of km) before attenuating to below threshold levels (Findlay 2005). Similarly, the sound level generated by sampling operations fall within the 120-190 dB re 1 µPa range at the sampling unit, with main frequencies between 3 – 10 Hz. The noise generated by sampling operations thus falls within the hearing range of most fish and depending on sea state would be audible for up to 20 km around the vessel before attenuating to below threshold levels[39].

The noise emissions from the geophysical sources are highly directional, spreading as a fan from the sound source, predominantly in a cross-track direction. Based on the rapid attenuation of high-frequency sound in the ocean, the spatial extent of the impact of noise on catch rates is expected to be localised. Based on the location of fishing grounds of the various fisheries sectors in respect to the prospecting application area, the effects of acoustic disturbance on catch rates would be considered to be of negligible significance for most sectors. However, in the case of the pole-and-line, traditional linefish, west coast rock lobster, beach-seine and gillnetfisheries, small-scale fisheries and fisheries research, the spread of sound into fishing grounds may affect catch rates. The impact of multi-beam and sub-bottom profiling sonar on these sectors is assessed to be of very low consequence and overall, very low significance (Table 7-18). No mitigation measures are possible or considered necessary for the generation of noise by the geophysical survey methods proposed in the current project. The impact is considered to be highly reversible – any disturbance of behaviour that may occur as a result of survey noise would be temporary.

[39] Typical natural ambient noise levels in the study area are estimated to have overall root-mean-square sound pressure levels (RMS SPLs) in the range of 80 – 120 dB re 1 µPa, with a median level around 100 dB re 1µPa upon calm to strong sea state conditions (Li & Lewis 2020 in Pulfrich, 2021).

Table 7-18: Significance of impacts of multi-beam and sub-bottom profiling sonar on fisheries.

Without Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Local	Medium	Short-term	Very Low	Probable	**VERY LOW**	– ve	Medium
1	2	1	4				
With Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Local	Medium	Short-term	Very Low	Probable	**VERY LOW**	– ve	Medium
1	2	1	4				
Degree to which impact can be reversed				The impact can be reversed to some extent.			
Degree to which impact may cause irreplaceable loss				This impact can cause some irreplaceable loss.			
Degree to which impact can be mitigated				The impact can be mitigated to some extent. Mitigation measures are presented directly after this table and in Section 7.4.			
Mitigated outcome				A less significant impact from multi-beam and sub-bottom profiling sonar on fisheries.			

Mitigation measures for the potential impact include the following:

- “Soft starts” should be carried out for any equipment of source levels greater than 210 dB re 1 μPa at 1 m over a period of 20 minutes to give adequate time for marine fauna to leave the vicinity;
- The pole-and-line sector targets snoek inshore of the Concession Area during the period March to July. Timing of the survey activities to avoid taking place within the inshore extent of the Concession Area during this fishing period could reduce the impact on the sector;
- The traditional linefish sector operates in close proximity to Port Nolloth and Doringbaai over the period March to September. Timing of the survey activities to avoid taking place within the inshore extent of the Concession Area during this fishing period could reduce the impact on the sector; and
- A demersal research survey is undertaken each year and trawls are expected to be undertaken within the Concession Area over the period January/February. Acoustic surveys for small pelagic species are carried out twice a year and may be expected within the Concession Area any time from mid-May to mid-June and from mid-October to mid-December. It is recommended that prior to the commencement of the proposed activities, Samara consult with the managers of the DFFE research survey programmes to discuss their respective programmes and the possibility of altering the prospecting programme in order to minimises or avoid disruptions to both parties, where required.

Potential Impact F2: Temporary Exclusion of Fishing Operations from the Geophysical Survey Phase

Under the Convention on the International Regulations for Preventing Collisions at Sea (COLREGS, 1972, Part A, Rule 10), a vessel 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. Furthermore, under the Marine Traffic Act, 1981 (No. 2 of 1981), a vessel used for the purpose of exploiting the seabed falls under the definition of an “offshore installation” and as such it is protected by a 500 m safety zone. It is an offence for an unauthorised vessel to enter the safety zone. In addition to a statutory 500 m safety zone, a vessel operator would request a safe operational limit (that is greater than the 500 m safety zone) that it would like other vessels to stay beyond.

While the survey and sampling vessels are operational at a given location, a temporary 500 m operational safety zone around the unit would be in force, i.e., no other vessels (except the support vessels) may enter this area. A vessel conducting marine sampling operations would operate using dynamic positioning or typically operate on a 3 or 4 anchor spread with unlit anchor mooring buoys. For the duration of operations, a coastal navigational warning would be issued by the South African Navy Hydrographic Office (SANHO) requesting a 1.5 nautical mile and 500 m clearance from the survey and sampling vessels, respectively. The safety zones aim to ensure the safety both of navigation and of the project vessel, avoiding or reducing the probability of accidents caused by the interaction of fishing boats and gears and the survey and sampling vessels.

The exclusion of vessels from entering the safety zone poses a direct impact to fishing operations in the form of loss of access to fishing grounds or displacement of fishing effort into alternative fishing grounds.

The affected fisheries sectors have been identified based on the extent of overlap of fishing grounds with the Concession Area. The demersal longline sector is the only commercial fishery that currently shows activity in the area and operates only in the deep-water extent of the area around the 200 m bathymetric contour. Fisheries research surveys have routinely been conducted across the extent of the Concession Area each year between January and March. A research vessel could therefore be affected by the presence of survey and sampling vessels within the area through navigational exclusion.

Pole-and-line (snoek-directed) and traditional linefish (snoek-directed) fishing activity occur inshore of the Concession Area and these sectors are not expected to be affected by the navigational exclusion zone around survey or sampling vessels. Similarly, rock lobster fishing, netfishing and abalone ranching are nearshore activities and would not extend into the Concession Area.

The sensitivity of a particular fishing sector to the impact of the exclusion zone would differ according to the degree of disruption to that fishing operation. The current assessment considers this to be related to the type of gear used by the particular fishery, the mobility of fishing operations and the probability that the fishing operation can be relocated away from the affected area into alternative fishing areas. For instance, those that set fishing gear for extended periods (i.e., rock lobster traps anchored at seabed or drifting long-lines) are more susceptible to exclusion than those more mobile operations (i.e., trawl nets are towed directly behind the vessel). The sensitivity of fisheries research surveys is considered to be medium and that of the demersal longline sector, high.

The exclusion of vessels from entering the safety zone around a vessel engaged either in survey or sampling poses a direct impact to fishing operations in the form of loss of access to fishing grounds.

Demersal trawlers operate on both the Namibian and South African sides of the maritime border but at a seabed depth range of approximately 200 m to 1000 m. The inshore extent of demersal trawl grounds is situated about 10 km from the offshore boundary of the Concession Area and there is no direct overlap of the area with trawling grounds. The demersal longline fleet operates in similar areas, however slightly shallower than the trawler fleet and, in places, on hard grounds not accessible to trawlers. Namibian-registered vessels operate on the Namibian side of the maritime border at a depth range of 200 m to about 500 m. As such, fishing activity can be expected along the boundary of Sea Area 4C which runs along the maritime border with Namibia. The South African fleet of demersal longline vessels also operate at a similar depth range and there is minimal overlap of fishing ground with the offshore portions of the prospecting application area. Over the period 2018 to 2020, an average of 128 000 hooks per year were set within the prospecting application area yielding 21.9 tonnes of hake. This is equivalent to 0.47% of the overall effort and 0.47% of the overall catch reported nationally by the sector.

There is no overlap of the Concession Area with fishing grounds of the midwater trawl and small pelagic purse-seine sectors, which are situated at least 330 km and 150 km, respectively, southwards of the area.

In the vicinity of the prospecting application area, the South African fleet of the pelagic longlinefishery targets fishing areas offshore of the 500 m bathymetric contour and the closest activity would be expected 50 km from the offshore boundary of the Concession Area. However, the Namibian fleet of large pelagic longline vessels are permitted to target pelagic shark species in addition to tuna and therefore also operate in shallower waters inshore of the shelf break. The Namibian fleet would be expected to operate offshore of the 200 m depth contour adjacent to the South African maritime border and Sea Area 4c.

Vessels registered under the pole-and-line sector target either albacore in favoured areas off the shelf break, or they target snoek and yellowtail in coastal waters. Tuna-directed fishing is not expected to coincide with the prospecting application area. A significant amount of snoek-directed fishing activity occurs inshore of the 100 m depth contour over the period March to July.

Boat-based fishing for linefish takes place in close proximity to launch sites at Port Nolloth and Doringbaai. Over the period March to September, snoek is targeted in nearshore waters. Although unlikely to extend into the Concession Area, the possibility of fishing activity extending into the shallow water areas of the Concession Areas cannot be excluded.

Although the prospecting application area coincides with the designated management areas of the nearshore west coast rock lobster, abalone ranching, netfish and seaweed sectors, the depths exploited by these fisheries are less than 50 m and therefore would not be expected to coincide with the areas of operation for the proposed survey and sampling activities.

Certain areas on the coast are prioritized and demarcated by DFFE as small-scale fishing areas. Small-scale fishermen along the Northern Cape coast are typically involved in the fisheries for linefish and west coast rock lobster. Approximately 103 small-scale fishers are registered with the Port Nolloth fishing community co-operative. The small-scale fishery rights cover the nearshore area (defined in Section 19 of the MLRA as being within close proximity of shoreline). Since the grounds fished by the nearshore rock lobster sector are situated inshore of the Concession Area, fishing activity is not expected to be affected by the proposed survey and sampling activities. However, the impact of potential disruption of fishing activities for linefish species cannot be excluded and is assessed to be of very low magnitude and of overall negligible significance.

Research trawls are undertaken by DFFE on a national scale to establish the stock status of key commercial species. The demersal trawl survey would be expected to take place within the prospecting application area over the period January to March whereas the acoustic survey for small pelagic species would be expected to operate within the area during November and again during

May/June (a pre-recruitment biomass survey for small pelagic species). The magnitude of the impact on the sector is expected to be very low and, due to the medium sensitivity of the sector, of overall very low significance.

A process of notification and information-sharing should be followed with key identified fishing industry associations including the SA Tuna Association; SA Tuna Longline Association, SADSTIA, South African Hake Longline Association (SAHLLA), West Coast Rock Lobster Association, South African Linefish Associations (various) and SA Marine Linefish Management Association (SAMLMA). Other key stakeholders: SANHO, South African Maritime Safety Association, representatives of small-scale local fishing co-operatives and DFFE Vessel Monitoring, Control and Surveillance Vessel Monitoring System (VMS) Unit in Cape Town. These stakeholders should again be notified on completion of the project when the survey/sampling vessel is off location.

The required safety zones around the survey and sampling vessels should be communicated via the issuing of Daily Navigational Warnings for the duration of the sampling operations through the South African Naval Hydrographic Office.

The impact is assessed to be insignificant and would remain insignificant with the implementation of the proposed mitigation measures (Table 7-19).

Table 7-19: Significance of impact of temporary exclusion of fishing operations during survey and sampling operations.

Without Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Local	Medium	Short-term	Very Low	Possible	**INSIGNIFICANT**	– ve	Medium
1	2	1	4				
With Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Local	Medium	Short-term	Very Low	Possible	INSIGNIFICANT	– ve	Medium
1	2	1	4				
Degree to which impact can be reversed				The impact can be reversed to some extent.			
Degree to which impact may cause irreplaceable loss				This impact can cause some irreplaceable loss.			
Degree to which impact can be mitigated				The impact can be mitigated to some extent. Mitigation measures are presented directly after this table and in Section 7.4.			
Mitigated outcome				Less exclusion of fishing operations during survey and sampling operations.			

Mitigation measures for the potential impact include the following:

- A process of notification and information-sharing should be followed with key identified fishing industry associations including the SA Tuna Association; SA Tuna Longline Association, SADSTIA, South African Hake Longline Association (SAHLLA), West Coast Rock Lobster Association, South African Linefish Associations (various) and SAMLMA. Other key stakeholders: SANHO, South African Maritime Safety Association, representatives of small-scale local fishing co-operatives and DFFE Vessel Monitoring, Control and Surveillance VMS

Unit in Cape Town. These stakeholders should again be notified on completion of the project when the survey/sampling vessel is off location;

- The required safety zones around the survey and sampling vessels should be communicated via the issuing of Daily Navigational Warnings for the duration of the sampling operations through the South African Naval Hydrographic Office;
- The pole-and-line sector targets snoek inshore of the Concession Area during the period March to July. Timing of the survey activities to avoid taking place within the inshore extent of the Concession Area during this fishing period could reduce the impact on the sector;
- The traditional linefish sector operates in close proximity to Port Nolloth and Doringbaai over the period March to September. Timing of the survey activities to avoid taking place within the inshore extent of the Concession Area during this fishing period could reduce the impact on the sector; and
- A demersal research survey is undertaken each year and trawls are expected to be undertaken within the Concession Area over the period January/February. Acoustic surveys for small pelagic species are carried out twice a year and may be expected within the Concession Area any time from mid-May to mid-June and from mid-October to mid-December. It is recommended that prior to the commencement of the proposed activities, Samara consult with the managers of the DFFE research survey programmes to discuss their respective programmes and the possibility of altering the prospecting programme in order to minimises or avoid disruptions to both parties, where required.

Potential Impact F3: Increase in Ambient Noise from the Exploration Sampling Phase

Please refer to Potential Impact F1 for a discussion of the nature of the impact of noise on marine fauna.

The impact is assessed to be of very low significance and with the implementation of mitigation remains of very low significance (Table 7-20).

Table 7-20: Significance of impact of noise from sampling/trenching operations on fisheries.

Without Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Local	Low	Short-term	Very Low	Probable	**VERY LOW**	– ve	Medium
1	1	1	3				
With Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Local	Low	Short-term	Very Low	Probable	**VERY LOW**	– ve	Medium
1	1	1	3				
Degree to which impact can be reversed				The impact can be reversed to some extent.			
Degree to which impact may cause irreplaceable loss				This impact can cause some irreplaceable loss.			
Degree to which impact can be mitigated				The impact can be mitigated to some extent. Mitigation measures are presented directly after this table and in Section 7.4.			
Mitigated outcome				A less significant impact of noise from sampling on fisheries.			

Mitigation measures for the potential impact include the following:

- “Soft starts” should be carried out for any equipment of source levels greater than 210 dB re 1 μPa at 1 m over a period of 20 minutes to give adequate time for marine fauna to leave the vicinity;
- The pole-and-line sector targets snoek inshore of the Concession Area during the period March to July. Timing of the survey activities to avoid taking place within the inshore extent of the Concession Area during this fishing period could reduce the impact on the sector;
- The traditional linefish sector operates in close proximity to Port Nolloth and Doringbaai over the period March to September. Timing of the survey activities to avoid taking place within the inshore extent of the Concession Area during this fishing period could reduce the impact on the sector; and
- A demersal research survey is undertaken each year and trawls are expected to be undertaken within the Concession Area over the period January/February. Acoustic surveys for small pelagic species are carried out twice a year and may be expected within the Concession Area any time from mid-May to mid-June and from mid-October to mid-December. It is recommended that prior to the commencement of the proposed activities, Samara consult with the managers of the DFFE research survey programmes to discuss their respective programmes and the possibility of altering the prospecting programme in order to minimises or avoid disruptions to both parties, where required.

Potential Impact F4: Discharge of sediment from the exploration sampling phase

The proposed sampling activities are expected to result in the disturbance of sediments by the crawler suction head. Up to 20 bulk samples are proposed, disturbing an area of 0.0048 km^2.

The sampled seabed sediments are pumped to the surface and discharged onto sorting screens on the sampling vessel. The screens separate the fine sandy silt and large gravel and cobbles from the size fraction of interest, the 'plantfeed' (usually 2 - 20 mm). The fine sediments are immediately discarded overboard where they form a suspended sediment plume in the water column which dissipates with time. The 'plantfeed' is mixed with a high-density ferrosilicon (FeSi) slurry and pumped under pressure into a DMS plant resulting in a high-density concentrate. The majority of the ferrosilicon is magnetically recovered for re-use in the DMS plant and the fine sediments (-2 mm) from the DMS process are similarly deposited overboard. Furthermore, fine sediment re-suspension by the sampling tools will generate suspended sediment plumes near the seabed. The main effect of plumes is an increase in water column turbidity. It is noted that the sampling is not contiguous and therefore there will be a delay in time whilst the seabed tool is transferred to the new sampling site before additional sediment is released overboard with the next sample. The relevance of this in terms of effects on fisheries is the potential impairment of egg and/or larval development through high sediment loading.

Sedimentation has been shown to have significant adverse effects on fish spawning and recruitment patterns (Newell *et al.*, 1998; Wilber and Clark 2001; Wenger *et al.*, 2017; Spearman 2015). Several studies have demonstrated the smothering of fish eggs and larvae occurring during times of dreading operations Newell *et al.*, 1998; Wilber and Clark 2001; Wenger *et al.*, 2017; Spearman 2015. Although the relative effects of sedimentation on fish larvae are species-specific, the overall effects are largely adverse on fish recruitment patterns. Fish eggs and larvae are not capable of swimming and hence, cannot avoid the impact. The effects of smothering due to sedimentation also severely impact benthic communities (Norkko *et al*., 2001). Unlike mobile marine organisms such as fish, invertebrates are slow swimming or sessile and, therefore, cannot avoid sediment plumes to the extent mobile organisms can. Sea urchins, abalone, and rock lobster are also affected negatively by smothering and ingesting particulate matter, albeit at much higher concentrations than many fish species. Invertebrate larvae are impacted in the same manner as that of fish larvae (smothering and abrasion).

The direct physical impacts on fish species can be considered negligible as mobile species can avoid impacts; however, the same is not true for sessile and invertebrate species. Previous work has shown drilling activities have significant effects on invertebrate species diversity and abundance, which can persist for up to 4 months after drilling activities (Currie *et al*., 2005). Adverse effects occur within 500 meters of drilling locations, after which the impacts become less pronounced, and invertebrate communities are able to recover after a period of time (~4 months) (Currie *et al.*, 2005). Therefore, the highly localised nature of the impact and the ability of invertebrate communities to recover makes the overall direct physical effects of drilling negligible on marine invertebrate communities.

Sedimentation impacts would be limited to the proposed bulk sampling (trenching) activities. In Phase 3 (localised drilling and disposal of excess sediment at the surface), the sediment plume footprint will be considerable due to the height in the water column in which sediments are disposed. Sediments released at the surface can travel further distances from the source compared to sediments released from seafloor operations. Still, they will also be more diluted as the concentration of sediment is spread over a larger area when released from the surface. Smothering and abrasion impacts from surface-released sediments will most likely be insignificant to minimal as the concentration within the water column is not enough to cause harm to fish and invertebrate species, including spawning and recruitment patterns (Wilber and Clark 2001).

The taxa most vulnerable to increased turbidity and reduced light penetration are phytoplankton. Due to the location of the prospecting application area within the Namaqua upwelling cell, the abundance of phytoplankton can be expected to be seasonally high. Being dependent on nutrient supply, plankton abundance is typically spatially and temporally highly variable and is thus considered to have a low sensitivity. Pelagic fish likely to be encountered in the water column are highly mobile and would be expected to avoid elevated suspended sediment plumes in the water column. Likewise demersal fish would be expected to avoid elevated suspended sediment plumes near the seabed. These fauna are thus considered to have a low sensitivity.

Typically, fisheries stock recruitment is highly variable and shows a strong spatial and temporal signal. For example, this variability would apply to the small pelagic species that comprise the largest commercial fishery by volume on the West Coast of South Africa. Spawning and recruitment of these small pelagic species as well as of many demersal species occurs primarily well to the south of Sea Areas 4c and 5c. At the start of winter every year, juveniles of most small pelagic shoaling species recruit into coastal waters in large numbers between the Orange River and Cape Columbine. They recruit in the pelagic stage, across broad stretches of the shelf, 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.

Two species that migrate along the West Coast following the shoals of small pelagic species are snoek and chub mackerel. Their appearance along the West and South-West coasts are highly seasonal. Snoek migrating along the southern African West Coast reach the area between St Helena Bay and the Cape Peninsula between May and August. They spawn in these waters between July and October before moving offshore and commencing their return northward migration (Payne & Crawford 1989). Chub mackerel similarly migrate along the southern African West Coast reaching South-Western Cape waters between April and August. They move inshore in June and July to spawn before starting the return northwards offshore migration later in the year.

The spawn products from these fisheries typically drift northwards with the prevailing Benguela Current and larval development mainly occurs nearshore and in bays along the West Coast of South Africa, referred to as nursery areas. These areas provide a suitable niche for development of juveniles of these species. Most of the species potentially impacted are broadcast spawners, with large volumes of spawn products being dispersed over large areas. This would apply equally, for example, to west coast rock lobster, hake and sardine. Relative to the location of the nursery areas, the sediment plumes generated during benthic sampling would be predominantly dispersed northwards and offshore of the nursery areas. However, wind has been shown to be a significant influencer of sediment plume dispersal (Geyer *et al.*, 2004; Fernandes *et al.*, 2021). Given the prevailing wind conditions within the Concession Area, the sediment plume may move shoreward and towards sensitive nursery areas. Additionally, longshore sediment transport occurs primarily through wave-induced currents, while cross-shore transport is mainly through the direct effect of waves and undertow from breaking waves in the nearshore (Geyer *et al.*, 2004; Fernandes *et al.*, 2021). The movement of sediment into nursery and recruitment areas could have significant detrimental effects on fish early life stages of fish and invertebrate species. Sediment plumes can damage eggs and larvae through abrasion and inhibiting environmental cues that control growth and development. The developmental stages of fish and invertebrate larvae are prone to predation, and prolonged periods of development could increase the probability of predation and lower abundance. The mortality and damage of larvae through abrasion, extended time in larvae forms, and increased risk of predation could significantly reduce the recruitment potential of fish and invertebrate species within the Concession Area.

Whereas sediment plumes would result in a negative impact on stock recruitment, the impact on fish recruitment is considered to be of very low consequence and of overall insignificance due to the localised nature of the proposed sampling events in relation to fish nursery areas. Since the impact is unlikely to result in a significant impact on fish stock recruitment, mitigation against this impact is not considered necessary.

In terms of seaweeds, sediment plumes could significantly reduce the photosynthetic ability, spore settlement, and spore survival of E. maxima and L. pallida. The sediment plume would need to persist for an extended time for kelp populations within the Concession Area to be negatively affected. However, the sediment plume may enhance cumulative impacts of turbidity, as high amounts of turbidity characterise the West Coast. The high turbidity in the area is a result of the combination of the presence of sand on the seafloor, the hydrodynamic environment, and the cumulative effects of anthropogenic activities along the West Coast.

The medium-intensity negative impact of sediment removal during sampling operations and its effects on the associated communities is unavoidable, but as it will be extremely localised amounting to a total of only 0.2 km^2 should all anticipated 50 bulk samples be taken. The area disturbed constitutes ~0.003 % of the overall Concession Area. The impact can confidently be rated as being of very low significance without mitigation.

The impact is assessed to be of Very Low significance to the demersal trawl, demersal longline, pole-and-line, small pelagic purse-seine, traditional linefish, abalone ranching, small-scale fisheries, seaweed, west coast rock lobster and netfish sectors. No mitigation measures are proposed (Table 5-21).

Table 7-21: Significance of impact of sediment plume on fish stock recruitment.

Without Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Local	Medium	Short-term	Very Low	Probable	**VERY LOW**	– ve	Medium
1	2	1	4				
With Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Local	Medium	Short-term	Very Low	Probable	**VERY LOW**	– ve	Medium
1	2	1	4				
Degree to which impact can be reversed				The impact can be reversed to some extent.			
Degree to which impact may cause irreplaceable loss				This impact can cause some irreplaceable loss.			
Degree to which impact can be mitigated				The impact can be mitigated to some extent. Mitigation measures are presented directly after this table and in Section 7.4.			
Mitigated outcome				A less significant impact of sediment plumes on fish stock recruitment.			

Potential Impact F5: Temporary exclusion of fishing operations from the exploration sampling phase

Please refer to Potential Impact F2 for a discussion of the nature of the impact of temporary exclusion of fishing operations.

The impact is assessed to be insignificant and would remain insignificant with the implementation of the proposed mitigation measures (Table 7-22).

Table 7-22: Significance of impact of temporary exclusion of fishing operations during exploration sampling operations.

Without Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Local	Medium	Short-term	Very Low	Possible	**INSIGNIFICANT**	– ve	Medium
1	2	1	4				
With Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Local	Medium	Short-term	Very Low	Possible	**INSIGNIFICANT**	– ve	Medium
1	2	1	4				
Degree to which impact can be reversed				The impact can be reversed to some extent.			
Degree to which impact may cause irreplaceable loss				This impact can cause some irreplaceable loss.			
Degree to which impact can be mitigated				The impact can be mitigated to some extent. Mitigation measures are presented directly after this table and in Section 7.4.			
Mitigated outcome				Less exclusion of fishing operations during survey and sampling operations.			

Mitigation measures for the potential impact include the following:

- A process of notification and information-sharing should be followed with key identified fishing industry associations including the SA Tuna Association; SA Tuna Longline Association, SADSTIA, South African Hake Longline Association (SAHLLA), West Coast Rock Lobster Association, South African Linefish Associations (various) and SAMLMA. Other key stakeholders: SANHO, South African Maritime Safety Association, representatives of small-scale local fishing co-operatives and DFFE Vessel Monitoring, Control and Surveillance VMS Unit in Cape Town. These stakeholders should again be notified on completion of the project when the survey/sampling vessel is off location;
- The required safety zones around the survey and sampling vessels should be communicated via the issuing of Daily Navigational Warnings for the duration of the sampling operations through the South African Naval Hydrographic Office;
- The pole-and-line sector targets snoek inshore of the Concession Area during the period March to July. Timing of the survey activities to avoid taking place within the inshore extent of the Concession Area during this fishing period could reduce the impact on the sector;
- The traditional linefish sector operates in close proximity to Port Nolloth and Doringbaai over the period March to September. Timing of the survey activities to avoid taking place within the inshore extent of the Concession Area during this fishing period could reduce the impact on the sector; and
- A demersal research survey is undertaken each year and trawls are expected to be undertaken within the Concession Area over the period January/February. Acoustic surveys

for small pelagic species are carried out twice a year and may be expected within the Concession Area any time from mid-May to mid-June and from mid-October to mid-December. It is recommended that prior to the commencement of the proposed activities, Samara consult with the managers of the DFFE research survey programmes to discuss their respective programmes and the possibility of altering the prospecting programme in order to minimises or avoid disruptions to both parties, where required.

7.2.3 Potential Archaeology / Palaeontology (Heritage) Impacts

Of all the activities to be undertaken as part of the prospecting in Concession Areas 4C and 5C only the bulk seabed sampling has the potential impacts on cultural heritage resources.

Seabed sampling will be undertaken by a crawler vehicle deployed from a specialised sampling vessel. The crawler uses water jets to loosen seabed sediment which is then pumped to surface for shipboard processing. The Draft Scoping Report anticipates that up to 50 seabed sampling trenches, each 200 m long, 20 m wide and up to at least 1.5 m deep, will be excavated in the Concession Areas as part of the prospecting programme.

The potential impacts of seabed sampling on palaeontological resources, submerged prehistoric and maritime archaeological resources are assessed in the following sections.

Assessment of Impacts

The following potential direct impacts on heritage were identified:

- H1: Damage to or loss of palaeontological materials.
- H2: Damage to or loss of submerged prehistoric archaeological sites or materials.

Potential Impact H1: Damage to Palaeontological Materials

Fossils are rare objects, often preserved due to unusual circumstances. This is particularly applicable to vertebrate fossils (bones), which tend to be sporadically preserved and have high value with respect to palaeoecological and biostratigraphic (dating) information. Such fossils are non-renewable resources. Provided that no subsurface disturbance occurs, the fossils remain sequestered.

The seabed sampling involves a considerable volume of the inner shelf deposits and for the most part the excavated material is the Last Transgression Sequence deposits with expected “subfossil” extant shell species and a ‘sprinkling” of scientifically important extralimital species and rare reworked old fossil shells, bones and teeth in the gravels.

The palaeontological impact of seabed sampling in Concession Areas 4C and 5C will be localised but where impacts do occur and because of the non-renewable nature of these resources the effects will be permanent.

Although the Namaqua Fossil Forest in Concession Area 4C is subject to a Marine Protected Area and together with a buffer of 5 km will be excluded from all prospecting activities, reworked, petrified Cretaceous fossil wood is fairly common in the adjacent Concession 5B and nearby onshore deposits and may thus also be more prevalent in other areas of 4C and 5C. Although impacts will be localised, where they do occur their intensity will be high, the effects will be permanent, and the consequence rating is thus medium.

It is possible that seabed sampling will intersect and impact such material. The impact rating for Cretaceous fossil wood in the Concession Areas is thus assessed to be low negative. The lack of concrete information about both the potential presence and distribution of these fossils in the Concession Areas means that the level of confidence in this assessment of impacts is low.

Cenozoic shelly macrofauna are expected to be sparse and where present mostly in the form of worn shell casts. Impacts of sampling on the *ex-situ* Cenozoic shelly macrofauna will be localised, the intensity low, and the effects permanent. The consequence rating is thus low.

It is unlikely that seabed sampling will intersect and impact such material. and the impact rating is thus assessed to be very low negative. The lack of concrete information about both the potential presence and distribution of these fossils in the Concession Areas means that the level of confidence in this assessment of impacts is low.

Fossil bones and teeth are phosphatized (petrified) to various degrees and probably also worn by transport and/or pitted by boring organisms. This material is scarce, but the large volumes involved increase the probability that some will be encountered, and these could be of high scientific value. The intensity of impacts will thus be high, although localised, and the consequence rating to such material is thus assessed to be high.

It is possible that seabed sampling will intersect and impact such material. The impact rating is thus assessed to be medium negative. The lack of concrete information about both the potential presence and distribution of these fossils in the Concession Areas means that the level of confidence in this assessment of impacts is low.

Quaternary fossil shell assemblages from the Last Transgression Sequence consist mainly of well-known, usual taxa and it is the unexpected, out of range or unknown shell species which are important. The concern here are shell species which are not typical of the normal faunal assemblages of the Namaqua shelf and are generally sparse, although several may occur in the same area. Seabed sampling in Concession Areas 4C and 5C have a strong potential to yield fossil shells of extralimital Algoa species. The intensity of impacts will be medium, duration permanent, but localised. The consequence rating to such material is thus assessed to be medium.

It is probable that seabed sampling will intersect and impact such material. The impact rating is thus assessed to be medium negative. The lack of concrete information about both the potential presence and distribution of these fossils in the Concession Areas means that the level of confidence in this assessment of impacts is low.

Table 7-23: Risk assessment for potential significant loss of Cretaceous fossil wood.

Without Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Local	High	Long-term	Medium	Possible	**MEDIUM**	– ve	Low
1	3	3	7				
With Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Local	Medium	Long-term (Irreversible)	Low	Possible	**LOW**	+ ve	High
1	2	3	6				
Degree to which impact can be reversed				The impact cannot be reversed.			
Degree to which impact may cause irreplaceable loss				This impact can cause some irreplaceable loss.			
Degree to which impact can be mitigated				The impact can be mitigated to some extent. Mitigation measures are presented directly after this table and in Section 7.4.			
Mitigated outcome				A less significant impact heritage sites and artifacts.			

Table 7-24: Risk assessment for potential significant loss of Cenozoic shelly macrofauna.

Without Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Local	Low	Long-term	Low	Improbable	**VERY LOW**	– ve	Low
1	1	3	5				
With Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Local	Low	Long-term (Irreversible)	Low	Improbable	**VERY LOW**	– ve	Low
1	1	3	5				
Degree to which impact can be reversed				The impact cannot be reversed.			
Degree to which impact may cause irreplaceable loss				This impact can cause some irreplaceable loss.			
Degree to which impact can be mitigated				The impact can be mitigated to some extent. Mitigation measures are presented directly after this table and in Section 7.4.			
Mitigated outcome				A less significant impact heritage sites and artifacts.			

Table 7-25: Risk assessment for potential significant loss of fossil bones and teeth.

Without Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Local	High	Long-term	High	Possible	**MEDIUM**	– ve	Low
1	3	3	7				
With Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Local	Low	Long-term (Irreversible)	Low	Possible	**VERY LOW**	– ve	Low
1	1	3	5				
Degree to which impact can be reversed				The impact cannot be reversed.			
Degree to which impact may cause irreplaceable loss				This impact can cause some irreplaceable loss.			
Degree to which impact can be mitigated				The impact can be mitigated to some extent. Mitigation measures are presented directly after this table and in Section 7.4.			
Mitigated outcome				A less significant impact heritage sites and artifacts.			

Table 7-26: Risk assessment for potential significant loss of shells from the last transgression sequence.

Without Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Local	Medium	Long-term	Medium	Probable	**MEDIUM**	– ve	Low
1	2	3	6				
With Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Local	Low	Long-term (Irreversible)	Low	Probable	**LOW**	– ve	Low
1	1	3	5				
Degree to which impact can be reversed				The impact cannot be reversed.			
Degree to which impact may cause irreplaceable loss				This impact can cause some irreplaceable loss.			
Degree to which impact can be mitigated				The impact can be mitigated to some extent. Mitigation measures are presented directly after this table and in Section 7.4.			
Mitigated outcome				A less significant impact heritage sites and artifacts.			

Mitigation measures for the potential impact include the following:

- The Namaqua Fossil Forrest MPA is excluded from prospecting activities through the implementation of a 5 km exclusion zone around the MPA boundary;
- The EMPr must include provisions for the collection of representative examples of the fossils that occur;
- "Run of mine" material on the oversize screen should be monitored for fossils as part of normal sampling and mining process;
- Potential fossil material should be collected for later identification and evaluation. The company must apply to SAHRA for a general permit to destroy, damage, excavate, disturb, and collect fossils identified during sampling, as per the NHRA and any recovered material is to be temporarily stored by the company. When a collection of fossil material has been accumulated, the appointed palaeontologist should undertake the identification and evaluation of the fossil material and compile the report for submission to SAHRA. The Environmental Manager/Officer) is to liaise with the appointed palaeontologist on the progress of the fossil collection and the scheduling of the evaluation;
- For overall monitoring purposes it is suggested that a few small bulk samples of shells (~5 litres) are collected on occasion. The idea is to sample the typical assemblage at a few points in the sampling/mining area. It is possible that an uncommon assemblage may be encountered, such as a shallow-water fauna or a lagoonal fauna, in which case it should also be sampled;
- Any fossils found during the processing of drill samples must have the details of context recorded, must be kept for identification by an appropriate specialist and, if significant, be deposited in an appropriate institution;
- As part of the normal sampling and mining process the material crossing the oversize screen must be monitored for the occurrence of the various fossil types. Potential fossil material should be collected for later identification and evaluation;
- For overall monitoring purposes it is suggested that a few small bulk samples of shells (~5 litres) be collected on occasion. The idea is to sample the typical assemblage at a few points in the sampling/mining area. It is possible that an uncommon assemblage may be encountered, such as a shallow-water fauna or a lagoonal fauna, in which case it should also be sampled. Data to be recorded during fossil collection includes:
    - Date;
    - Company name;
    - Sample no.;
    - Collector’s name;
    - Position (co-ordinates);
    - Water depth;
    - Sample subsurface depth;
    - Vessel;
    - Brief description and photographs;

- A copy of the graphic log of the sample drill hole or mining face showing the vertical sequence of units and the estimated location of the fossil in the sequence;
- A map of the fossil finds in the particular sampling/mining area, such as a contoured multibeam bathymetric image showing the context of samples in relation to the bedrock topography and sediment bodies;

- During all operations, personnel can send queries and images by email to an appointed palaeontologist for evaluation and prompt feedback; and
- Collected samples are to be temporarily stored by the company but when a collection of fossil material has been accumulated, the appointed palaeontologist should undertake the identification and evaluation of the fossil material and compile the report for submission to SAHRA. A selection of material could be removed for further study. The Environmental Manager/Officer) is to liaise with the appointed palaeontologist on the progress of the fossil collection and the scheduling of the evaluation.

With mitigation, impact significance is assessed to be of low or very low for palaeontological resources.

Potential Impact H2: Damage to Submerged and Maritime Prehistoric Archaeological Sites

The past use by our hominin ancestors of the exposed continental shelf is beyond doubt and the evidence of this presence is possible where archaeological material and palaeo-environmental evidence has survived post-glacial marine transgressions.

Although no geophysical data for the Concession Areas are presently available, there is the potential for this material to be found on, or associated with surviving palaeo-landsurfaces or in association with any now submerged palaeo-channels in the extreme eastern portion of Concession Area 5C where the water depth is less than 120 m. The equivalent area of Concession Area 4C forms part of the excluded Namaqua Fossil Forest MPA and buffer and will thus not be subject to impacts from seabed sampling.

Sampling activities will have a direct impact on seabed sediments and should there be archaeological material in the affected sediments this will be disturbed and its archaeological context destroyed. The extent of any impacts to submerged prehistoric archaeological sites and material will be localised and limited to the sampling trenches. However, the non-renewable nature of such resources means that where impacts do occur their intensity will be high, the effects will be permanent, and the consequence rating is thus high.

It is extremely difficult to predict whether prehistoric archaeological remains will be present in or on the seabed within the Concession Areas or, if they are, where they may be located. The growing evidence-base for submerged prehistoric archaeological remains on the continental shelf globally and in South African waters suggests that wherever seabed disturbance occurs in particularly the landward portion of Concession Area 5C, it is possible that prospecting activities will intersect and impact such material.

The impact rating for submerged prehistoric archaeological remains in the Concession Areas is thus assessed to be medium negative.

The lack of concrete information about both the potential presence and distribution of submerged prehistoric resources in the Concession Areas means that the level of confidence in this assessment of impacts is low.

In respect of mitigation measures, if the prospecting process includes the recovery and retention of the stone and gravel fraction of the recovered sediments in addition to the gem fraction, and samples of the former material can be archaeologically assessed for the presence of stone age lithics and other archaeological material (e.g., bone) this would be beneficial and would make a positive contribution to archaeological knowledge.

Similarly, and bearing in mind the obvious commercial sensitivity of such data, if any evidence in the geophysical data (particularly the Chirp seismic data) for submerged palaeo-river channels, associated gravel terraces and the presence in those portions of the Concession Areas in water depths of less than 120 m of organic remains or sediment horizons can be made available to researchers, this would also make a positive contribution to the furtherance of archaeological knowledge.

The impact is assessed to be of medium significance and with the implementation of mitigation is reduced to low (Table 7-27).

Table 7-27: Risk Assessment for potential significant loss of submerged prehistoric archaeological sites and materials.

Without Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Local	High	Long-term	High	Possible	**MEDIUM**	– ve	Low
1	3	3	7				
With Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Local	Medium	Long-term (Irreversible)	Medium	Probable	**LOW**	+ ve	High
1	2	3	6				
Degree to which impact can be reversed				The impact cannot be reversed.			
Degree to which impact may cause irreplaceable loss				This impact can cause some irreplaceable loss.			
Degree to which impact can be mitigated				The impact can be mitigated to some extent. Mitigation measures are presented directly after this table and in Section 7.4.			
Mitigated outcome				A less significant impact heritage sites and artifacts.			

Mitigation measures include:

- If the stone and gravel fraction of the sampled sediments is retained, archaeological review of this material is strongly recommended;
- The making available to archaeological research of information about the presence of certain seabed features from particularly the seismic Chirp data is strongly recommended;
- The absence of historical wrecks in the Concession Areas can be confirmed from the geophysical data to be acquired for the proposed prospecting;
- Any wreck or possibly anthropogenic seabed anomaly identified in the geophysical data during Phase 2 of the prospecting programme must be is flagged;
- These sites and/or anomalies must be excluded from the areas to be subject to bulk seabed sampling. The implementation of a buffer of at least 50 m around each such site and/or anomaly will serve to ensure that they are not impacted by the bulk sampling;
- Any such sites or flagged anomalies must be reported to SAHRA;

- If an undetected wreck is encountered during seabed sampling, it is recommended that the following mitigation measures must be implemented:
  - Seabed sampling activities in the area must be stopped immediately;
  - The responsible Environmental Manager must be informed immediately;
  - The Environmental Manager must inform SAHRA immediately;
  - A suitably qualified maritime archaeologist must be contacted to assess the find;
  - If any artefacts have been recovered from the site these must be kept wet and retained for assessment by the maritime archaeologist;
  - The location of the find and any associated data used to identify the wreck must be provided to SAHRA be added to the national shipwreck database; and
  - Following consultation with SAHRA and the maritime archaeologist, an exclusion zone around the site is likely to be required within which seabed sampling activities may not take place.

7.2.4 Potential Impacts on Marine Prospecting/Exploration/Mining

Assessment of Impacts

The following potential direct impacts on marine prospecting/exploration/mining in the area have been identified:

- MP1: The presence of survey and support vessels may have an impact due to the legislative requirement of a 500 m safety zone around these vessels.

Potential Impact MP1: Impacts on Marine Prospecting Vessels

Legislation dictates that vessels operating in a marine environment should consist of a 500 m safety zone around the vessels. This means that only a number of vessels can be present on a section of the ocean at any one time. The impact thus relates to the number of vessels that are allowed in the vicinity and other prospecting or mining activities taking place in the nearby area at the same time.

This impact was assessed with the EIA Methodology in Section 7.1. Results of the risk assessment is presented in Table 7-28 with the proposed mitigation measures.

Table 7-28: Risk assessment for potential impacts on marine prospecting vessels.

Without Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Regional	Medium	Medium-term	Medium	Possible	**LOW**	– ve	High
2	2	2	6				
With Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Regional	Low	Medium-term	Low	Possible	**VERY LOW**	– ve	High
2	1	2	5				
Degree to which impact can be reversed				The impact can be reversed.			
Degree to which impact may cause irreplaceable loss				This impact will not likely cause irreplaceable loss.			
Degree to which impact can be mitigated				The impact can be mitigated to some extent. Mitigation measures are presented directly after this table and in Section 7.4.			
Mitigated outcome				A less significant impact on other vessels in the region.			

Mitigation measures for the potential impact include the following:

- Establish a communication and notification procedure with other marine prospecting and mining companies undertaking activities in the vicinity prior to the start of planned activities.

7.2.5 Potential Impact on Marine Transport Routes

Assessment of Impacts

The following potential direct impact on marine transport routes was identified:

- MTR1: The presence of survey and support vessels may have an impact due to the legislative requirement of a 500 m safety zone around these vessels.

Potential Impact MTR1: Impact on Transport and Other Vessels

Legislation dictates that vessels operating in a marine environment should consist of a 500 m safety zone around the vessels. Once again, this means that only a number of vessels can be present on a section of the ocean at any one time. The impact thus relates to the number of vessels that are allowed in the vicinity and specifically, vessels undertaking other activities. Such vessels include vessels used for the import, transport, and export of goods as well as boats used by fishermen in the area. This will cause transportation companies to potentially use alternative transport routes and reducing the area for fishing communities to fish.

This impact was assessed with the EIA Methodology in Section 7.1. Results of the risk assessment is presented in Table 7-29 with the proposed mitigation measures.

Table 7-29: Risk assessment for potential impacts on transport and other vessels.

Without Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Regional	Medium	Medium-term	Medium	Possible	**LOW**	– ve	High
2	2	2	6				
With Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Regional	Low	Medium-term	Low	Possible	VERY LOW	– ve	High
2	1	2	5				
Degree to which impact can be reversed				The impact can be reversed.			
Degree to which impact may cause irreplaceable loss				This impact will not likely cause irreplaceable loss.			
Degree to which impact can be mitigated				The impact can be mitigated to some extent. Mitigation measures are presented directly after this table and in Section 7.4.			
Mitigated outcome				A less significant impact on other vessels in the region.			

Mitigation measures for the potential impact include the following:

- Establish a communication and notification procedure, in particular transport companies and the South African Navy Hydrographic Office, SAMSA, DFFE, and relevant port Captains;
- Daily Navigational Warnings need to be communicated during sampling operations; and
- Only certified seaworthy vessels should be used that is internationally recognised.

7.2.6 Potential Socio-Economic Impacts

Assessment of Impacts

The following potential direct Socio-Economic impact was identified:

- SE1: Creation of employment opportunities and revenues in local areas.

Potential Impact SE1: Employment Opportunity

As confirmed in the Planning Policy Framework in Section 2.2, the mining industry contribute significantly towards the development and economic state of the Namaqua District, Nama Khoi Local Municipality, and Richtersveld Local Municipality. Accordingly, undertaking prospecting activities will improve job creation, especially for local communities and local municipalities.

This impact was assessed with the EIA Methodology in Section 7.1. Results of the risk assessment is presented in Table 7-30. This impact was positive, and no mitigation was necessary.

Table 7-30: Risk assessment for potential impact on employment opportunities.

Without Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Regional	Low	Medium-term	Low	Definite	**LOW**	+ ve	High
2	1	2	5				
With Mitigation							
Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Regional	Low	Medium-term	Low	Definite	**LOW**	+ ve	High
2	1	2	5				
Degree to which impact can be reversed				The impact is positive, and this section is therefore not applicable.			
Degree to which impact may cause irreplaceable loss				The impact is positive, and this section is therefore not applicable.			
Degree to which impact can be mitigated				The impact is positive, and this section is therefore not applicable.			
Mitigated outcome				The impact is positive, and this section is therefore not applicable.			

Mitigation measures for the potential impact include the following:

- Where possible employ people from the local communities.

7.2.7 Cumulative Impacts

For the purposes of this report, cumulative impacts are defined as 'direct and indirect impacts that act together with existing or future potential impacts of other activities or proposed activities in the area / region that affect the same resources and / or receptors.

For the most part, cumulative effects or aspects thereof are too uncertain to be quantifiable, due mainly to a lack of data availability and accuracy. This is particularly true of cumulative effects arising from potential or future projects, the design, or details of which may not be finalised or available and the direct and indirect impacts of which have not yet been assessed.

For practical reasons, the identification and management of cumulative impacts are limited to those effects generally recognised as important on the basis of scientific concerns and/or concerns of affected communities.

Activities that potentially have cumulative impacts with the proposed Concession Area 4C and 5C prospecting and which are considered in the cumulative impact assessment are listed in Table 7-31 . **Note that past and present projects, activities, and stressors should have been largely considered in the baseline and thus the impact assessments.**

Table 7-31: Projects, Activities and/or Stressors with Potential Cumulative Impacts.

Project, activity and/or natural stressor	Potentially cumulatively impacted environmental resource										
	Fisheries	Air quality	Noise	Groundwate	Freshwater	Marine/Coas	Flora /	Socio-econ	Heritage	Visual	Traffic
Possible present natural stressors											
N/A											
Past and present projects and activities											
Current offshore mineral prospecting or mining in the surrounding Concession Areas	X					X			X		
Possible future natural stressors											
N/A											
Potential future projects											
Offshore prospecting or mining in the surrounding Concession Areas	X					X			X		
Application for offshore oil and gas prospecting in Block 1, which overlaps with Areas 4C and 5C	X					X			X		

Although no development or production from the South African West Coast offshore, exploration for oil and gas (hydrocarbons) has been and continues to be undertaken in the Benguela offshore environment (Refer to Figure 7-3 for a map showing the spatial distribution of geophysical survey transects undertaken historically off the West Coast of South Africa). Such activities present the potential impacts of both increased ambient noise and temporary exclusion of fishing operations in the vicinity of the survey vessel.

Figure 7-4 shows the location of exploration wells (abandoned) that have been drilling off the West Coast of South Africa, as well as offshore leases and open acreages. Oil and gas operators have an interest in offshore petroleum lease blocks, and these licence blocks overlap minerals mining/prospecting Concession Areas. Wellheads pose a potential impact on fisheries operations in the form of permanent exclusion to trawling/anchoring in the vicinity of a wellhead (500 m radius).

Both marine diamond prospecting and mining occurs near the proposed 4C and 5C Concession Area. These activities present a potential impact of increased ambient noise, temporary exclusion of fishing operations, as well as the removal/alteration of benthic habitat, sediment discharge and plume effects (increased water turbidity) during the dredging of unconsolidated seabed sediment. Figure 7-5 shows the location of prospecting and mining application areas in the vicinity of the Concession Area.

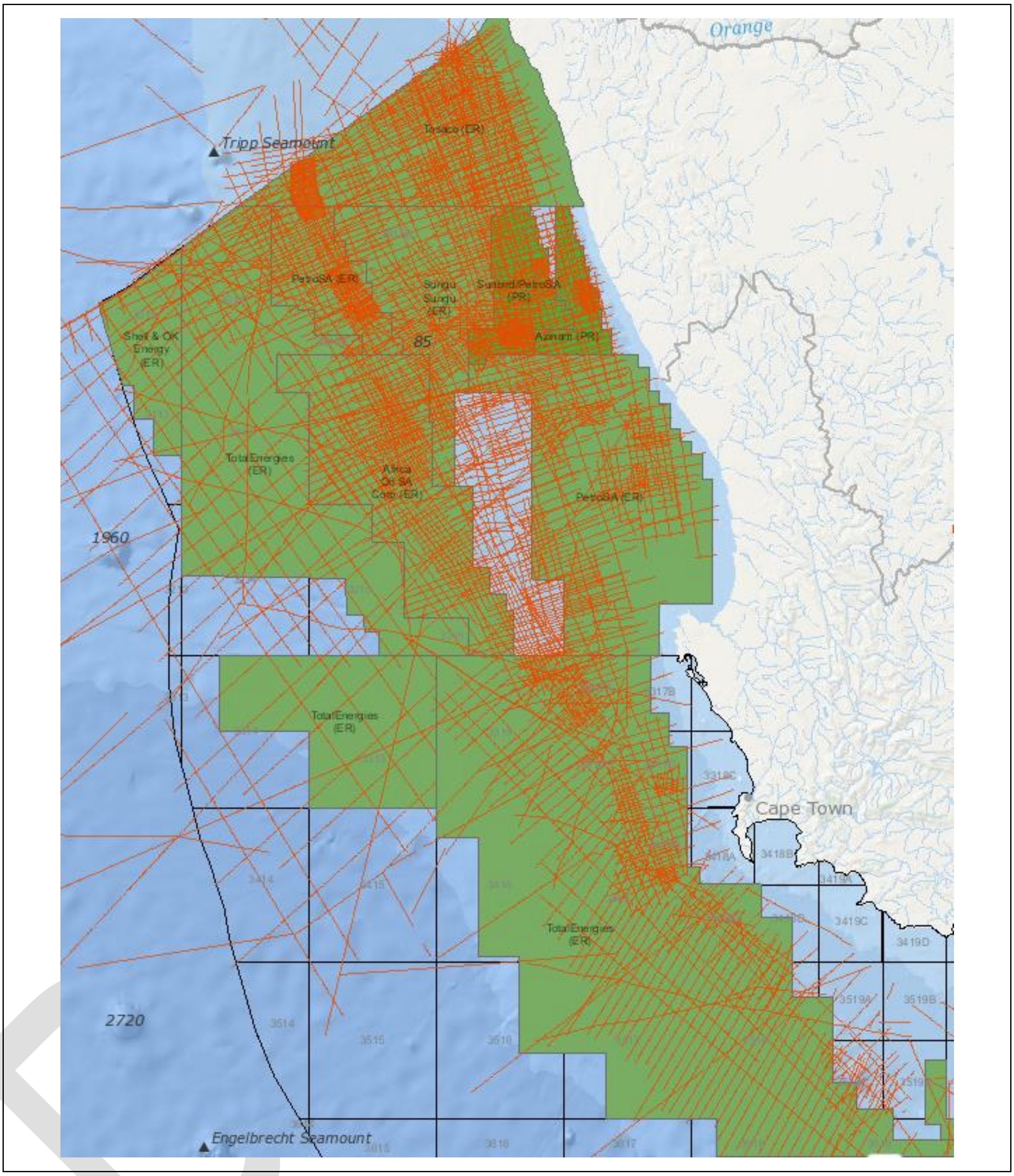


Figure 7-3: Spatial distribution of acquired 2D seismic survey transect data, offshore leases, and open acreages off the west coast of South Africa (Source: Petroleum Agency of South Africa https://geoportal.petroleumagencysa.com/Storefront/Viewer/index_map.html).

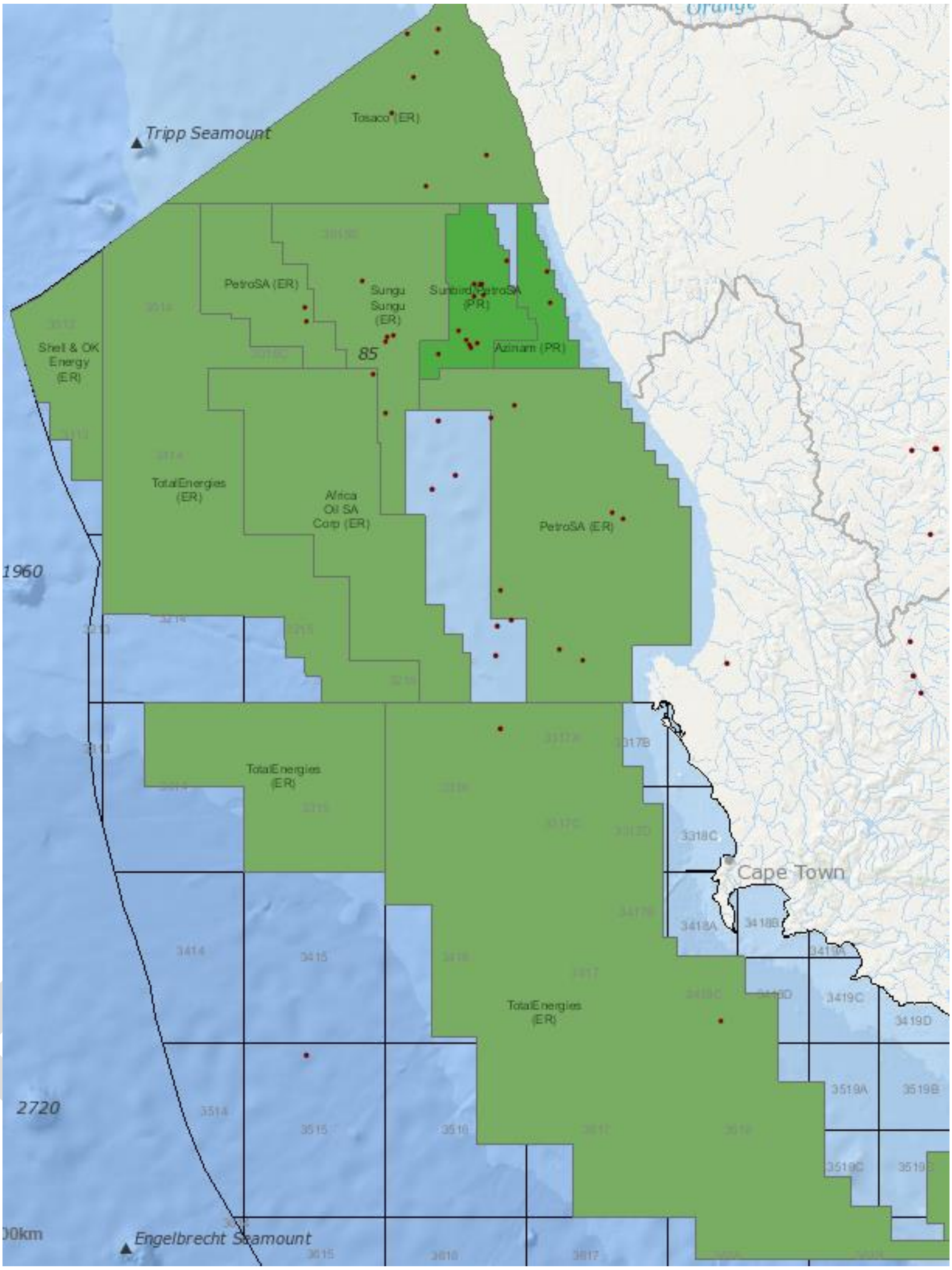


Figure 7-4: Location of wells (abandoned), offshore leases, and open acreages off the west coast of South Africa (Source: Petroleum Agency of South Africa https://geoportal.petroleumagencysa.com/Storefront/Viewer/index_map.html).

Table 7-32: Applications for hydrocarbon exploration and mineral prospecting rights in the Southern Benguela region (South African West Coast and southern Namibia) since 2007, indicating which of these have been undertaken.

YEAR	RIGHT HOLDER / OPERATOR	BLOCK	ACTIVITY	APPROVAL	CONDUCTED / COMPLETED
SOUTH AFRICAN SEA AREAS MINERALS PROSPECTING AND MINING					
2011	Aurumar	SASA 1C-9C SASA 12C, 14C-18C, 20C	Heavy minerals coring	Yes	Jan-Mar 2011 2C-5C: Geophysical & coring 7C-10C: Geophysical & coring 12C, 14C-18C & 20C: Only desktop
2013-2014	Belton Park Trading	SASA 2C-5C	Geophysical surveys, coring, bulk sampling	Yes	Survey: ongoing in 2C and 3C Sampling: ongoing in 2C and 3C Various prospecting operations undertaken over duration of prospecting right
2017	Belton Park Trading	SASA 2C (3C was incorporated into mining right area in 2019)	Mining	Yes	Ongoing prospecting and mining has taken place over various campaigns to date: SASA 2C: 9 Aug – 7 Nov 2018 SASA 2C: 13 Mar – 5 May 2019; SASA 2C: 9 Jul – 25 Oct 2019 SASA 2C & 3C: 27 Feb – 31 Aug 2020 Mining is currently ongoing
2018	De Beers Marine	SASA 6C	Geophysical surveys, coring, bulk sampling	Yes	Survey: May-Jul 2021 Sampling: Dec 2021 – Jan 2022
2020	Belton Park Trading	SASA 14B, 15B, 17B	Geophysical surveys, coring, bulk sampling	Yes but appeal still under review	
2020	Belton Park Trading	SASA 13C, 15C, 16C, 17C, 18C	Geophysical surveys, coring, bulk sampling	Yes but appeal still under review	
2021	De Beers Marine	SASA 4C & 5C	Geophysical surveys, coring, bulk sampling	Application in prep.	
2021-2022	Moonstone Diamond Marketing	SASA 11B, 13B	Geophysical surveys, coring, bulk sampling	Applications delayed. Second round EIAs in prep.	

YEAR	RIGHT HOLDER / OPERATOR	BLOCK	ACTIVITY	APPROVAL	CONDUCTED / COMPLETED
2022	Trans-Atlantic Diamonds	SASA 14A	Geophysical surveys, coring, sampling	Yes	
2022	Trans-Atlantic Diamonds	SASA 11C	Geophysical surveys, coring, sampling	FBAR submitted to DMRE on 2 March 2022	
2023	Samara Mining	SASA 4C & 5C	Geophysical surveys, coring, bulk sampling	Application in prep.	
SOUTH AFRICAN WEST COAST PETROLEUM EXPLORATION					
2007	PASA	Orange Basin	2D Seismic	Yes	Nov-Dec 2007
2008	PASA	West Coast	2D Seismic	Yes	Sep 2008
2008	PetroSA	Block 1	3D Seismic	Yes	Jan-Apr 2009
2011	Forest Oil (Ibhubesi)	Block 2A	3D Seismic	Yes	May-Jul 2011
2011	PetroSA / Anadarko	Block 5/6 (ER224); Block 7 (ER228)	2D / 3D Seismic and CSEM	Yes	2D: Dec 2012 – Feb 2013 3D: Jan–Apr 2020
2011	PetroSA	Block 1	Exploration drilling	Yes	unknown
2012	BHP Billiton (now Ricocure Azinam & Africa Oil)	Block 3B/4B	2D and 3D Seismic	Yes	unknown
2013	Spectrum	West Coast regional	2D Seismic	Yes	2D: April 2015
2013	PetroSA	Block 1	2D and 3D Seismic	Yes	3D: Feb-May 2013 (conducted by Cairn)
2013	Anadarko	Block 2C	2D and 3D Seismic, MBES, heat flow, seabed sampling	Yes	unknown
2013	Anadarko	Block 5/6/7	MBES, heat flow, coring	Yes	Jan-Mar 2013
2014	OK/Shell	Northern Cape Ultra Deep ER274	2D and 3D Seismic, MBES, magnetics, seabed sampling	Yes	2D: Feb-Mar 2021

YEAR	RIGHT HOLDER / OPERATOR	BLOCK	ACTIVITY	APPROVAL	CONDUCTED / COMPLETED
2014	Shell	Deep Water Orange Basin	Exploration drilling	Yes	No (Shell relinquished block to TEEPSA)
2014	Cairn	ER 12/3/083	2D Seismic	Yes (obtained by PetroSA)	2D: Feb-Mar 2014
2014	Cairn	Block 1	Seabed sampling	Yes	unknown
2014 - 2015	Thombo	Block 2B (ER105)	Exploration drilling	Yes	No (Africa Energy preparing to drill in late 2022/23)
2014	New Age Energy	Southwest Orange Basin	2D Seismic	unknown	unknown
2015	Cairn	Block 1	Exploration drilling	unknown	unknown
2015	Sunbird	West Coast	Production pipeline (Ibhubesi)	Yes	No (EA was renewed for an additional 5 years on 30 June 2022)
2015	Rhino	Southwest coast (inshore)	2D Seismic, MBES	unknown	unknown
2015	Rhino	Block 3617/3717	2D and 3D Seismic, MBES	Yes	unknown
2017	Impact Africa / TEEPSA	Southwest Orange Deep	2D and 3D Seismic	unknown	unknown
2018	PGS	West Coast regional	2D and 3D Seismic	Yes	
2019	Anadarko	Block 5/6/7	2D Seismic	Yes	
2021	Searcher	West Coast regional	2D and 3D Seismic	Yes (currently appealed)	2D: Jan 2022 (incomplete)
2021	TGS	West Coast regional	2D Seismic	Yes	No
2021	Tosaco	Block 1, ER362	3D Seismic	Withdrawn	-
2022	Ion	Deep Water Orange Basin	3D Seismic	Application in prep.	No
2022	Searcher	Deep Water Orange Basin	3D Seismic	Basic Assessment ongoing	No
2022	Shearwater	Deep Water Orange Basin	3D Seismic	Basic Assessment ongoing	No

YEAR	RIGHT HOLDER / OPERATOR	BLOCK	ACTIVITY	APPROVAL	CONDUCTED / COMPLETED
2022	TGS	Deep Water Orange Basin	3D Seismic	Basic Assessment ongoing	No
2022	TEEPSA	Block 5/6/7	Exploration drilling	EIA ongoing	No - current project
2022	TEEPSA	Deep Water Orange Basin	2D and 3D Seismic, drilling	EA application yet to be submitted	No
SOUTHERN NAMIBIA PETROLEUM EXPLORATION					
2011	Signet	Block 2914B (now part of PEL39)	2D and 3D Seismic; development of production facility	unknown	unknown
2011	PGS	Block 2815	3D Seismic	Yes	3D: 2011 (HRT)
2013	Spectrum Namibia	Orange Basin multiclient	2D Seismic	Yes	2D: April 2014
2014	Shell Namibia	2913A; 2914B	3D Seismic	Yes	3D: 2015
2016	Spectrum	Southern Namibia regional	2D Seismic	Yes	2D: April 2019
2017	Shell Namibia	PEL39	Exploration drilling	Yes	2021 and 2023
2019	Galp Namibia	PEL83	Exploration drilling	Yes	No (Applying for ECC extension)
2019	TEEPNA	Block 2913B (PEL56)	Exploration drilling	Yes	Drilling: Nov 2021 – Mar 2022
2020	TEEPNA	Block 2912, 2913B (PEL91; PEL56)	3D Seismic	Yes	Planned for Jan 2023
2020	TGS Namibia	Blocks 2711, 2712A, 2712B, 2713, 2811, 2812A, 2812B, 2913B in the Orange Basin	3D Seismic	Pending	No
2020	Tullow Namibia (Harmattan Energy Ltd)	Block 2813B (PEL90)	3D Seismic	EIA ongoing	No

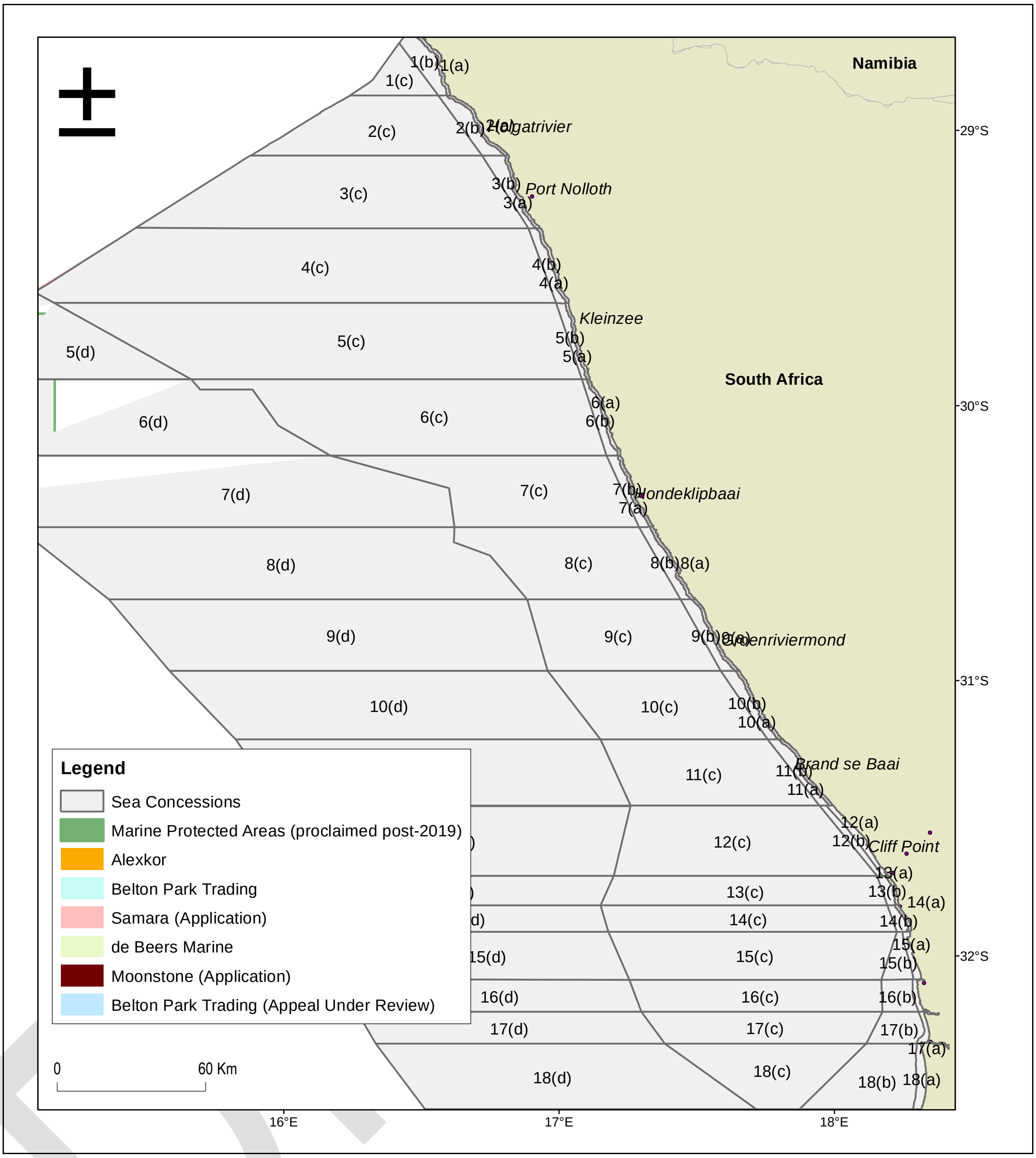


Figure 7-5: South African Sea Concession Areas, the proposed Samara Concession Area and the minerals rights application areas. Current MPAs are also shown.

Marine Ecology

The published goals of the marine spatial planning initiative were to:

- Unlock the ocean economy through providing an enabling environment for marine investments and developments to occur. Specifically, it aimed to *"identify compatible uses and reduce conflicts between incompatible uses.";*
- Engage with the ocean through increasing awareness of the ocean and how it relates to South African identity;

- Ensure healthy marine ecosystems through protection, conservation, and restoration activities. This was to be achieved through the integration of biologically and ecologically important areas into decision making; and
- Contribute to good ocean governance through the inclusion of role players in the planning and decision-making processes.

The National Coastal and Marine Spatial Biodiversity Plan was developed in order to identify areas of importance for safeguarding representative areas of marine biodiversity. The output of the process is a CBA map which serves as a spatial plan to inform future marine spatial planning in support of sustainable development. The plan was developed taking into consideration all aspects of sustainable development, which include conservation and sustainable natural resource use and extractive activities. The activities of the industries such as marine mining which utilise the marine ecosystem are taken into account in the design and preparation of the CBA maps. The areas that have been determined to be suitable for exploitation in mining have been selected as such while considering the conservation needs of each habitat type. Thus, the National Coastal and Marine Spatial Biodiversity Plan has already considered multiple users and their cumulative impacts on marine areas.

The sea use guidelines were specifically developed for use in EIAs such as these, to guide practitioners in identifying the most suitable areas and activities to be undertaken in South Africa's territorial waters. The individual impacts assessed above were considered within the National Coastal and Marine Spatial Biodiversity Plan Sea use guidelines, and the mitigation measures suggested will result in the outcomes of the project meeting the requirements of the plan. Given this outcome, and the fact that the Plan was developed taking into consideration the entire extent of the Namaqua Bioregion, cumulative impacts related to exploration activities in the benthic ecosystem types (Namaqua Muddy Sands, Southern Benguela Sandy Outer Shelf, Namaqua Muddy Mid Shelf Mosaic and Namaqua Sandy Mid Shelf) in the Concession Area will result in minimal cumulative impacts. Indeed, the intention of the National Coastal and Marine Spatial Biodiversity Plan is to ensure that foreseeable cumulative impacts are minimised and managed appropriately by designating protected and limited use areas.

Fisheries

Cumulative effects can occur when impacts are additive (incremental), interactive, sequential, or synergistic and would include anthropogenic impacts (including fishing and hydrocarbon industries) as well as non-anthropogenic effects such as environmental variability and climate change[40] .

In the Benguela region, fisheries are at risk of additional disruption due to accumulated pressure should new exploration and mining activities commence (by other applicants or existing exploration right holders) during the same period within which the exploration activities in SASA 4C/5C are proposed. Table 7-32 lists the applications for petroleum exploration and mineral prospecting rights in the Southern Benguela region (South African West Coast and southern Namibia) since 2007, indicating which of these have been undertaken. Concurrent activities such as geophysical surveys, coring, bulk sampling, mining and other planned speculative or proprietary seismic surveys in the southern Benguela region could add to the cumulative impact on fisheries.

Oil and gas exploration could be undertaken in various licence blocks off the West, South and East coasts of South Africa, although very little drilling has been undertaken in the last 10 years. In the order of 358 wells have been drilled in the South African offshore environment to date (based on information provided by PASA in 2023), the majority of which have been drilled off the South Coast on

[40] Refer to Augustyn *et al.* (2018) for a synopsis of climate change impacts on South African Fisheries.

the Agulhas Bank. There is no current development or production from the South African West Coast offshore. The Ibhubesi Gas Field (Block 2A) (off West Coast, approximately 100 km south of the proposed Concession Area) and Kudu Gas Field (off southern Namibia) have been identified for development. On the South Coast, PetroSA operates the F-A production platform, which was brought into production in 1992. The F-A platform is located 85 km south of Mossel Bay in a water depth of 100 m. Gas and associated condensate from the associated gas fields are processed through the platform. The produced gas and condensate are exported through two separate 93 km pipelines to the PetroSA GTL plant located just outside the town of Mossel Bay. It is widely reported that the gas supplying the Mossel Bay GTL plant from Block 9 was due to cease in late 2020 and it seems likely to close unless a domestic gas supply is identified or a large bail out by the South Africa taxpayer is agreed to fund processing of higher cost feedstocks.

There are a number of reconnaissance permit application and EIA/BAs being undertaken for proposed seismic surveys off the West Coast (Ion, Shearwater and TGS), although it is unlikely that all these will be undertaken as they are targeting similar areas in the Deep-Water Orange Basin. The reconnaissance permit application areas for these proposed surveys are situated westward of SASA 4c/5c and are unlikely to have any overlapping impacts.

In relation to SASA 4c and 5c, neighbouring mining/prospecting right holders include Belton Park Trading 127 (Pty) Ltd (3c), de Beers Consolidated Mines Limited (6c) and Alexkor (1a, 1b, 1c, 2a, 3a,4a, 4c) – Refer to Figure 7-5.

In the Benguela region, it has been suggested that the seasonal movement of Longfin Tuna northwards from the West Coast of South Africa into southern Namibia may be disrupted by the noise associated with an increasing number of seismic surveys. While the potential exists to disrupt the movement of albacore tuna in the Benguela, this disruption, if it occurs, would be localised spatially and temporarily and would be compounded by environmental variability. In Australia, no direct cause and effect in changes in movement or availability of Bluefin Tuna could be attributed to seismic surveys (Evans *et al.*, 2018), with observed changes being attributed to inter-annual variability. Due to the dearth of information on the impacts of seismic noise on truly pelagic species links between changes in migration patterns and subsequent catches thus remains speculative.

Noise, operational lighting and discharges associated with the proposed exploration programme would also have cumulative impact on marine fauna, and possible indirect impact on fishing in the area of interest. Due to the licence area being located within the main vessel traffic routes that pass around southern Africa, ambient noise levels are naturally elevated.

Fishing receptors are unlikely to be significantly additionally affected as fish behaviour will not be affected beyond the nearfield around the survey and sampling vessels. Most of the potential impacts will be of short duration, typically ceasing once the activity is completed. Such impacts are, therefore, considered unlikely to contribute to future cumulative impacts, and thus no more significant than assessed in the preceding sections.

Heritage

Given the nature of palaeontological, submerged prehistoric and maritime archaeological heritage resources and the extent of our knowledge about their occurrence and distribution, an assessment of the cumulative impact of current and future seabed activities on these resources in the area surrounding Concession Areas 4C and 5C, can only be qualitative and descriptive.

The presence of palaeontological resources within the seabed of the area is a given, although they are generally scarce, and their distribution is patchy. Thus, while current and future seabed activities in the area which will disturb the seabed, including mineral, and oil and gas prospecting or mining, have the potential to impact palaeontological resources, it is likely that such impacts will be infrequent and of low cumulative significance.

Although there is very little concrete evidence for the distribution of submerged prehistoric sites and materials in and on the seabed around the South African coast, it is clear these sites and material will exist. Using the terrestrial archaeology of the West Coast as a proxy for the spatial distribution of sites on the now inundated continental shelf, it is also clear that significant archaeological sites and material will be highly localised and most of the seabed will not contain such material.

Thus, while current and future seabed activities in the area which will disturb the seabed, including mineral, and oil and gas prospecting or mining, have the potential to impact submerged prehistoric sites and materials, it is likely that such impacts will be infrequent and of low cumulative significance.

With respect to potential cumulative impacts on historical shipwrecks, the project area of South Africa's West Coast has relatively few wrecks, when compared to places like Table Bay which alone contains more than 400 wrecks. The majority of West Coast wrecks are also located close to the coast, and cumulative impacts arising from offshore mining and prospecting are thus potentially more of a risk in the A Concession Areas.

Generally, however, historical wrecks and related maritime archaeological debris are avoidable (through the prior collection and analysis of geophysical data) and actively avoided (because of potential damage they can cause to mining plant and machinery) by seabed activities such as mining or prospecting.

Impacts on historical shipwrecks arising from seabed activities are likely to be accidental where they do occur, and once a site has been encountered on the seabed it is likely to be excluded from the area of activities as an operational obstruction or risk.

There is thus a very low potential for cumulative impacts on maritime archaeological resources, principally historical shipwrecks, arising out of current and future seabed activities in the area surrounding Concession Areas 4C and 5C.

7.3 Risk Assessment Summary

Site layout alternatives were not considered in the Impact Assessment Phase, but specific technologies and affected footprints within the Offshore Concession Areas took account of environmental constraints identified during the Impact Assessment Phase. Table 7-33 therefore, provides the risk assessment results for the potential positive and negative impacts of the project as described in 7.2. Please refer to Section 7.4 for the management and mitigation measures.

Table 7-33: Quantitative impact assessment on prospecting activities.

	Without Mitigation								With Mitigation							
	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*	*Extent*	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Geophysical Surveying, Drill/Bulk Sampling Activities																
Marine Ecology																
Noise pollution impacts on invertebrates.	Local	Medium	Short-term	**Very low**	Definite	VERY LOW	– ve	Low	Local	Medium	Short-term	**Very low**	Definite	VERY LOW	– ve	Low
	1	2	1	**4**					1	2	1	**4**				
	Degree to which impact can be reversed								**The impact can be reversed to some extent.**							
	Degree to which impact may cause irreplaceable loss								**This impact can cause some irreplaceable loss.**							
	Degree to which impact can be mitigated								**The impact can be mitigated to some extent. Mitigation measures are presented directly after this table and in Section 7.4.**							
	Mitigated outcome								**A less severe impact on and confusion of invertebrates.**							
Noise pollution impacts on fish.	Local	Medium	Short-term	**Very low**	Definite	VERY LOW	– ve	High	Local	Low	Short-term	**Very low**	Definite	VERY LOW	– ve	High
	1	2	1	**4**					1	1	1	**3**				
	Degree to which impact can be reversed								**The impact can be reversed to some extent.**							
	Degree to which impact may cause irreplaceable loss								**This impact can cause some irreplaceable loss.**							
	Degree to which impact can be mitigated								**The impact can be mitigated to some extent. Mitigation measures are presented directly after this table and in Section 7.4.**							
	Mitigated outcome								**A less severe impact on and confusion of fish.**							
Noise pollution impacts on marine mammals.	Local	Medium	Short-term	**Very low**	Definite	VERY LOW	– ve	High	Local	Low	Short-term	**Very low**	Definite	VERY LOW	– ve	High
	1	2	1	**4**					1	1	1	**3**				
	Degree to which impact can be reversed								**The impact can be reversed to some extent.**							
	Degree to which impact may cause irreplaceable loss								**This impact can cause some irreplaceable loss.**							
	Degree to which impact can be mitigated								**The impact can be mitigated to some extent. Mitigation measures are presented directly after this table and in Section 7.4.**							
	Mitigated outcome								**A less severe impact on and confusion of marine mammals.**							
Potential vessel strikes on marine mammals.	Local	High	Short-term	**Low**	Improbable	VERY LOW	– ve	High	Local	Low	Short-term	**Very low**	Improbable	INSIGNIFICANT	– ve	High
	1	3	1	**5**					1	1	1	**3**				
	Degree to which impact can be reversed								**The impact is not likely to be reversed.**							
	Degree to which impact may cause irreplaceable loss								**This impact can cause some irreplaceable loss.**							
	Degree to which impact can be mitigated								**The impact can be mitigated to some extent. Mitigation measures are presented directly after this table and in Section 7.4.**							
	Mitigated outcome								**A less significant impact on marine mammals.**							

	Without Mitigation								With Mitigation							
	Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***	***Extent***	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Potential drill/bulk sampling impacts on Benthic Fauna.	Local	High	Short-term	**Low**	Definite	LOW	– ve	High	Local	Medium	Short-term	**Very low**	Definite	**VERY LOW**	– ve	High
	1	3	1	**5**					1	2	1	**4**				
	Degree to which impact can be reversed								**The impact can be reversed to some extent.**							
	Degree to which impact may cause irreplaceable loss								**This impact can cause some irreplaceable loss.**							
	Degree to which impact can be mitigated								**The impact can be mitigated to some extent. Mitigation measures are presented directly after this table and in Section 7.4.**							
	Mitigated outcome								**A less significant impact on benthic fauna.**							
Crushing of epifaunal communities by crawler tracks.	Local	Low	Short-term	**Very low**	Definite	**VERY LOW**	– ve	High	Local	Low	Short-term	**Very low**	Definite	**VERY LOW**	– ve	High
	1	1	1	**3**					1	1	1	**3**				
	Degree to which impact can be reversed								**The impact cannot be reversed to some extent.**							
	Degree to which impact may cause irreplaceable loss								**This impact can cause some irreplaceable loss.**							
	Degree to which impact can be mitigated								**The impact can be mitigated to some extent. Mitigation measures are presented directly after this table and in Section 7.4.**							
	Mitigated outcome								**A less significant impact on epifaunal communities by crawler tracks.**							
Increased turbidity in the water column due to the suspension of fine sediments during drill sampling/bulk sampling.	Local	Low	Short-term	**Very low**	Definite	**VERY LOW**	– ve	Medium	Local	Low	Short-term	**Very low**	Definite	**VERY LOW**	– ve	Medium
	1	1	1	**3**					1	1	1	**3**				
	Degree to which impact can be reversed								**The impact can be reversed to some extent.**							
	Degree to which impact may cause irreplaceable loss								**This impact can cause some irreplaceable loss.**							
	Degree to which impact can be mitigated								**The impact can be mitigated to some extent. Mitigation measures are presented directly after this table and in Section 7.4.**							
	Mitigated outcome								**A less significant impact on marine fauna and flora due to the suspension of fine sediments.**							
Sedimentation impacts on benthic communities due to coarse tailings.	Local	High	Short-term	**Low**	Probable	**LOW**	– ve	Medium	Local	Low	Short-term	**Very low**	Improbable	**INSIGNIFICANT**	– ve	Medium
	1	3	1	**5**					1	1	1	**3**				
	Degree to which impact can be reversed								**The impact can be reversed to some extent.**							
	Degree to which impact may cause irreplaceable loss								**This impact can cause some irreplaceable loss.**							
	Degree to which impact can be mitigated								**The impact can be mitigated to some extent. Mitigation measures are presented directly after this table and in Section 7.4.**							
	Mitigated outcome								**A less significant impact on benthic communities due to coarse tailings.**							
Marine pollution originating from operational discharges during vessel operations.	Local	Medium	Short-term	**Very low**	Definite	**VERY LOW**	– ve	High	Local	Low	Short-term	**Very low**	Improbable	INSIGNIFICANT	– ve	High
	1	2	1	**4**					1	1	1	**3**				
	Degree to which impact can be reversed								**The impact can be reversed to some extent.**							
	Degree to which impact may cause irreplaceable loss								**This impact can cause some irreplaceable loss.**							
	Degree to which impact can be mitigated								**The impact can be mitigated to some extent. Mitigation measures are presented directly after this table and in Section 7.4.**							
	Mitigated outcome								**A less significant impact on marine fauna and flora due to pollution discharges.**							

	Without Mitigation								With Mitigation							
	Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***	***Extent***	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Fisheries																
Impacts of multi-beam and sub-bottom profiling sonar on fisheries.	Local	Medium	Short-term	**Very Low**	Probable	**VERY LOW**	– ve	Medium	Local	Medium	Short-term	**Very Low**	Probable	**VERY LOW**	– ve	Medium
	1	2	1	**4**					1	2	1	**4**				
								Degree to which impact can be reversed	**The impact can be reversed to some extent.**							
								Degree to which impact may cause irreplaceable loss	**This impact can cause some irreplaceable loss.**							
								Degree to which impact can be mitigated	**The impact can be mitigated to some extent. Mitigation measures are presented directly after this table and in Section 7.4.**							
								Mitigated outcome	**A less significant impact from multi-beam and sub-bottom profiling sonar on fisheries.**							
Impact of temporary exclusion of fishing operations during survey and sampling operations.	Local	Medium	Short-term	**Very Low**	Possible	**INSIGNIFICANT**	– ve	Medium	Local	Medium	Short-term	**Very Low**	Possible	**INSIGNIFICANT**	– ve	Medium
	1	2	1	**4**					1	2	1	**4**				
								Degree to which impact can be reversed	**The impact can be reversed to some extent.**							
								Degree to which impact may cause irreplaceable loss	**This impact can cause some irreplaceable loss.**							
								Degree to which impact can be mitigated	**The impact can be mitigated to some extent. Mitigation measures are presented directly after this table and in Section 7.4.**							
								Mitigated outcome	**Less exclusion of fishing operations during survey and sampling operations.**							
Impact of noise from sampling/trenching operations on fisheries.	Local	Low	Short-term	**Very Low**	Probable	**VERY LOW**	– ve	Medium	Local	Low	Short-term	**Very Low**	Probable	**VERY LOW**	– ve	Medium
	1	1	1	**3**					1	1	1	**3**				
								Degree to which impact can be reversed	**The impact can be reversed to some extent.**							
								Degree to which impact may cause irreplaceable loss	**This impact can cause some irreplaceable loss.**							
								Degree to which impact can be mitigated	**The impact can be mitigated to some extent. Mitigation measures are presented directly after this table and in Section 7.4.**							
								Mitigated outcome	**A less significant impact of noise from sampling on fisheries.**							
Impact of sediment plumes on fish stock recruitment.	Local	Medium	Short-term	**Very Low**	Probable	**VERY LOW**	– ve	Medium	Local	Medium	Short-term	**Very Low**	Probable	**VERY LOW**	– ve	Medium
	1	2	1	**4**					1	2	1	**4**				
								Degree to which impact can be reversed	**The impact can be reversed to some extent.**							
								Degree to which impact may cause irreplaceable loss	**This impact can cause some irreplaceable loss.**							
								Degree to which impact can be mitigated	**The impact can be mitigated to some extent. Mitigation measures are presented directly after this table and in Section 7.4.**							
								Mitigated outcome	**A less significant impact of sediment plumes on fish stock recruitment.**							
Impact of temporary exclusion of fishing operations during exploration sampling operations.	Local	Medium	Short-term	**Very Low**	Possible	**INSIGNIFICANT**	– ve	Medium	Local	Medium	Short-term	**Very Low**	Possible	**INSIGNIFICANT**	– ve	Medium
	1	2	1	**4**					1	2	1	**4**				
								Degree to which impact can be reversed	**The impact can be reversed to some extent.**							
								Degree to which impact may cause irreplaceable loss	**This impact can cause some irreplaceable loss.**							
								Degree to which impact can be mitigated	**The impact can be mitigated to some extent. Mitigation measures are presented directly after this table and in Section 7.4.**							
								Mitigated outcome	**Less exclusion of fishing operations during survey and sampling operations.**							

	Without Mitigation								With Mitigation							
	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*	*Extent*	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Archaeology/Palaeontology																
Potential significant loss of Cretaceous fossil woods.	Local	High	Long-term	**Medium**	Possible	**MEDIUM**	– ve	Low	Local	Medium	Long-term	**Low**	Possible	**LOW**	+ ve	High
	1	3	3	**7**					1	2	3	**6**				
	Degree to which impact can be reversed								**The impact cannot be reversed.**							
	Degree to which impact may cause irreplaceable loss								**This impact can cause some irreplaceable loss.**							
	Degree to which impact can be mitigated								**The impact can be mitigated to some extent. A summary of the mitigation measures is provided Section 7.4.**							
	Mitigated outcome								**A less significant impact heritage sites and artifacts.**							
Potential significant loss of Cenozoic shelly macrofauna.	Local	Low	Long-term	**Low**	Improbable	**VERY LOW**	– ve	Low	Local	Low	Long-term	**Low**	Improbable	**VERY LOW**	– ve	Low
	1	1	3	**5**					1	1	3	**5**				
	Degree to which impact can be reversed								**The impact cannot be reversed.**							
	Degree to which impact may cause irreplaceable loss								**This impact can cause some irreplaceable loss.**							
	Degree to which impact can be mitigated								**The impact can be mitigated to some extent. A summary of the mitigation measures is provided Section 7.4.**							
	Mitigated outcome								**A less significant impact heritage sites and artifacts.**							
Potential significant loss of fossil bones and teeth.	Local	High	Long-term	**High**	Possible	**MEDIUM**	– ve	Low	Local	Low	Long-term (Irreversible)	**Low**	Possible	**VERY LOW**	– ve	Low
	1	3	3	**7**					1	1	3	**5**				
	Degree to which impact can be reversed								**The impact cannot be reversed.**							
	Degree to which impact may cause irreplaceable loss								**This impact can cause some irreplaceable loss.**							
	Degree to which impact can be mitigated								**The impact can be mitigated to some extent. A summary of the mitigation measures is provided Section 7.4.**							
	Mitigated outcome								**A less significant impact heritage sites and artifacts.**							
Potential significant loss of shells from the last Transgression Sequence	Local	Medium	Long-term	**Medium**	Probable	**MEDIUM**	– ve	Low	Local	Low	Long-term	**Low**	Probable	**LOW**	– ve	Low
	1	2	3	**6**					1	1	3	**5**				
	Degree to which impact can be reversed								**The impact cannot be reversed.**							
	Degree to which impact may cause irreplaceable loss								**This impact can cause some irreplaceable loss.**							
	Degree to which impact can be mitigated								**The impact can be mitigated to some extent. A summary of the mitigation measures is provided Section 7.4.**							
	Mitigated outcome								**A less significant impact heritage sites and artifacts.**							
Potential significant loss of submerged prehistoric archaeological sites and materials	Local	High	Long-term	**High**	Possible	**MEDIUM**	– ve	Low	Local	Medium	Long-term	**Medium**	Probable	**LOW**	+ ve	High
	1	3	3	**7**					1	2	3	**6**				
	Degree to which impact can be reversed								**The impact cannot be reversed.**							
	Degree to which impact may cause irreplaceable loss								**This impact can cause some irreplaceable loss.**							
	Degree to which impact can be mitigated								**The impact can be mitigated to some extent. A summary of the mitigation measures is provided Section 7.4.**							
	Mitigated outcome								**A less significant impact heritage sites and artifacts.**							

	Without Mitigation								With Mitigation							
	Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***	***Extent***	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Marine Prospecting/Exploration/Mining																
The presence of survey and support vessels may have an impact due to the legislative requirement of a 500 m safety zone around these vessels.	Regional	Medium	Medium-term	**Medium**	Possible	**LOW**	– ve	High	Regional	Low	Medium-term	**Low**	Possible	**VERY LOW**	– ve	High
	2	2	2	**6**					2	1	2	**5**				
	Degree to which impact can be reversed								**The impact can be reversed.**							
	Degree to which impact may cause irreplaceable loss								**This impact will not likely cause irreplaceable loss.**							
	Degree to which impact can be mitigated								**The impact can be mitigated to some extent. A summary of the mitigation measures is provided Section 7.4.**							
	Mitigated outcome								**A less significant impact on other vessels in the region.**							
Marine Transport Routes																
The presence of survey and support vessels may have an impact due to the legislative requirement of a 500 m safety zone around these vessels.	Regional	Medium	Medium-term	**Medium**	Possible	**LOW**	– ve	High	Regional	Low	Medium-term	**Low**	Possible	**VERY LOW**	– ve	High
	2	2	2	**6**					2	1	2	**5**				
	Degree to which impact can be reversed								**The impact can be reversed.**							
	Degree to which impact may cause irreplaceable loss								**This impact will not likely cause irreplaceable loss.**							
	Degree to which impact can be mitigated								**The impact can be mitigated to some extent. A summary of the mitigation measures is provided Section 7.4.**							
	Mitigated outcome								**A less significant impact on other vessels in the region.**							
Socio-Economic																
Creation of employment opportunities and revenues in local areas.	Regional	Low	Medium-term	**Low**	Definite	**LOW**	+ ve	High	Regional	Low	Medium-term	**Low**	Definite	**LOW**	+ ve	High
	2	1	2	**5**					2	1	2	**5**				
	Degree to which impact can be reversed								**The impact is positive, and this section is therefore not applicable.**							
	Degree to which impact may cause irreplaceable loss								**The impact is positive, and this section is therefore not applicable.**							
	Degree to which impact can be mitigated								**The impact is positive, and this section is therefore not applicable.**							
	Mitigated outcome								**The impact is positive, and this section is therefore not applicable.**							
No-Go Option																
Option of not continuing with the planned prospecting activities.	Regional	Medium	Medium-term	**Medium**	Probable	**Medium**	– ve	High	Regional	Medium	Medium-term	**Medium**	Probable	**Medium**	– ve	High
	2	2	2	**6**					2	2	2	**6**				
	Degree to which impact can be reversed								**This is the no go option, the alternative is to continue with the prospecting activities with impacts as assessed previously.**							
	Degree to which impact may cause irreplaceable loss								**This is the no go option, the alternative is to continue with the prospecting activities with impacts as assessed previously.**							
	Degree to which impact can be mitigated								**This is the no go option, the alternative is to continue with the prospecting activities with impacts as assessed previously.**							
	Mitigated outcome								**This is the no go option, the alternative is to continue with the prospecting activities with impacts as assessed previously.**							

7.4 Mitigation Measures Summary

Input from specialists and experienced SRK EAPs, have informed the high-level mitigation measures outlined in Table 7-34. Detailed mitigation and monitoring measures were further developed as part of the Impact Assessment Phase and are provided in the EMPr in Appendix F.

Table 7-34: High level mitigation measures for potential impacts identified for the project.

Activities	Aspect	Potential Impact	Nature of Impact	High Level Mitigation
Geophysical Surveying; Drill/Bulk Sampling Activities	Marine Ecology	Noise pollution on invertebrates.	Negative (-ve)	• No mitigation measures are proposed.
		Noise pollution on fish.	Negative (-ve)	• Implement “soft starts” for the surveys for sound levels > 210 dB re 1 μPa at 1 m over a period of 20 minutes to give sensitive species an opportunity to move away from the sampling area, particularly if large aggregations of fish are observed on the ship’s sonar.
		Noise pollution on marine mammals.	Negative (-ve)	• Undertake a visual scan of the area 15 minutes prior to the commencement of surveying activities and soft starts. Visual scans should be undertaken by a trained MMO; • Implement “soft starts” for the surveys for sound levels > 210 dB re 1 μPa at 1 m over a period of 20 minutes to give sensitive species an opportunity to move away from the sampling area; • Cease survey activities if abnormal behaviour in marine mammals is observed until the animal has moved away from the area; • Avoid surveys during known periods of cetacean migration into the area for feeding (beginning of June to the end of November) and ensure that cetaceans are able to move around sonar operations; and • Implement PAM on board survey ships, with a view to: o Detect the range and frequencies of marine mammal vocalisations expected to be present in the survey are; o Detect and identify vocalising marine mammals and establish bearing and range in a reasonable period of time; and o Ensure real time relaying of the recordings to the PAM operator to allow for immediate mitigation activities to be implemented.
		Potential vessel strikes on marine mammals.	Negative (-ve)	• Marine Mammal Observer to be onboard the survey vessel at all times; • Reduce vessel speed to < 10 knots during the geophysical surveys; • Avoid known areas of high marine mammal activity; and • Where possible avoid periods of high marine mammal activity within the Concession Area (June-November).
		Potential impact of drill/bulk sampling activities on benthic fauna.	Negative (-ve)	• Exclude CBA and ESA areas from drill sampling/bulk sampling activities unless significant mineral resources can be demonstrated through non-invasive techniques; • Additional in situ assessment will be required for any invasive sampling within CBA areas; • Leave undisturbed areas between excavated pits to enhance recolonisation opportunities; and

Activities	Aspect	Potential Impact	Nature of Impact	High Level Mitigation
				• Monitor incoming benthic sediment for coral or fossil fragments, if observed halt sampling and mark the location.
		Crushing of epifaunal community by crawler tracks.	Negative (-ve)	• No mitigation measures are proposed.
		Increased turbidity in the water column due to fine sediment suspension.	Negative (-ve)	• No mitigation measures are proposed (assumes CBAs are excluded from sampling area).
		Sedimentation impacts on benthic communities due to coarse tailings.	Negative (-ve)	• No discharge of tailings to be undertaken within the CBA areas; and • Non-invasive geophysical survey data should be used to identify hard substrate and these areas should be avoided when discharging coarse tailings.
		Marine pollution from vessel operational discharges.	Negative (-ve)	• Implement MARPOL regulations to manage ship effluent and discharges.
	Fisheries	Impacts of multi-beam and sub-bottom profiling sonar on fisheries.	Negative (-ve)	• “Soft starts” should be carried out for any equipment of source levels greater than 210 dB re 1 µPa at 1 m over a period of 20 minutes to give adequate time for marine fauna to leave the vicinity; • The pole-and-line sector targets snoek inshore of the Concession Area during the period March to July. Timing of the survey activities to avoid taking place within the inshore extent of the Concession Area during this fishing period could reduce the impact on the sector; • The traditional linefish sector operates in close proximity to Port Nolloth and Doringbaai over the period March to September. Timing of the survey activities to avoid taking place within the inshore extent of the Concession Area during this fishing period could reduce the impact on the sector; and • A demersal research survey is undertaken each year and trawls are expected to be undertaken within the Concession Area over the period January/February. Acoustic surveys for small pelagic species are carried out twice a year and may be expected within the Concession Area any time from mid-May to mid-June and from mid-October to mid-December. It is recommended that prior to the commencement of the proposed activities, Samara consult with the managers of the DFFE research survey programmes to discuss their respective programmes and the possibility of altering the prospecting programme in order to minimises or avoid disruptions to both parties, where required.
		Impacts of temporary exclusion of fishing operations during survey and sampling operations.	Negative (-ve)	• A process of notification and information-sharing should be followed with key identified fishing industry associations including the SA Tuna Association; SA Tuna Longline Association, SADSTIA, South African Hake Longline Association (SAHLLA), West Coast Rock Lobster Association, South African Linefish Associations (various) and SAMLMA. Other key stakeholders: SANHO, South African Maritime Safety Association, representatives of small-scale local fishing co-operatives and DFFE Vessel Monitoring,

Activities	Aspect	Potential Impact	Nature of Impact	High Level Mitigation
				Control and Surveillance VMS Unit in Cape Town. These stakeholders should again be notified on completion of the project when the survey/sampling vessel is off location; • The required safety zones around the survey and sampling vessels should be communicated via the issuing of Daily Navigational Warnings for the duration of the sampling operations through the South African Naval Hydrographic Office; • The pole-and-line sector targets snoek inshore of the Concession Area during the period March to July. Timing of the survey activities to avoid taking place within the inshore extent of the Concession Area during this fishing period could reduce the impact on the sector; • The traditional linefish sector operates in close proximity to Port Nolloth and Doringbaai over the period March to September. Timing of the survey activities to avoid taking place within the inshore extent of the Concession Area during this fishing period could reduce the impact on the sector; and • A demersal research survey is undertaken each year and trawls are expected to be undertaken within the Concession Area over the period January/February. Acoustic surveys for small pelagic species are carried out twice a year and may be expected within the Concession Area any time from mid-May to mid-June and from mid-October to mid-December. It is recommended that prior to the commencement of the proposed activities, Samara consult with the managers of the DFFE research survey programmes to discuss their respective programmes and the possibility of altering the prospecting programme in order to minimises or avoid disruptions to both parties, where required.
		Impact of noise from sampling/trenching operations on fisheries.	Negative (-ve)	• “Soft starts” should be carried out for any equipment of source levels greater than 210 dB re 1 μPa at 1 m over a period of 20 minutes to give adequate time for marine fauna to leave the vicinity; • The pole-and-line sector targets snoek inshore of the Concession Area during the period March to July. Timing of the survey activities to avoid taking place within the inshore extent of the Concession Area during this fishing period could reduce the impact on the sector; • The traditional linefish sector operates in close proximity to Port Nolloth and Doringbaai over the period March to September. Timing of the survey activities to avoid taking place within the inshore extent of the Concession Area during this fishing period could reduce the impact on the sector; and • A demersal research survey is undertaken each year and trawls are expected to be undertaken within the Concession Area over the period January/February. Acoustic surveys for small pelagic species are carried out twice a year and may be expected within the Concession Area any time from mid-May to mid-June and from mid-October to mid-December. It is recommended that prior to the commencement of the proposed activities, Samara consult with the managers of the DFFE research survey programmes to discuss their respective programmes and the possibility of altering the prospecting programme in order to minimises or avoid disruptions to both parties, where required.

Activities	Aspect	Potential Impact	Nature of Impact	High Level Mitigation
		Impact of sediment plumes on fish stock recruitment.	Negative (-ve)	• No mitigation measures are proposed.
		Impacts of temporary exclusion of fishing operations during exploration sampling operations.	Negative (-ve)	• A process of notification and information-sharing should be followed with key identified fishing industry associations including the SA Tuna Association; SA Tuna Longline Association, SADSTIA, South African Hake Longline Association (SAHLLA), West Coast Rock Lobster Association, South African Linefish Associations (various) and SAMLMA. Other key stakeholders: SANHO, South African Maritime Safety Association, representatives of small-scale local fishing co-operatives and DFFE Vessel Monitoring, Control and Surveillance VMS Unit in Cape Town. These stakeholders should again be notified on completion of the project when the survey/sampling vessel is off location; • The required safety zones around the survey and sampling vessels should be communicated via the issuing of Daily Navigational Warnings for the duration of the sampling operations through the South African Naval Hydrographic Office; • The pole-and-line sector targets snoek inshore of the Concession Area during the period March to July. Timing of the survey activities to avoid taking place within the inshore extent of the Concession Area during this fishing period could reduce the impact on the sector; • The traditional linefish sector operates in close proximity to Port Nolloth and Doringbaai over the period March to September. Timing of the survey activities to avoid taking place within the inshore extent of the Concession Area during this fishing period could reduce the impact on the sector; and • A demersal research survey is undertaken each year and trawls are expected to be undertaken within the Concession Area over the period January/February. Acoustic surveys for small pelagic species are carried out twice a year and may be expected within the Concession Area any time from mid-May to mid-June and from mid-October to mid-December. It is recommended that prior to the commencement of the proposed activities, Samara consult with the managers of the DFFE research survey programmes to discuss their respective programmes and the possibility of altering the prospecting programme in order to minimises or avoid disruptions to both parties, where required.

Activities	Aspect	Potential Impact	Nature of Impact	High Level Mitigation
	Archaeology/ Palaeontology	Potential significant loss of Cretaceous fossil woods. Potential significant loss of Cenozoic shelly macrofauna. Potential significant loss of fossil bones and teeth. Potential significant loss of shells from the last transgression sequence.	Negative (-ve)	• The Namaqua Fossil Forrest MPA is excluded from prospecting activities through the implementation of a 5 km exclusion zone around the MPA boundary; • The EMPr must include provisions for the collection of representative examples of the fossils that occur; • "Run of mine" material on the oversize screen should be monitored for fossils as part of normal sampling and mining process; • Potential fossil material should be collected for later identification and evaluation. The company must apply to SAHRA for a general permit to destroy, damage, excavate, disturb and collect fossils identified during sampling, as per the NHRA and any recovered material is to be temporarily stored by the company. When a collection of fossil material has been accumulated, the appointed palaeontologist should undertake the identification and evaluation of the fossil material and compile the report for submission to SAHRA. The Environmental Manager/Officer) is to liaise with the appointed palaeontologist on the progress of the fossil collection and the scheduling of the evaluation; • For overall monitoring purposes it is suggested that a few small bulk samples of shells (~5 litres) are collected on occasion. The idea is to sample the typical assemblage at a few points in the sampling/mining area. It is possible that an uncommon assemblage may be encountered, such as a shallow-water fauna or a lagoonal fauna, in which case it should also be sampled; • Any fossils found during the processing of drill samples must have the details of context recorded, must be kept for identification by an appropriate specialist and, if significant, be deposited in an appropriate institution; • As part of the normal sampling and mining process the material crossing the oversize screen must be monitored for the occurrence of the various fossil types. Potential fossil material should be collected for later identification and evaluation; • For overall monitoring purposes it is suggested that a few small bulk samples of shells (~5 litres) be collected on occasion. The idea is to sample the typical assemblage at a few points in the sampling/mining area. It is possible that an uncommon assemblage may be encountered, such as a shallow-water fauna or a lagoonal fauna, in which case it should also be sampled. Data to be recorded during fossil collection includes: ○ Date ○ Company name ○ Sample no. ○ Collector's name ○ Position (co-ordinates) ○ Water depth ○ Sample subsurface depth

Activities	Aspect	Potential Impact	Nature of Impact	High Level Mitigation
				○ Vessel ○ Brief description and photographs; • A copy of the graphic log of the sample drill hole or mining face showing the vertical sequence of units and the estimated location of the fossil in the sequence; • A map of the fossil finds in the particular sampling/mining area, such as a contoured multibeam bathymetric image showing the context of samples in relation to the bedrock topography and sediment bodies; • During all operations, personnel can send queries and images by email to an appointed palaeontologist for evaluation and prompt feedback; and • Collected samples are to be temporarily stored by the company but when a collection of fossil material has been accumulated, the appointed palaeontologist should undertake the identification and evaluation of the fossil material and compile the report for submission to SAHRA. A selection of material could be removed for further study. The Environmental Manager/Officer) is to liaise with the appointed palaeontologist on the progress of the fossil collection and the scheduling of the evaluation.
		Potential significant loss of submerged prehistoric archaeological sites and materials.	Negative (-ve)	• If the stone and gravel fraction of the sampled sediments is retained, archaeological review of this material is strongly recommended; • The making available to archaeological research of information about the presence of certain seabed features from particularly the seismic Chirp data is strongly recommended; • The absence of historical wrecks in the Concession Areas can be confirmed from the geophysical data to be acquired for the proposed prospecting; • Any wreck or possibly anthropogenic seabed anomaly identified in the geophysical data during Phase 2 of the prospecting programme must be is flagged; • These sites and/or anomalies must be excluded from the areas to be subject to bulk seabed sampling. The implementation of a buffer of at least 50 m around each such site and/or anomaly will serve to ensure that they are not impacted by the drill/bulk sampling; • Any such sites or flagged anomalies must be reported to SAHRA; and • If an undetected wreck is encountered during seabed sampling, it is recommended that the following mitigation measures must be implemented: ○ Seabed sampling activities in the area must be stopped immediately; ○ The responsible Environmental Manager must be informed immediately; ○ The Environmental Manager must inform SAHRA immediately; ○ A suitably qualified maritime archaeologist must be contacted to assess the find; ○ If any artefacts have been recovered from the site these must be kept wet and retained for assessment by the maritime archaeologist;

Activities	Aspect	Potential Impact	Nature of Impact	High Level Mitigation
				○ The location of the find and any associated data used to identify the wreck must be provided to SAHRA be added to the national shipwreck database; and ○ Following consultation with SAHRA and the maritime archaeologist, an exclusion zone around the site is likely to be required within which seabed sampling activities may not take place.
	Marine Prospecting/ Exploration/ Mining	The presence of survey and support vessels may have an impact due to the legislative requirement of a 500 m safety zone around these vessels.	Negative (-ve)	• Establish a communication and notification procedure with other marine prospecting and mining companies undertaking activities in the vicinity prior to the start of planned activities.
	Marine Transport Routes	The presence of survey and support vessels may have an impact due to the legislative requirement of a 500 m safety zone around these vessels.	Negative (-ve)	• Establish a communication and notification procedure, in particular transport companies and the South African Navy Hydrographic Office, SAMSA, DFFE, and relevant port Captains; • Daily Navigational Warnings need to be communicated during sampling operations; and • Only certified seaworthy vessels should be used that is internationally recognised.
	Socio-Economic	Creation of employment opportunities and revenues in local areas.	Positive (+ve)	• Where possible employ people from the local communities.

Please refer to Appendix F for the detailed EMPr.

8 Conclusions and Recommendations

This chapter summarises the impact of the proposed prospecting at the West Coast in the Northern Cape Province. The principal findings are presented in this chapter, followed by an analysis of the need and desirability of the project and a discussion of the key factors DMRE will have to consider in order to take a decision which is aligned with the principles of sustainable development. Key recommendations are also presented.

As is to be expected, proposed prospecting to be undertaken by Samara will have both negative and positive impacts. The EIA has examined the available project design information and drawn on both available (secondary) and acquired (primary) baseline data to identify and evaluate environmental (biophysical and socio-economic) impacts of the proposed project. The EIAR aims to inform decision-makers of the key considerations by providing an objective and comprehensive analysis of the potential impacts and benefits of the project and has created a platform for the formulation of mitigation measures to manage these impacts, presented in the EMPr attached as Appendix F.

This chapter presents the general conclusions drawn from the S&EIR process, which should be considered in evaluating the project. It should be viewed as a supplement to the detailed assessment of individual impacts presented in Section 7.2.

8.1 Environmental Impact Statement

The EIA Regulations, 2014 prescribe the required content of an EIAR, including, *inter alia*, an EIS.

8.1.1 Principal Findings

The proposed project concerned itself with environmental (taken to mean biophysical) sustainability, social equity and economic efficiency. This serves as a useful construct to frame the evaluation of environmental impacts of the project.

The challenge for DMRE is to take a decision which is sustainable in the long term, and which will probably entail trade-offs between social, environmental, and economic costs and benefits. The trade-offs are documented in the report, which assesses environmental impacts and benefits and compares these to the No-Go alternative. SRK believes it will be instructive to reduce the decision factors to the key points which the authorities should consider. These points constitute the principal findings of the EIA:

1. The potential environmental impacts associated with the proposed project considered in the S&EIR process include nuisance from the operation and presence of additional vessels; discharge of deck drainage, sewage, and galley wastes; accidental spillages of hazardous substances; dredging equipment operating on the seabed and pipelines connected to the vessels; pulses, noise, and light emitted from prospecting equipment; upwelling of sediment by equipment under water; and the possible temporary closing of certain oceanic transport routes.

2. Assuming that the recommended mitigation measures will be effectively implemented, the project will not have unacceptably significant adverse impacts, while socio-economic benefits are also fairly modest.

3. The No-Go alternative entails the cessation of the proposed prospecting activities and effectively cancelling the Samara Concession Prospecting Project. As such, significant benefits of this alternative have been identified. However, the negative socio-economic impact of the No-Go alternative is considered to be of medium significance and therefore not a recommended option.

4. A number of mitigation and monitoring measures have been identified to avoid, minimise and manage direct potential environmental impacts associated with the project. These are laid out in detail in the EMPr (Appendix F).
5. Cumulative impacts are generally rated as being of very low significance when implementing mitigation measures, while the cumulative socio-economic benefit of mining in this region is considered to be low.

8.1.2 Integrated Project and Sensitivity Map

The EIA Regulations, 2014 prescribe that an integrated map at an appropriate scale is presented. The map should, so far as it is applicable, superimpose the proposed activity and associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers. Figure 4-1shows key project infrastructure relative to environmentally sensitive areas ("restricted areas").

8.1.3 Evaluation and Summary of Positive and Negative Impacts and Alternatives

The evaluation is undertaken in the context of:

- The project information provided by the proponent (Samara);
- The assumptions made for this EIAR;
- The assumption that the recommended (essential) mitigation measures will be effectively implemented; and
- The assessments provided by specialists.

This evaluation aims to provide answers to a series of key questions posed as objectives at the outset of this report, which are repeated here:

- Assess in detail the environmental and socio-economic impacts that may result from the project;
- Identify environmental and social mitigation measures to address the impacts assessed; and
- Produce an EIAR that will assist DMRE to decide whether (and under what conditions) to authorise the proposed development.

The evaluation and the basis for the subsequent discussion are represented concisely in Table 8-1, which summarises the potentially significant impacts and their significance ratings before and after application of mitigation and/or optimisation measures.

Table 8-1: Potential residual risk pre- and post-mitigation.

Activities	Aspect	Potential Impact	Significance Without Mitigation	Significance With Mitigation
Geophysical surveying; Drill/bulk sampling activities.	Marine Ecology	Potential noise impacts on invertebrates.	VERY LOW	VERY LOW
		Potential noise impacts on fish.	VERY LOW	VERY LOW
		Potential noise impacts on marine mammals.	VERY LOW	VERY LOW
		Potential vessel strikes on marine mammals.	VERY LOW	INSIGNIFICANT
		Drill/bulk sampling impacts on benthic fauna.	LOW	VERY LOW
		Potential crushing of epifaunal communities by crawler tracks.	VERY LOW	VERY LOW
		Increased turbidity in the water column due to the suspension of fine sediments during Drill/Bulk sampling activities.	VERY LOW	VERY LOW
		Potential sedimentation impacts on benthic communities due to coarse tailings.	LOW	INSIGNIFICANT
		Marine pollution originating from operational discharges during vessel operations.	VERY LOW	INSIGNIFICANT
	Fisheries	Impact of multi-beam and sub-bottom profiling sonar on fisheries.	VERY LOW	VERY LOW
		Impact of temporary exclusion of fishing operations during survey and sampling operations.	INSIGNIFICANT	INSIGNIFICANT
		Impact of noise from sampling/trenching operations on fisheries.	VERY LOW	VERY LOW
		Impact of sediment plumes on fish stock recruitment.	VERY LOW	VERY LOW
		Impact of temporary exclusion of fishing operations during exploration sampling operations.	INSIGNIFICANT	INSIGNIFICANT
	Archaeology/ Palaeontology	Potential significant loss of Cretaceous fossil woods.	MEDIUM	LOW (+)
		Potential significant loss of Cenozoic shelly macrofauna.	VERY LOW	VERY LOW
		Potential significant loss of fossil bones and teeth.	MEDIUM	VERY LOW
		Potential significant loss of shells from the last Transgression Sequence	MEDIUM	LOW
		Potential significant loss of submerged prehistoric archaeological sites and materials	MEDIUM	LOW (+)
	Marine Prospecting/ Mining/Exploration	The presence of survey and support vessels may have an impact due to the legislative requirement of a 500 m safety zone around these vessels.	LOW	VERY LOW

Activities	Aspect	Potential Impact	Significance Without Mitigation	Significance With Mitigation
	Marine Transport Routes	The presence of survey and support vessels may have an impact due to the legislative requirement of a 500 m safety zone around these vessels.	**LOW**	**VERY LOW**
	Socio-Economic	Creation of employment and business opportunities.	**LOW (+)**	**LOW (+)**
	Cumulative	Potential impact on benthic environment.	**LOW**	**LOW**
		Potential impact on the socio-economic environment.	**LOW**	**LOW**
	No-Go alternative	Option of not continuing with the planned prospecting activities.	**MEDIUM**	**MEDIUM**

Relevant observations with regard to the overall impact ratings, assuming mitigation measures are effectively implemented, are:

- The predicted *marine ecology* impact is rated as **very low** to **insignificant** significance due to the implementation of the EMPr and MARPOL standards, informing staff about sensitive species, responsible waste management, limiting the duration of the dredging activities, and using dynamically positioned sampling vessels.
- The predicted *fisheries* impact is rated as **very low** significance due to notification and communication to local communities regarding prospecting activities.
- The predicted *archaeology/palaeontology* impact is rated as **low** to **very low** significance due to the exclusion of shipwreck sites and the notification of any sites or materials encountered or damaged that could potentially be of importance.
- The predicted *marine prospecting/exploration/mining* impact is rated as **very low** significance due to the establishment of a communication and notification procedure to local communities regarding prospecting activities.
- The predicted *marine transport routes* impact is rated as **very low** significance due to the establishment of a communication and notification procedure to local communities regarding prospecting activities.
- The predicted *socio-economic* impact is rated as **low** significance due to the employment of a workforce from local communities.
- The No-Go alternative entails the cancellation of prospecting activities. As such, air quality, groundwater, ecology, and visual benefits of the No-Go alternative are rated **medium** significance, while the socio-economic impact of the No-Go alternative is also rated as medium significance.

Cumulative impacts, and socio-economic benefits, in the region mainly derive from mining activities. In the context of the project, cumulative impacts on the above aspects will be suitably mitigated through strict implementation of the EMPr.

The Samara prospecting activities are expected to contribute to the cumulative loss of marine habitat in the area. Cumulative impacts are therefore generally rated as being of **low to very low** significance if mitigated, while the cumulative socio-economic benefit of mining and agriculture in this socio-economically stressed region is also considered to be **low**.

8.2 Analysis of Need and Desirability of the Project

NEMA and the EIA Regulations, 2014 call for a hierarchical approach to the selection of development options, as well as impact management which includes the investigation of alternatives to avoid, reduce (mitigate and manage) and/or remediate (rehabilitate and restore) negative (ecological) impacts.

In summary:

- Social, economic, and ecological factors were considered and assessed during the EIA process, to ensure that the prospecting is sustainable. Mitigation measures are recommended in the EIAR to prevent, minimise (and optimise) impacts and to secure stakeholders' environmental rights. An EMPr has been drafted and will be implemented to ensure that potential environmental pollution and degradation can be minimised, if not prevented (Appendix F).
- The Project will generate impacts, both negative and positive (Section 6.1) and these should be considered in evaluating the desirability of the project. Section 7.2 to Section 7.4 demonstrates that impacts can be managed to acceptable levels.

Should diamonds be found in the project area, subject to acquisition of requisite approvals, Samara Mining will be able to mine the available reserves. This will result in job creation and boost local businesses.

Exploration activities typically require highly skilled people and therefore limited opportunities for unskilled labour. Where feasible, local labour could potentially be utilised but it is anticipated that this will be extremely limited, if at all. The majority of the work will be done remotely through the acquisition and processing of existing and new information. Should local labour be required, then travel will be from suitable ports.

Whilst the prospecting project activities are aligned with the National Framework for Marine Spatial Planning (2017), the National Development Plan 2030 (2012), various Regional and Local Policy and Planning Frameworks including the Northern PSDF, Namaqua District Municipality IDP Revision 2017 – 2022, the Nama Khoi Local Municipality SDF (2014), the Nama Khoi Local Municipality IDP (2019 – 2022) and the Kamiesberg Local Municipality IDP (2017 0 2022), due to the limited scope and extend of the exploration activities associated with the Samara Project, it is unlikely to promote or facilitate spatial transformation or urban development during the prospecting phase. Spatial transformation or urban development will materialise should diamonds be found in the project area.

8.3 Recommendations

The specific recommended mitigation and optimisation measures are presented in Section 7.4 and the EMPr (Appendix F) and key measures are summarised in Table 7-34. Samara would need to implement these mitigation measures to demonstrate compliance with the various authorisations (should they be granted).

Although it is in theory possible that the potential impacts (or unintended consequences) of implementing mitigation and optimisation measures could offset their intended effect, the majority of the recommendations made in this EIAR can be implemented without resulting in any physical effects. The potential for such unintended consequences in the case of the project is therefore considered **Low**.

A key recommendation, which are considered essential, is to implement the EMPr to guide construction and operations activities and to provide a framework for the ongoing assessment of environmental performance.

8.4 Conclusion and Authorisation Opinion

This EIAR has identified and assessed the potential biophysical and socio-economic impacts associated with the Samara Concession Prospecting Project which entails planned prospecting in an offshore area for diamonds in the Namaqua District Municipality around the Nama Khoi and Richtersveld Local Municipalities in the Northern Cape Province.

In terms of Section 31 (n) of NEMA, the EAP is required to provide an opinion as to whether the activity should or should not be authorised. In this section, a qualified opinion is ventured, and in this regard SRK believes that sufficient information is available for DMRE to take a decision.

The project will result in unavoidable negative environmental impacts, however, these are of limited intensity and limited scale, assuming the implementation of recommended mitigation and are not considered unacceptably significant. In addition, the project will ensure the ongoing regional socio-economic benefits.

The Stakeholder Engagement Process conducted during the EIA process has given stakeholders the opportunity to assist with the identification of issues and potential impacts, and to submit their comments. Various Organs of State submitted comments, and none raised objections or fatal flaws.

Working on the assumption that Samara is committed to ensuring that the project is operated and constructed to high standards, achieved through implementation of the recommended mitigation measures and ongoing monitoring of performance, SRK believes, and the EIAR demonstrates that, through effective implementation of the stipulated mitigation measures, the adverse impacts can be reduced to levels compliant with national standards or guidelines.

The fundamental decision is whether to allow the prospecting for diamonds, which is generally consistent with development policies for the area, but which may have limited biophysical impacts.

The HIA specialist's reasoned opinion is that the proposed prospecting activities in Concession Areas 4C and 5C are likely to have a very low impact on palaeontological and submerged prehistoric archaeological resources, and no impact on maritime archaeological sites and materials. Provided the recommendations to mitigate and offset potential impacts are implemented, the proposed prospecting can be considered to be archaeologically acceptable.

According to the Marine Impact Assessment the most significant impact concern relating to the proposed prospecting application is that of bulk sampling and the dumping of tailings over potentially sensitive habitat types found within the Concession Area. While the existing Concession Area layout to excludes potentially sensitive areas around the two MPAs found in the immediate vicinity by including 5 km buffer zones, there are other areas that have been identified in the National Coastal and Marine Spatial Biodiversity Plan (NCMSBP) as Critical Biodiversity Areas (CBAs) which are not compatible with the current proposed exploration proposal. The CBA maps identify 32% of the Concession Area as CBA-N, 3% as an ESA and <0.001% considered as CBA-R. The remaining 65% of the Concession Area is unclassified in terms of the CBA maps. Based on this recent marine spatial planning, a significant portion of the proposed Concession Area is not compatible with the proposed bulk sampling methods. The remaining potential impacts on the marine environment include the presence of the ship and the associated surveying activities are not seen to be major cause for concern if specific mitigation measures are implemented which have been outlined in this report.

The Marine Impact Assessment specialist is thus of the opinion that exploration in the Concession Areas that fall outside the areas delineated on the CBA maps should be approved. Approval for non-invasive studies in the CBA and ESA areas should be granted. Approval for invasive sampling (drilling and bulk sampling) in the CBAs and ESAs should be withheld at this stage pending further information on the mineral resources in this area based on the findings of the geophysical survey from which a detailed spatial sampling plan can be developed.

It is the opinion of the Fisheries Impact Assessment specialist that, if all environmental guidelines, and appropriate mitigation measures and management actions advanced in this report, and the EIA and Environmental Management Programme (EMPr) for the proposed prospecting operations as a whole, are implemented, there is no reason why the proposed prospecting activities should not proceed.

In conclusion SRK is of the opinion that on purely 'environmental' grounds (i.e., the project's potential socio-economic and biophysical implications) the application as it is currently articulated should be approved, provided the essential mitigation measures are implemented. Ultimately, however, the DMRE will need to consider whether the project benefits outweigh the potential impacts (and if the negative socio-economic impact of the No-Go alternative is acceptable in the context of relatively low significance biophysical impacts of the development alternative).

If approved, it is SRK's opinion that the authorisation should be valid for a period of 5 years.

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All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

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Appendices

Appendix A: Copy of EAP's Curriculum Vitae and Qualifications/ EAP's Professional Registration Certificates

Appendix B: DFFE Screening Report

Appendix C: Certified Copy of Affirmation

Appendix D: Location Map indicating Proposed Area

Appendix E: Stakeholder Engagement Process

Appendix E_ 1: Stakeholder Database

Appendix E_ 2: Project Announcement Notification Letters

Appendix E_ 3: Newspaper Advertisements

Appendix E_ 4: Site Notices

Appendix E_ 5: Scoping Report Notification Letters

Appendix E_ 6: Environmental Impact Assessment Report Notification Letters

Appendix E_ 7: Comments and Responses Register

Appendix E_ 8: Competent and Commenting Authority Correspondence

Appendix E_ 9: Interested and Affected Party Correspondence

Appendix F: Environmental Management Programme

Appendix G: Specialist Reports

Appendix G_ 1: Underwater Heritage Impact Assessment

Appendix G_ 2: Marine Ecology Impact Assessment

Appendix G_ 3: Fisheries Impact Assessment