TotalEnergies EP South Africa B.V.

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) FOR THE OFFSHORE PRODUCTION RIGHT AND ENVIRONMENTAL AUTHORISATION APPLICATIONS FOR BLOCK 11B/12B – REF NO: 12/4/13 PR

Draft Environmental and Social Impact Assessment Report

CHAPTER 7

REPORT NO: 41105306-358669-10
SEPTEMBER 2023

PUBLIC

TotalEnergies EP South Africa B.V.

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PROJECT NO. 41105306

OUR REF. NO. REPORT NO: 41105306-358669-10

DATE: SEPTEMBER 2023

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7 RECEIVING ENVIRONMENT

This chapter provides the background of the environmental and social context within Block 11B/12B. Comprehending the sensitivities within the application area is key to understanding the interactions of the potential impacts to the baseline condition of the receiving environment.

The receiving environment is defined as the physical (metocean data, noise and air quality), biophysical (ecology and biodiversity) and the socio-economic environment (demographical characteristics, economic conditions, offshore marine and coastal infrastructure, tangible and intangible cultural heritage resources, palaeontological resources and fisheries activities).

7.1 INTRODUCTION

Information in this Chapter has been sourced from:

- Previous studies undertaken in the Block (SLR Consulting (South Africa) (Pty) Ltd, 2021);
- Specialist studies undertaken for the Project, including:
  - Maritime Heritage Impact Assessment Report (ACO Associates cc, 2023);
  - Marine Ecology and Fisheries Impact Assessment Report (Anchor Environmental Consultants, 2023);
  - Palaeontological Impact Assessment Report (Bamford, 2023);
  - Cultural Heritage Impact Assessment Report (Boswell, 2023);
  - Oil Spill Modelling Report (DHI Water & Environment, Inc., 2023);
  - Economic Impact Report (Urban-Econ, 2023);
  - Air Quality Screening Assessment (WSP Group Africa (Pty) Ltd, 2023a);
  - Climate Change Impact Assessment Report (WSP Group Africa (Pty) Ltd, 2023b);
  - Closure Plan (WSP Group Africa (Pty) Ltd, 2023c);
  - Marine Acoustics Technical Report (WSP Group Africa (Pty) Ltd, 2023d); and
  - Social Baseline Report (WSP Group Africa (Pty) Ltd, 2023e).
- An environmental baseline survey undertaken in 2022 (Benthic Solutions Limited, 2023); and
- Available literature.

7.2 AREA OF INFLUENCE

The area of influence of the Project is defined as a basis for defining the boundaries for baseline data gathering by taking into consideration the spatial extent of potential direct and indirect impacts of the Project. The potential impacts of the Project have been delineated to include the direct area of influence and the indirect area of influence. Further detail is provided below.

7.2.1 DIRECT AREA OF INFLUENCE

The direct area of influence includes the areas in which the Project activities would take place and consists of the following:

- **Project Development Area:** This area comprises wells and a subsea system in the south-west corner of Block 11B/12B to produce gas and associated condensates.
- **Exploratory Priority Area**: This area is located in the east-north-east section of Block 11B/12B and will be utilised to assess the potential for additional hydrocarbon resources.

- **Project Pipeline Corridor:** Two pipeline alignment corridors are currently proposed which will be utilised to connect the production wells to the F-A Platform. The base case pipeline alignment is a direct route measuring approximately 109 km from the anticipated well location in the Project Development Area to the F-A Platform. The alternative pipeline alignment measures approximately 115 km, routing slightly north-east from the base case with a bend to reach the F-A Platform.

The above-mentioned direct areas of influence are depicted in Figure 7-1.

7.2.2 INDIRECT AREA OF INFLUENCE

The indirect areas of influence include the areas outside of the direct areas of influence where the Project activities will take place. This area includes all areas where the effects of the Project activities are felt and include the following:

- F-A Platform.
- Existing PetroSA-operated gas and condensate pipelines.
- Onshore logistics base located at the port of Mossel Bay.
- Onshore supply base located at the ports of Cape Town, Mossel Bay and/or Gqeberha comprising:
  - Equipment and material storage areas;
  - Operation and maintenance centres;
  - Quayside services to support vessels; and
  - Loading and offloading supplies and equipment being transported to and from the drill unit and the F-A Platform.
- Onshore helipad located in George.

7.3 PHYSICAL ENVIRONMENT

7.3.1 METOCEAN DATA

Metocean statistics have been compiled to support the numerical modelling of condensate dispersion from a subsea blowout and submarine pipeline leak, and dispersion of drilling mud and cuttings discharges at the seabed and near the water surface. The data was sourced from a SAT-OCEAN (TotalEnergies, 2022) hindcast model covering a 5-year period (Jan 2012 – Dec 2016). Three locations, Discharge 4 and Discharge 5, on the southwest end of Block 11B/12B, and Pipe Leak on the shallower continental shelf and approximately 87 km northwest of Discharge 5, were considered for the assessment. In this regard, offshore metocean conditions at Discharge Point 5, was utilised as a representative point for the Block. The location of Discharge Point 5 is indicated in Figure 7-1.

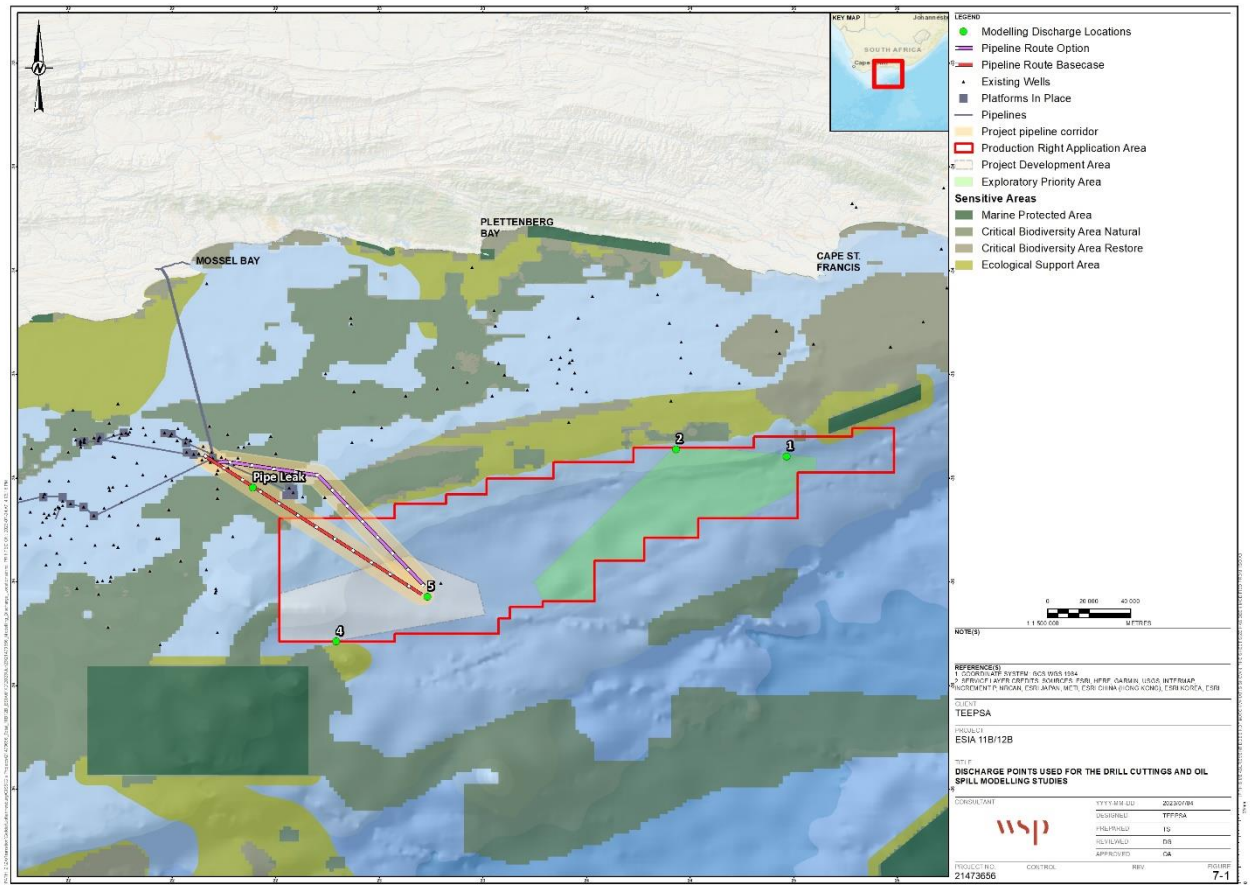


Figure 7-1 - Locations of Discharge Points 4 and 5, and condensate Pipe Leak

7.3.1.1 Wind and Currents

The average metocean data at Discharge 5 over a five-year period (2012 – 2016) is presented in Figure 7-2.

The dominant direction for surface current at Discharge 5 is towards SW and WSW for the 2012 to 2016 period with an occurrence probability greater than approximately 70%. Current speeds can reach up to 4 m/s at the surface. Dominant current direction at the seabed is towards WSW and SW for approximately 80% of the time. Part of the drill cuttings are discharged at the seabed, which makes seabed currents an important factor in drilling discharge modelling.

Dominant wind directions are from between WSW and WNW (approximately 36% of the time), and ENE and ESE (approximately 28% of the time). Wind speeds are mostly in the 5 m/s to 20 m/s range.

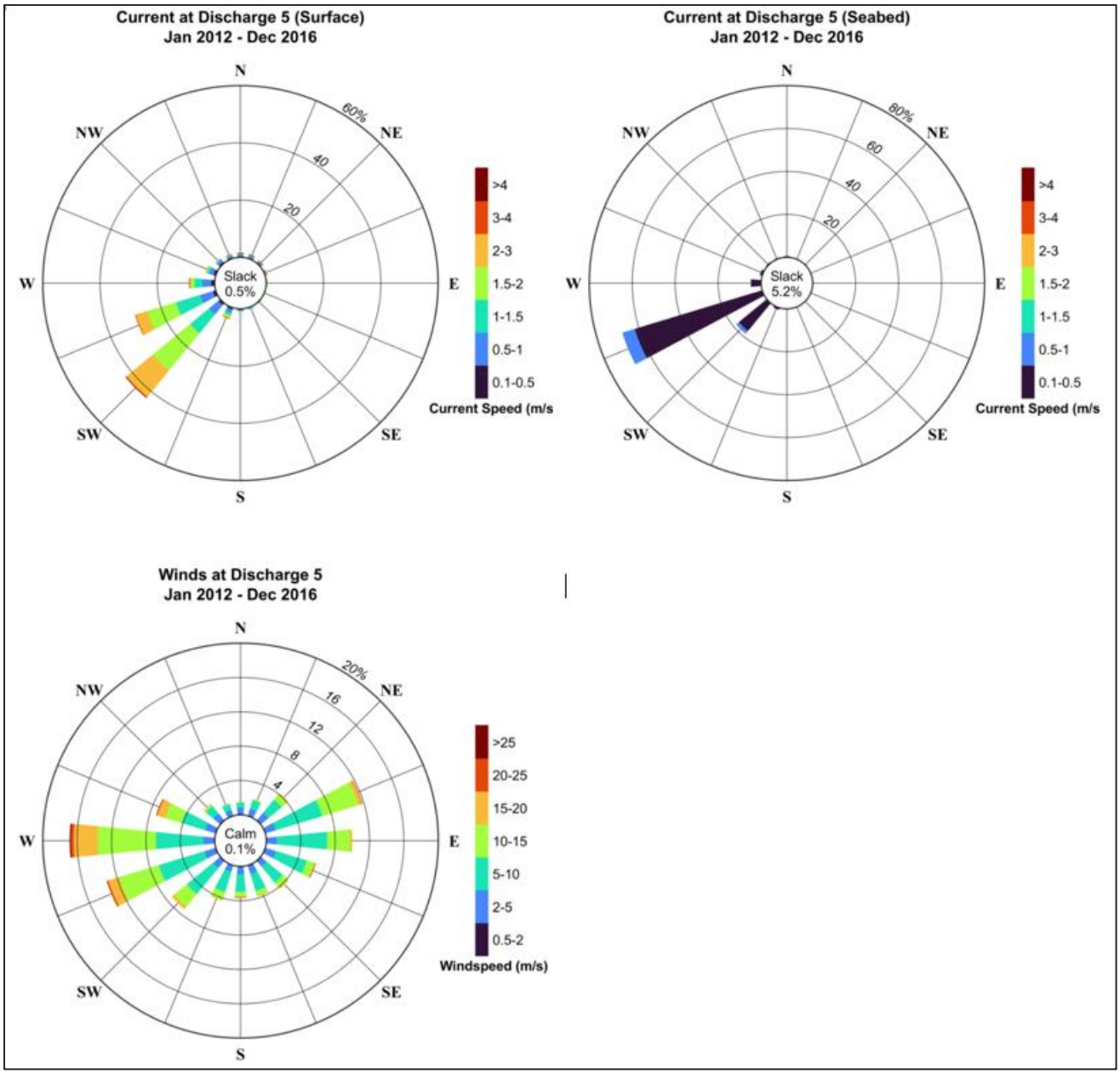


Figure 7-2 - Average annual current and wind speed roses at Discharge 5 for 2012-2016

7.3.1.2 Tides

Tides are typically semi-diurnal along the South Coast of South Africa, with two high tides and two low tides during a tidal day. The tidal range is between 2 - 2.5 m [(Searson, 1994) in (Benthic Solutions Limited, 2023)]. Wind-driven upwelling occurs in the nearshore, especially when easterly winds blow during summer. Such upwelling usually begins at the capes and progresses westwards. Tidal influence will be minimal in Block 11B/12B (WSP Group Africa (Pty) Ltd, 2023a).

7.3.1.3 Waves

Waves along the South Coast of South Africa generally come from the south-west [(Whitefield et al., 1983 and Carter and Brownlie, 1990) in (Benthic Solutions Limited, 2023)]. Wave heights,

particularly during winter and spring, exceed 6 m and can reach heights of 10 m [(Heydorn, 1989) in (Benthic Solutions Limited, 2023)]. Giant waves, higher than 20 m, are encountered within the Agulhas current during the summer months when seas are driven by an easterly wind, causing the southerly flowing Agulhas current to collide with the south-westerly swells [(Heydorn and Tinley, 1980; Heydorn, 1989 and Carter and Brownlie, 1990) in (Benthic Solutions Limited, 2023)].

7.3.2 CLIMATE

7.3.2.1 Air Temperature

For the period 1992-2022, annual mean temperatures were estimated at 18.6°C in the offshore environment. Monthly mean temperatures were noted to be greatest in February, at 21.5°C, and lowest in August, at 16.1°C. Over the 1922-2022 period, an increasing trend was present indicating a gradual increase in mean temperatures over time. Higher temperatures were also noted to be found on land and closer to the coast, while lower temperatures were noted further offshore [(Copernicus Climate Change Service, 2021) in (WSP Group Africa (Pty) Ltd, 2023b)].

The average air temperature at Discharge 5 is 19.3°C.

7.3.2.2 Water Temperature

The minimum and maximum surface and seabed water temperatures in Block 11B/12B are presented in **Table 7-1** (WSP Group Africa (Pty) Ltd, 2023a).

Table 7-1 - Minimum and maximum sea temperatures within Block 11B/12B

Area	Min and Max Temperature (°C)
Seabed (1 684 m water depth)	1.7 - 4
Surface	16 - 28

Water temperature profiles in Block 11B/12B indicate that the upper 20 m of the water column is thermally well-mixed, with temperatures greater than 20°C. The water column temperature declines rapidly from 20 – 120 m depth, indicating an intense thermocline (Benthic Solutions Limited, 2023). Intense thermoclines induced by shelf-edge upwelling and insolation are characteristic of the eastern and central Bank [(Largier and Swart, 1987) in (Benthic Solutions Limited, 2023)]. According to Poulton *et al.,* 2022 in (Benthic Solutions Limited, 2023), *"The advection of cold, deep waters onto the Agulhas Bank exhibits seasonality, causing seasonal changes in stratification and the speed of the Agulhas current. These shifting factors are key to the formation and maintenance of the thermocline across the bank."*

7.3.2.3 Rainfall

For the period 1922-2022, mean annual precipitation in Block 11B/12B was estimated at 1 242.7 mm [(Copernicus Climate Change Service, 2021) in (WSP Group Africa (Pty) Ltd, 2023b)].

7.3.3 BATHYMETRY

Within Block 11B/12B, the water depth increases significantly from north to south across the Block, and the Agulhas current that moves down the coast from the northeast, roughly follows the seafloor drop-off and cuts through the Block. Water depths in Block 11B/12B range from approximately 110 m to 1 800 m below sea level (see Figure 1-1 and Figure 7-4) (Benthic Solutions Limited, 2023).

Benthic environments and associated biodiversity are largely linked to bathymetry. Further detail is provided in Section 7.4.

7.3.4 NOISE

Existing underwater noise levels are influenced by natural and anthropogenic sources. Noise sources have different levels of noise with frequencies ranging from low to high. Low frequencies are generally impacted by human influences, such as marine shipping, while higher frequencies may be impacted by natural, physical or bioacoustics sources such as surface waves, precipitation or marine fauna (WSP Group Africa (Pty) Ltd, 2023d).

Ambient noise levels generally range from 80 dB to 120 dB re 1 µPa [(Swan et al., 1994, in: (WSP Group Africa (Pty) Ltd, 2023d)]. Noise levels in Block 11B/12B are influenced by anthropogenic influences such as marine vessel movements, as well as natural sources such as wind, waves and marine mammal vocalisations. Marine vessel movements are the largest contributor to underwater noise levels in the application area, given the presence of several major ports along the coast of South Africa in Cape Town, Mossel Bay, Gqeberha, East London and Durban (see **Figure 7-3**) (WSP Group Africa (Pty) Ltd, 2023d).

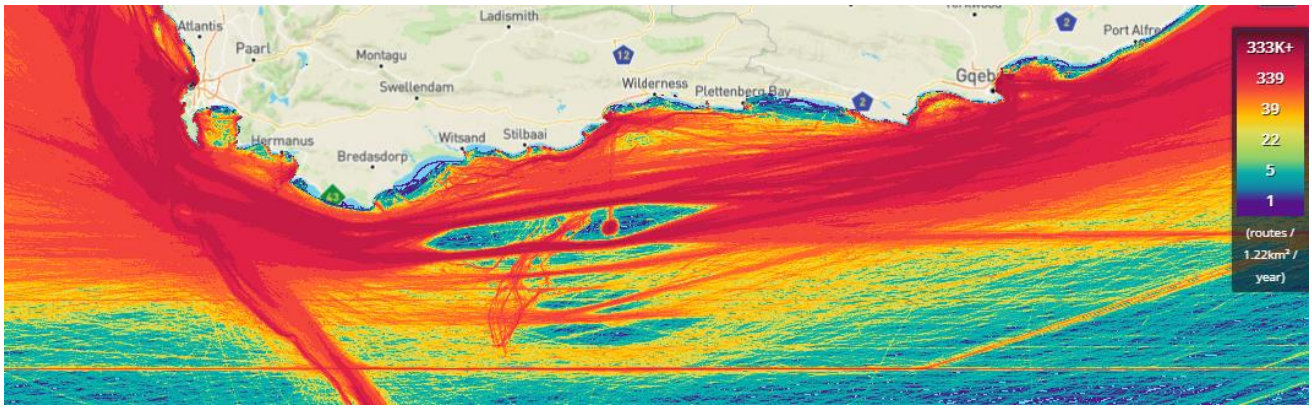


Figure 7-3 - Existing vessel traffic in 2021 in the vicinity of the project. (https://www.marinetraffic.com/)

7.3.5 AIR QUALITY

7.3.5.1 Ambient Air Quality

Offshore, key contributors to ambient air pollutant concentrations include (WSP Group Africa (Pty) Ltd, 2023b):

- Long-range transboundary transportation of pollutants through large scale weather systems. Key pollutants comprise CO, NOx, PM, SO_2, and VOCs including Benzene (C_6H_6).
- Exhaust emissions from vessels in the area, with key pollutants comprising CO, NOx, PM, SO_2, and VOCs including benzene.
- Offshore oil and gas exploration, extraction and processing, with key emissions being CO, NOx, PM, SO_2, and VOCs from flaring, vessels and drill rigs.
- Offshore combustion installations for operational maintenance and power generation with key pollutants comprising CO, NOx, PM, SO_2, and VOCs including benzene.

- Onshore, and within the ports and surrounding residential, and commercial areas there are several existing sources of atmospheric emissions. The main sources, based on land use types, are expected to be low-level mobile and stationary fugitive sources comprising:
- Storage and handling of fuel, mainly petroleum products, with the key pollutant being VOCs, including benzene.
- Railway yard operations emitting PM.
- Locomotive exhaust emissions comprising CO, NOx, PM, SO_2, and VOCs including benzene.
- Offloading and loading of break-bulk, bulk, and other materials at the Port, emitting PM.
- Entrainment of fine materials by mobile equipment, with the key pollutant being PM.
- Entrainment of fine materials by vehicles along paved and unpaved roads, with the key pollutant being PM.
- Vehicle and other mobile equipment exhaust emissions emitting CO, NOx, PM, SO_2, and VOCs.
- Ship (also referred to as vessels), vehicles and mobile equipment refuelling emitting VOCs, including benzene.
- Ship maintenance and repair including sandblasting or shotblasting, painting and hull repairs, emitting PM and VOCs, and possibly Lead (Pb).
- Ship hotelling resulting in generator exhaust emissions, with key pollutants being CO, NOx, PM, SO_2, and VOCs.
- The erosion of unvegetated areas during incidents of high wind speeds, including coastal dunes, bare agricultural areas, construction areas, sports grounds, fine material stockpiles, unpaved roads, overgrazed areas. The key pollutant being PM.
- Residential fuel burning mostly in the lower income areas but also to a small extent in other residential areas and at isolated homesteads or farmsteads, with pollutants comprising CO, NOx, PM and SO_2.
- Biomass burning, predominantly comprising agricultural burning and wildfires, with key pollutants being CO, NOx, PM and SO_2.
- Agricultural activities including soil management, sewing, and harvesting, with key pollutants being PM, with smaller portions of HCs, SO_2, Nitrogen Monoxide (NO), Ammonia (NH_3), H_2S, and Ozone (O_3).

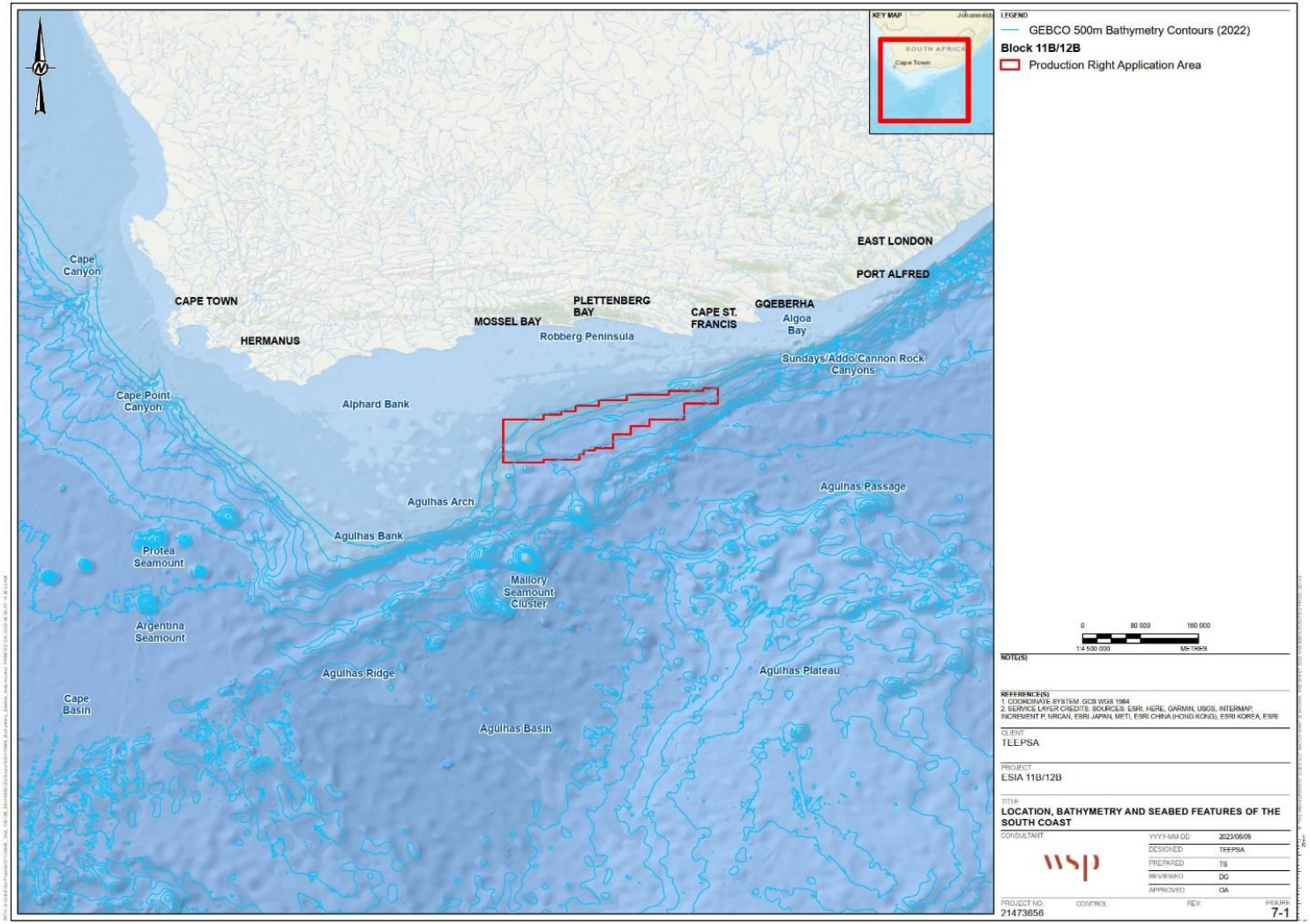


Figure 7-4 - Location, bathymetry (500 m countour line) and seabed features of the South Coast

7.3.5.2 Sensitive Receptors

Sensitive receptors are identified as areas that may be impacted negatively by pollutant emissions to atmosphere associated with the proposed activities. Receptors associated with human health and nuisance impacts include, but are not limited to, schools, nursing homes, hospitals, clinics, specialised medical facilities treating patients with chronic illnesses, office blocks and residential properties.

The PR application area is located offshore, extending between Mossel Bay and Cape St. Francis with the closest north-eastern point of the PR application area about 75 km offshore from Cape St Francis, whereas the closest north-western point is about 120 km offshore from Mossel Bay.

Onshore support operations will be conducted from logistics base located at the ports of Mossel Bay, Gqeberha and/or Cape Town. It is anticipated these will make use of existent areas and facilities already established inside the ports. It is likely that transport of bulk equipment will be done from the ports of Gqeberha and/or Cape Town. All other vessels will operate from the Mossel Bay port and used the most for Project related vessel operations, consequently the sensitive receptors near the Mossel Bay port have been identified in detail. A helicopter will operate from George airport.

Additional to the commercial infrastructure and residential sites nearby, other receptors within the port area (seaside) are tourism activities, onshore natural vegetation and fauna, and marine life.

High sensitive receptors within the onshore support area and surrounds, as well as along the coastal area north of Block 11B/12B include (WSP Group Africa (Pty) Ltd, 2023a):

- Hospitals, clinics, hospice, chronic illness treatment centres, and retirement homes including frail care facilities.
- Schools and creches.
- Individual homesteads and farmsteads.
- Leisure and contractor accommodation.
- Residential areas.
- Conservation and tourism areas.
- Crop and livestock farming areas.

At Mossel Bay, the preferred Port to operate from, the closest residences and commercial operations are 150 m from the port. Within 3.5 km from the port, seven schools, one creche, three hospitals, one clinic and an emergency response services centre were identified (see Figure 7-5). The shipping operations at the ports of Gqeberha and Cape Town are approximately 350 m, and 300 m from the closest sensitive receptors, respectively.

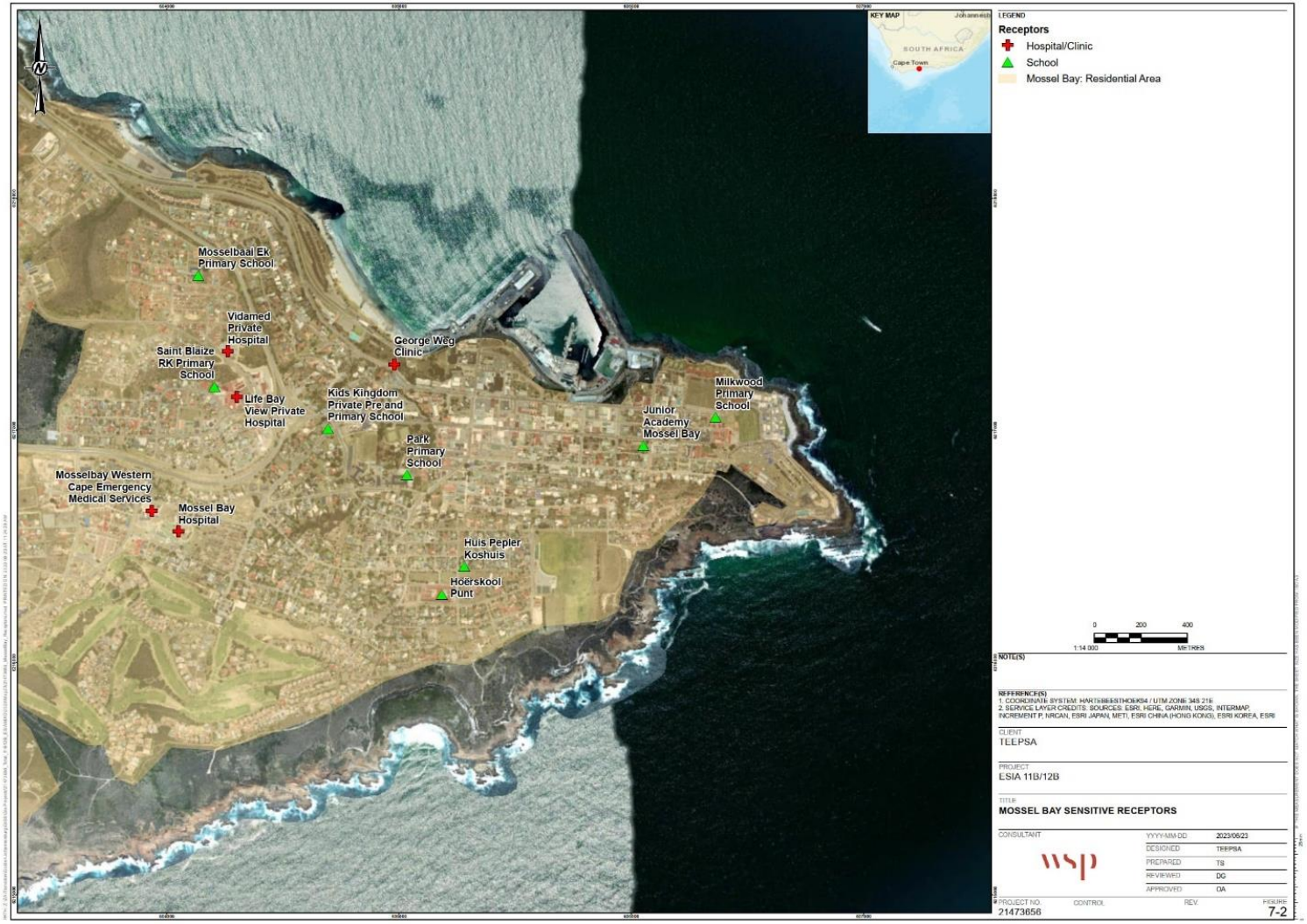


Figure 7-5 - Mossel Bay Port location and nearby high sensitive receptors

7.4 ECOLOGY AND BIODIVERSITY

The following is extracted from the Marine Impact Assessment undertaken for the Project (Anchor Environmental, 2023), attached in Appendix 11 of this ESIA report.

7.4.1 OCEANOGRAPHY

Given that the physical oceanography of an area, particularly water temperature, nutrient and oxygen levels, are the principal driving forces that shape the marine communities, it is worth considering the broader oceanography of the region. The oceanography of the Block 11B/12B PR Application Area is influenced by both the strong-flowing Agulhas current that moves down the east coast of South Africa, as well as by localised oceanographic processes (see Figure 7-6).

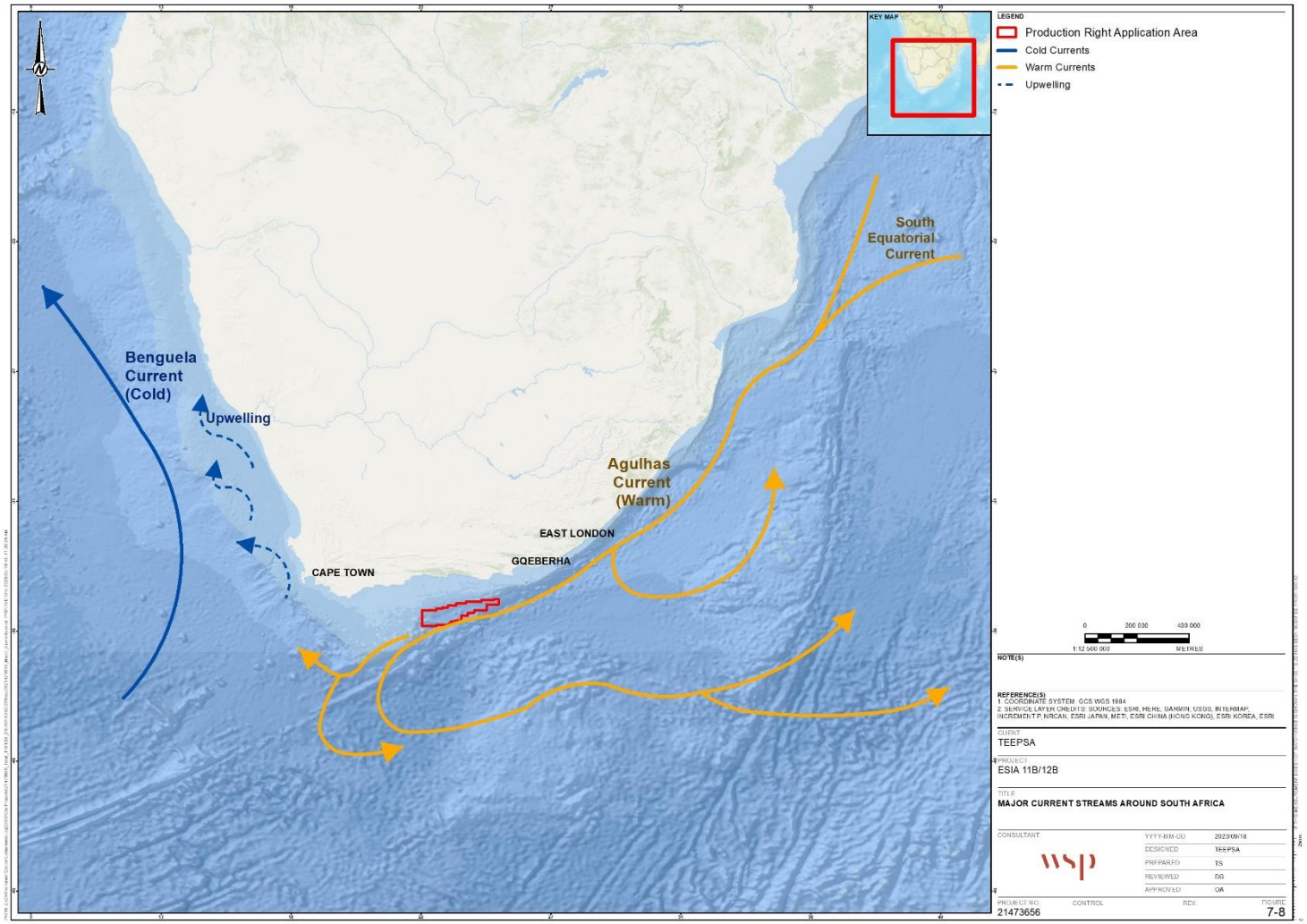


Figure 7-6 - Major current streams around South Africa. The warm Agulhas Current (orange) flows down the east coast, and cold upwelling plumes (light blue) can be observed along the west coast.

The interaction of the warm Agulhas current with cooler temperate waters is the principal reason for the diverse range of coastal and marine flora and fauna for which South Africa is famous. The Agulhas current forms part of the Indian Ocean Gyre, which brings warm water from the tropics to the east coast of South Africa and moves at a speed of approximately 2.6 m/s (Branch & Branch, 1981). The Agulhas current hugs the continental shelf, moving close to the shore edge when the shelf is narrow but is deflected away from the coast as the shelf widens (i.e. from Gqeberha westwards). The continental shelf becomes progressively wider from Port St John's in the Eastern Cape down to the Agulhas Bank in the southern Cape [(Heydorn & Tinley, 1980) (refer to figure 7-6).

The current produces large, complex meanders of approximately 130 km across the shelf, and eddies, which advect onto the Agulhas Bank (Swart & Largier 1987, Penven *et al.* 2001, Lutjeharms 2006, Pisces 2019) (see Figure 7-7). After detaching from the shelf edge at 15°E, the Agulhas Current retroflects and lows eastwards [(Schumann *et al.,* 1998).

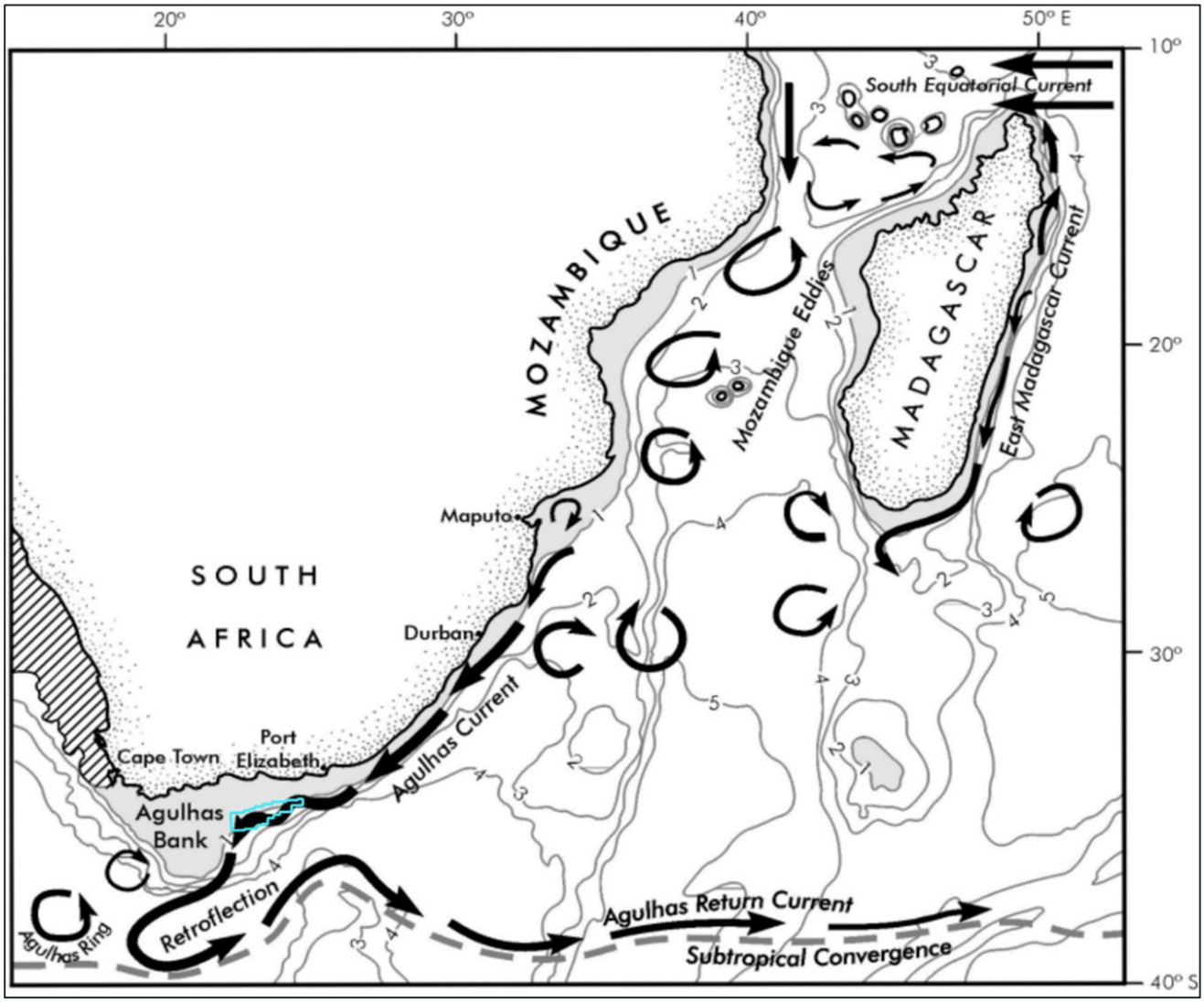


Figure 7-7 - The major circulatory elements along the South Coast in relation to the Block 11B/12B PR Application Area (blue polygon) [(Lutjeharms 2006 and Pisces 2014a in Anchor Environmental, 2023)].

The thermal structure of Agulhas Bank is complex and is influenced by Agulhas current water intrusions at the surface and subsurface, upwelling and solar heating of surface waters [(Pisces, 2014a). The warm, tropical water carried by the Agulhas current cools as it moves southwards and supports a changing array of species. At the inner boundary of the Agulhas current, cold bottom water is advected onto the Agulhas Bank via shelf-edge upwelling [(Schumann *et al.,* 1982, 1998, 2005. This process is linked to bottom topography and is most intense at the eastern boundary of the South Coast (Hutchings, 1994). Such shelf-edge upwelling largely defines the strong thermocline and halocline topography that typically develops between the cold bottom water and the sun warmed surface layer during spring, summer and autumn. Cool counter-currents also flow inshore of the Agulhas current in an easterly direction, providing important opportunities for northward and eastward migration of certain species such as the sardine *Sardinops sagax*. South of the continental shelf, the current turns back on itself (retroflects) and begins flowing eastwards and once again joins the Indian Ocean Gyre as the Agulhas Return Current.

7.4.2 BIOGEOGRAPHY

Numerous attempts have been made to understand and map marine biogeographic patterns around the coast of South Africa [the most recent being (Sink *et al.,* 2012). Most of the studies recognised three coastal regions; a cool temperate west coast, a warm temperate south coast and a subtropical east coast region (Bustamante & Branch 1996, Branch *et al.* 2017). The Block 11B/12B PR Application Area falls within the warm temperate south coast, a region characterised by high diversity, with components of both the cool temperate and subtropical marine faunas, as well as high levels of endemism (species with distributions restricted to the bioregion).

According to the most recent biogeographic divisions, the Block 11B/12B PR Application Area falls within the Southwestern Indian Ecoregion and the Southwestern Indian upper and lower bathyal ecozones (see Figure 7-8) (Sink *et al.,* 2012). The more recent NBA that was released in 2019 does not reclassify these biogeographic regions. Communities within this marine habitat are largely ubiquitous throughout the southern African South Coast region, being particular only to substrate type or depth zone. The biological communities occurring in Block 11B/12B consist of many hundreds of species, often displaying considerable temporal and spatial variability (Pisces, 2019).

7.4.3 BENTHIC HABITATS

The Block 11B/12B PR Application Area falls within the Outeniqua Basin, on the Agulhas Bank, southwards of the 200 m isobath and down to approximately 2 000 m depth. The diverse benthic habitats of the Block 11B/12B area therefore fall within the Agulhas sub-photic biozone (from 30 m depth to the shelf edge) and the continental slope biozone (beyond to the lower slope) (Pisces, 2019). While the shelf edge is considered a distinct zone, benthic and pelagic components of the ecosystem interact closely in this steeper zone and it is therefore classified as part of the shelf (Karenyi *et al.,* 2016 and Sink *et al.,* 2019). Within the shelf, four finer scale biomes are recognised, namely an inner, mid and outer shelf zone, and the shelf edge (Sink *et al.,* 2019).

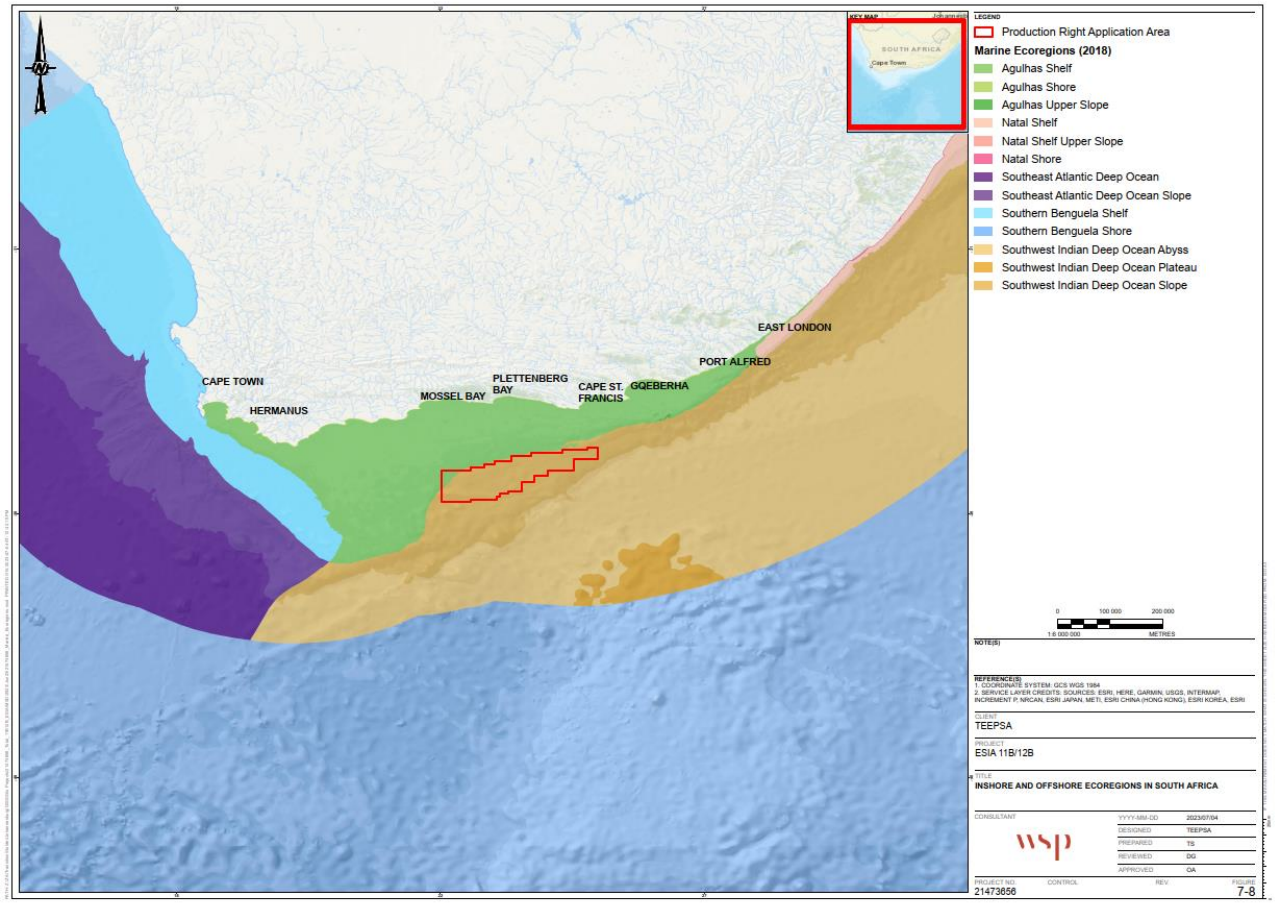


Figure 7-8 - Inshore and offshore Ecoregions in South Africa

The NBA, 2018 delineation of offshore habitat types in the PR Application Area and surrounds is presented in Figure 7-10. The benthic habitat types in the area of interest include (moving from south to north) Southwest Indian Lower Slopes, Southwest Indian Mid Slope, Southwest Indian Upper Slope, with intersection with Agulhas Rocky Shelf Edge, Eastern Agulhas Outer Shelf Mosaic and Agulhas Blues in the vicinity of the pipeline routing (see Figure 7-10) (SANBI, 2018).

This means that most of the PR Application Area is a mosaic of both rocky reef and areas with sparse sediment cover, with the northern area characterised by hard sediment, meaning that a narrow layer of unconsolidated sand sits atop a denser clay layer (SANBI, 2018 and Pisces, 2019). To the north-east, there are sandy outer shelf and shelf edge sediments, and hard shelf edge sediments to the west. The area beyond the 1 000 m depth comprises of unconsolidated sediments, and along the eastern half of the South Coast, the seabed is predominantly rocky reefs (Birch & Rogers, 1973).

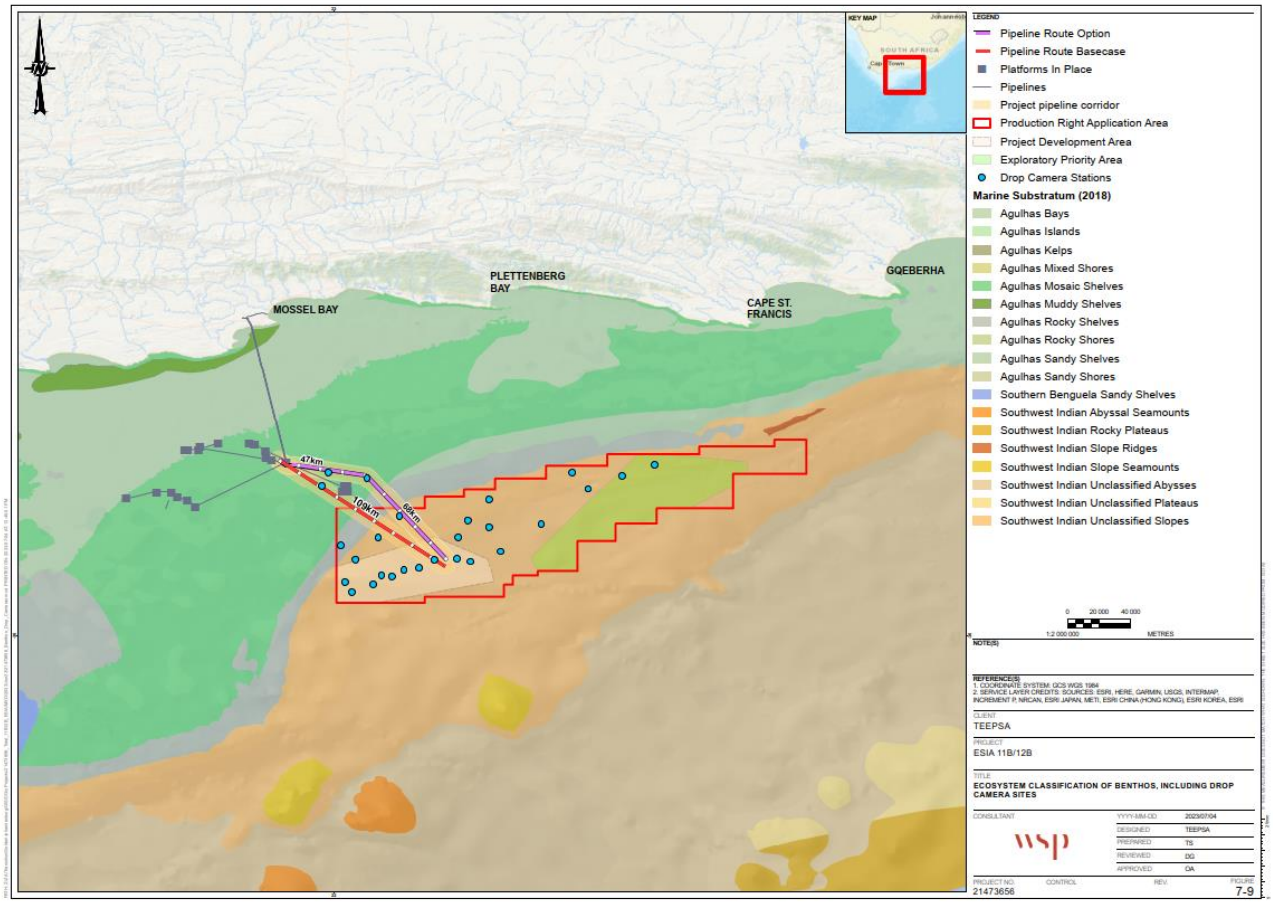


Figure 7-9 - The ecosystem classification of benthos [(SANBI, 2018) in (Anchor Environmental Consultants, 2023)]. The drop camera sites of the 2022 Bourbon Evolution 807 benthic epifaunal assessment of the Block 11B/12B PR Application Area are indicated as yellow points

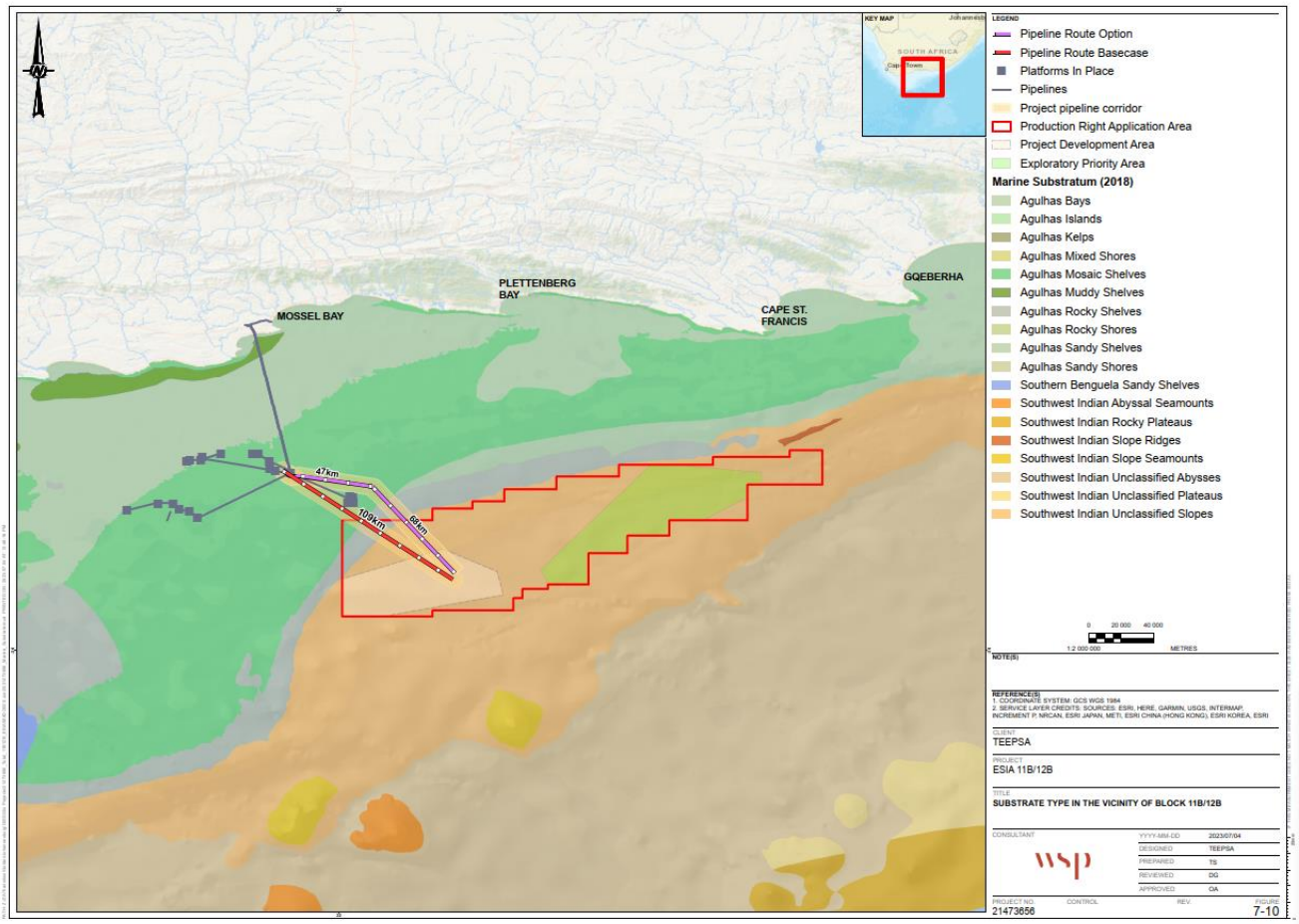


Figure 7-10 - The substrate type in the vicinity of the PR Application Area [(SANBI, 2018) in (Anchor Environmental Consultants, 2023)].

Substrate types in the vicinity of the Block 11B/12B PR Application Area are presented in Figure 7-10. The substrate that covers most of the Block is classified as “Southwest Indian Unclassified Slopes”, rocky area in the north-western side of the Block (“Agulhas Rocky Shelf Edge”) and along the proposed pipeline routing (“Agulhas Mosaic shelves”) (refer to Figure 7-10). *In situ* validation of these habitat types was undertaken as part of the 2022 Bourbon Evolution 807 benthic epifaunal assessment of the Block 11B/12B PR Application Area. The drop camera sites are indicated as yellow points in Figure 7-10.

Eastern Agulhas Outer Shelf Mosaic

Preliminary drop results from the 2022 Bourbon Evolution 807 campaign shows that stations surveyed in the Eastern Agulhas Outer Shelf Mosaic habitat type (i.e., in both proposed pipeline routing areas) were mostly soft sediment habitats, with mixed mud and sand soft bottom/sand seabed (BSL, 2023). The ROV survey in this habitat showed that the habitat was mostly sandy substrate of variable coarseness, with limited hard substrate for epifaunal attachment. Areas of greater heterogeneity tended to have higher levels of species diversity.

Agulhas Rocky Shelf Edge

The one drop camera station within the Agulhas Rocky Shelf Edge habitat consisted of coral debris overlaying a hard clay seabed with a thin film of finer silty sediment. The ROV transects show that this is a hugely diverse benthic habitat, ranging from a coarse sandy seabed to a rocky/silty sand/muddy seabed with broken coral shards, rocks, dropstones, and boulders. The heterogeneity of the hard substrate results in high benthic epifaunal species diversity.

Southwest Indian Upper Slope

Drop camera stations within the Southwest Indian Upper Slope habitat consisted of a mix of hard bottom (concreted clay bottom, sometimes with a slight veneer of mud) and soft bottom, with low density of pebbles, often with some phytodetritus and high density of nodules. The ROV transect results show that this benthic habitat type is also highly diverse, ranging from hard coral outcrops to a coarse/rocky area seabed (with manganese nodules and pebbles), to intermediate coarse and silty sand/mud (i.e., patches of coarse areas between silty sand), to a complete silty sand/mud seabed with bioturbation. The heterogeneity of the hard substrate results in high benthic epifaunal species diversity.

Benthic features from the transect conducted within this habitat type shows the diverse range of features that characterise the Southwest Indian Upper Slopes. The benthos included big rock boulders and/or large clay formations that create drop offs/steps on which coral outcrops are present. These drop offs host several different species such as spider crabs, eels, squid and molluscs. Both rocky particulates on top of mud and corals were found on these features. Compacted clay sediment and rocky seabed features were also recorded, interspersed with aggregation of nodules (dark, well-rounded pebbles) separated by compact clay mounds or banks. Corals were also found in the area, both in discrete patches and in large, reef-like fields.

Southwest Indian Mid Slope

Most of the stations surveyed during the 2022 Bourbon Evolution 807 drop camera survey fell within the Southwest Indian Mid Slope zone. A diverse range of habitat types were observed in this zone, ranging from hard clay bottom with large boulders and dropstones, to large cobbles/boulders with

interspersed soft bottom, to entirely soft bottom habitats with granules, heterogeneous pebbles and phytodetritus. The ROV transect results show that this habitat type appears to be more homogeneous than the Southwest Indian Upper Slope and the Agulhas Rocky Shelf Edge habitats, with a benthic community characterised mostly by sandy/silty mud, coarse sand or small pebbles and dropstones. Less hard rocky substrate and a more homogenous environment results in a lower epifaunal species diversity.

7.4.4 BENTHIC INVERTEBRATE COMMUNITIES

The benthic biota of offshore substrates constitutes invertebrates that live on (epifauna), or burrow within (infauna), the sediments, and are generally divided into megafauna (animals >10 mm), macrofauna (>1 mm) and meiofauna (<1 mm). The structure and composition of benthic invertebrate communities is primarily a function of abiotic factors such as water depth and substratum (e.g., sediment grain size in unconsolidated sediments and reef structure/topography in areas of hard ground), current velocity and organic content of the sediment (Snelgrove & Butman 1994, Flach & Thomsen 1998 and Ellingsen 2002). Biotic factors that influence benthic community structure include predation, food availability, larval recruitment and reproductive success (Pisces, 2019).

The diverse seabed habitats on the Agulhas Bank within the Block 11B/12B PR Application Area support diverse benthic invertebrate communities. Benthic habitats type directly affects community composition. The finer soft mud sediments in Block 11B/12B have been reported to typically comprise a high biodiversity of benthic macrofauna including polychaetes, nematodes, amphipods, isopods, molluscs, echinoderms etc.) (Quick & Sink, 2005, Sink et al., 2010, and Shipton & Atkinson, 2010). Soft, relatively stable sandy habitats of varying grain size in Block 11B/12B also support highly diverse benthic communities, including seapens, molluscs, echinoderms (brittle stars and heart urchins), cerianthids (tube anemones), sponges, the deep-water rock lobster *Palinurus gilchristi* and a wide diversity of infauna (polychaetes, amphipods, isopods, molluscs) (Quick & Sink, 2005, Sink et al., 2010 and Shipton & Atkinson, 2010).

Previous work has also described low-profile rocky habitat (which is often sand inundated) with communities of sponges, black corals, gorgonians and ascidians (Sink et al., 2006). There are also rock outcrops within Block 11B/12B, which are highly structured reef habitats that are generally characterised by highly diverse benthic and motile biota including sponges, azooxanthellate corals, octocorals, gorgonians, black corals, cerianthids and stylasterine lace corals, bryozoans, ascidians, basket stars and the South Coast rock lobster *P. gilchristi* (Quick & Sink, 2005, Sink et al., 2010 and Shipton & Atkinson, 2010). Fauna occurring in the deeper reef areas and canyons have community assemblages distinctly different to those from shallower reefs (Sink et al., 2006).

As reported in previous studies, preliminary ROV results from the 2022 Bourbon Evolution 807 campaign survey showed high benthic epifaunal and mobile biota diversity across both Block 11B/12B, and Block 9 (for the pipeline routing), with approximately 357 taxa from up to 11 different phyla recorded. These included Porifera (Sponges), Cnidaria (Anemones, softa and hard corals, and sea pens), Annelidas (segmented worms), Arthropoda (barnacles, lobsters, prawns, sea spiders, hermit crabs and true carbs), Bryozoa (lace animals), Mollusca (gastropods, scaphypods and chiton), Cephalopods, (octopus, cuttlefish and squid), Echinodermata (starfish, feather stars, sea urchins, brittle and basket stars and sea cucumbers), and Chordata (bony fish, eels, sharks and skates).

Preliminary results from the 2022 Bourbon Evolution 807 benthic epifaunal ROV campaign show that there is a strong link between depth and community composition (Griffiths *et al*., 2010, and Lange & Griffiths, 2014). Shallow-, mid- and deep-water samples were statistically different, with PERMANOVA indicates a significant difference amongst depths (Pseudo-F = 4.554, p= 0.001) (Dawson *et al*., 2023). Similarly, a pairwise assessment showed that communities from all three depths zones were significantly different (p<0.002 for all) (Dawson *et al.,* 2023).

The high diversity in the can be attributed to the numerous substrate types (unconsolidated sediments, soft and hard clay, nodules and cobbles to dispersed boulders, small coral outcrops to dense coral reefs/fields) observed over depths ranging from relatively shallow waters on the continental shelf (lowest average depth 117 m) to deep waters off the shelf (maximum average depth of approximately 1 800 m). The lack of unconsolidated soft sediments in the area resulted in low occurrence of Lebensspuren (Deep-sea 'Life traces") and/or bioturbation. Mobile species included squid and cuttlefish species, a reef dwelling sea goldie (*Pseudanthias sp*.), one of the largest cusk eel species, Kingklip (*Genypterus capensis*), flatfish/sole (*Cynoglossus capensis*), a green Blenny (*Blenniidae sp.),* and various skates, catsharks and dogfish. Sessile species were observed included sponges, soft corals, true corals (e.g., *Lophelia sp.)* and false hard corals, bryozoans and hydrozoans, especially lace coral species (*Stylasteridae spp*.).

The preliminary results of the number of epifaunal taxa across the Block 11B/12B PR Application Area shows that the diversity of taxa is highest on the west and particularly the south-west corner of the Block , dropping in the middle of the Block and then increasing again (although not as high) to the east of the Block (see Figure 7-11).

The substantial shelf areas of the Agulhas Bank support rich, deep-water communities of filter-feeding corals and sponges. Of particular interest in this area are the extensive reef framework–forming cold-water corals that have been documented within the Southwest Indian Upper Bathyal, Agulhas Sandy Shelf Edge zones, and in association with deep reefs and submarine canyons on the Agulhas Inner Shelf and Shelf Edge zones, respectively (Sink & Samaai, 2009, Sink *et al.*, 2011 and Pisces, 2018).

A number of sites sampled by 2016 Deep Secrets Offshore Research survey undertaken by the National Research Foundation and African Coelacanth Ecosystem Programme were characterised by highly sensitive benthic communities including reef-building Scleractinia corals and Stylasterine lace corals (Sink, 2016, cited in Sink *et al.*, 2019). These cold-water corals are cnidarians encompassing stony corals (Scleractinia), soft corals (Octocorallia, including ''precious'' corals, gorgonian sea fans, and bamboo corals), black corals (Antipatharia), and hydrocorals (Stylasteridae) (Roberts *et al.,* 2006). These corals are long-lived (hundreds of years old) and can form large reef frameworks that persist for millennia.

Arguably the most three dimensionally complex habitats in the deep ocean, these reefs provide niches for many species, including commercially important fish species, with diversity that may be comparable to tropical reef systems (Roberts *et al,.* 2006). In recognition of these habitats, the NBA, 2018 denotes the Kingklip Corals' Ecologically or Biologically Significant Marine Area (EBSA) to the

north of the Project Area as a Vulnerable Marine Ecosystem (VME)[27] (Atkinson & Sink, 2018). This area was specifically highlighted for the high number of VME indicator species on rocky substrate at 150-800 m depth, hosting reef-forming Scleractinia corals, deep-water soft corals, Brisingida sea stars, the dominant octocoral Thouarella, along with several associates (brittlestars, scale worms) as well as fish eggs and larvae within bottlebrush corals.

The proposed alternative pipeline route passes through the southwestern corner of the Kingklip Corals EBSA; however, the base case route for the pipeline is located further away.

Species of importance observed in Block 11B/12B and Block 9, has potential indicators of VMEs, and recorded during the 2022 Bourbon Evolution 807 benthic epifaunal ROV campaign, included the reef building cold water coral (*Lophelia pertusa*), Right angle corals (*Dendrophylliidae: Cladopsammia and Eguchipsammia sp.*), Zigzag corals (*Enallopsammia rostrata*), Bottle brush sea fan (*Primnoidae, Thouarella sp*.), Sabre bryozoan (*Adeonella sp*.), and the Honeycomb false lace coral (*Phidoloporidae sp*.).

[27] VMEs are “groups of species, communities or habitats characterized by their structural functionality and their vulnerability to physical disturbance” (FAO 2009, NBA 2018).

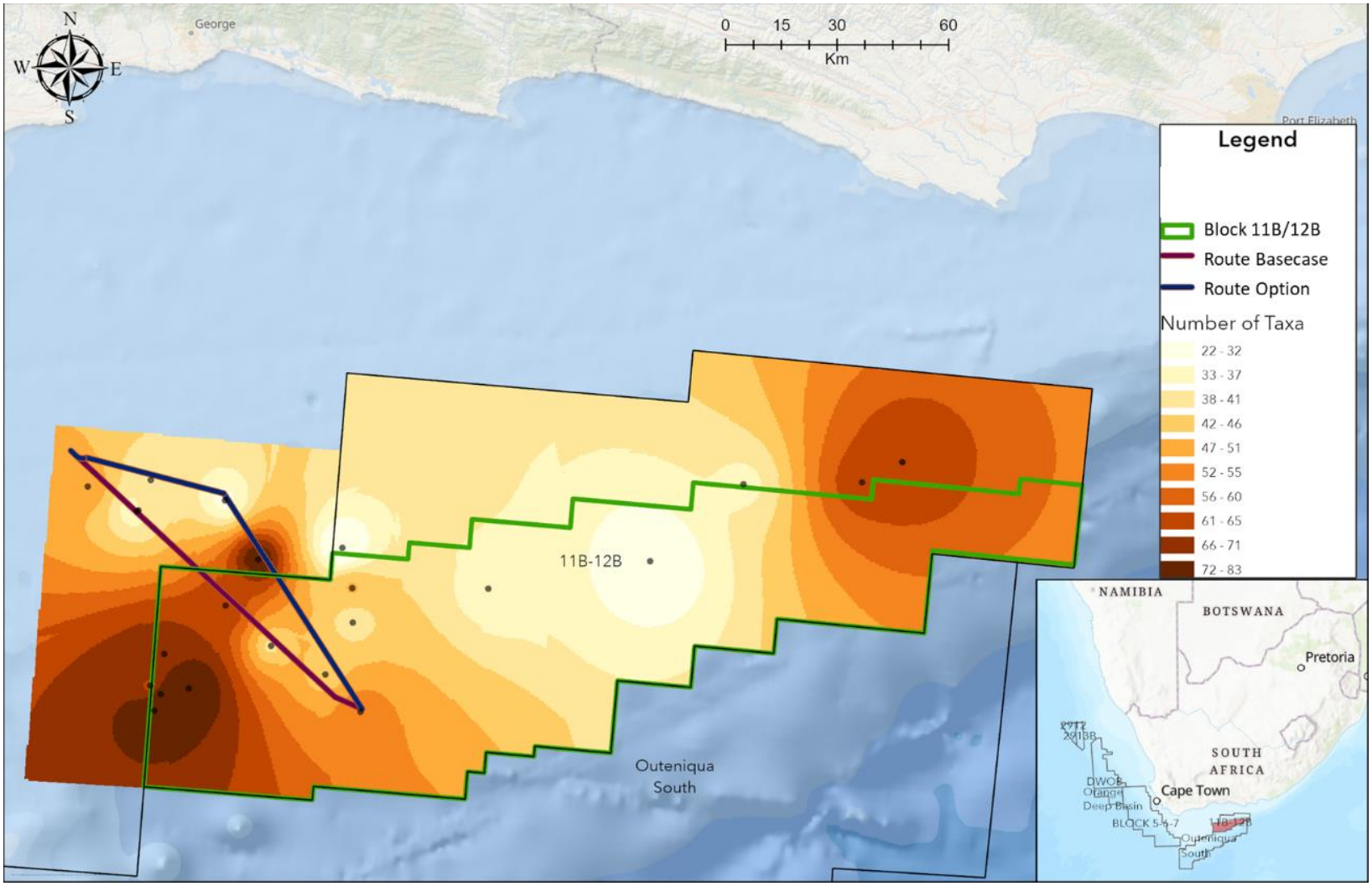


Figure 7-11 - Heat map of the number of taxa, according to phyla, based on preliminary data from the 2022 Bourbon Evolution 807 environmental survey ROV campaign (Anchor Environmenta, 2023)

7.4.5 PLANKTON

Phytoplankton biomass over the Agulhas Bank is strongly linked to environmental conditions (Brown *et al.,* 1991 and Brown 1992). Low phytoplankton biomass in the surface waters of the Agulhas Bank is generally associated with periods of deep winter mixing, or when strong thermoclines are present, which results in low nutrient availability (Probyn *et al.,* 1994 and Pisces, 2019). Under these conditions, surface water phytoplankton communities are generally dominated by large-celled diatoms and dinoflagellates, with an overall phytoplankton productivity of 200-800 mgC/m^2/hr, declining with depth to near zero in bottom waters (Pisces, 2019).

South Coast zooplankton communities have comparatively high species diversity, ranging from 3-6 gC/m^2 (De Decker, 1984). The South Coast mesozooplankton (>200 µm) is dominated by the calanoid copepod *Calanus agulhensis*, an important food source for pelagic fish stocks (Peterson *et al*., 1992). As with phytoplankton, mesozooplankton biomass increases from west (~0.51.0 g C/m^2) to east (~1.0-2.0 g C/m^2) and peaks on the central and eastern Agulhas Bank during summer in association with the subsurface ridge of cool upwelled water (Pisces, 2019). Standing stocks are estimated to be 0.079 gC/m^2 between Cape Agulhas and Cape Recife. Macrozooplankton (>1 600 µm) of the area include dense swarms of euphausiids, which are an important food source for pelagic fishes (Cornew *et al.*, 1992, Verheye et *al.,* 1994 and Pisces, 2019).

7.4.6 FISH AND SQUID

The South Coast ichthyofauna community comprises both temperate and tropical species because the region forms the transition zone between the warm south flowing Agulhas current and the cool upwelling Benguela Current System on the West Coast. This results in a productive system and diverse fish community which is supported by the species rich benthic habitat present in the area.

The area of the Agulhas Bank east of Cape Agulhas between the shelf-edge upwelling and the cold-water ridge (where copepod availability is highest) is a spawning ground for many commercially important fish stocks, such as hake, kingklip, pelagic and squid (see Figure 7-12) (Crawford, 1980, Hutchings, 1994 and Roel & Armstrong, 1991, Hutchings *et al*., 2002 and Pisces, 2019).

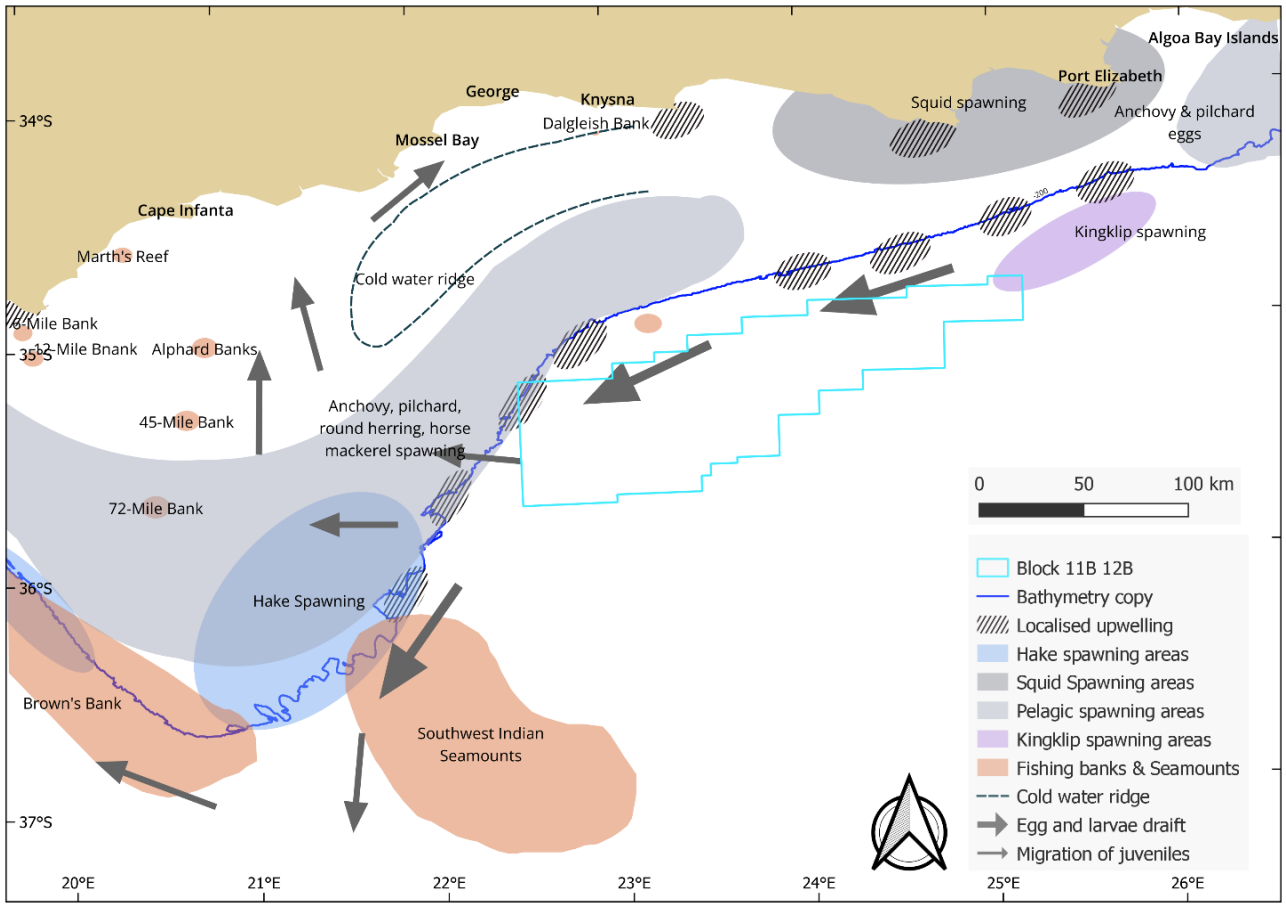


Figure 7-12 - Block 11B/12B (blue polygon) in relation to important seamounts, pelagic and demersal fish and squid spawning areas (Anchor Environmental, 2023)

While most of the spawned eggs and larvae remain on the Bank, some are carried to the West Coast or out to sea via the Agulhas retroflection [Hutchings, 1994, Duncombe Rae *et al.,* 1992, Hutchings *et al.,* 2002 and Pisces, 2019). Anchovy *Engraulis encrasicolus* spawn between October-January around the 200 m depth contour on the Agulhas Bank between Mossel Bay and Plettenberg Bay, after which the adults move inshore and eastwards. Sardine *Sardinops sagax* also spawn on the Agulhas Bank during spring and summer with adults moving eastwards and northwards after spawning, with recruits found inshore along the South Coast (see Figure 7-12 and Figure 7-13) (Crawford, 1980, Hutchings, 1994, Pisces, 2019 and Teske *et al.,* 2021.

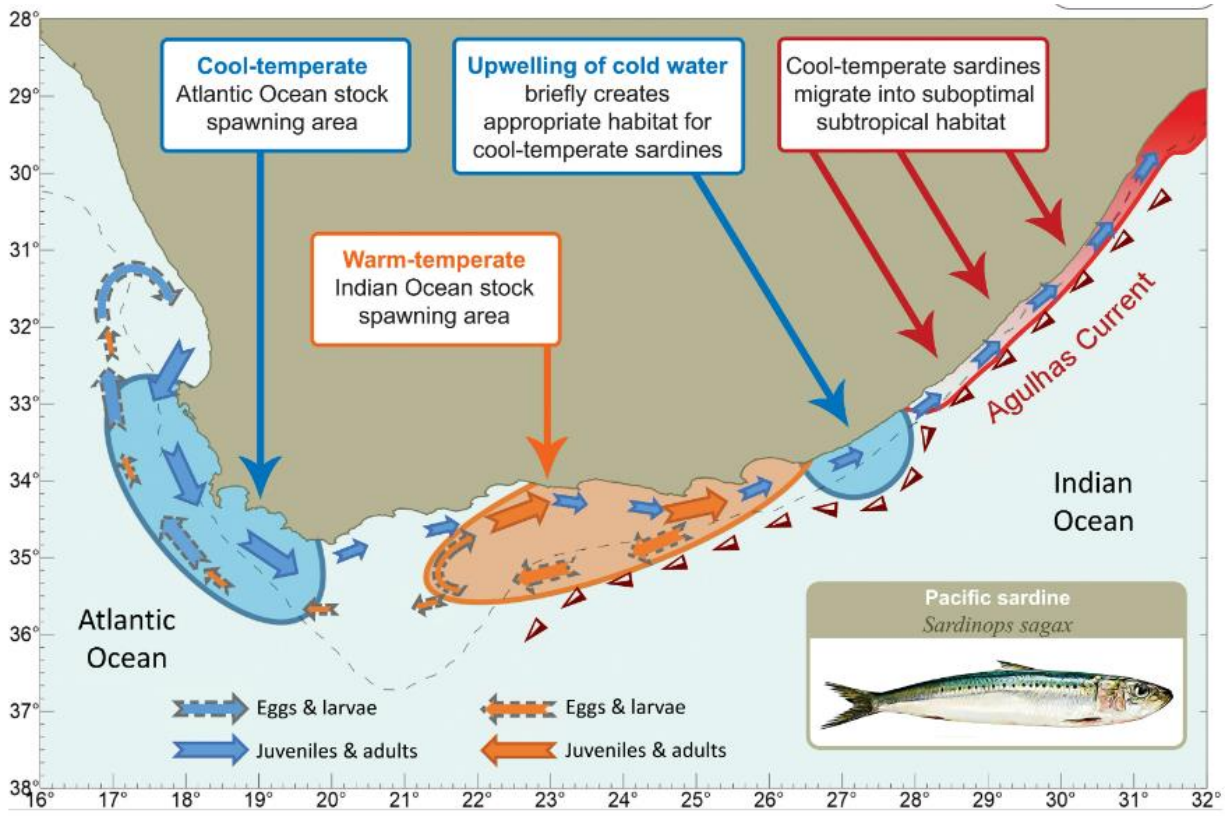


Figure 7-13 - [28]The spawning area in the Atlantic Ocean (blue, to the west) is numerically dominated by cool-temperate sardines, and the spawning area in the Indian Ocean (orange, to the east and south) is dominated by warm-temperate sardines. Source: [Teske et al. (2021) in: Anchor Environmental, 2023)]

Winter (June-July) spawning of sardines on the central Agulhas Bank has also been reported in small areas characterised by high concentrations of phytoplankton (van der Lingen *et al.,* 2006). Round herring are also reported to spawn along the South Coast, as do the demersal cape hakes and kingklip (Figure 7-12) (Roel & Armstrong, 1991 and Pisces, 2019). Spawning of the shallow-water hake *Merluccius capensis* occurs primarily over the shelf (<200 m) whereas that by the deep-water hake *M. paradoxus* occurs off the shelf (Pisces, 2019). Kingklip spawn off the shelf edge to the south of St Francis and Algoa Bay, on the eastern edge of the Block 11B/12B PR Application Area (Hutchings, 1994 and Pisces, 2019). Squid (*Loligo* spp.) spawn principally in the inshore waters (<50 m) between Knysna and Gqeberha, with larvae and juveniles spreading westwards.

Small pelagic species of the Agulhas Bank include anchovy *E. encrasicolus*, sardine *S. sagax*, round herring (or redeye) *Etrumeus whiteheadi*, chub mackerel *Scomber japonicas* and horse

[28] There is considerable exchange between these areas, with eggs and larvae from the Indian Ocean stock primarily moving westward and juveniles and adults of both stocks moving eastward. Upwelling on the southeast coast attracts cool-temperate sardines present on the south coast, which follow the cooler water as it is transported northward. When the upwelling ceases, these sardines eventually find themselves in an ecological trap of suboptimal subtropical habitat.

mackerel *Trachurus capensis* (Pisces, 2019). Since 1996, there has been a population shift of the commercially important anchovy and sardine eastward from the west coast to the Eastern Agulhas Bank. Since 1996, 37% of the observed average adult anchovy biomass was in the area to the west of Cape Agulhas since 1996, compared to 64% of average prior to this date (DFFE, 2020).

While highly variable, the sardine biomass in the area to the west of Cape Agulhas has declined from 71% of the sardine biomass in 2016, to 32% in 2017 and 23% in 2019 (DFFE, 2020). Anchovies are most abundant between the cool upwelling ridge and the Agulhas Current i.e., mostly on the inshore edge of the Block 11B/12B PR Application Area (Hutchings, 1994 and Pisces, 2019). Horse mackerel are semi-pelagic shoaling fish that occur on the continental shelf off southern Africa and are currently more abundant off the South Coast than the West Coast (DFFE, 2020). Round herring juveniles similarly occur inshore along the South Coast but move offshore with age (Roel *et al.,* 1994 and Hutchings, 1994). Fisheries catch data and areas of operation relative to the Block 11B/12B PR Application Area are presented in Section 7.7.

In late summer and during winter, pockets of cool water are sporadically uplifted onto the shallow continental shelf inshore of the warm, southward-flowing Agulhas Current, expanding the suitable habitat available for *S. sagax* northward along the Eastern Cape coast (Teske *et al.,*2021). This results in the movement of large shoals that can reach 30-40 km in length northwards into southern KwaZulu-Natal following this cool water in what is known as the 'sardine run' (Van der Lingen *et al.,* 2010 and Pisces, 2018).

The shoals begin gathering in Algoa Bay in late February and move rapidly northwards in the cooler nearshore along the Eastern Cape coast, arriving in southern KwaZulu Natal coast in late May/early June before disappearing into the waters north of Durban (Figure 7-13) (van der Lingen *et al.,* 2010 and Pisces, 2018). These large shoals are pursued by a variety of piscivorous predators, including great white sharks *Carcharodon carcharias*, copper sharks *Carcharhinus brachyurus*, common dolphins *Delphinus capensis* and cape gannets *Morus capensis* (O'Donoghue *et al.,* 2010a).

Demersal fish on the wide Agulhas Bank continental shelf include demersal cape hakes *Merluccius capensis* and *M. paradoxus* (Boyd *et al.,* 1992, Hutchings, 1994 and DFFE, 2020). See more details on the demersal fishery in Section 7.7. The nursery grounds for these hake species are located off the west coast, and fish move southwards onto the Agulhas Bank as they grow, with juveniles of both species occupying shallower waters than the adults (Pisces, 2018). Other important demersal species include kingklip *Genypterus capensis*, which inhabit deeper water across the whole southern coast, and are particularly associated with deep water rocky habitat (Japp *et al.,* 1994 and Pisces, 2018).

The species is thought to spawn beyond the 200 m isobaths between Cape St Francis and Gqeberha, in the north-eastern portion of Block 11B/12B during spring, with juveniles occurring further inshore along the entire south coast (refer to Figure 7-12). The Agulhas or East Coast sole *Austroglossus pectoralis* inhabits inshore muddy seabed (<125 m) on the shelf between Cape Agulhas and Algoa Bay (Boyd *et al.* 1992 and Pisces 2018).

Commercially important linefish pelagic species that migrate and spawn along the South Coast include elf *Pomatomus saltatrix*, geelbek *Atractoscion aequidens*, yellowtail *Seriola lalandi*, kob *Argyrosomus* sp. seventy-four *Cymatoceps nasutus*, strepie *Sarpa salpa*, and Cape stumpnose *Rhabdosargus holubi* (Van der Elst, 1988) (see Table 7-2). Indeed, the inshore region of the

Agulhas Bank is an important nursery area for linefish species such as elf *P. saltatrix*, leervis or garrick *Lichia amia*, geelbek *A. aequidens* and carpenter *Argyrozona argyrozona* (Wallace *et al.* 1984, Smale *et al.,* 1994 and Pisces, 2019).

Adults undertake spawning migrations northwards along the South Coast between the cool water ridge and the shore, with eggs and larvae from the Kwa-Zulu Natal waters to the north dispersed southwards by the Agulhas Current, and juveniles occurring on the inshore Agulhas Bank (Garratt, 1988, Beckley & van Ballegooyen, 1992 and Pisces, 2019).

Carpenter, for example, appear to have high reproductive output between central Agulhas Bank and the Tsitsikamma (MPA (Brouwer & Griffiths, 2005 and Pisces, 2019). There are two separate nursery grounds for the species, one off the deep reefs off Cape Agulhas and another near Gqeberha, from where older fish disperse to the west and east (van der Lingen *et al.,* 2006 and Pisces, 2019).

Table 7-2 - Important demersal and pelagic linefish species landed by commercial and recreational boat fishers and shore anglers along the South Coast [(CCA &CMS 2001, Pisces 2018 and DFFE unpublished data) in (Anchor Environmental, 2023)]

Common name	Species	Common name	Species
Demersal teleosts			
Bank steenbras	*Chirodactylus grandis*	Scotsman	*Polysteganus praeorbitalis*
Belman	*Umbrina canariensis*	Seventyfour	*Polysteganus undulosus*
Blacktail	*Diplodus sargus*	Silver Kob	*Argyrosomus inodorus*
Blue hottentot	*Pachymetopon aeneum*	Slinger	*Chrysoblephus puniceus*
Bronze bream	*Pachymetopon grande*	Snapper salmon	*Otolithes ruber*
Cape stumpnose	*Rhabdosargus holubi*	Spotted grunter	*Pomadasys commersonnii*
Carpenter	*Argyrozona argyrozona*	Squaretail kob	*Argyrosomus thorpei*
Dusky Kob	*Argyrosomus japonicus*	Steentjie	*Spondyliosoma emarginatum*
Dageraad	*Chrysoblephus christiceps*	Snoek	*Thyrsites atun*
Englishman	*Chrysoblephus anglicus*	Strepie	*Sarpa salpa*
Fransmadam	*Boopsoidea inornata*	White steenbras	*Lithognathus lithognathus*
Galjoen	*Dichistius capensis*	White stumpnose	*Rhabdosargus globiceps*
Grey chub	*Kyphosus bigibbus*	Wreckfish	*Polyprion americanus*
Kob	*Argyrosomus hololepidotus*	Zebra	*Diplodus cervinus*
Mini kob	*Johnius dussumieri*	Red steenbras	*Petrus rupestris*
Musselcracker	*Sparodon durbanensis*	Red stumpnose	*Chrysoblephus gibbiceps*
Natal stumpnose	*Rhabdosargus sarba*	River bream	*Acanthopagrus berda*
Poenskop	*Cymatoceps nasutus*	Rockcod	*Epinephelus spp.*
Pompano	*Trachinotus africanus*	Sand steenbras	*Lithognathus mormyrus*
Red roman	*Chrysoblephus laticeps*	Santer	*Cheimerius nufar*
Pelagic teleosts			

Common name	Species	Common name	Species
Elf	*Pomatomus saltatrix*	Kingfish species	*Caranx spp.*
Garrick/leerfish	*Lichia amia*	Queenfish	*Scomberoides commersonnianus*
Geelbek	*Atractoscion aequidens*	Queen mackerel	*Scomberomorus plurilineatus*
Green jobfish	*Aprion virescens*	Tenpounder	*Elops machnata*
King mackerel	*Scomberomorus cavalla*	Wahoo	*Acanthocybium solandri*
		Yellowtail	*Seriola lalandi*

The large migratory pelagic fish species most likely to occur offshore, and in the Block 11B/12B PR Application Area, include various tunas, billfish and sharks (see Table 7-3). Many of these species are International Union for the Conservation of Nature (IUCN) listed species. Populations of migratory pelagic species are facing declines on a global scale because their biology, behaviour and migratory nature make them particularly vulnerable to threats throughout their life history (Lascelles *et al.,* 2014 and Allan *et al.,* 2021). These species are large consumers, and as such declines in their populations have cascading effects on ecosystem structure and function (Allan *et al.,* 2021).

Table 7-3 - Important large migratory pelagic fish likely to occur in the offshore regions of the South Coast [(IUCN 2023, adapted from Pisces, 2018, 2019) in (Anchor Environmental, 2023)]

Common name	Species name	IUCN Conservation Status (IUCN, 2023)
Tunas		
Southern Bluefin tuna	*Thunnus maccoyii*	Endangered
Bigeye tuna	*Thunnus obesus*	Vulnerable
Longfin tuna/albacore	*Thunnus alalunga*	Least concern
Yellowfin tuna	*Thunnus albacares*	Least concern
Frigate tuna	*Auxis thazard*	Least concern
Eastern little tuna/Kawakawa	*Euthynnus affinis*	Least concern
Skipjack tuna	*Katsuwonus pelamis*	Least concern
Atlantic bonito/Katonkel	*Sarda sarda*	Least concern
Billfish		
Black marlin	*Istiompax indica*	Data deficient
Blue marlin	*Makaira nigricans*	Vulnerable
Striped marlin	*Kajikia audax*	Least concern
Sailfish	*Istiophorus platypterus*	Least concern
Swordfish	*Xiphias gladius*	Near Threatened
Pelagic Sharks		
Great Hammerhead shark	*Sphyrna mokarran*	Critically Endangered
Smooth Hammerhead shark	*Sphyrna zygaena*	Vulnerable

Common name	Species name	IUCN Conservation Status (IUCN, 2023)
Pelagic Thresher shark	*Alopias pelagicus*	Endangered
Bigeye Thresher shark	*Alopias superciliosus*	Vulnerable
Common Thresher shark	*Alopias vulpinus*	Vulnerable
Dusky shark	*Carcharhinus obscurus*	Endangered
Great White shark	*Carcharodon carcharias*	Vulnerable
Shortfin Mako shark	*Isurus oxyrinchus*	Endangered
Longfin Mako shark	*Isurus paucus*	Endangered
Whale shark	*Rhincodon typus*	Endangered
Blue shark	*Prionace glauca*	Near Threatened
Oceanic whitetip shark	*Carcharhinus longimanus*	Critically Endangered
Bronze whaler shark	*Carcharhinus brachyurus*	Vulnerable

The coastal spawning grounds for Chokka squid Loligo reynaudii are mostly found between Plettenberg Bay and Algoa Bay in waters shallower than approximately 60 m (Jacobs et al., 2022a). This cephalopod species is the basis for an important commercial fishery that mostly targets the species on the spawning grounds or “nests” during the spawning season (spring-summer). The egg capsules of this species are deposited directly onto the seafloor and develop optimally at temperatures of 12-20ºC and dissolved oxygen concentrations of >3 ml/l, which makes the Agulhas Bank an optimal area for spawning (Roberts, 2005).

The extent of the known inshore spawning grounds between Plettenberg Bay and Algoa Bay was estimated at approximately 90 km^2 (Sauer *et al.,* 1992). Once they have spawned, surface currents transport some of the paralarvae towards the central Agulhas Bank, which offers rich feeding grounds (Huggett and Richardson, 2000, Roberts, 2005 and Jacobs *et al.,* 2022b). Both juvenile and adult chokka make use of the wider Agulhas Bank and the Benguela upwelling area (west coast of South Africa) to feed before returning east to spawn (Jacobs *et al.,* 2022a).

Details regarding the fisheries dependent on these species, including participation (right holding and employment), fishing methods, fleet sizes, ports of operation and economic value are included in Section 7.7 below.

Coelacanths have been found in the waters off South Africa, Kenya, Tanzania, Mozambique, Madagascar, Comoros and Indonesia. Along South Africa’s east coast, coelacanths are known from four locations — Wright, Jesser and Diepgat canyons off Sodwana Bay, Chaka canyon off Cape Vidal, Umzumbe (90 km south of Durban), and off East London where the first coelacanth specimen was recorded. The most recent sighting of a live coelacanth was off the south coast of KwaZulu-Natal, some 325 km south of the iSimangaliso MPA where the main South African population is located. This suggests coelacanths are more widespread along the South African coast than previously thought (Fraser et al. 2020).

7.4.7 SEA TURTLES

The loggerhead turtle (*Caretta caretta)*, the leatherback turtle (*Dermochelys coriacea*) and the green turtle (*Chelonia mydas*) are the three species of turtle that breed in South African waters. In addition to these three species, the olive ridley turtle *Lepidochelys olivacia* and the Hawksbill turtle *Eretmochelys imbricata* have also been reported as rare visitors (https://www.marineprotectedareas.org.za/turtle).

Green turtles are non-breeding residents often found feeding on inshore reefs. Leatherback turtles inhabit the deeper waters of the Atlantic Ocean and are considered a pelagic species that travel the ocean currents in search of their prey (primarily jellyfish) and may dive to over 600 m and remain submerged for up to 54 minutes (Hays *et al*., 2004 and Lambardi *et al*., 2008). They come into coastal bays and estuaries to mate and lay their eggs on the adjacent beaches. Loggerheads tend to keep more inshore, hunting around reefs, bays and rocky estuaries along the African East Coast, where they feed on a variety of benthic fauna including crabs, shrimp, sponges, and fish. In the open sea their diet includes jellyfish, flying fish, and squid.

Green turtles nest mainly along the coast of Mozambique and on both Europa and Tromelin Islands (Lauret-Stepler et al. 2007). Loggerheads and leatherbacks nest along the sandy beaches of the northeast coast of KwaZulu-Natal, South Africa, as well as southern Mozambique during summer months. These loggerhead and leatherback nesting populations are the southern-most in the world (Nel et al. 2013). Even though these populations are smaller (in nesting numbers) than most other populations, they are genetically unique and thus globally important populations in terms of conservation of these species (Dutton et al. 1999, Shamblin et al. 2014).

Between breeding events (which occur every two-three years), loggerhead and leatherback turtles migrate to foraging grounds throughout the Southwestern Indian Ocean, as well as in the eastern Atlantic Ocean. Loggerheads tend to stay inshore and travel north to foraging grounds along the southern Mozambican coastline or cross the Mozambique Channel to forage in the waters off Madagascar.

Leatherbacks tend to move south with the Agulhas Current to forage in deeper waters offshore, with some individuals following the Benguela Current along the west coast of South Africa, as far north as central Angola (de Wet, 2013). Both loggerhead and leatherback turtles are likely to be encountered the Block 11B/12B PR Application Area.

Block 11B/12B MMO surveys from December 2019 to March 2020 (1 175.83 hours of visual observations) showed one sighting of a loggerhead turtle (*Caretta caretta*) during the survey (CapMarine 2020a. There were no observations of sea turtles in Block 11B/12B during the 2022 survey, although it is noted that turtles are difficult to locate in swells of above 2 m, and therefore, turtles would not have been seen in choppy or rough seas (BSL & CapMarine 2023).

7.4.8 BIRDS

Some 60 seabird species have been recorded or are considered likely to occur on the south coast of South Africa. These include resident species that breed along the coast (including the African penguin *Spheniscus demersus* and Cape gannet *Morus capensis* (both of which are listed as Endangered by the IUCN), migratory species that visit the coast to overwinter, breed and feed (like Damara tern *Sternula balaenarum*), as well as rare vagrants, which are species that stray outside

their expected breeding, wintering or migrating range (Liversidge & Le Gras, 1981 and Ryan & Rose, 1989.

Fifteen species breed within the South Coast region (see Table 7-4). These species all breed on the coast or islands — Damara terns breed inshore between Cape Agulhas and Cape Infanta, a breeding colony of Cape cormorant is established on Robberg Peninsula, while kelp gulls breed in high numbers on the Keurbooms River estuary spit (Marnewick, et al. 2015, Witteveen, 2015).

There are African penguin colonies along the South Coast at Dyer Island, east of Cape Agulhas, Cape Recife, and on the islands in Algoa Bay (St Croix Island, Jaheel Island, Bird Island, Seal Island, Stag Island and Brenton Rocks), with a new colony established in the De Hoop Reserve east of Cape Agulhas (van der Lingen et al. 2006; Pisces, 2019; SANCCOB, 2023). Several species breed on the beaches between Plettenberg Bay and the eastern boundary of the Tsitsikamma Section of the Garden Route National Park, such as the Caspian tern Hydroprogne caspia, African black oystercatcher *Haematopus moquini* and white-fronted plover *Charadrius marginatus* (Pisces 2019).

Table 7-4 – Breeding resident seabirds present along the South Coast and their Conservation Status

Common Name	Species	Global IUCN Conservation Status (2023)
African Penguin	*Spheniscus demersus*	Endangered
African Black Oystercatcher	*Haematopus moquini*	Least Concern
White-breasted Cormorant	*Phalacrocorax carbo*	Least Concern
Cape Cormorant	*Phalacrocorax capensis*	Endangered
Bank Cormorant	*Phalacrocorax neglectus*	Endangered
Crowned Cormorant	*Phalacrocorax coronatus*	Least Concern
White Pelican	*Pelecanus onocrotalus*	Least Concern
Cape Gannet	*Morus capensis*	Endangered
Kelp Gull	*Larus dominicanus*	Least Concern
Greyheaded Gull	*Larus cirrocephalus*	Least Concern
Hartlaub's Gull	*Larus hartlaubii*	Least Concern
Caspian Tern	*Hydroprogne caspia*	Least Concern
Swift Tern	*Sterna bergii*	Least Concern
Roseate Tern	*Sterna dougallii*	Least Concern
Damara Tern	*Sterna balaenarum*	Least Concern

The seabird colonies, as well as the migratory and vagrant seabird visitors, are mostly supported by an abundance of small pelagic fish species within the productive waters of the Agulhas Bank. Most of the breeding resident seabird species feed on fish (with the exception of the gulls, which scavenge, and feed on molluscs and crustaceans). All these species feed relatively close inshore, although gannets and kelp gulls may feed further offshore (Pisces, 2019).

Large numbers of pelagic seabirds exploit the pelagic fish stocks of the Southern Benguela and Agulhas Bank. Of the 49 species of seabirds that occur in the Benguela region, 14 are defined as resident, ten are visitors from the northern hemisphere and 25 are migrants from the Southern Ocean. Most of the species in the region reach highest densities offshore of the shelf break (200-

500 m depth), with highest population levels during their non-breeding season (winter). Pintado petrels and *Prion* spp. show the most marked variation.

During marine mammal observer (MMO) surveys within Block 11B/12B from 28 November 2022 to 9 December 2022, a total of 14 bird species (1 384 seabird individuals) were counted. The most abundant of which included Cory's shearwater (*Caloneactris borealis*), the Cape gannet (*Morus capensis*), the white-chinned petrel (*Procellaria aequinoctialis*) and the great-winged petrel (*Pterodroma macroptera*) (BSL & CapMarine, 2022).

Additional mid-water trawl vessel observer bird counts from an April 2005 campaign in the region of Block 11B/12B PR were made available by PA Whittington (Pers. Comm. 2023). These data, while expected to vary seasonally, provide insight as to which species utilise the area and some approximation of numbers of species in the area (see details in Table 3.6 of Anchor Environmental Consultants, 2023). The most abundant species were the vulnerable white-chinned Petrel *P. aequino*ctialis (which is a night surface feeding and surface diving species) with 1 209 individuals counted over 16 days. Also abundant were the endangered plunge-diving Cape gannet *M. capensis* (792 individuals) and Indian yellow-nosed Albatross *Thalassarche carteri* (280 individuals), the near threatened shy albatross *Diomedia cauta* (195 individuals) and Wilson's storm petrel *Oceanites oceanicus* (109 individuals).

7.4.9 MARINE MAMMALS

7.4.9.1 Species

Based on historic sightings or strandings records, as well as habitat projections of known species parameters, an estimated 35 species of cetaceans (whales and dolphins) are thought to occur (or are likely to occur) in the waters of the South Coast (see Table 7-5) (Findlay *et al.*, 1992, Best, 2007, Weir ,2011, unpublished records held by Sea Search, Pisces, 2014 and Pisces, 2019). One resident species of coastal pinniped is present (the Cape fur seal *Arctocephalus pusillus pusillus*), while vagrant records include southern elephant seal (*Mirounga leoninas*), subantarctic fur seal (*A. tropicalis*), crabeater seal (*Lobodon carcinophagus*) and leopard seal (*Hydrurga leptonyx*) (David, 1989). The position of Block 11B/12B in relation to Important Marine Mammal Areas (IMMA) is presented in more detail in Section 7.4.12 below.

The distribution of cetaceans can largely be split into those associated with the continental shelf and those that occur in deep, oceanic water. Importantly, species from both environments may be found on the continental slope (200 -2 000 m), making this a very species rich area for cetaceans. Cetacean density on the continental shelf is usually higher than in pelagic waters as species associated with the pelagic environment tend to be wide ranging covering thousands of kilometres.

The most common species within Block 11B/12B (in terms of likely encounter rate, not total population sizes) are the long-finned pilot whale and humpback whale. Southern right whales, Bryde's whales, common bottlenose dolphins, common dolphins and sperm whales are also likely to occur in Block. Sei whales (Endangered) and killer whales are also likely to occur in low densities. Blue (Critically Endangered), fin (Vulnerable), Antarctic minke (Near Threatened), dwarf or common minke and pygmy right whales may also occur in Block 11B/12B as they all show some degree of migration to, or through, the area between their feeding and breeding grounds (CapMarine, 2020a; 2020b; Purdon, *et al.* 2020a; IUCN 2023).

Table 7-5 - Cetacean occurrence off the South Coast of South Africa, their distribution, seasonality, hearing frequency, and IUCN Red List conservation status [(Southall et al. 2019), (IUCN 2023), (*Penry et al. 2016), (Barendse & Carvalho 2016) in (Anchor Environmental, 2023)]**

Common name	Species name	Hearing Frequency[29]	Distribution		Seasonality (presence in the area)	Global IUCN (2023) Conservation Status
			Shelf (<200 m)	Offshore (>200 m)		
Delphinids (Odontocetes)						
Dusky dolphin	*Lagenorhynchus obscurus*	HF	Yes (0-800 m)	No	Year round	Least Concern
Heaviside's dolphin	*Cephalorhynchus heavisidii*	VHF	Yes (0-200 m)	No	Year round	Near Threatened
Common bottlenose dolphin	*Tursiops truncatus*	HF	Yes	Yes	Year round	Least Concern
Common dolphin	*Delphinus delphis*	HF	Yes	Yes	Year round	Least Concern
Indo-Pacific bottlenose dolphin	*Tursiops aduncus*	HF	Yes	No	Year round	Near Threatened
Southern right whale dolphin	*Lissodelphis peronii*	HF	Yes	Yes	Year round	Least Concern
Striped dolphin	*Stenella coeruleoalba*	HF	No	Data deficient		Least Concern
Indian Ocean humpback dolphin	*Sousa plumbea*	HF	Yes	No	Year round	Endangered
Pantropical spotted dolphin	*Stenella attenuata*	HF	Yes (edge)	Yes	Year round	Least Concern
Risso's Dolphin	*Grampus griseus*	HF	Yes (edge)	Yes	Data deficient	Least Concern
Long-finned pilot whale	*Globicephala melas*	HF	Yes (edge)	Yes	Year round	Least Concern
Short-finned pilot whale	*Globicephala macrorhynchus*	HF	Data deficient			Least Concern
Rough-toothed dolphin	*Steno bredanensis*	HF	Data deficient			Least Concern
Killer whale	*Orcinus orca*	HF	Yes (occasional)	Yes	Year round	Data deficient

[29] Hearing frequency abbreviations: HF = High Frequency, VHF = Very High Frequency, LF = Low Frequency

Common name	Species name	Hearing Frequency[29]	Distribution		Seasonality (presence in the area)	Global IUCN (2023) Conservation Status
			Shelf (<200 m)	Offshore (>200 m)		
False killer whale	*Pseudorca crassidens*	HF	Yes (occasional)	Yes	Year round	Near Threatened
Pygmy killer whale	*Feresa attenuata*	HF	Data deficient			Least Concern
Sperm whales (Odontocetes)						
Pygmy sperm whale	*Kogia breviceps*	VHF	Yes (edge)	Yes	Year round	Least Concern
Dwarf sperm whale	*Kogia sima*	VHF	Yes (edge)	Data deficient		Least Concern
Sperm whale	*Physeter macrocephalus*	HF	Yes (edge)	Yes	Year round	Vulnerable
Beaked whales (Odontocetes)						
Cuvier's beaked whale	*Ziphius cavirostris*	VHF	No	Yes	Year round	Least Concern
Baird's Beaked Whale	*Berardius bairdii*	HF	No	Yes	Year round	Least Concern
Southern bottlenose beaked whale	*Hyperoodon planifrons*	HF	No	Yes	Year round	Least Concern
Hector's beaked whale	*Mesoplodon hectori*	HF	No	Yes	Year round	Data Deficient
Strap-toothed Whale	*Mesoplodon layardii*	HF	No	Yes	Year round	Least Concern
True's beaked whale	*Mesoplodon mirus*	HF	No	Yes	Year round	Least Concern
Gray's beaked whale	*Mesoplodon grayi*	HF	No	Yes	Year round	Least Concern
Blainville's beaked whale	*Mesoplodon densirostris*	HF	No	Yes	Year round	Least Concern
Baleen whales (Mysticetes)						
Antarctic minke whale	*Balaenoptera bonaerensis*	LF	Yes	Yes	>Winter	Near Threatened
Common minke whale	*Balaenoptera acutorostrata*	LF	Yes	Yes	Year round	Least Concern
Fin whale	*Balaenoptera physalus*	LF	Yes	Yes	MJJ & ON	Vulnerable
Blue whale (Antarctic)	*Balaenoptera musculus ssp. intermedia*	LF	No	Yes	Winter peak	Critically Endangered
Sei whale	*Balaenoptera borealis*	LF	Yes	Yes	MJ & ASO	Endangered
Bryde's whale (inshore subspp.)	*Balaenoptera brydei* (previously *B. edeni*)	LF	Yes	Yes	Year round	Vulnerable*

Common name	Species name	Hearing Frequency[29]	Distribution		Seasonality (presence in the area)	Global IUCN (2023) Conservation Status
			Shelf (<200 m)	Offshore (>200 m)		
Pygmy right whale	*Caperea marginata*	LF	Yes	Data deficient	Year round	Least Concern
Humpback sp.	*Megaptera novaeangliae*	LF	Yes	Yes	Year round, SONDJF	Least Concern
Humpback B2 population	*Megaptera novaeangliae*	LF	Yes	Yes	Summer peak ONDJF	Vulnerable**
Southern right whale	*Eubalaena australis*	LF	Yes	No	Year round, SONDJF	Least Concern

7.4.9.2 Migration

The following section details the common cetacean species distribution and behaviour in South African waters, with particular focus on the probability on presence within Block 11B/12B.

- **Southern right whale:** Southern right whales migrate to the lower latitudes of southern Africa to breed and calve and arrive between June and November each year. They exhibit an exclusively coastal distribution mainly in sheltered bays, 90% <2 km from shore (Best 1990, Elwen & Best 2004). Southern right whales are likely to occur in Block 11B/12B during winter. They typically arrive in coastal waters off the South Coast between June and November each year, although animals may be sighted as early as April and as late as January. Although there are no recent data available on the numbers of right whales feeding in the St Helena Bay area, mark-recapture data from 2003-2007 estimated roughly one third of the South African right whale population at that time were using St Helena Bay for feeding (Peters et al. 2005). Given this high proportion of the population known to feed in the southern Benguela, and the historical records, it is highly likely that several hundreds of right whales can be expected to pass directly through Block 11B/12B between May and June and then again November to January.
- **Bryde's whale**: Two genetically and morphologically distinct populations of Bryde's whales are present off the coast of southern Africa (Best 2001, Penry 2010, Penry et al. 2016, Penry et al. 2018). The larger offshore form has recently been described as *Balaenoptera brydei*, while the taxonomic status of the smaller inshore form is uncertain but may be considered a subspecies of *B. brydei* (Best 2007, Penry et al. 2016, Penry et al. 2018). The offshore form is unlikely to be encountered off the South Coast. The "inshore population" is unique amongst the southern African baleen whales in that it is resident year-round on the continental shelf and Agulhas Bank, occasionally undertaking small seasonal trips up the east coast during the annual sardine migration (Caputo et al. 2017). The inshore form has a small population of approximately 600 individuals, possibly declining in numbers. The current distribution of this population implies that it is highly likely to be present in Block 11B/12B throughout the year, with peak encounter rates in late summer and autumn (Penry et al. 2011, Purdon et al. 2020a).
- **Humpback whale**: The majority of humpback whales on the south and east coasts of South Africa are migrating past southern Africa from their Antarctic feeding grounds to their winter breeding grounds in the tropical waters off both east and west Africa (Rosenbaum et al. 2009, Barendse et al. 2010). The main winter concentration areas for humpback whales on the African east coast include Mozambique, Madagascar, Kenya and Tanzania on the east coast. Those feeding in the southern Benguela are defined as breeding stock B2 by the International Whaling Commission (IWC), and are classified as Vulnerable (Barendse et al. 2011, Barendse & Carvalho 2016, IWC 2012). The number of humpback whales feeding in the southern Benguela region has increased substantially since estimates made in the early 2000s (Barendse et al. 2011). Three principal migration routes for humpbacks in the south-west Indian Ocean have been identified. The first route extends along the East Coast of South Africa, reaching the coast near Knysna and continuing as far north as central Mozambique. This migration route therefore passes through Block 11B/12B. The second route approaches Madagascar directly from the south, with the humpbacks possibly following the Mozambique Ridge. A third, less well-established route appears to move up the centre of the Mozambique Channel to Aldabra and the Comoros Islands (Findlay et al. 1994; Best et al. 1998). Most humpbacks reach southern African waters around April, continuing through to September/October when the southern migration begins and continues

through to December. The calving season for humpbacks extends from July to October, peaking in early August (Best 2007).
Off Cape Vidal, whale abundances peak around June/July on their northward migration (although some have been observed still moving north as late as October). Southward moving animals on their return migration are generally first seen in July, peaking in August and continuing to late October. Humpbacks have been recorded by Marine Mammal Observers in Block 11B/12B (CapMarine, 2020b, BSL & CapMarine, 2023). Humpback whales are likely to be present in Block 11B/12B during summer and winter, with higher probability of occurrence in summer. Members of the Vulnerable B2 breeding stock may be encountered year-round (Rosenbaum *et al.* 2009), (Pisces, 2018).
Sei Whale: The Endangered Sei whale migrates through South African waters to unknown breeding grounds further north, peaking in abundance on the East Coast in June and September. There is no contemporary information on their abundance or distribution patterns in the region. However, given their historical migration routes they are likely to occur in Block 11B/12B in low densities (Pisces, 2018).
Sperm whale: Sperm whales live in deep ocean waters usually >1 000 m, but occasionally come inshore on the shelf into depths of 500-200 m (Best 2007). Seasonality of catches off the East Coast suggest that medium- and large-sized males are more abundant during winter (June to August), while female groups are more abundant in summer (December-February), although animals occur year-round (Best 2007). Although considered relatively abundant worldwide, no current data are available on density or abundance of sperm whales in African waters, and they are now classified as Vulnerable (Whitehead, 2002; IUCN, 2023).
Recent results on their distribution suggest that they have a relatively high probability of occurring in Block 11B/12B, increasing in winter (Purdon *et al.* 2020a) . They have been frequently encountered or detected via Passive Acoustic Monitoring (PAM) during seismic surveys in Block 11B/12B (CCA Environmental, 2005; CapMarine, 2020a, 2020b; BSL & CapMarine 2023).
Beaked whales: Little is known about the distribution of beaked whales, as they were never targeted commercially, and they tend to be inaccessible to researchers. They are usually seen in waters over 1 000-2 000 m deep (Best 2007). Beaked whales are known to undertake dives over 2 km, lasting over an hour, making them more difficult to detect visually (Tyack *et al.* 2011).
This group is particularly vulnerable to some sources of anthropogenic noise, especially mid-frequency naval sonar, with evidence of decompression sickness often present in stranded animals (Fernandez *et al.* 2005).

- ***Kogia* species**: Pygmy Sperm Whales *Kogia breviceps* and Dwarf Sperm Whales *K. sima* are widely distributed species that inhabit deep water in tropical, subtropical and temperate habitats across the globe (McAlpine, 2018). Due to their cryptic nature, distributional ranges are inferred from strandings, or occasional individuals captured in fisheries, rather than live sightings at sea (McAlpine, 2018). Both species are likely to occur in Block 11B/12B year around.
- **Common dolphin**: Two species of common dolphin are currently recognised, the short-beaked common dolphin *Delphinus delphis* and the long-beaked common dolphin *D. capensis*. While the distribution of common dolphins tends to be in warm-temperate and tropical waters globally, off South Africa the short-beaked seems to prefer offshore habitats and the long-beaked appears to have multiple disjunct populations in nearshore waters <500 m deep. Both species have been encountered in Block 11B/12B during seismic surveys (CCA Environmental, 2005; CapMarine

2020a, 2020b; BSL & CapMarine, 2023). Their predicted distribution indicates a high probability of occurrence in Block 11B/12B (Purdon *et al.* 2020b).

- **Bottlenose dolphin**: Two species of bottlenose dolphins occur around southern Africa. the smaller, Near Threatened Indo-Pacific Bottlenose dolphin *Tursiops aduncus* occurs exclusively to the east of Cape Point in water usually less than 50 m deep and generally within 1 km of the shore, while the larger common bottlenose dolphin *T. truncatus* generally further offshore around the shelf edge and pelagic waters on the south coast (Ross, 1984; Ross et al. 1987). Their distribution is essentially continuous from Cape Agulhas eastwards to southern Mozambique. There are also seasonal movements of a genetically distinct 'migratory stock' of Indo-Pacific bottlenose dolphins along the South and East Coasts in association with the 'sardine run' (Natoli et al. 2008). Common bottlenose dolphins have been frequently sighted within Block 11B/12B (CCA Environmental, 2005; CapMarine 2020a, 2020b).
- **Risso's dolphin**: Risso's dolphins Grampus griseus have worldwide distribution in tropical and temperate waters, showing a general preference for the shelf edge <1 500 m deep (Best, 2007; Purdon et al. 2020). This species has been sighted many times along the shelf edge of the Agulhas Bank and has also been sighted in Block 11B/12B [(CapMarine 2020a). Their predicted distribution indicates a high probability of occurrence in the Block 11B/12B PR Application Area (Purdon et al. 2020b).
- **Killer whale (Orca):** Killer whales *Orcinus orca* occur circum-globally and are found in all oceans between the equator and the ice edge (Best, 2007). They occur year-round in low densities off the South African coast (Best et al. 2010). Their predicted distribution indicates a moderate to high probability of occurrence in Block 11B/12B and they have been encountered in low levels in the Block (CapMarine, 2020b; Purdon et al. 2020b).
- **Long-finned and short-finned pilot whale**: Long-finned pilot whales display a preference for temperate waters and are usually associated with the continental shelf or adjacent deep water (Mate et al. 2005; Weir, 2011). The distinction between long-finned and short-finned pilot whales is difficult to make at sea. As the latter are regarded as more tropical species, it is likely that most of pilot whales encountered in Block 11B/12B will be long-finned (Best, 2007). However, due to the influence of the Agulhas Current in the area, the occurrence of short-finned pilot whales cannot be excluded. Pilot whales have been frequently encountered during seismic surveys in Block 11B/12B (CapMarine, 2020b).
- **Other species**: Other dolphins that may occur within Block 11B/12B at low levels include the pygmy killer whale, Fraser's dolphin, pan-tropical spotted dolphin and striped dolphin (Findlay et al. 1992; Best, 2007). Striped dolphins were frequently encountered during a seismic survey in Block 11B/12B in early 2020 (CapMarine, 2020a, 2020b).
- The **Cape fur seal** *Arctocephalus pusillus pusillus* is the only species of seal resident along the South Coast, occurring at numerous breeding and non-breeding sites on the mainland, namely at Seal Island in Mossel Bay (population of about 4 000 individuals), on the northern shore of the Robberg Peninsula in Plettenberg Bay (5 000) and at Black Rocks (Bird Island group) in Algoa Bay (Pisces, 2019). These colonies are all well inshore of Block 11B/12B.

  Seals are highly mobile animals with a general foraging area covering the continental shelf up to 120 nautical miles offshore. While the movement of seals from the three South Coast colonies are poorly known, limited tracking of the Algoa Bay colony has suggested these seals generally feed in the inshore region south of Cape Recife (Pisces, 2019). The Cape fur seal population in South Africa is regularly monitored by the DFFE, and the overall population is considered healthy and

stable in size, although there has been a westward and northward shift in the distribution of the breeding population (Kirkman et al. 2013).

The 2022 Bourbon Evolution 807 environmental survey campaign of Block 11B/12B and both pipeline routing options included opportunistic MMO surveys (BSL & CapMarine 2023). Between 28 November 2022 and 14 December 2022, there were 13 cetacean sightings in Block 11B/12B, consisting of 212 striped dolphins (*S. coeruleoalba*), 82 long-beaked common dolphins (*D. capensis*), six unidentified dolphins, four unidentified whales and two humpback whales (*M. novaeangliae*) (BSL, 2023B). There were eight Passive Acoustic Monitoring (PM) detections within Block 11B/12B, including at least two sperm whales (*P. macrocephalus*), at least 40 unidentified Delphinidae and one Odontocete detections (BSL & CapMarine, 2023).

7.4.10 NEAR ENVIRONMENT

7.4.10.1 Intertidal and Subtidal Habitats

The South Coast between Cape Agulhas and Gqeberha is approximately 730 km long and is characterised by a number of Capes (e.g., Cape Agulhas, Cape Infanta, Cape Seal, Robberg and Cape Recife) separated by sheltered sandy half-heart embayments (e.g., Algoa Bay, St Francis Bay, Plettenberg Bay, Mossel Bay and St Sebastian Bay) (Lubke and Moor, 1998). The nearshore region comprises mainly sandy beaches, wave cut rocky platforms and exposed rocky headlands and cliffs, although pebble beaches are also present. The relatively high rainfall and regional topography has also resulted in the formation of a number of estuaries (Lubke and Moor, 2008). Most of the south coast nearshore and coastal zone is rocky shore (~53%), with a general zonation pattern typical of temperate systems (Jackson and Lipschitz 1984, Harris et al. 2019). Some 47% of the coast is made up of sandy beaches and other sedimentary features (Umvoto, 2010). The subtidal environment is again divided between subtidal soft sediment communities and rocky subtidal areas. These nearshore rocky reefs host diverse communities of both epifauna and mobile biota (Dorrington et al. 2018). It should be noted too that the bulk of the South African population of the Damara Tern *Sternula balaenarum* breeds between the Sundays River and Woody Cape (BirdLife, 2018).

7.4.10.2 Estuaries

An “estuary” or “estuarine system” is defined as “a body of surface water that (a) is permanently or periodically open to the sea; (b) in which a rise and fall of the water level as a result of the tides is measurable at spring tides when the body of surface water is open to the sea; or (c) in respect of which the salinity is higher than fresh water as a result of the influence of the sea, and where there is a salinity gradient between the tidal reach and the mouth of the body of surface water.’’

In South Africa, a revised classification system has recently been introduced which categorises coastal outlets into nine different estuary types and three micro-system types. Based on this classification system, South Africa has 290 functional estuaries and 202 micro-systems (Van Niekerk *et al.* 2019a). The National Biodiversity Assessment (NBA) defines the Estuarine Functional Zone (EFZ) as “*the area that not only encapsulates the estuary waterbody, but also the supporting physical and biological processes and habitats necessary for estuarine function and health. It includes all dynamic areas influenced by long-term estuarine sedimentary processes, i.e., sediment stored or eroded during floods, changes in channel configuration, aeolian transport processes, and changes due to coastal storms. It also encompasses all the multiple ecotones of floodplain and estuarine vegetation that contribute detritus (food source) and provide refuge from strong currents during high*

flow events". In other words, the EFZ defines the 'space' within which estuaries function over longer time scales, because the promotion of wise use of estuarine resources and the protection and conservation of estuarine biodiversity requires not only the protection of estuarine habitat and biota, but also the protection of the physical processes/functions that sustain ecological and evolutionary processes (Van Niekerk & Turpie 2012, Van Niekerk *et al.* 2013, Van Niekerk *et al.* 2019a).

Estuaries along the South Coast generally fall within the Warm Temperate bioregion, and range in scale from the moderately large Breede and Knysna River systems down to micro-estuaries with very little flow at all (van Niekerk et al. 2019a). There are 46 estuarine systems along the South Coast coastline between Cape Agulhas and Gqeberha, of which 23 are classed as Natural or Near Natural, three are listed as Endangered and 20 others are listed as Vulnerable (Van Niekerk et al. 2019b) (Figure 7-14). One of the estuaries (the Heuningnes) (Figure 7-14) has been proclaimed as a Ramsar Site, while 13 fall within National Parks and four others are protected within local or provincial nature reserves (Russell *et al.* 2012) .

Nine of the estuarine systems are classed as predominantly open and one (the Knysna estuary) as an estuarine bay. These ten systems are particularly important for recruitment for inshore linefish species and are the most vulnerable to marine pollution events as they receive tidal inflows almost constantly. Only six of the estuaries are fluvially dominated and therefore largely invulnerable to marine pollution, with the remainder vulnerable as often as the estuary mouth is open (Van Niekerk et al. 2019a). Tidal range varies greatly, with tidal range in the Breede estuary extending over 50 km inland, making it vulnerable to potential marine pollution (DWAF 2003).

Estuaries are highly productive systems and offer rich feeding grounds, warmer temperatures and sheltered habitat for many organisms. The high productivity is exploited by many line-fish and harvested invertebrate species either as a nursery or later in life either directly through habitat availability or indirectly through the contribution to overall coastal productivity (van Niekerk et al. 2019c).

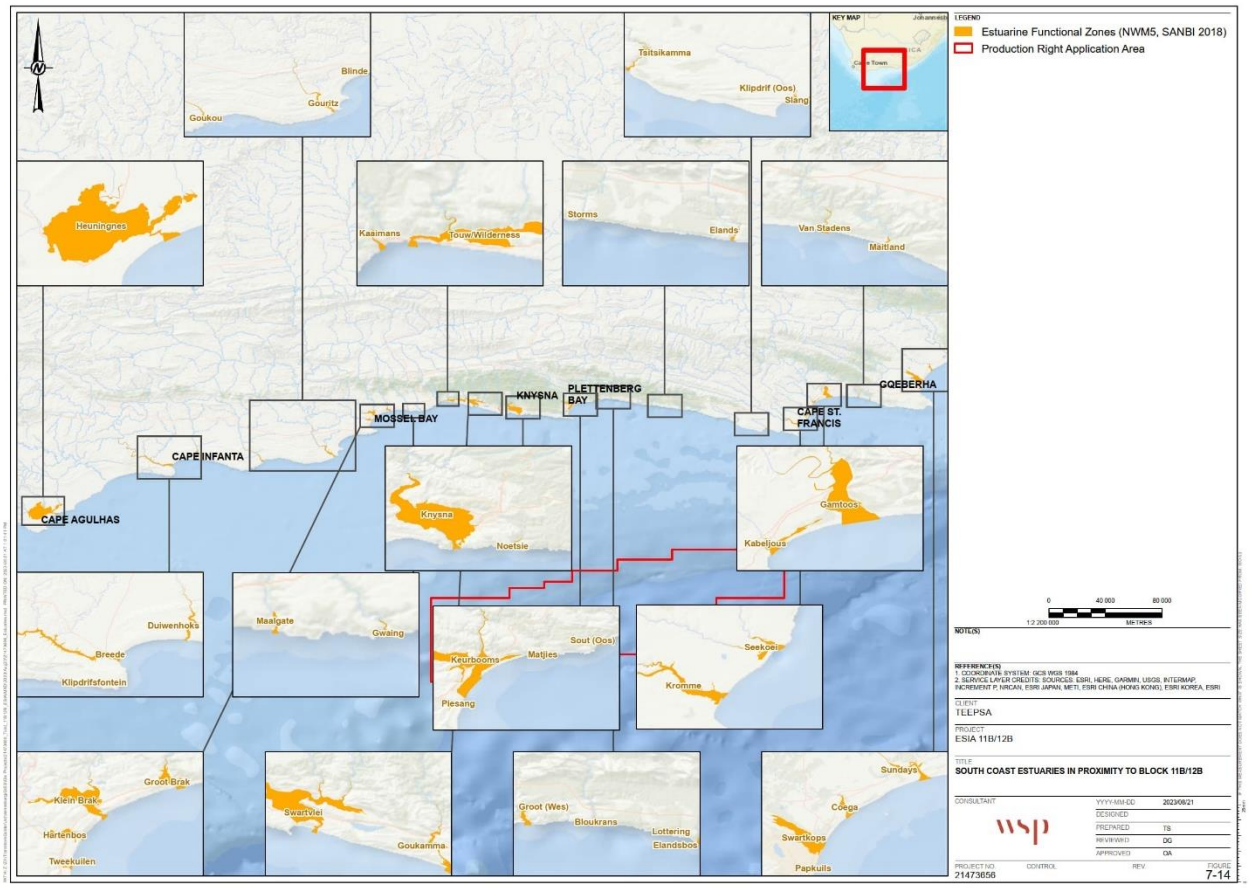


Figure 7-14 – South Coast estuaries in proximity to Block 11B/12 (Anchor Environmental, 2023)

7.4.11 RED LIST SPECIES

Red list species that could occur in proximity to Block 11B/12B are presented in As per the IUCN Red listing, leatherback and loggerhead **turtles** are both described as “Vulnerable”, and the green turtle is “Endangered” on a global scale (IUCN, 2023). As a signatory of Convention on Migratory Species, South Africa has endorsed and signed two sister agreements specific to the conservation and management of sea turtles (these are the Africa-Atlantic and Indian Ocean South East Asia Memoranda of Understanding). South Africa is therefore committed to the protection of all species of sea turtles occupying its national waters, whether they are non-resident nesters (loggerhead and leatherback turtles) or resident foragers (green turtles) (Pisces, 2014a). The NEM: BA Threatened or Protected Species Regulations (2007) list leatherback *Dermochelys coriacea* and *loggerhead Caretta caretta* turtles as Critically Endangered Species and the green turtle *Chelonia mydas* as Endangered.

Numerous seabird species have shown a steady deterioration in status around the world and South Africa (Butchart *et al.,* 2004, Crawford *et al.,* 2018 and Sherley *et al.,* 2019). This is reflected in the upgrading of some species to the IUCN Endangered list (2023), including the African penguin (upgraded from Vulnerable to Endangered in 2010), the Cape Gannet (upgraded from Vulnerable to Endangered in 2010), and the Cape Cormorant (upgraded from Near Threatened to Endangered in 2013).

These declines have not been equal across South Africa, with the bulk of declines occurring at West Coast colonies. For example, the Eastern Cape African penguin population (specifically Algoa Bay) has declined at a slower rate than elsewhere in South Africa, the area has become increasingly important in terms of its relative contribution to the global population (Sherley *et al.,* 2020). In a similar way, the Cape Gannet colony at Bird Island/Algoa Bay grew from approximately 22 000 pairs in 1956/57 to approximately 95 000 pairs in 2004/05 and subsequently plateaued, with >70% of all Cape Gannets (i.e., the global population) now nesting at Bird Island/Algoa Bay, at the eastern extremity of their breeding distribution (Sherley *et al.,* 2019).

Red list pelagic species likely to be encountered in Block 11B/12B (as per observer data) include the endangered Indian yellow-nosed albatross, Atlantic yellow-nosed albatross and Cape gannet, the vulnerable White-chinned petrel, Spectacled petrel and Leach’s storm petrel. Near threated species include the Shy albatross, Sooty shearwater and Flesh-footed Shearwater.

Of the 35 cetacean species listed as likely to occur in South Coast waters, the blue whale is listed as Critically Endangered, the sei whale and Indian Ocean humpback dolphin are considered Endangered, while fin, Bryde’s (inshore), Humpback (B2 population) and sperm whales are considered Vulnerable (IUCN, 2023). Although listed as Near Threatened in the IUCN Red Data book, the Indo-Pacific bottlenose dolphin is listed as Vulnerable in the South African Red Data Book, while the migratory subpopulation is considered Endangered (Peddemors & Oosthuizen, 2004).

Many of the large pelagic fish species likely to be encountered are considered threatened by the IUCN, primarily due to overfishing. Tuna and swordfish are targeted by high seas fishing fleets and illegal overfishing has severely damaged the stocks of many of these species. Globally, the Southern Bluefin tuna is considered Endangered, while Bigeye tuna and Blue marlin are ‘Vulnerable’ and Striped marlin is ‘Near Threatened’ (IUCN, 2023.

Of the eleven shark species likely to occur in the vicinity of the Block 11B/12B PR Application Area, five are listed as Endangered by the IUCN Red List (the Pelagic Thresher shark, Dusky shark, Whale

shark, Shortfin and Longfin Mako shark), while the Great Hammerhead shark and Oceanic whitetip shark are listed as Critically Endangered (IUCN, 2023). The great white shark *C. carcharias* is a significant apex predator in the Algoa Bay area, and while listed as Vulnerable by the IUCN (2023), also listed in the CITES Appendix II as a species in which trade must be controlled in order to avoid utilisation incompatible with their survival and has been a Protected species in South Africa since 1991 (Pisces, 2019). The bronze whaler shark is also listed as Vulnerable (IUCN, 2023).

7.4.12 MARINE PROTECTED AREAS AND OTHER VULNERABLE AREAS

7.4.12.1 Marine Protected Areas

A MPA is an area of ocean and/or coastline specifically protected for the benefit of people and the environment. It is stated in the Protected Areas Act, 2003 (Act 57 of 2003) that "*no person may conduct commercial prospecting or mining, exploration, production or related activities in a protected environment without the written permission of the Minister and the Cabinet member responsible for minerals and energy affairs*". Therefore, these areas provide some refuge from human induced impacts for marine species and ecosystems. Prior to 2019, South Africa had 25 formally declared MPAs which covered a total ocean area of 0.43% of South Africa's mainland ocean territory (not including the Prince Edward Island in the Southern Ocean).

In May 2019, the government formally gazetted the addition of 20 new or expanded MPAs (identified through Operation Phakisa), thereby increasing the total number of MPAs to 41 and the protected area of South Africa's Exclusive Economic Zone (EEZ) to 5% (Government Gazette 42478, Notice No. 757). These areas provide some protection to 87% of the different marine ecosystem types found in South African waters, ensuring that the MPA network is representative of the country's important diversity (SANBI 2019). Included in this was the addition of a number of new offshore MPAs, the purpose of which is to help ensure the sustainability of food and job security provided by fisheries, by securing the spawning grounds of numerous marine species as well as protecting vulnerable and unique habitats.

The seabed communities in Block 11B/12B are known to exhibit high levels of endemism, and as such, the coastal area in the vicinity of Mossel Bay has been recognised as one of seven areas in the biozone in need of additional protection which has been granted in the form of these offshore MPA designations. Offshore MPAs in close proximity to Block 11B/12B include the **Southwest Indian Seamounts MPA** (Notice No. 42478) to the southwest of Block, and the **Port Elizabeth Corals MPA** (Notice No. 42478) to the northeast (Figure 7-15-). There is no overlap of the proposed production area or either pipeline corridor with any offshore MPAs (Figure 7-15-).

There are also a number of MPAs closer to shore to the north of 11B/12B (Figure 7-15-). These include **Tsitsikamma MPA** (95 km to the north of the Block), **Robberg MPA** (~100 km to the north of the Block), **Goukamma MPA** (~115 km to the northwest of the Block), **De Hoop MPA** (170 km to the northwest of the Block), **Sardinia Bay MPA** (100 km to the northeast of the Block) and **Addo Elephant National Park Marine Protected Area** (~130 km to the northeast of the Block).

7.4.12.2 Ecosystem Threat Status

The Ecosystem Threat Status developed by SANBI (2018) is an indicator of how threatened ecosystems are, specifically the degree to which ecosystems are still intact or alternatively losing vital aspects of their structure, function, or composition (Harris et al. 2018). Ecosystem types are

categorised as “Critically Endangered”, “Endangered”, “Vulnerable”, “Near Threatened” or “Least Concern”, based on the proportion of the original extent of each ecosystem type that remains in good ecological condition relative to a series of biodiversity thresholds.

The habitat threat status of most the ecosystem types within the PR Application Area and both associated pipeline routing corridor options is “Least Concern” (see Figure 7-16-17). The Agulhas Blues habitat to the northwest (see 7.4.2) is considered “Near Threatened” and the Agulhas Coarse Sediment Shelf Edge is “Vulnerable” (Sink et al. 2019). The Kingklip Ridge habitat type to the northeast falls within the Port Elizabeth Corals Marine Protected Area and is considered to be ‘Endangered’ (Sink et al. 2019).

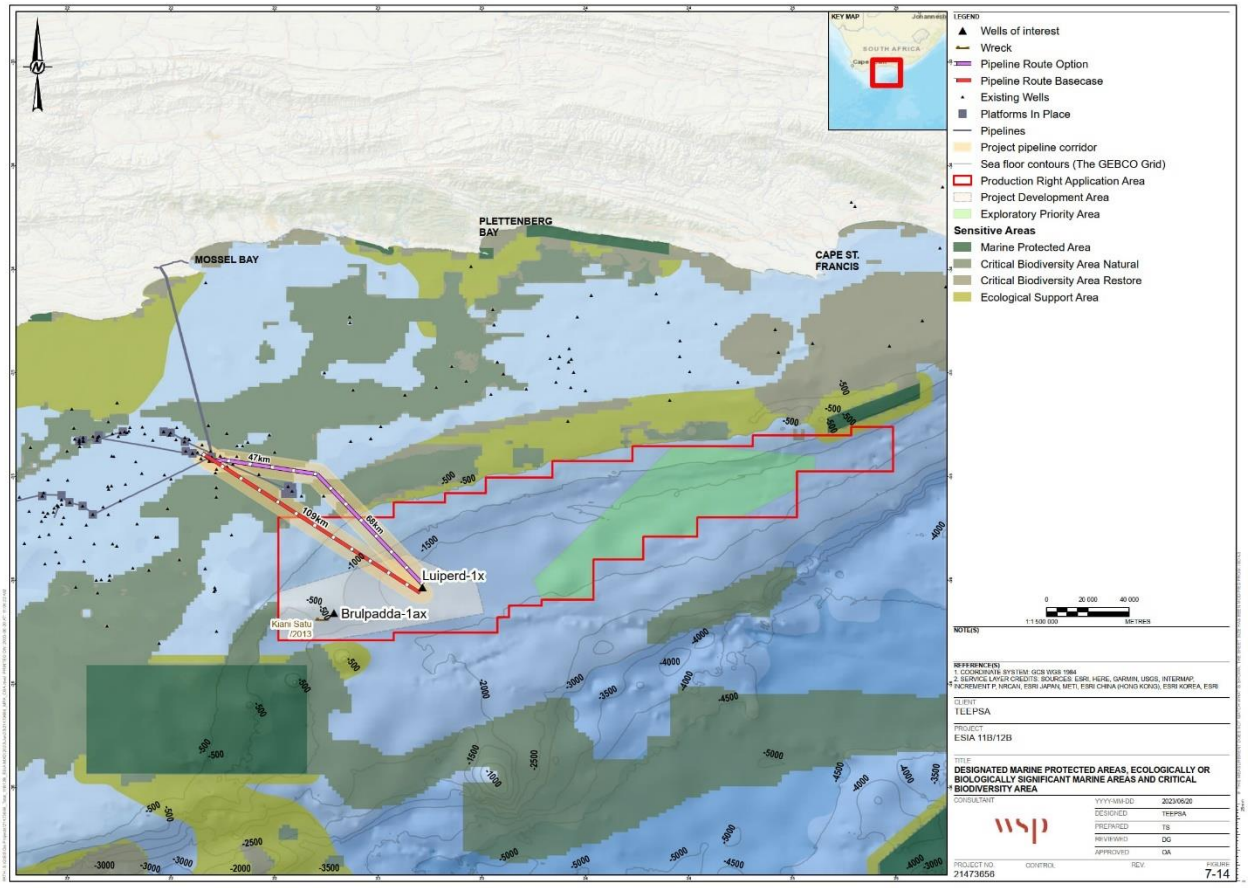


Figure 7-15-- Designated MPAs, EBSAs and Proposed CBAs in the Project Area

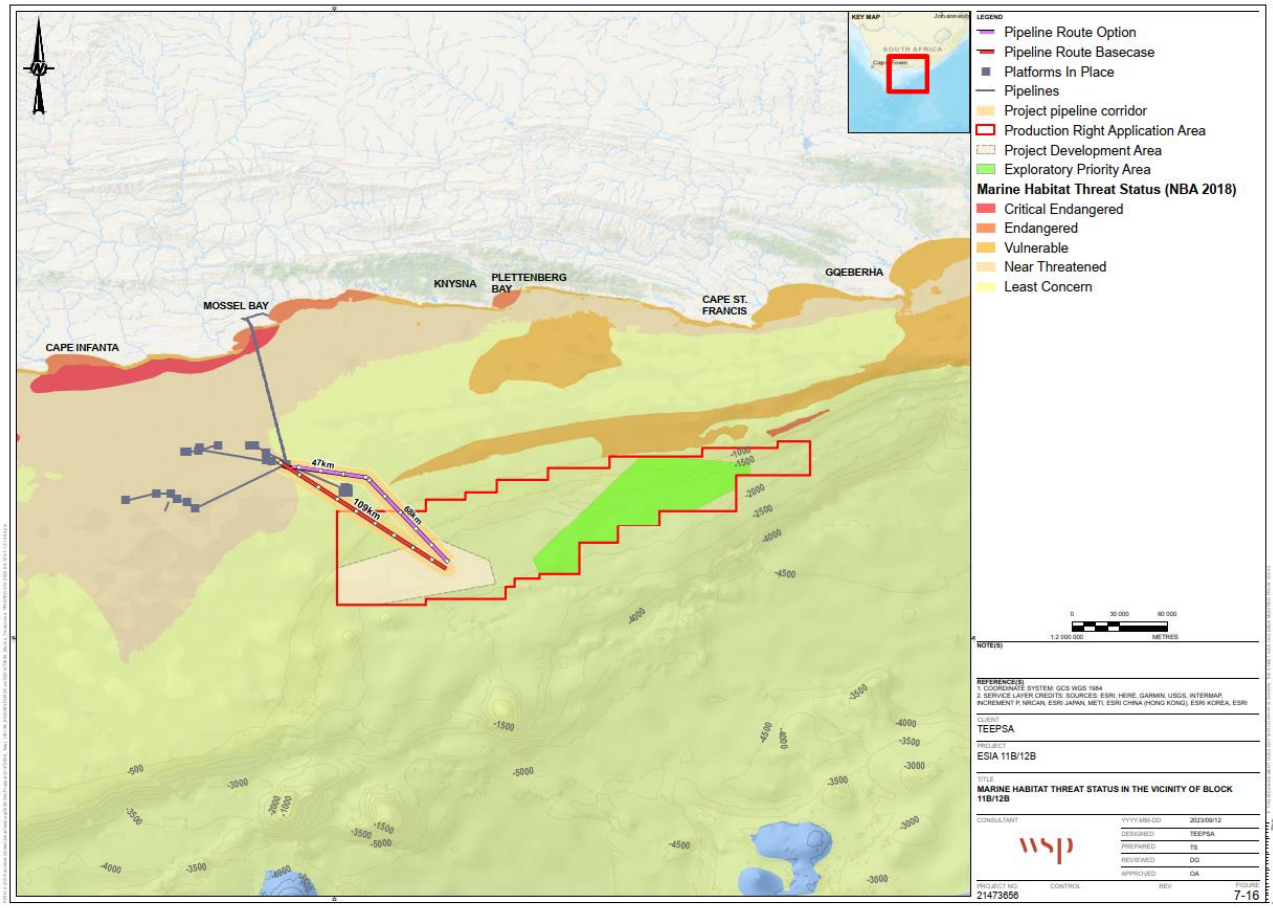


Figure 7-16-17 – Ecosystem types categorised as "Critically Endangered" (CE), "Endangered" (E), "Vulnerable" (V), "Near Threatened" (NT) or "Least Concern" (LC) as per the NBA (Sink et al. 2019) within and around Block 11B/12B (Anchor Environmental, 2023)

7.4.12.3 Ecologically or Biologically Significant Areas

Ecologically or Biologically Significant Marine Areas (EBSAs) are defined by the Convention on Biological Diversity (CBD) as “geographically or oceanographically discrete areas that provide important services to one or more species/populations of an ecosystem or to the ecosystem as a whole, compared to other surrounding areas or areas of similar ecological characteristics, or otherwise meet the [EBSA] criteria”. In the marine realm, South Africa has a network of EBSAs, based on original focus areas for offshore MPAs, which were adopted by the CBD in 2014 (CBD, 2016 and MARISMA, 2020).

The Benguela Current Commission (BCC) and its member states have been working on a regional Marine Spatial Management and Governance Programme (MARISMA 2014-2020). The intent is to refine the boundaries of existing EBSAs and identify relevant new ones, assess their status and management requirements, and incorporate these into Marine Spatial Planning (MSP) processes in each country to achieve sustainable ocean use in the Benguela Current (Harris et al. 2019). Through the MARISMA Project (https://cmr.mandela.ac.za/Research-Projects/EBSA-Portal/MARISMA), South Africa currently has 12 EBSAs solely within its national jurisdiction and shares 8 transboundary EBSAs with other countries (Namibia and Mozambique) and/or the high seas.

The principal objective of these EBSAs is identification of features of higher ecological value that may require enhanced conservation and management measures. The northern border of Block 11B/12B falls alongside the full extent of the ‘Kingklip Corals’ EBSA, and the Block lies just to the northeast of the Shackleton Seamount Complex EBSA. While the Base case route for the pipeline is located approximately 16 km from the Kingklip Corals EBS, the proposed Option pipeline route passes through the southwestern corner of the Kingklip Corals EBSA (Figure 7-15-).

7.4.12.4 Critical Biodiversity Areas

A proposed Critical Biodiversity Area (CBA) assessment presents a spatial plan for the natural environment, designed to inform planning and decision-making in support of sustainable development, and CBA maps are developed using the principles of systematic biodiversity planning (SANBI, 2017, Proposed Approach to Spatial Development and Management for South Africa’s Marine Planning Areas, 2019, and the Draft Marine Sector Plan for the Biodiversity Sector, 2023). These maps comprise three categories of proposed biodiversity priority areas, namely Protected Areas, CBAs (called “Biodiversity Conservation/Restoration Areas” in the Draft Marine Sector Plan for the Biodiversity Sector 2023) and Ecological Support Areas (ESAs) (“Biodiversity Impact Management Zones”), which are jointly important for the persistence of a viable representative sample of all ecosystem types and species, as well as the long-term ecological functioning and connectivity of the landscape or seascape as a whole.

Both of the proposed pipeline routing options pass through a proposed Critical Biodiversity Area (CBA), specifically a CBA Natural area (a Biodiversity Conservation Area) (Figure 7-15-). Linear development of Base case pipeline routing will impact 369 km^2 of CBA Natural area (a Biodiversity Conservation Areas), and the Option pipeline routing will impact 415 km^2.

There are two categories of proposed CBA, namely ‘CBA Natural’ areas and ‘CBA Restore’ areas. CBA Natural sites have natural/near-natural ecological condition, with the management objective of maintaining the sites in that natural/near-natural state. CBA Restore sites have moderately modified or poorer ecological condition, with the management objective to improve ecological condition and, in

the long term, restore these sites to a natural/near-natural state, or as close to that state as possible. As a minimum in CBA Restore sites, further deterioration in ecological condition must be avoided, and options for future restoration must be maintained. The ESAs include all portions of EBSAs that are not already within MPAs or CBAs, and a 5 km buffer area around all MPAs (where these areas are not already CBAs or ESAs). Within ESAs, 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.

The preliminary benthic epifauna ROV survey results suggest a hotspot of VME indicator species in the south-east west of Block 11B/12B, and that fossilized forest remains are also concentrated in the middle and in the southwestern corner of the Block (Dawson et al. 2020, in BSL, 2023). Based on these results, it is considered highly likely that the proposed CBA Natural Area should extend through the southwest corner of Block 11B/12B, connecting the area to the south to the Kingklip Corals EBSA. The proposed CBA areas stop at the borders of Block 11B/12B, but the preliminary in situ ROV campaign results suggests that the proposed CBA areas should extend into the Block in the south west corner, at minimum.

7.4.12.5 Other designations of consideration

Important Marine Mammal Areas (IMMA) are a marine spatial planning tool formulated by the joint IUCN Species Survival Commission and World Commission on Protected Areas, Marine Mammal Protected Areas Task Force. The areas considered as IMMAs include sites that host vulnerable species or a significant percentage of the members of a species, sites that are important for reproduction or feeding, and sites that are home to a wide variety of species. In South Africa, three IMMAs have been identified: the Cape Coastal Waters IMMA, Southern Coastal and Shelf Waters IMMA and the Southeast African Coastal Migration Corridor IMMA (refer to Figure 7-15-) [(Purdon *et al.,* 2020). The north-western corner of the Block 11B/12B PR Application Area intersects the Southern Coastal and Shelf Waters IMMA.

Whilst they do not directly intersect with Block 11B/12B, sensitive and significant coastal areas of biodiversity importance will be discussed here, given that potential far-field impacts (such as oil spills) may affect these areas. For example, there are a number of Ramsar sites along the South Coast adjacent to Block 11B/12B.

A Ramsar site is a wetland site designated to be of international importance under the under the Ramsar Convention on Wetlands of International Importance, to which South Africa is a signatory. Ramsar sites are important wintering, staging and feeding areas for several species of breeding birds and locally migrant waterbirds. Ramsar Sites do not intersect with Block 11B/12B but are located along the South Coast adjacent to the Block 11B/12B PR Application Area. These Ramsar sites include De Hoop (approximately 160 km from the PR Application Area and approximately 130 km from the proposed pipe routing), De Mond (approximately 220 km from the PR Application Area and approximately 200 km from the proposed pipe routing), and Wilderness Lakes (approximately 130 km from the PR Application Area and approximately 106 km from the proposed pipe routing. These Ramsar sites are important wintering, staging and feeding areas for several species of breeding birds and locally migrant waterbirds.

7.5 SOCIAL CONDITIONS

This section details the social conditions within the immediate zone of influence and has been sourced from the SIA compiled for the project (WSP Group Africa (Pty) Ltd, 2023e).

7.5.1 DELINEATION OF THE STUDY AREA

The study area to measure the potential socio-economic impacts of the project is delineated as follows:

- **Tertiary study area:** South Africa is considered the tertiary area. Increasing local gas production may benefit procurement and have significant economic impacts downstream. If required skills are not available locally, employment opportunities could extend to a national level.
- **Secondary study area**: The secondary study area includes the provinces in which the immediate zone of influence and primary study area are located, namely the Western Cape and the Eastern Cape. While the production activities of the project are within the Western Cape, the proximity to the Eastern Cape creates the potential to benefit the Eastern Cape economy through procurement.
- **Primary study area**: The primary study area includes the towns and cities where most goods required during the development stages will be fabricated and assembled. The primary study area comprises the immediate zone of influence and the towns and cities that are located close to the shore and already boast marine-servicing and manufacturing activities that could therefore be able to supply goods required during the development and operations of the project. These are towns and cities such as Cape Town, Gqeberha, Saldanha Bay and East London. Thus, the primary study area can be delineated as the stretch along the Indian and Atlantic Oceans between Saldanha Bay and East London.
- **Immediate zone of influence**: The immediate zone of influence, also known as the directly affected community, represents the local areas where most development and production-related activities will occur. This area will supply auxiliary services to offshore activities, which include accommodation, catering and onshore transport. The logistics hub for the development and operation of the project will be located in the immediate zone of influence. These areas encompass towns such as Mossel Bay, Knysna and George, which are situated in the MBLM, the GLM and the Knysna Local Municipality (KLM), respectively.
  These municipalities also have the closest communities to the onshore project area and are located within the GRDM. Onshore activities during the development and production phases will mostly occur in Mossel Bay, where the port is located. This port will be a base for loading and unloading vessels, storing equipment, and providing supplies for drilling rig operations and crew changes. The port and main tourist attractions can be found in Ward 8. Mossel Bay also comprise the closest coastal community to the offshore project area. The immediate zone of influence study area extends along the coastline to both east and west of Mossel Bay town within the municipal area.

The afore-mentioned areas are indicated in Figure 7-18.

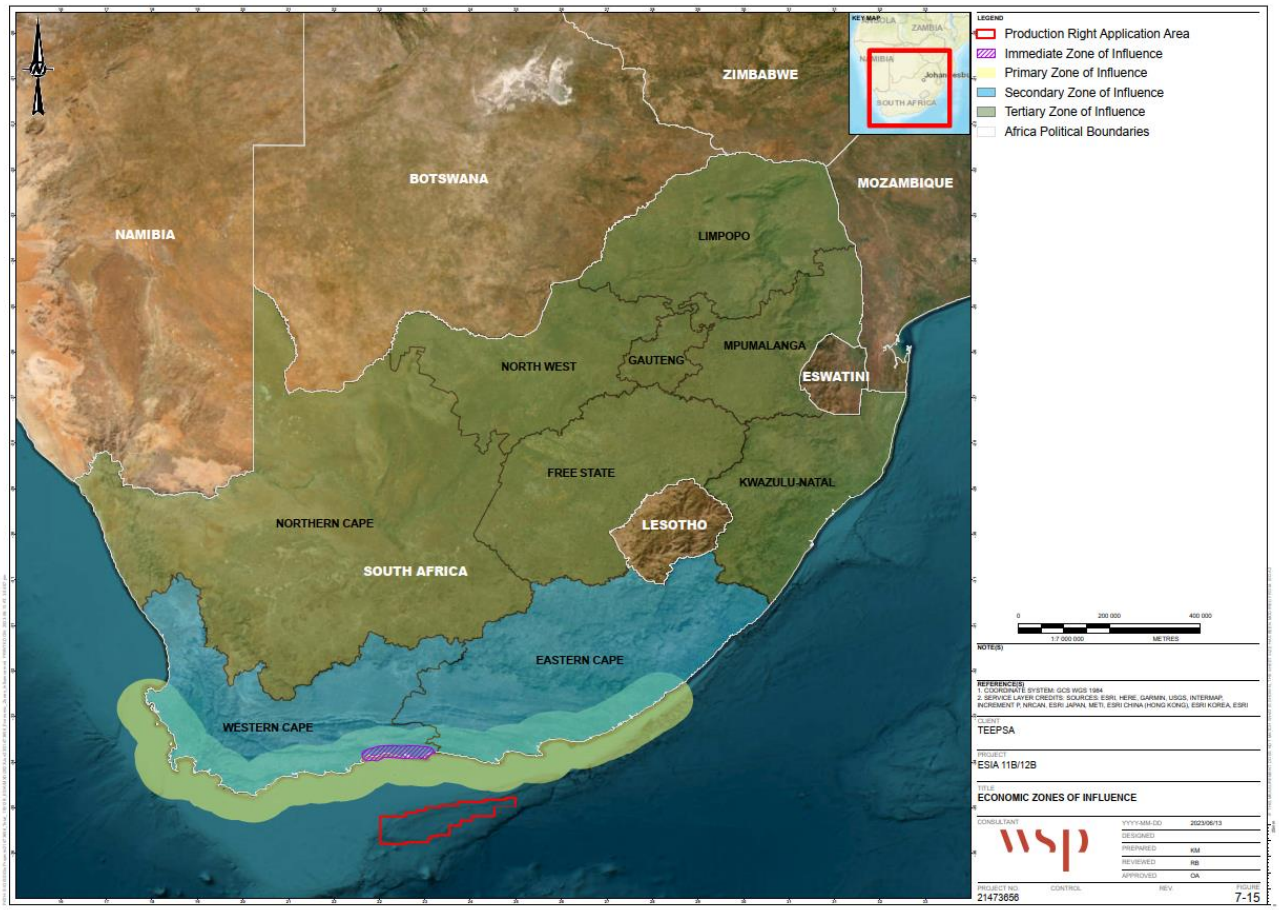


Figure 7-18 – Delineation of the Study Area

7.5.2 DESCRIPTION OF THE SOCIO-ECONOMIC BASELINE

7.5.2.1 Tertiary study area

South Africa is the southernmost country on the African continent. It is bordered by Botswana, Mozambique, Namibia, eSwatini, and Zimbabwe in the north, and it surrounds the small nation of Lesotho. South Africa covers an area of 1,22 million km². (Republic of South Africa, 2021; Logic Publishers, 2022).

South Africa is a multi-ethnic and constitutional democracy encompassing a parliamentary republic and nine provinces. The country has three official capitals, namely Pretoria (administrative capital), Bloemfontein (judicial capital) and Cape Town (legislative capital). The African National Congress (ANC) is the ruling party, and the Democratic Party is the official opposition party.

In 2022, South Africa had a population of 60 604 992 million (World Bank, 2021). The country has a median age[30] of 27,6 years. This median age is older than other countries on the African continent but still considerably younger than European countries.

Most citizens are classified as Black/African, with the second and third-largest racial groups being Coloured and White. The Indian/Asian population remains the smallest minority group in SA. South Africa has 11 official languages, with Zulu, isiXhosa and Afrikaans being the most widely spoken.

South Africa contributes ± 0.4% to the world economy. In 2021 the South African Gross Domestic Product was US$ 353.3 billion. GDP is projected to grow by 0.92 in 2022, compared to 1.76% in 2021 (The Global Economy.com, 2023). The country is in a relatively poor economic position, considering that the GDP growth target set in the National Development Plan is 5.5%. Considering the country's human and natural resources, it has the potential to be around 6%. This economic scenario is partially because of global economic conditions, the COVID impact and the shortage of electricity supply.

Almost 80% of the population uses public health care, whereas the remaining 20% use private health care. Tuberculosis was overall the leading cause of death (27450), followed by diabetes mellitus (26879), Cerebrovascular diseases,[31] other heart diseases (22940), and HIV/AIDS (21894). As on 1 February 2023, the COVID-19 pandemic resulted in a total number of confirmed infected cases of just over 4 million in the country. At this time, the official number of deaths was 102,595 (Republic of South Africa: Department of Health, 2023).

The Gallup Global Polling Group recently ranked South Africa as the fifth most dangerous country from 144. From January to March 2023, assault was the most common crime (43 090 cases). Compared to the similar 2022 reporting period, the murder rate increased by 3.4% (6 289 cases) and attempted murder increased by 18.3% (6192 cases). Sexual offences, which include rape and sexual assault, decreased by 4.3% to 13 205 cases (South African Police Service, 2023).

[30] The median age of a population is the age at which half of the people are younger than this age and the other half are older.
[31] Stroke, carotid stenosis

Only 5.5% of South Africa's energy comes from renewable energy, with the rest from fossil fuels (88,9%) and nuclear (5.5). The South African renewables energy focus is mainly on solar photovoltaic (PV), solar thermal, wind and biomass energy (Akinbami, Oke and Bodunrin, 2021, p. 5078).

7.5.2.2 Secondary study area

The secondary study area includes the Western Cape and Eastern Cape provinces. Although the project's production activities are located in the Western Cape, the proximity to the Eastern Cape creates the potential for economic benefits for the Eastern Cape.

Western Cape

The Western Cape Province is located on the southern end of the African continent between the Indian and Atlantic Oceans, bordered inland by the Northern Cape and Eastern Cape Provinces. The region is topographically and climatically diverse, and its southern coast is moderately mountainous. This province covers an area of 129,462 km².

The capital city of the Western Cape is the City of Cape Town, which forms the City of Cape Town Metropolitan Municipality.[32] The province is further divided into five district municipalities. These districts are the Garden Route, Overberg, West Coast, Cape Winelands, and Central Karoo district municipalities. The five districts are further subdivided into 24 local municipalities. The Western Cape is currently (2023) ruled by the Democratic Alliance (DA). The ANC is the official opposition in the province.

In 2022, the Western Cape population was approximately 7.2 million (Western Cape Government, 2023, p. 44). The province has a median age of 28 years, slightly higher than the national median age of 27,1 years but lower than the global value of 30,3 years (United Nations, 2023).

The two major ethnic groups in the Western Cape are Coloured and Black/African. The two most spoken languages in the province are Afrikaans and isiXhosa.

The Western Cape is the third-largest economy among the nine provinces of South Africa. Following the economic decline of -6.2% in 2020, the province registered a 4.8% GDP growth in 2021 (Western Cape Government, 2022, p. 6). The Western Cape economy is forecasted to grow at an average annual rate of 2.2% in 2022 and only 0.3% in 2023 (WESGRO, 2022).

Almost 76% of the Western Cape population relied on public healthcare in 2019. Among the leading causes of natural death in 2018, diabetes mellitus accounted for 7.6%, followed by ischaemic heart disease (6.1%) and cerebrovascular disease (5.9%). The leading cause of death in the Western Cape was accidental injury (excluding transport accidents), accounting for 9.1% of all fatalities (Western Cape Government, 2022, p. 92). As of 5 March 2023, the Western Cape has suffered 742,799 COVID-19 infections. The pandemic resulted in 22,483 deaths (Western Cape Government, 2022).

[32] A metropolitan Municipality has exclusive executive and legislative authority in its area (also described in the constitution (Section I55 (1) as a category A municipality. (Republic of South Africa, 1999)

Between 2017/18 and 2021/22 in the Western Cape, murder increased by 9.2% (4 074 reported), sexual offences decreased by 1.6% and residential robbery by 5.4%).

Eastern Cape

The information on the Eastern Cape is based on the following sources (Republic of South Africa: Government Communication and Information System, 2021, pp. 3, 4; Statistics South Arica, 2021, p. 34; Yes Media, 2021a).

The Eastern Cape is on the east coast of South Africa and is bordered by the Western Cape and KwaZulu-Natal. Inland it borders the Northern Cape and Free State Provinces. This province is the second largest province in South Africa. It covers an area of 168,966 km^2 (Statistics South Arica, 2021).

The Eastern Cape has two Metropolitan Municipalities: Nelson Mandela Metropolitan Municipality and Buffalo City Metropolitan Municipality, with Bhisho being the province's capital. The province comprises six district municipalities: Alfred Nzo, Amathole, Chris Hani, Joe Gqabi, OR Tambo, and Sarah Baartman Districts. In the Eastern Cape, two areas will be significant for this baseline; Kouga for its contribution to the small fishers identified and Nelson Mandela Metropolitan Municipality for its port facility. The Eastern Cape is currently (2023) governed by the ANC. The DA is the official opposition in the province.

Approximately 6,734,001 people live in the Eastern Cape at a density of 39 people per km^2. Roughly 11% of South Africa's population resides in this region. Approximately 11.5% of the provincial population is between 10 and 14. It is estimated that 52.8% of the population is female, and 47.8% is male (Republic of South Africa, 2022a).

The two major ethnic groups in the Eastern Cape are Black/African with 86.3%, followed by Coloureds with 8.3% representation. The two most spoken languages in the province are isiXhosa and Afrikaans.

The Eastern Cape Province contributes 7.6% to the South African GDP. The province is rated the poorest in South Africa (Republic of South Africa, 2022a).

The unemployment rate decreased from 47.9% in Quarter 4 of 2020 to 42.1% in Quarter 4 of 2022. As a result of the crippling economy, it remains the highest in the country, and it is higher than the national rate of 32.7%. The government, trade and construction sectors employ more than half of the workers in the province (Republic of South Africa: Government Communication and Information System, 2021; Statistics South Arica, 2021; Yes Media, 2021a).

Almost 83% of the Eastern Cape population relied on public healthcare in 2019. Among the leading causes of natural death in 2019, HIV/AIDS accounted for the most, followed by stroke, tuberculosis and ischaemic heart disease. As of 1 February 2023, the Eastern Cape has suffered 366,907 COVID-19 infections. The pandemic resulted in 16,940 deaths (Province of the Eastern Cape - Health, 20AD, p. 25; Republic of South Africa: Department of Health, 2023; The Institute for Health Metrics and Evaluation, 2023).

From January-March 2022 to January-March 2023, in the Eastern Cape, the murder rate increased by 6.4% (1 112 reported), and attempted murder by 10.3% to 586 cases. The rate of sexual offences decreased by 11.7% cent (and residential robbery by 1.1%) (Republic of South Africa, 2022a).

7.5.2.3 Primary Study Area

The primary study area includes the towns and cities where most goods required during the development stages will be fabricated and assembled. The focus is on the Nelson Mandela Bay Metropolitan Municipality and the Kouga Local Municipality.

Nelson Mandela Bay Metropolitan Municipality

Nelson Mandela Bay Metropolitan Municipality is one of eight metropolitan municipalities in South Africa. It is located on the shores of Algoa Bay in the Eastern Cape Province and comprises Gqeberha, the nearby towns of Uitenhage and Despatch, and the surrounding rural area. The boundaries are formed by Cassie Mountain View in the north, Cape Recife in the south, Sundays River Mouth in the east, and Van Stadens River Mouth in the west.

The Nelson Mandela Bay Metropolitan Municipality occupies 1 959 km² and had a 2020 population of 1,251,575. The predominant languages spoken are English, Afrikaans and isiXhosa(Nelson Mandela Bay Municipality, 2022).

Nelson Mandela Bay is a major seaport and automotive manufacturing centre. It is the economic powerhouse of the Eastern Cape Province, with main economic sectors such as manufacturing (25%), community services (23%), finance (23%), trade (13%), and transport (13%). The city is a tourism hot spot for both national and international tourists.

Kouga Local Municipality

The Kouga Local Municipality is in the Eastern Cape of South Africa, approximately 80 km west of Gqeberha, and forms part of the Sarah Baartman District Municipality. The municipality includes the coastal zone between the Van Stadens River in the east and the Tsitsikamma River in the west. Inland the municipality stretches towards the Baviaanskloof Mountains in the north (Kouga Local Municipality, 2021, p. 66; Yes Media, 2021a; Kouga Local Municipality, 2023).

The Kouga Local Municipality occupies 2,670 km². In 2016, the population was 112,941, up from 98,558 in 2011. The predominant languages spoken are English, Afrikaans and isiXhosa (Koega Local Municipality, 2022).

Traditionally, economic activities were focussed on tourism and agriculture. Recently the energy sector emerged as a focal point. Numerous wind farms, such as Gibson Bay Wind Farm, Tsitsikamma Wind Farm, and Kouga Wind Farm, are under development in the municipal area. Thyspunt, one of the preferred sites for a new nuclear power station, is also located in the Kouga Local Municipality.

7.5.2.4 Immediate Zone of Influence

As described earlier, the immediate zone of influence, which can also be described as the locally affected community, represents the local areas where most development and production-related activities will occur. In the instance of the TEEPSA project, the locally affected towns include Mossel Bay (where the port is located), Knysna and George (where the airport is located). These towns are situated in the MBLM, the KLM and the GLM, respectively. These local municipalities fall within the GRDM.

The GLM and KLM (in addition to the MBLM) are included in the socio-economic baseline due to their proximity to the project area and the possibility of auxiliary services being supplied to the project from

these areas. The area of influence is mainly Mossel Bay and specific focus will be given to Ward 8, where the port and main tourist attractions can be found.

Garden Route District Municipality

The project area of influence falls within the GRDM, one of six district municipalities in the Western Cape Province. The GRDM is in the south-eastern part of the Western Cape. The GRDM borders several district municipalities, including the Central Karoo to the north, Cape Winelands, and Overberg to the west. The GRDM runs up to the Eastern Cape Provincial boundary in the east. The municipality comprises seven local municipalities, all within the GRDM. The local municipalities within the Garden Route include Bitou, Knysna, George, Mossel Bay, Hessequa, Kannaland and Oudtshoorn.

The GRDM extends across 23 331 km² and has approximately 627,917 residents, making it the second most populated district in the province outside of the metro. This total is expected to grow to 641,094 by 2025, equating to an average annual growth rate of 0.5% (Garden Route District Municipality, 2022).

The inland areas of the GRDM are characterised by a rural setting with dispersed farming communities and small towns, which in some cases are isolated due to transport and social service delivery costs.

Approximately 80% of the district's population lives in urban areas along the coast. Oudtshoorn is the largest inland town along the R62 and N12, linking smaller inland towns of Ladysmith, Calitzdorp, De Rust and Uniondale. Along the coast, Mossel Bay is functionally connected inland with George, the services centre of the district.

The largest ethnic group in the GRDM is Coloured (52%), followed by Black/African citizens (30%). Therefore, it is unsurprising that the most spoken language in GRDM is Afrikaans, followed by isiXhosa.

The overall sex ratio indicates more females than males in the GRD municipal area, with a ratio of 92.2 males per 100 females in 2023, predicted to rise to 92.4 males per 100 females in 2024 (Garden Route District Municipality, 2022) . Between 2020 and 2026, the highest population growth is estimated for children aged 0-14.+ aged group, with expected growth for the period reaching an average annual rate of 0.6%. For the same period, the working-age population is expected to grow at an average annual of 0.9% (Garden Route District Municipality, 2022).

The main economic sectors in the Garden Route are finance and business services (23.4%), manufacturing (17.3%), wholesale and accommodation (17%), general government (12.1%), construction (9.5%), transport and communication (7.8%), community services (5.5%), agriculture, forestry, and fishing (5.5%) (Western Cape Government, 2020).

In the GRDM, approximately 79% of households have piped water inside the dwelling, and 92% of households have electricity for lighting and other purposes. In terms of healthcare, there are six district hospitals, one regional hospital and 69 primary healthcare clinics. GRDM’s functional literacy rate is 87%. 33% of GRDM’s population live below the poverty line.

George Local Municipality

The GLM is the third-largest municipality in the Western Cape Province of South Africa and occupies an area of 5,191 km². GLM is located within the GRDM on the main transit route (the N2) between Cape Town in the south and Gqeberha in the east. George is a tourist, lifestyle, business, and investment destination of interest. The town also has the only major airport in the district. It is this airport that places George within the immediate zone of influence. The municipality has 27 wards. The wards include the coastal areas of Kleinkrantz, Wilderness, Victoria Bay, Herolds Bay and Gwaing, and the rural areas of Herold, Waboomskraal, Uniondale, and Haarlem.

George is the second largest city in the Western Cape Province, and the GLM is the most populous municipality in the GRDM. The population of George was 221 637 in 2021 and is expected to grow to 230 183 by 2025, equating to an average annual growth rate of 1.0%.

The data indicates that there are slightly more females than males in the George municipal area, with a ratio of 51.8% females to 48.2% males. The number of males per 100 females in George is expected to increase slightly year on year towards 2025, attributed to the in-migration of working males to the George municipal area (George Municipality, 2022).

Between 2021 and 2025, the most significant population growth was recorded in the 0-14 age cohort, which grew at an annual average rate of 1.2%. These predicted growth rates increase the dependency ratio from 51.2 in 2021 to 51.5 in 2025. Higher dependency places strain on the income of the working-age population.

Service access levels were significantly higher when compared with access to formal housing. An example is the 95.8% of households with access to piped water inside/within 200m of the dwelling.

In terms of sectoral contribution, the finance, insurance, real estate and business services (R5.012 billion), wholesale and retail trade, catering and accommodation (R3,480 billion) and manufacturing (R2,804 billion) sectors were the main drivers that contributed to growth in the George economy (Garden Route District Municipality, 2021c; George Municipality, 2022; Western Cape Government, 2021b; Yes Media, 2021a).

Knysna Local Municipality

The KLM is approximately 500 kilometres east of Cape Town and 267 kilometres west of Gqeberha (formerly Port Elizabeth) and traversed by the N2 highway. The GLM borders the KLM to the west and the Bitou Local Municipality to the east. The Greater Knysna Municipal Area covers 1,059 km^2 and stretches from Swartvlei in Sedgefield in the west to Harkerville in the east. The Outeniqua Mountains border the municipal area in the north and the Indian Ocean in the south.

The municipality is renowned for its natural attractions, which include the famous estuary at Knysna (more commonly known as the "Knysna Lagoon"), the Outeniqua Mountains, the Knysna Forests, Fynbos vegetation (part of the Cape Floral Region), and a striking coastline, among others. Tourism is an essential source of revenue for the municipality. The KLM is approximately 500 kilometres east of Cape Town and 267 kilometres west of Gqeberha (formerly Port Elizabeth) and traversed by the N2 highway. The GLM borders the KLM to the west and the Bitou Local Municipality to the east. The Greater Knysna Municipal Area covers 1,059 km^2 and stretches from Swartvlei in Sedgefield in the west to Harkerville in the east. The Outeniqua Mountains border the municipal area in the north and the Indian Ocean in the south.

The population of the KLM was 76 857 people in 2022, with an expected population growth of 1.2%, bringing the municipality's population to an estimated 780 391 people in 2026. The data indicates slightly more females than males in the Knysna municipal area, with a 51.7% female ratio to 48.3% male. As with the other local municipalities in the immediate zone of influence, the number of males per 100 females for Knysna is expected to increase slightly year on year towards 2025. This increase is attributed to increased female fertility rates and the in-migration of working males to the Knysna municipal area (Knysna Local Municipality, 2023).

The Draft Amended IDP Review of the KLM reports that the most significant population growth between 2022 and 2025 is projected in the 0-14 years age cohort, which is expected to grow at an annual average rate of 1.0%. Increases in learner enrolment (an increase of 0.9% annually) reflect this high growth rate. The dependency ratio is expected to increase from 52.9 in 2021 to 53.2 in 2025, placing additional strain on the working-age population.

Mossel Bay Local Municipality

As indicated, Mossel Bay will be the site of the onshore production phase activities. The Mossel Bay port will be used to load and unload vessels, store equipment, and provide supplies for drilling rig operations and crew changes. As a result of these factors, the socio-economic baseline focuses on the MBLM, including Ward 8, where the port is located. This section presents a summary of the socio-economic baseline for the MBLM, along with information on its community's socio-economic status.

Location

The MBLM is situated within the GRDM in the Western Cape Province. The MBLM is bordered by the local municipalities of Oudtshoorn to the north, George to the east, and Langeberg to the west. The Outeniqua Mountains make up the northern limit of the MBLM. The MBLM stretches to the Maalgate River to the east, while the Gouritz River forms the western boundary. Mossel Bay town is approximately halfway between Cape Town and Gqeberha, some 50 km east of Albertina and 56 km west of George. Mossel Bay is located close to the N2. The MBLM has a geographical area of 2,007 km² (MapQuest, 2021; Mossel Bay Municipality GIS Viewer, 2021).

Institutional context

The MBLM is a Category B municipality[33] (The Republic of South Africa, 1996). The executive functions in the MBLM are delegated to the Executive Mayor and the Mayoral Committee, which assists the Executive Mayor in fulfilling the day-to-day decision-making and operational oversight roles. There are standing or portfolio committees for each functional municipal responsibility(Mossel Bay Local Municipality, 2022).

The Mossel Bay Municipal Administration comprises the municipal manager, supported by executive managers who head the service delivery directorates. The municipal manager is responsible for implementing the IDP under the direction and guidance of the Municipal Council. The IDP directs the

[33] A local municipality shares municipal executive and legislative authority in its area with a district municipality within whose area it falls.

municipality's socio-economic development plans over the short, medium, and longer-term(Mossel Bay Local Municipality, 2022).

Demography

Mossel Bay had a population of 96,114 in 2022 and is the second most populated area in the GRDM, second only to the GLM. The population size of Mossel Bay is expected to increase at an average growth rate of 0.4% to reach 97,514 people by the year 2025. The age group of persons older than 65 shows the highest growth rate (1.6%) of all age groups. This aspect is related to a decline in the working-age population and a higher dependency ratio (55.4 in 2021, expected 56.6 in 2025). The decreased working population reduces the base from which the MBLM can collect revenue for the essential services rendered. Mossel Bay has an average population density of 48 people per km^2. The Mossel Bay population comprises 53% females and 47% males (Mossel Bay Local Municipality, 2022, pp. 34, 35; Western Cape Government, 2021d).

The port is located in Ward 8. Ward 8 has a population of 2 906 with a median age of 44.

Households

As of 2021, there were 30 015 households within the MBLM. The average household had 3.2 people. By 2025, the number of people per household is expected to decrease to 3.1 (Mossel Bay Local Municipality, 2022). From a developing economy perspective, decreasing household sizes may positively affect the household heads' ability to provide for household needs (Okogu, 2011).

There are 1,149 households in Ward 8. Women head 31.2% of households. This ward is unlikely to have many households headed by children.

In 2020, of just more than 30,000 households in the MBLM, only 84.6% had access to formal housing. Thus, the MBLM had the fifth highest proportion of informal households in the GRDM at 13.4%. These access levels were above the district averages for all services.

Basic service delivery

Some 95.5% of MBLM households have piped water available (inside or within 200m), 93.5% have access to electricity, and 92.6% have at least weekly access to refuse removal services. During the 2018 financial year, the municipality received R99,380,000. In the same period, 34,310 people received free water, 33,947 basic electricity, 11,677 received basic refuse removal, and 10 935 received basic sanitation (Western Cape Government, 2020; Mossel Bay Local Municipality, 2022).

The financial state of MBLM

The MBLM is considered functional (low risk) but with room for improvement. Financially, the municipality has also been rated as low risk. The MBLM received three consecutive clean audit outcomes for the Auditor General (Mossel Bay Local Municipality, 2022). Mossel Bay has consistently managed its finances prudently and is in a healthy financial position, as evidenced by its substantial liquidity. In addition to ensuring the long-term financial sustainability of the municipality, this position provides MBM with the ability to deliver quality services to residents, upgrade infrastructure, and address infrastructure backlogs in a financially sustainable manner (Mossel Bay Local Municipality, 2022).

Income levels

The average 2018 monthly household income in the MBLM was R18,107, compared to the R17,613 of the GRDM. Between 2014 and 2018, household income in the MBLM increased by 0.8% (Mossel Bay Local Municipality, 2022).

Poverty and inequality

The 2016 poverty rate (less than R810 per month) showed that people living in poverty in the Mossel Bay municipal area fell from 3.2% cent of the population in 2011 to 2.1% in 2016. Reducing poverty reduces the pressure on the municipalities' financial resources. There has been a decrease in the intensity of poverty[34] from 43,5% in 2011 to 43% in 2016. Despite this, poverty severity continues to be a problem (Mossel Bay Local Municipality, 2022).

During the 2017 – 2020 period, the Gini coefficient[35] of the MBLM increased from 0.62 to 0.63. The increase in the Gini coefficient shows that wealth inequality has increased within the MBLM. This trend is expected to worsen without interventions to address poverty and inequality, given the potential for ongoing in-migration of job seekers.

Human development index

The Human Development Index (HDI) is a standard measure determining whether an area is developed or developing. HDI is a composite indicator used by the United Nations to assess the relative level of socio-economic development in countries and measure people's ability to live a long and healthy life and afford a decent standard of living. HDI includes education levels, health, and income. HDI is represented as a value between 0 and 1, with 1 indicating a high level of human development and 0 meaning no human development.

During the 2012 – 2018 period, the HDI of Mossel Bay increased from 0.69 to 0.75. According to the United Nations, the HDI is considered high when it is 0.8 and higher; medium when it ranges between 0.5 to 0.8; and an index value of 0.5 and lower will be regarded as a low rating. The lower the HDI score range, the more it indicates that improvements are required in literacy, life expectancy and per capita income (Western Cape Government, 2021d, pp. 11).

Civil society

Civil society is vital to the country's development and anti-poverty drive, especially in disadvantaged communities. Civil society organisations (including non-governmental organisations (NGOs) or non-profit organisations), pursue activities to relieve suffering, promote the interests of the poor and marginalised, protect the environment, provide essential social services, or undertake community development. Civil society organisations are typically independent of government control and are formed by groups of individuals or communities with a common interest. The activities of civil society organisations are spread across many sectors and address a wide range of issues.

[34] Proportion of poor people living below the poverty line.
[35] The Gini coefficient represent the income or wealth inequality within the select group. The Gini coefficient ranges between 0 and 1, with 0 indicating complete equality and 1 complete inequality.

The following civil society organisations are active in the MBLM:

- ACV: A non-profit organisation representing vulnerable groups in the social services sector.
- Association for People with Disabilities: Provides purposeful social services development to people with disabilities and their families.
- BADISA: Is a child and family welfare organisation that performs statutory work where neglected and abused children are removed from their parents to foster care.
- Creating Effective Families: A non-profit organisation working with families in Mossel Bay impacted by dependencies.
- Ikhaya Community Development Forum: Focus on keeping the youth occupied with healthy sporting, musical, and cultural activities after school. The focus area is to minimise substance abuse and crime in the community.
- Agulhas Offshore Forum: Monitor offshore activities along the south-eastern coast of South Africa.
- Mossel Bay Environmental Forum: Facilitate increased tourism and sustainable employment opportunities for the greater Mossel Bay area.
- National Khoisan Council: The Council aims is to unite the Khoisan communities in South Africa and raise issues in the community to formal government structures so to better living conditions for their people.

Education

There are 24 public schools in Mossel Bay, a relatively small number compared to the high number of learners enrolled.[36] Two pre-primary schools provide day-care services to approximately 500 children. The low number of public schools accentuates the need for additional schools in the Mossel Bay area (Western Cape Government, 2020; Mossel Bay Local Municipality, 2021). Schools with libraries and media centres decreased from 15 in 2018 to 13 in 2020. This decrease is concerning since it negatively affects the overall quality of education.

The learner enrolment in Mossel Bay grew by 0.9% annually, from 16,986 in 2019 to 17,458 in 2020, lower than the district's annual average growth rate of 1.1% (Mossel Bay Local Municipality, 2022). Learner retention decreased in Mossel Bay from 73,7% in 2019 to 69,0% in 2020, meaning fewer learners completed their schooling than the previous year. The 2020 Mossel Bay learner-teacher ratio was 30,2 learners per teacher (Mossel Bay Local Municipality, 2022).

The education outcomes (Matric Pass Rates) decreased from 84.7% in 2019 to 79.7% in 2020. It underperformed against the district matric pass rate of 80.1% (Mossel Bay Local Municipality, 2022).

According to the Stats SA 2016 Community Survey, 26.61% of the Mossel Bay population has attained a senior certificate or equivalent. A further 10.68% and 8.85% achieved Grade 10 and Grade 11, respectively. Of the total population, 39.66% have no schooling or education below Adult Education Training level 4.

[36] No-Fee Schools means parents do not pay school fees and the school governing body cannot deny learner admission.

Employment and unemployment

MBLM employed 33,651 in 2020, down by 1,368 in 2021. COVID-19 and job losses from PetroSA drove these phenomena. The National Union of Metalworkers of South Africa claimed 500 PetroSA workers were made redundant (Creamer Media's Engineering News, 2022). More people are employed in the tertiary sector than in the primary and secondary sectors combined. Almost 46% of tertiary sector employees work in wholesale, retail, catering, accommodation, finance, insurance, and business services. Approximately 36.1% of informal employment was in wholesale and retail catering, followed by 34.4% in construction. Informal employees comprised 21.4% and 33.7% of employees in the community, social, and personal services sectors. From an oil and gas perspective, the secondary sector (manufacturing, electricity, gas, water, and construction) only employs 14.2% of the available workforce.

The 2020 unemployment rate[37] in Mossel Bay was 15.2%. This rate is lower than the national unemployment rate of 34%, the Western Cape (18.9%) and the GRDM (15.4%). Escalating unemployment is challenging, particularly among women, youth, and vulnerable people.

Skills levels

Skill levels are classified as skilled, semi-skilled, and low-skilled. In 2022, 26.7% of the formally employed cadre was skilled, 30.4% semi-skilled, and 18.7% low-skilled. Mining and quarrying (43.8%), general government (46.6%) and finance, insurance, real estate, and business services (44.6%) had the highest levels of skilled people. A different trend was observed for semi-skilled workers. Most semi-skilled workers work in the electricity, gas, and water sector (50.5%), followed by manufacturing (41%). With 40.4%, mining and quarrying ranked third. Low-skilled workers were primarily employed in agriculture, forestry, and fishing (35.5%), followed by community, social, and personal services (26.68%). The general government sector was third at 20.6% (Western Cape Government Provincial Treasury, 2022).

Health

Preventable and contagious diseases are kept at arm's length by various factors. These avoidance factors include drinking water, sanitation, and solid waste disposal. In Mossel Bay, there is a district hospital. Mossel Bay has five community health centres, three primary health care facilities, and two community day centres. PetroSA built and renovated three care facilities. Mossel Bay also has 11 mobile primary health care units. There are three provincial ambulances per 1000 people (Mossel Bay Local Municipality, 2022; Western Cape Government, 2021d).

There were 775 cases of tuberculosis in 2019 and 570 cases in 2020. HIV/AIDS patients receiving antiviral treatments increased by 832 between 2018 and 2019 (compared to 26,996 for the GRDM). In 2019, 0.3 children under five were malnourished, up from 0.4 in 2019. Neonatal mortality (per thousand live births) remained stable at 6.0 in 2019. There was a zero maternal mortality rate in 2020. At 15,2%, teenage pregnancies remain high. Delivery rates for women under 20 were 15,2%. From 2019 to 2020, the pregnancy termination rate remained at 0.6%. The COVID-19 virus pandemic in the

[37] Unemployment defined in a narrow sense as people able to work, but not able to find employment.

Garden Route District affected Mossel Bay severely by having the second-highest mortality rate, averaging nearly 20% of all regional deaths (Garden Route District Municipality, 2021b).

Safety and security

Murder rates in Mossel Bay decreased between 2020 and 2021. Human trafficking, rape, sex work, pornography, and public indecency are all sexual offences. Mossel Bay reported 91 sexual offences in 2020/2021, down from 111 the previous year. According to reports, most crimes committed in the MBLM are drug and gang-related. As a result of the decriminalisation of marijuana, drug-related crime in Mossel Bay has more than halved from 1 034 cases in 2018/19 to 505 cases in 2020/21. Driving under the influence of alcohol or drugs decreased from 479 cases in 2018/19 to 184 in 2020/2021. Drugs and alcohol-related driving have declined due to curfews and COVID-19 (Western Cape Government, 2020; Mossel Bay Local Municipality, 2022).

Municipal services

The municipality is committed to providing its communities with a clean, healthy environment with good hygiene. However, there are some challenges, and the municipality intends to initiate programmes to improve waste education and awareness and increase waste minimisation and recycling. Some 95.5 % of MBLM households have piped water available (inside or within 200m), 93.5 % has access to electricity20, and 92.6 % has at least weekly access to refuse removal services. Mossel Bay has an approved indigent policy to provide free basic service delivery to those most in need who cannot afford these services. The services are paid for through an equitable share that the municipality receives annually. During 2020, 34 310 people received free water, 33 947 basic electricity, 11 677 received basic refuse removal, and 10 935 received basic sanitation.

The municipality is committed to providing a clean, healthy environment with good hygiene for its communities. In 2019, 90.4 % of the population had access to flush or chemical toilets. There are three operational landfill sites, eight mini drop-off facilities and two transfer stations. In 2019, refuse removal was available to 92.6 % of households at least once a week. Some rural areas still need waste collection services, and the municipality still faces challenges with illegal dumping (Mossel Bay Local Municipality, 2022; Western Cape Government, 2021d). The MBLM recycles 7.5% of household, commercial, and industrial waste, and about 40% of households participate in source separation. The MBLM disposes of most organic waste at landfills. The pilot composting facility receives 32 tonnes/month. There are no large-scale compost facilities at MBLM.

Energy

Eskom supplies electricity at seven intake substations. There is a maximum demand of 82MVA. The peak demand for power is currently 68,1MVA, and the spare capacity that can be used is 13,9MVA. Municipal electricity is supplied at voltages ranging from 230V to 66,000V. In the MBLM, electricity is distributed under a NERSA licence. More than 93% of households in Mossel Bay use electricity as their primary lighting source. The municipality also saw an increase in the number of indigents receiving basic services free of charge. Free basic electricity was supplied to 33,947 households in 2020 (Mossel Bay Local Municipality, 2022). In February 2016, the MBLM adopted a policy to guide all types of small-scale embedded generation to the municipality's electricity network. Solar water geysers are a priority in 11 of the 14 municipal wards.

Ward 8 Mossel Bay

Ward 8 is the tourist mecca of Mossel Bay and comprises an area of 3.8 km². The Mossel Bay Port is situated just north of the Mossel Bay CBD. The port is where the harbour development is envisaged. Ward 8 is essentially a heritage precinct with historical buildings in the CBD, the Diaz Museum, the Post Office Tree and many more. Paved walkways along the beach with scenic rock formations and hiking trails attract many tourists (Western Cape Government, 2020b; Mossel Bay Local Municipality, 2021; Municipal Demarcation Board, 2021).

The main ethnic group living in Ward 8 is whites (80%), followed by Black/African (9%) and Coloured (8%) groups. The most spoken language is Afrikaans, with English as the second preferred language. Ward 8 has a population of 2 906 with a median age of 44 years, significantly higher than the 29 years of the GRDM. Interestingly only 86.3% of Ward 8 residents were born in South Africa compared to 93.95% of the GRDM (Western Cape Government, 2020b; Mossel Bay Local Municipality, 2021; Municipal Demarcation Board, 2021).

There are 1,149 households in Ward 8, of which women head 31.2%. It is unlikely that there are many child-headed households in this ward. Almost 52% of households are wholly owned or in the process of being paid off, and 34% are rented houses. There is a 61.4% employment rate, and 71.1% of households have internet access.

7.5.3 VULNERABLE GROUPS

7.5.3.1 Who is Vulnerable?

TotalEnergies' General Specification, Sustainable Development, Social Baseline Study (GS EP SDV 101) emphasises the importance of "*identifying vulnerable stakeholders, groups or PAPs, especially those that may not have been identified through the desktop study, the evaluation of their vulnerability and resilience to future project impacts*." It further states that "*particular attention should be paid to groups that are potentially excluded from the community or power or not recognised through existing or official information, e.g., women, migrant workers, people with disabilities or children*."

The Revised 'White Paper' on Families in South Africa, produced by the Department of Social Development in 2021, defines vulnerable families as "families that need particular support and services". This document adds female-headed households, child-headed households, homeless people, families or people in extreme economic and social need, families in rural areas, teenage parents, caregivers with mental health conditions, and economically distressed households to the list of vulnerable people.

Regarding the Western Cape Government Disaster Management Definitions, Vulnerability is defined as follows: "*Vulnerability is seen as the ability a person or community has, to predict, cope with, or avoid and recover from, the consequences of a hazard or disaster. Marginalised, poorer, and over-populated communities are more vulnerable and less able to cope with disasters*".

The GRDM and the Mossel Bay Local Municipality refer to "vulnerable groups" in their IDPs; however, the term "vulnerable" is unclear. In their respective IDPs, both municipalities state alignment with the Western Cape Government's regional, economic, and strategic plans. Therefore, it could be concluded that the definition of vulnerable groups would fit the national definition from a regional, district, and local point of view.

In its Vulnerable Groups Indicator Report, Statistics South Africa defines vulnerable groups as "*a part of the South African population that experience a higher risk of poverty and social exclusion than the general population. This sector requires effort at all policy planning and implementation levels to inform, among other things, resource allocation*".

The Vulnerable Groups Indicator Report identified vulnerable groups as follows:

- *Children (those aged 17 years and below)*
- *Older persons (people aged 60 years and older)*
- *Persons with disabilities (experiencing various difficulties in functional domains such as seeing, hearing, walking, remembering, concentrating, self-care, communicating, and social interaction)*
- *The youth (people aged between 15-34 years)*[38]
- *Women (the female population)*

The "Revised White Paper on Families in South Africa" refers to "families that are in need of particular support and services".

Existing research shows that coastal communities remain on the fringes of developmental prospects, bearing many costs without receiving many benefits. It can be due to a lack of skills limiting job access, environmental impacts negatively affecting local livelihoods and unresolved governance dilemmas across different scales and actors. Millions of people dwelling in coastal communities worldwide already exist at the margins. They often contend with converging pressures that place them in a vulnerable position to make a decent living (Andrews *et al*., 2021, in WSP, 2023e).

7.5.3.2 Responsibility of Care

The responsibility to care for individuals is not limited to families. The state is the most recognised caretaker of individuals and families. However, in practice, neither the state nor families are solely responsible for the care of individual members as local communities and NGOs, and the private sector is involved in the caretaking of individuals.

The White Paper for Social Welfare (1997) reiterated the country's obligation to provide basic welfare and human rights and focus on the family in its entirety, from children to youth and then the aged. The purpose is to support relationships and community interaction for vulnerable groups, including vulnerable families. This focus will result in stronger families and communities where removing children from the families should be the last resort (Republic of South Africa: Department of Social Development, 2021, p. 5).

As of 2019, approximately 18 million South Africans vulnerable to poverty or in need of state support received social grants, relief assistance or social relief paid by the government. But this has increased since the outbreak of Covid-19 and following the July 2021 unrest. The largest group that received social grants were African and Coloured South Africans Statista, "South Africa: Social Grant Recipients, by Province," Statista, 2020, https://www.statista.com/statistics/1116081/population-receiving-social-grants-in-south-africa-by-province/; EWN, "A Basic Income Grant: The Nitty-Gritty

[38] In contrast, the South Africa National Youth Policy defined the youth) as those aged between 14 and 35 years.

and Feasibility of This Proposed Idea," EWN Web Site, February 2022, https://ewn.co.za/2022/02/09/a-basic-income-grant-the-nitty-gritty-and-feasibility-of-this-proposed-idea.

The social grants available are as follows ("Social Grant Increases", South African Social Security Agency, 2023, https://www.sassa.gov.za/newsroom/articles/Pages/Social-Grants-Amount.aspx):

- *Older person's grant (old-age pension) R2,080 – R2,100*
- *Child support grant: R500*
- *Care dependency grant: R2,080*
- *Grant-in-aid (if you live on a social grant but need someone to take care of you) R500*
- *War veteran's grant: R2,100*
- *Foster child grant: R1,120*
- *Disability grant: R2,080*

NGOs and welfare organisations receive a small percentage of funding from the government through the Department of Social Development. Each welfare organisation propose programmes for which funding is needed. The funding is sourced from the Department of Social Development, the National Lotteries Commission, donations from private companies or individuals and fundraising projects.

Poverty and inequality are the main contributors to a vulnerable society and remain critical challenges that South Africa grapples with; South Africa is known as one of the most unequal countries in the world. The World Bank reports close to half a million fewer jobs in South Africa at the end of end-2022 than in end-2019, with women and youth persistently more impacted. Poverty was an estimated 62.6% in 2022 based on the upper-middle-income country poverty line, only slightly below its pandemic peak (World Bank, 2023). The poor remains one of the most vulnerable groups in South Africa. The Southern Cape is not immune to the scourge of poverty, inequality and unemployment that prevails in the rest of South Africa, although, in some instances, to a lesser degree.

The national unemployment level was 32,7% in the fourth quarter of 2022 (Stats SA, 2023). The 2021 unemployment rate in Mossel Bay was 20.7% (Western Cape Provincial Treasury, 2021), with evidence that the job losses from PetroSA exacerbated this scenario (Golder Associates, 2021). Escalating unemployment, particularly among women, youth, and vulnerable people, is challenging (WSP, 2023; Mossel Bay Local Municipality, 2021; Western Cape Government, 2020).

During stakeholder engagement for the TEEPSA Block 11B/12B Social Baseline Study (Golder Associates, 2021), I&APs reported gender-based violence as a big concern in the Project area, one that does not receive adequate attention. Victims of gender-based violence can therefore be seen as a vulnerable group.

Other vulnerable groups in the IZoI (based on interactions with I&APs) are the poor, the unemployed, women, youth (substance abuse among young people was mentioned as a specific concern), indigenous peoples (Khoi-San and Nguni peoples), and small-scale fishers.

The Social and Labour Plan (SLP) developed for the Project has identified various initiatives that could support vulnerable groups in the IZoI, such as youth development programmes and programmes to empower women and vulnerable people. TEEPSA is committed to creating a culture of equity and building upon the strengths that diversity brings. To achieve this, one of the initiatives is to increase the number of women as well as other historically disadvantaged persons (HDPs) in management positions.

Furthermore, as part of TotalEnergies Corporate Social Investment programme, TEEPSA will invest in programmes focused on substance abuse and gender-based violence by connecting with relevant NGOs and CBOs to ascertain where assistance is needed.

7.5.4 HUMAN RIGHTS

The United Nations defines human rights as follows:

"*Human rights are rights inherent to all human beings, regardless of race, sex, nationality, ethnicity, language, religion, or any other status. Human rights include the right to life and liberty, freedom from slavery and torture, freedom of opinion and expression, the right to work and education, and many more. Everyone is entitled to these rights, without discrimination*" (United Nations, no date).

The UN Declaration on the Rights of Indigenous Peoples (UNDRIP) is a comprehensive international instrument on the rights of Indigenous Peoples. The 46 articles of the declaration acknowledge the historic treatment of indigenous peoples and recognise that individuals are entitled to all rights recognised in international law.

South Africa adopted the UNDRIP in 2016. The Declaration imposes a number of obligations on member states. It also prohibits discrimination against indigenous peoples and promotes their full and effective participation in all matters that concern them.

South Africa's history of apartheid has left a heritage of inequality. This heritage affects the economic potential of many areas and makes life more difficult and riskier for those excluded in times of crisis. South Africa's human rights record is marred by violence against environmental rights defenders, ongoing violence against women, xenophobia, and widespread corruption (Human Rights Watch, 2022).

However, South Africa has a highly professional civil society versed in human rights issues and remedies. This viewpoint was confirmed during the engagement with social baseline respondents (Golder Associates, 2021). Furthermore, the South African media largely operates free but proactive and self-regulatory.

On 28 July 2022, the United Nations General Assembly passed a resolution recognising the right to a clean, healthy, and sustainable environment as a human right (UNEP, 2022). The right to a clean, healthy and sustainable environment is pertinent here, seen explicitly in the light of the recent social mobilisation in France and South Africa against the TEEPSA Project (Green Building Africa, 2022) and other recent social mobilisation efforts against oil and gas exploration projects, such the Shell seismic survey process along the Wild Coast. The latter resulted in some legal challenges against Shell and has reached international audiences (BBC News, 2021; Govender, 2021; Isaac, 2021; le Monde avec AFP, 2021; O'Regan, 2021).

Specifically, the rights of vulnerable populations such as indigenous groups, including the Gourikwas and the Koi-San group (which claims coastal areas) and the rights and impacts on small-scale fishers (including informal and subsistence fishers) are of relevance. An indigenous peoples' representative stated, "It is important for us to have opportunities to express our dissatisfaction about this Project" (WSP Mossel Bay Public Meeting, 2023).

Small-scale fishers argue that offshore oil and gas extraction negatively affects their livelihoods and way of life. Concerns can be linked to the displacement of fishers from fishing grounds due to

increasing coastal traffic and infrastructure, designated safety zones, and the effects of oil and gas extraction activities on fish populations (Andrews et al., 2021).

Such displacement can potentially impact the livelihoods of small-scale and subsistence fishers and their right to provide sustenance for themselves and their family. "*Our vessels go from Mossel Bay to Port Elizabeth to catch fish for sale at Mossel Bay market. We are concerned that fishers will not have access to fishing grounds*" (WSP Mossel Bay Public Meeting, 2023).

With a specific focus on the Block 11B/12B Project, it is not foreseen that adverse human rights impacts will result from the normal operations of the Project. Human rights-related aspects that should however be noted for consideration by TEEPSA in the implementation of the proposed development include:

- The rights of indigenous groups such as the Gourikwas and the Koi-San group, who claims coastal areas.[39]
- The rights of and impacts on small-scale fishers, including informal and subsistence fishers.
- The right to a healthy environment.
- A catastrophic pollution event could be seen as a human rights infringement.

The TotalEnergies Charter of Principles and Guidelines regarding Indigenous and Tribal Peoples sets out its commitment to respect the culture, values and lifestyle of the local communities, and contributes to their economical development while carrying out its business. As such, it is understood that TEEPSA will endeavour to honour the principles of the charter together with applicable legal standards, while dealing with Indigenous Peoples.

It has been recommended that TEEPSA establish a stakeholder engagement forum to facilitate ongoing engagement with indigenous peoples, coastal communities and small-scale fisheries organisations, while carrying out its business in the IZoI.

7.5.5 SOCIAL SUSTAINABLE DEVELOPMENT GOALS

The UN set sustainable development goals (SDGs) as a universal call to end poverty, protect the planet and ensure that all people enjoy peace and prosperity. The social SDGs include: end poverty in all its forms everywhere (SDG 1); end hunger, achieve food security and improved nutrition and promote sustainable agriculture by 2030 (SDG 2); ensure healthy lives and promote well-being for all at all ages (SDG 3); ensure inclusive and equitable quality education and promote lifelong learning opportunities for all (SDG 4); and achieve gender equality and empower women in all spheres of life, including the economic, political and social spheres (SDG 5).

According to the SGD Country Report (2019), South Africa has set the following cross-cutting priorities to achieve the social SDGs:

- Improve social protection;
- Improve access to basic services;

[39] (Golder Associates Africa (Pty) Ltd, 2021k, pp. 2, 3)

- Expand early development childhood programmes;
- Promote higher quality and industry-relevant education and training;
- Address the unequal share of unpaid care and domestic work;
- Promote innovative and sustainable health financing;
- Improve frontline health care services;
- Prioritise social determinants of health; and
- Correct gaps in legislation and policy which address discrimination.

The Sustainability Development Report (2023) ranks South Africa as 110 out of 166 countries. Out of the 5 social SDGs, SDG 3 (good health and well-being) and 5 (gender equality) are improving, while SDG 4 (quality education) is decreasing.

The GRDM has 2% people without any education. In total, the number of people with primary and secondary education is 46.5%, while 31.1% of people in the City has matric. Only 3.7% of people in the GRDM have an undergraduate qualification. GRDM's functional literacy rate was 87.63% in 2019. In 2020, the GRDM municipal area had a total of 170 public ordinary schools, decreasing by 1 from 2019. In an effort to alleviate some of the funding challenges the Western Cape Department of Education (WCED) offered certain fee-paying schools to become no-fee schools. As such 131 schools (77.1 %) within the GRDM are registered with the WCED as no-fee schools.

The number of schools with libraries/media centres has declined from 107 in 2017 to 95 in 2020. Given that access to libraries and media centres can have a positive impact on the overall quality of education, there is room for expansion in this regard (Garden Route District municipality, 2021).

In accordance with Section 41 of the Mineral Petroleum Resources Development Plan Regulations (MPRD regulations), TEEPSA is required to prepare a social and labour plan (SLP) for the Project. Based on the draft SLP, which will focus on the GLM and MBLM for the first five-year cycle, the following is being considered for implementation:

- HRD Development: TEEPSA aims to implement a multipronged Human Resources Development Programme (HRDP), in collaboration with its JV partners. The HRDP will be implemented and focused on the immediate communities in the primary focus areas of the Block 11B/12B project particularly those from local municipalities within the GRDM and the Sarah Baartman District Municipality (SBDM). These municipalities include Hessequa, Mossel Bay, George, Knysna, Bitou, Kou-Kamma and Kouga local municipalities. Nelson Mandela Bay Metropolitan Municipality is also included in the primary focus area. In line with the requirements of the MPRDA, the Company will impose HRDP requirement on its partners to ensures an integrated approach to Human Resource Development.
- Adult education and training: TEEPSA will prioritise local hiring, along with community Adult Education and Training (AET) development.
- Portable skills development: TEEPSA is committed to a skills development strategy, which promotes portability of skills for the future, but also, as a primary objective, ensures that TEEPSA and its core contractors meet the operational requirements. An additional focus of the skills development initiatives anticipated is to provide skills that can be utilized not only in the formal sector but also in the informal sector.
- Learnerships: Learnership programmes will help community members from the identified municipalities in the IZoI, primary and secondary study areas earn relevant NQF-accredited

qualifications that combine structured practical work experience and structured theoretical training. These include work and school.

- Internships and bursaries: Internships and bursaries will be offered to help the Project develop the skills and competences needed for staffing plans. Bursaries will be available both to internal and external candidates. Bursaries will be awarded to students with the potential to succeed.
- Graduate development programme: TotalEnergies has implemented a graduate development programme which is managed through its Marketing Services Branch.

7.6 ECONOMIC CONDITIONS

The following section has been extracted from the economic impact assessment report (Urban-Econ, 2023), attached in Appendix 15 of this ESIA report.

7.6.1 AREA OF INFLUENCE

The area of influence for the purpose of this section is as presented in Section 7.5.1 and depicted in Figure 7-17.

7.6.2 ECONOMICS

7.6.2.1 Gross Value Added

The sizes of the various economies in terms of GVA[40] are outlined in Table 7-6. Given the different population sizes of the IZoI and the primary, secondary, and tertiary study areas, the total GVA of each cannot be used as an indicator of wealth. Therefore, the GVA per capita is also shown. GVA per capita is a valuable economic indicator as it can be used to show the well-being of a population (United Nations, 2007).

Table 7-6 – Total GVA and GVA per capita in the area of influence

	GVA (R billion current prices)	GVA per capita (current prices)
IZoI	R39.0 (0.7%)	R101 443
Primary area	R899.1 (16.2%)	R114 350
Secondary area	R1 183.7 (21.3%)	R86 308
Tertiary area	R5 563.5 (100%)	R92 954

The economy of the IZoI is relatively small (R39.0 billion), contributing 0.7% to the national economy and 5.1% to the economy of the Western Cape. However, the GVA per capita of the zone is significantly higher than the GVA per capita of the secondary (R86 308) and tertiary (R92 954) study

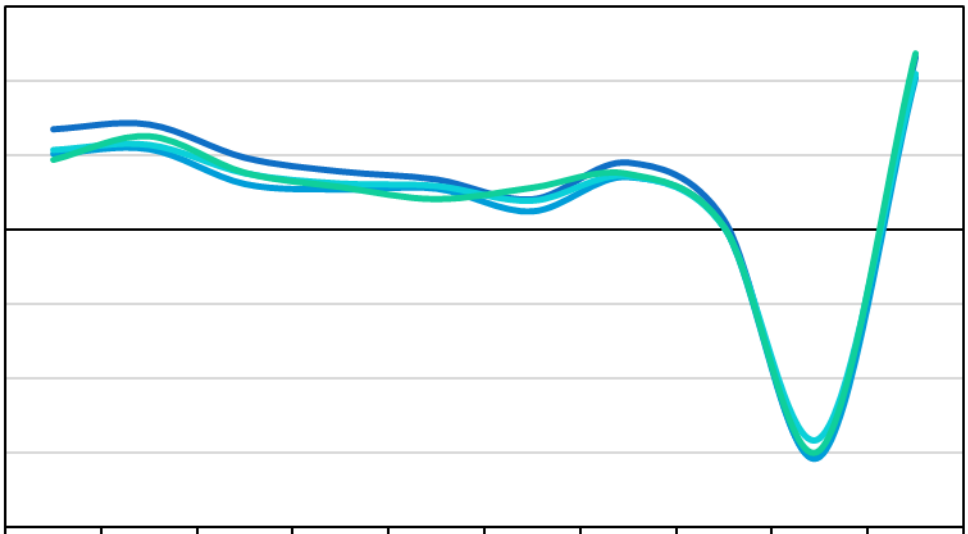
[40] GVA measures the contribution to the economy of each individual producer, industry or sector and is used in the estimation of GDP. GVA therefore is the difference between output and intermediate consumption for any given sector/industry. That is the difference between the value of goods and services produced and the cost of raw materials and other inputs, which are used up in production." (O'Connor,2018, in Urban-Econ. 2023)

areas. This indicates that populations in the IZoI and the primary study area have a better standard of living than those in the secondary and tertiary study areas.

Figure 7-19 illustrates the GVA growth rates in the study areas between 2012 and 2021.

Since 2012, the economy of the IZoI has been declining. This trend may be attributed to various factors, including drought across the Western Cape, the impact of loadshedding, and other national economic challenges. The primary, secondary, and tertiary study areas registered growth trends over the period in question. In 2020, the economy was impacted by the COVID-19 pandemic, leading to a sharp contraction of 6.1% in both the IZoI and the primary study area. This was marginally worse than the decline in the tertiary (5.9%) and secondary (5.6%) study areas, probably due to the importance of tourism as an economic driver in the IZoI.

In 2021, the economy of the IZoI partially recovered, with a growth rate of 4.6%. The tertiary study area yielded a better economic performance at 4.8% in 2021, while the secondary study area grew by 4.2%. The GVA contribution of the primary study area recorded the slowest recovery in 2021, namely 4.1%. As seen in Table 7-7, the economies of the IZoI and the primary and secondary study areas are structured differently from that of the tertiary study area. Therefore, it is important to understand sector dynamics to unpack the growth performance.



	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
IZOI	2.7%	2.8%	1.9%	1.6%	1.3%	0.8%	1.8%	0.3%	-6.1%	4.6%
Primary area	2.0%	2.2%	1.2%	1.1%	1.1%	0.5%	1.4%	0.1%	-6.1%	4.1%
Secondary area	2.1%	2.3%	1.5%	1.2%	1.2%	0.8%	1.4%	0.0%	-5.6%	4.2%
Tertiary area	1.9%	2.5%	1.5%	1.1%	0.8%	1.1%	1.5%	0.1%	-5.9%	4.8%

Figure 7-19 - GVA for the period 2012 to 2021 in the areas of influence

Table 7-7 – Sectoral GVA contribution, 2021 (Urban-Econ, 2023)

Sector	IZoI	Primary area	Secondary area	Tertiary area
Agriculture, forestry and fishing	3.8%	2.0%	3.1%	2.7%
Mining and quarrying	0.4%	0.2%	0.3%	8.6%
Manufacturing	13.9%	15.3%	13.9%	13.1%
Electricity, gas and water	2.3%	2.2%	2.2%	3.1%
Construction	3.6%	3.2%	3.2%	2.5%
Wholesale and retail trade, catering and accommodation	16.6%	16.8%	16.8%	13.7%
Transport, storage and communication	7.8%	7.9%	7.3%	7.1%
Finance, insurance, real estate and business services	33.1%	30.1%	27.5%	23.7%
General government	8.2%	9.5%	10.3%	8.6%
Community, social and personal services	10.2%	12.9%	15.4%	16.9%
Total	100%	100%	100%	100%

The sectors that contributed the most to the economy of the IZoI in 2021 were the finance, insurance, real estate and business services sector (33.1%), the wholesale and retail trade/catering and accommodation sector (16.6%), and the manufacturing sector (13.9%). The large contribution from the wholesale and retail trade/catering and accommodation sector to the economies of both the IZoI and primary study area indicates a prominent tourism industry, as many tourist activities are captured in this sector.

The manufacturing sector's contribution to the economy of the primary study area (15.3%) was greater than the contribution of this sector to the economies of the IzoI and the secondary and tertiary study areas. The metros included in the primary study area are all prominent manufacturing hubs. Goods from these hubs will probably be utilised for the proposed project, which will broaden the initiative's economic impact beyond the IzoI.

The economic s'ructure of the IZoI and the structure of the primary and secondary study areas differ most from that of the tertiary study area regarding the mining sector's contribution. This sector contributes less than 1% to the IzoI's economies and the primary and secondary study areas. In comparison, it contributes 8.6% to the economy of the tertiary area. Fewer mining and quarrying resources exist in the Western and Eastern Cape than in provinces such as the North West, Gauteng, and Mpumalanga. Consequently, the mining sector's contribution to the economies of the Western and Eastern Cape is smaller. Therefore, global and national occurrences that affect this sector have a larger impact on the economy of the tertiary study area than they would on the economies of the IzoI and the primary and secondary study areas.

7.6.2.2 Employment

Figure 7-20 indicates the changes in employment in the IzoI between 2017 and 2021. To compare changes in employment across the various areas under consideration, Figure 7-21 shows the employment growth rates for the IzoI and the primary, secondary, and tertiary study areas between 2017 and 2021.

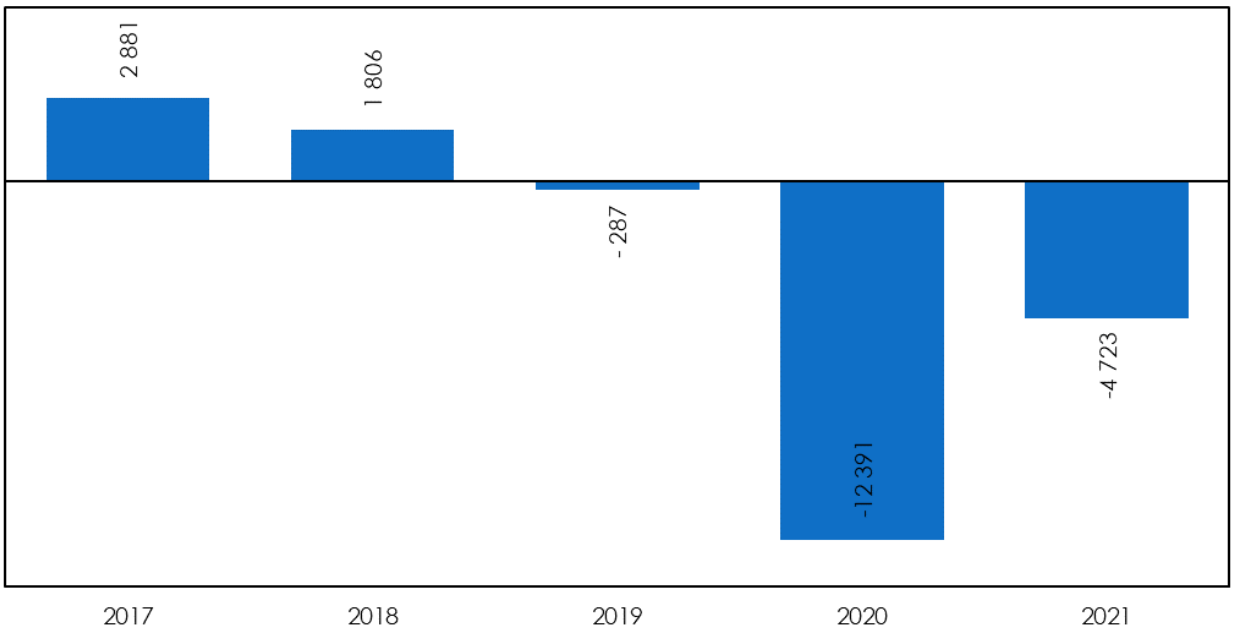


Figure 7-20 – IzoI employment changes, 2017 – 2021

In 2021, the IzoI recorded 129 298 employed people; however, since 2019, the economy of this area has shed jobs. The COVID-19 pandemic resulted in large-scale job losses in 2020 (12 391 jobs), and while the economy partially recovered in terms of GVA growth in 2021, continued job losses were recorded in that year (4 723 jobs).

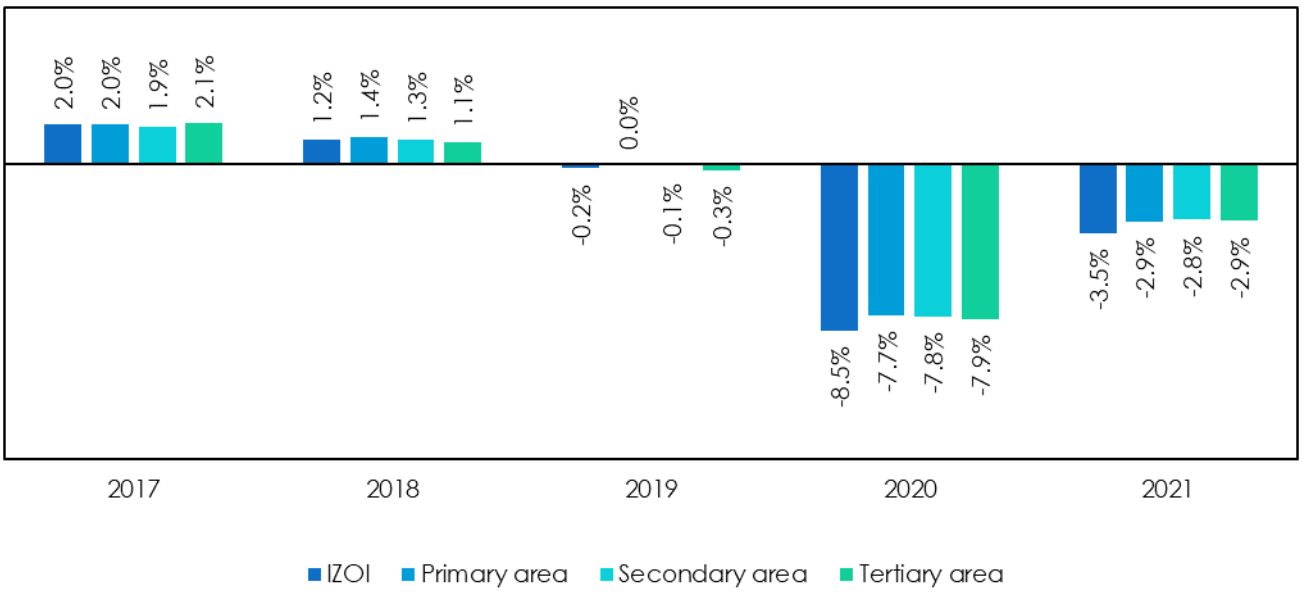


Figure 7-21 – Employment growth across all study areas, 2017 – 2021

Employment growth followed the same trajectory across all the study areas, emphasising that the local economic performance and subsequent impact on jobs cannot be separated from the national economy's performance. However, due to unique local conditions, variances do occur. In 2020 and 2021, the IzoI recorded job losses of 8.5% and 3.5%, respectively, which were marginally higher than

the losses registered in the primary, secondary, and tertiary study areas. The IzoI is highly dependent on seasonal tourism, and the severe impact of the COVID-19 pandemic on this industry could have contributed to the substantial number of job losses.

Table 7-8 indicates employment per sector in the IzoI and the primary, secondary, and tertiary study areas.

Table 7-8 – Sectoral employment composition, 2021 (Urban-Econ, 2023)

Sector	IzoI	Primary area	Secondary area	Tertiary area
Agriculture, forestry and fishing	9.8%	5.2%	9.3%	7.1%
Mining and quarrying	0.1%	0.1%	0.1%	3.4%
Manufacturing	9.0%	11.0%	9.4%	9.3%
Electricity, gas and water	0.4%	0.4%	0.3%	0.4%
Construction	5.8%	5.6%	5.4%	5.4%
Wholesale and retail trade, catering and accommodation	24.0%	23.0%	22.0%	21.1%
Transport, storage and communication	4.2%	4.2%	3.8%	4.0%
Finance, insurance, real estate and business services	21.4%	20.5%	17.9%	18.5%
General government	5.6%	7.3%	7.5%	6.7%
Community, social and personal services	19.7%	22.7%	24.3%	23.9%
Total	100%	100%	100%	100%

The sectors that contributed the most to employment in the IzoI were the wholesale and retail trade/catering and accommodation sector (24.1%), the finance, insurance, real estate and business services sector (21.4%), and the community, social and personal services sector (19.7%). The IzoI has a comparatively larger proportion of workers in the trade and finance centres, emphasising that the towns in the IzoI collectively serve as the economic hub of the Garden Route District and that tourism plays an important role in creating employment in the local economy.

Compared to the primary, secondary, and tertiary study areas, the IzoI employs a smaller proportion of manufacturing workers (9.0%). The primary study area includes large manufacturing hubs such as Saldanha Bay, Cape Town, Gqeberha, and East London, resulting in the manufacturing sector contributing 11.0% to employment in this area.

Table 7-9 illustrates the skills profile for 2021 of formally employed workers in the IzoI and in the primary, secondary, and tertiary study areas.

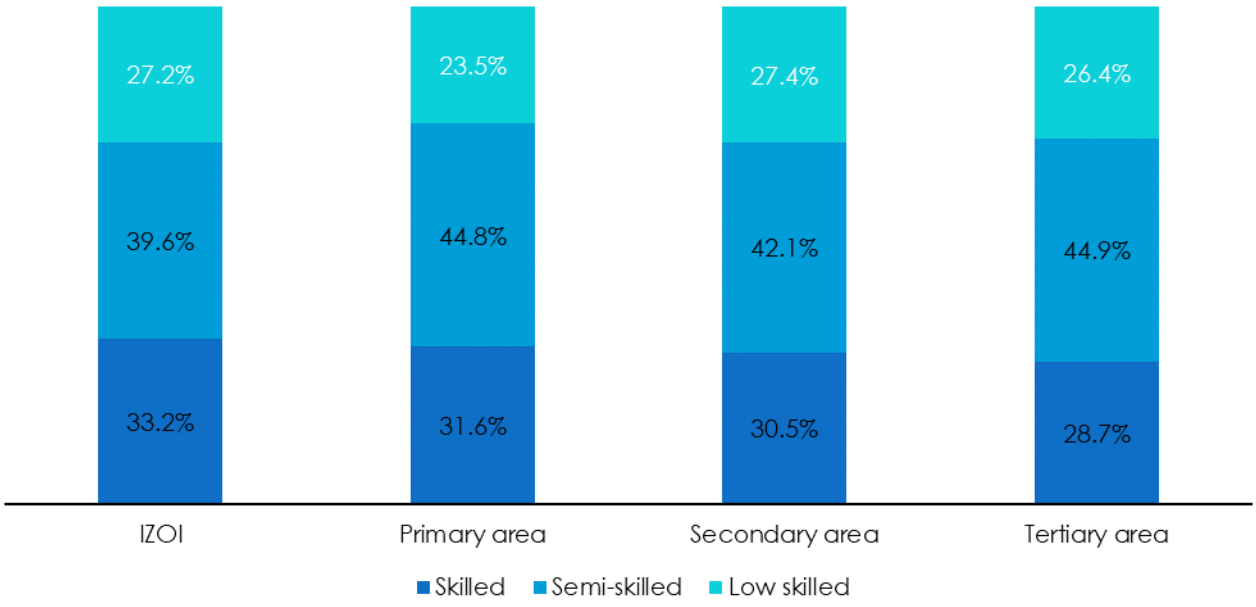


Figure 7-22 – Formal employment skills profile, 2021

The skills profiles of the various study areas are similar, with most formal workers being semi-skilled. Notably, the IzoI has a larger proportion of skilled workers (33.3%) than the other areas and a relatively large proportion of low-skilled workers (27.2%). This reflects the large cohort of agriculture, forestry and fishing workers in the IzoI.

Table 7-9 below indicates the average annual employment growth rates for skilled, semi-skilled, and low-skilled workers between 2017 and 2021.

Table 7-9 – Employment growth per skill level, 2017 – 2021 (Urban-Econ, 2023)

Sector	Izol	Primary area	Secondary area	Tertiary area
Skilled	1.8%	1.0%	1.2%	1.0%
Semi-skilled	-0.4%	0.0%	0.1%	0.0%
Low-skilled	-0.9%	-0.6%	-0.6%	-0.4%

The number of skilled workers in the IzoI increased substantially from 2017 to 2021 (1.8% per annum). The primary, secondary, and tertiary study areas also recorded positive growth rates for skilled workers over the reference period (1.0%, 1.2%, and 1.0%, respectively). Contrastingly, job losses were recorded in the IzoI for semi-skilled and low-skilled workers at a rate of 0.4% and 0.9% per annum, respectively. The primary and tertiary study areas recorded a stagnation in job creation for semi-skilled workers. In contrast, the secondary study area recorded marginal annual growth in employment for such workers (0.1%). Job creation favours skilled workers. There is, therefore, a need either to upskill workers or create employment opportunities for the low- and semi-skilled, especially in the IzoI.

7.6.3 ECONOMIC INDUSTRIES AND ACTIVITIES RELEVANT TO THE PROJECT

7.6.3.1 Fishing Activities

Given the proposed project's location, it is important to consider the fishing subsector and its contribution to the various economies under consideration.

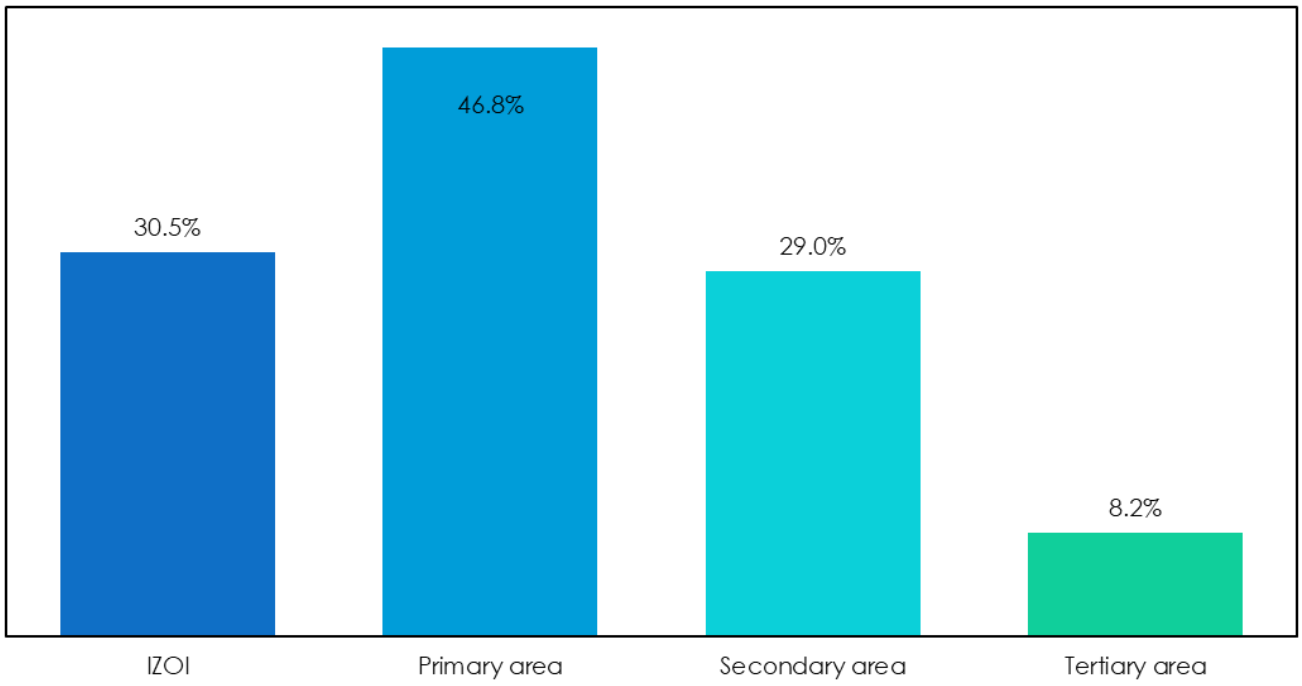


Figure 7-23 – Contribution of the Fishing Sector to Agriculture, Forestry and Fishing, 2021
(Urban-Econ, 2023)

The fishing subsector makes up a substantial proportion of the agriculture, forestry and fishing sector, particularly in the IzoI and primary study area. Fishing contributed 30.5% and 46.8% to the agriculture, forestry and fishing sectors of the IzoI and the primary study area, respectively, in 2021.

In the IzoI, the fishing subsector employed an estimated 2 294 people directly in 2021, contributing 18.2% to agriculture, forestry and fishing sector employment. The subsector's contribution to employment is particularly important in the primary study area, where it contributed 32.0% to employment in the agriculture, forestry and fishing sector in 2021.

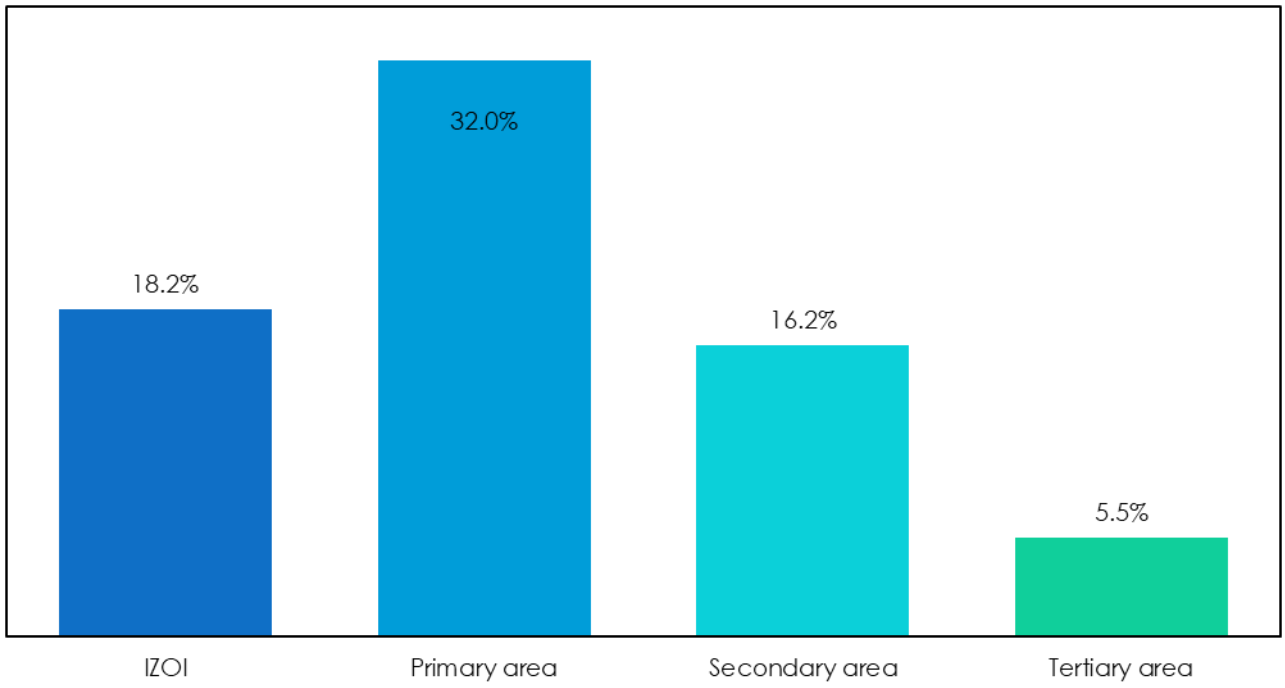


Figure 7-24 – Fishing Subsector Labour Contribution to Agriculture, Forestry and Fishing, 2021 (Urban-Econ, 2023)

The South Coast fish community supports a diversity of commercial, small-scale and recreational fisheries. The South African commercial fishing industry is an essential source of employment and income for coastal communities. It is also an important source of food security in the country. The industry is valued at approximately R8 billion. This sector is particularly valuable to communities in the Western Cape, where 11 of the 13 proclaimed fishing harbours are situated. Direct employment in the sector is believed to stand at 27 000 workers, of which 59.3% are in the primary sector, while indirect employment stands at 81 000 people (Department of Government Communications and Information System, 2022). Lastly, the industry also contributes substantially to exports.

Small-scale fishing activities are an essential source of food and income for some coastal households (Mbatha, 2021). In the Western Cape, the main species targeted by small-scale fishers include lobster, yellowtail and carpenter/silverfish, and fishing is mostly line fishing or intertidal harvesting. Small-scale fishers typically have larger household sizes (four per household) than average and low educational attainment (mostly incomplete high school education) (Mbatha, 2021). Low educational attainment affects the likelihood of obtaining employment, which emphasizes the importance of small-scale fishing activities on the livelihoods of those living in coastal areas.

Recreational fishing is a popular activity amongst South Africans and contributes substantially to the local economy. It's estimated that the industry (which includes freshwater and marine angling activities) contributed R36.2 billion to production, which sustained 94 070 jobs and contributed R32.6 billion to income in 2016. The spending of recreational anglers benefits particularly the transport, trade, and accommodation sectors (Potts, et al., 2002). While there is no information on recreational fishing volumes in the IzoI, it is anticipated that recreational fishing activities will increase in the area over peak domestic tourist periods such as December and March and will add to the overall tourist appeal of the area.

7.6.3.2 Tourism

The activities of tourists are captured in a range of economic sectors, including the retail trade, catering and accommodation, and transport. The South African tourism industry is still recovering from the severe impact of travel restrictions imposed in 2020 to contain the COVID-19 pandemic. It is estimated that tourism contributed 3.7% (R209.2 billion) to the national GDP in 2019. Furthermore, it is estimated that the industry created 773 533 jobs in the same year (Statistics SA, 2021).

The South African coastline is an important tourist attraction. In 2015, coastal destinations accounted for 28% of all tourist trips, 33% of bed nights, and 40% of tourist spending. The main coastal destinations in South Africa included the following municipal areas: the City of Cape Town, eThekwini (Durban), the Garden Route and Overberg (Western Cape), and Ugu (KwaZulu-Natal) (Rogerson & Rogerson, 2019).

The tourism sector is particularly important locally, contributing an estimated 19.5% to the regional economy in the Garden Route District in 2019. While this contribution declined to 8.0% in 2020, the industry rebounded in 2021 with an estimated 17.4% contribution to the economy (Western Cape Provincial Treasury, 2022).

In 2021, the Garden Route District was especially popular amongst domestic tourists (79.3% of visitors, particularly those from the Western Cape (50.7%), Gauteng (11.9%), and the Eastern Cape (10.4%). International tourists are mainly from the United States (20.0%), France (14.3%), Germany (14.3%), and the United Kingdom (14.3%). Visitors to the region stay mostly overnight (81.7%); 31.9% of tourists indicated staying there for more than seven days.

Approximately 35.5% of tourists indicated that they spend between R1 000 and R2 000 per day in the Garden Route District. This enhanced the economic impact that tourists have in the region. The top activities undertaken in the Garden Route District include visiting the beaches (28.4% of all activities), outdoor activities (20.1%), sampling cuisine (18.9%), and scenic drives (18.3%). Therefore, preserving the beaches and environment of the Garden Route District is essential for sustaining the tourism industry in the region.

From mobile location data collected by Wesgro in Mossel Bay in the first half of 2022, the following tourist characteristics can be identified (Wesgro, 2022):

- Most tourists that stay overnight in Mossel Bay are international tourists (63%).
- Approximately 45% of repeat visitors are domestic, while 25% are international.
- Most domestic tourists only stay in the area for one day, while international tourists mostly stay for two days.

International tourists are, therefore, a critical market for the tourism industry in the Mossel Bay area. According to Stoddart and Graham (2018), while the oil and gas industry typically has a larger per capita economic impact, tourism provides more employment opportunities.

7.6.3.3 Gas Industry

The consumption of gas is driven mainly by the petrochemical and chemical industries, as well as the industrial sector. The value chain of gas has a significant economic impact and is estimated to have sustained between 46 000 and 56 000 jobs in 2020, contributing up to 2% to South Africa's GDP. Further, it is estimated that taxable revenue stemming from the industry in 2020 ranged between

R150 billion and R215 billion. If no additional gas pathways are developed in South Africa, imports of gas will range in cost between R280 billion and R410 billion.

However, imports can be substantially reduced if domestic offshore gas reserves are developed for production. A reduction in imports will also have a positive impact on the balance of payments, which in South Africa, is typically negative. Reducing imports will reduce South Africa's trade deficit, which can strengthen local industries (National Business Initiative, 2022).

7.6.3.4 Maritime Traffic

Approximately 30 000 ships are estimated to sail around South Africa annually, while 13 000 enter the country's ports (Wessels, 2022). The ports in Cape Town and Gqeberha attract maritime traffic for resupply, repairs and maintenance, which substantially contribute to these towns' economy. It is estimated that the ship repairs and maintenance industry contributed R4 billion to the economy and sustains 4 000 jobs. However, given South Africa's strategic location on global trade routes and the availability of infrastructure and skilled labour, there is potential for these metrics to be increased to between R15 and R21 billion and between 15 000 and 21 000 jobs (InvestSA, 2017).

7.7 FISHERIES

The following section has been extracted from the marine ecology and fisheries impact assessment report (Anchor Environmental Consultants, 2023), attached as Appendix 11 to this ESIA report.

7.7.1 DEMERSAL HAKE TRAWL

Trawling involves dragging a fishing net (trawl) behind a vessel, or between two vessels. Fisheries in South Africa predominantly use "otter" trawls in which the mouth of the net is kept open by a pair of trawl doors, which are pushed outwards as they move through the water. In demersal trawling, the trawl is dragged along the seafloor, with the gear (including the trawl doors, net, and especially the ground rope) contacting the sediments and fauna on the seafloor (Sink et al., 2019) (Figure 7-25).

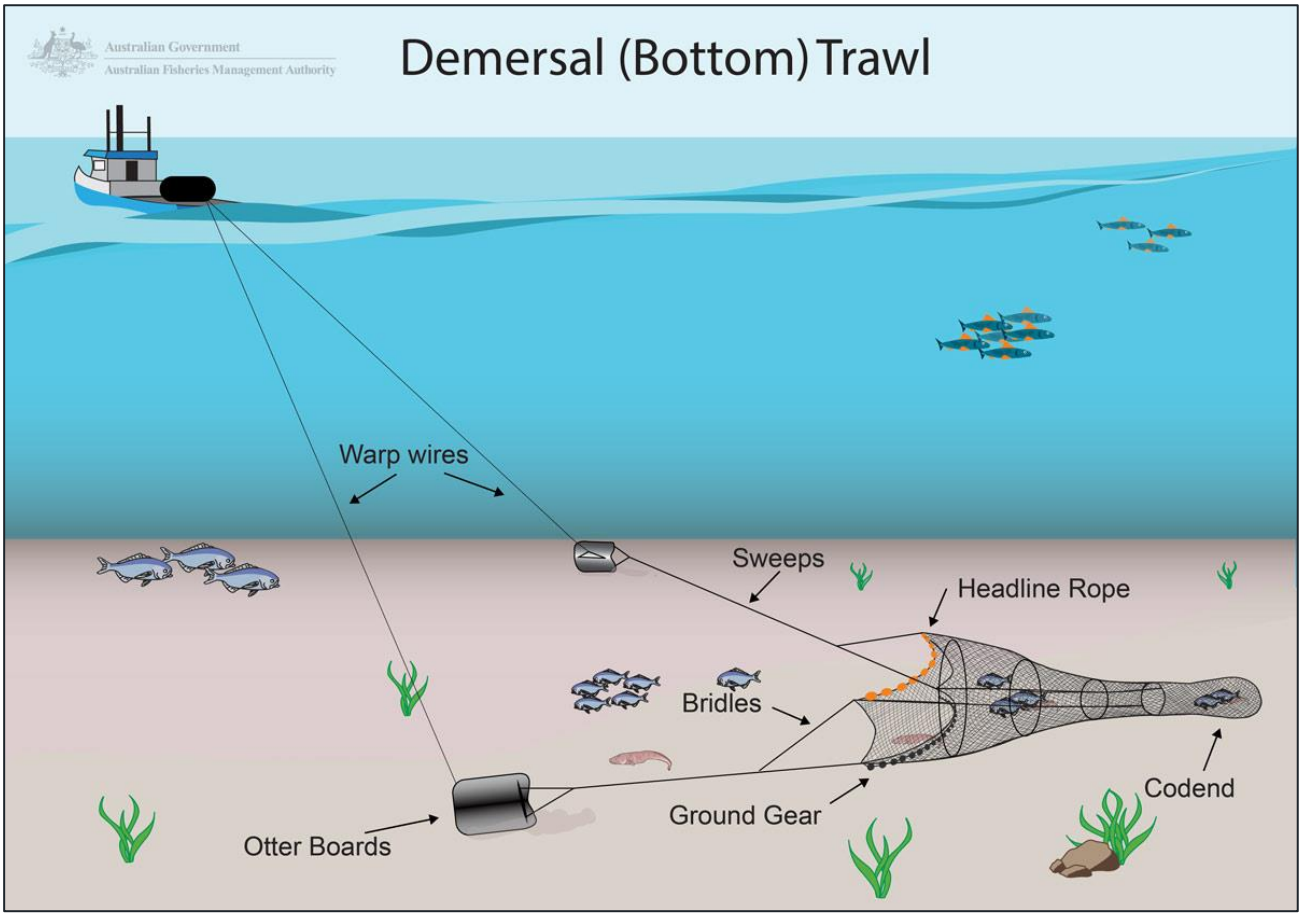


Figure 7-25 – Trawl gear typically used by demersal trawlers targeting hake (www.afma.gov.au/fisheries-management/methods-and-gear)

The inshore and deep-sea sectors of the South African hake demersal trawl fisheries target shallow water hake (*Merluccius capensis)* and deep-water hake (*M. paradoxus*) (Hutchings & Turpie 2019a). Valuable bycatch of the trawl fisheries include, monkfish (*Lophius vomerinus*), Kingklip (*Genypterus capensis*) Panga (*Pterogymnus laniarius*) and snoek (*Thyrsites atun*) (Norman *et al.*, 2018).

Shallow water hake is mostly found between 100-300 m water depth from southern Angola to northern KwaZulu Natal, whilst deep water hake mainly occupy water depths from 150 m to deeper than 1 000 m between northern Namibia and East London (Hutchings & Turpie 2019a).

The deep-sea trawl fishery is active between Namibia and East London, but most of the fishing effort is focussed on the west coast of South Africa. The inshore trawl fishery (distinguished from the deep-sea trawl sector by vessel size / power) is restricted to the south coast. The inshore (<110m depth) trawl grounds are located between Cape Agulhas in the west and the Great Kei River in the east (Walmsley *et al.,* 2007 and Japp *et al.,* 2018). Along the west coast, 90% of catches are deep water hake, while on the south coast (inshore sector dominated) shallow water hake make up 70% of the catch.

The deep-sea trawl sector takes around 88% of the hake catch, with the inshore trawl and longline fisheries taking approximately equal shares of the remainder (Hutchings & Turpie 2019a). Catches of hake over recent decades have typically fluctuated around 150 000 tonnes per annum with most of the catch being landed by the deep-sea trawl sector (Durholtz *et al.,* 2022.). For the inshore trawl sector, landings have fluctuated around 8 000 tonnes per annum. The inshore fleet is restricted to vessels less than 30m and is required to use lighter ground tackle.

The hake trawl sector (inshore and deep-sea combined) has maintained Marine Stewardship Council (MSC) certification since 2004 (Norman *et al.* 2018). The MSC certification specifies a "Hake Trawl Ring Fence", outside which no trawling may take place, which restricts trawling to grounds which have been systematically fished in the past and in which the benthos has already been altered by trawling (Norman *et al.* 2018). In general, trawling occurs on areas that are relatively flat or have low profiles, and have sandy substrate, as these areas incur a lower risk of fouling the gear (Norman *et al.* 2018). The deep-sea trawl fishing effort is concentrated on the shelf edge (Sink *et al.* 2019).

The hake deep-sea trawl primarily uses two types of vessels: "wetfish" steel trawlers that have an average length of 45 m, an average tonnage of 600 tonnes and use ice to preserve their catch; and large freezer trawlers ranging from 30-90 m length and 300-2 900 tonnes. There are 30 "wetfish" trawlers and 21 freezer trawlers active in the hake deep-sea trawl sector (Hutchings & Turpie 2019a). These vessels are mostly owned by large, vertically integrated companies that control all aspects of catching, processing and marketing.

In 2005, 15-year rights were allocated to 52 rights holders in the hake deep-sea trawl sector. These rights have been consolidated to result in 30 operational rights holders (DFFE 2021, Hutchings & Turpie 2019a). Although the latest rights allocation took place in 2021, these have not yet been finalised and the numbers of rights holders are not accessible. Approximately 30 trawlers participate in the inshore trawl sector. There are 17 rights holders in the inshore fleet (rights holders can own multiple vessels) with ongoing appeals process yet to be completed.

The hake deep-sea trawl industry employs approximately 12 400 South Africans, with about 6 600 employed directly on fishing vessels, at land-based processing plants and in a range of management, administrative or supportive roles, and another 5 800 indirectly (DFFE 2021, Hodge *et al.* 2018). Approximately half of these employees are sea-going staff who work on the wetfish and freezer trawlers. Freezer trawlers that have processing facilities have a much greater crew compliment (60-80 crew) than wetfish trawlers on which the fish is mostly gutted and preserved on ice (~30 crew) (Hutchings & Turpie 2019a). The inshore sector has employment creation of around 4500 jobs.

Economically, the demersal trawl fishery is the largest South African fishing sector and contributes more than half of the total value of all commercial fisheries (Hutchings & Turpie 2019a). In most years, most of the hake total allowable catch (TAC) is landed, and in 2018, the TAC of ~112 000 tonnes had a landed catch value estimated at USD 280 million (assuming a 50:50 split in small: large hake with small hake selling at USD 2.5/kg and large hake at USD 2.9/kg). Several valuable bycatch species such as monkfish (USD 7.7/kg), kingklip (USD 6/kg), snoek (USD 1.7/kg) and horse mackerel (USD 1/kg) increased the value of the landed catch to approximately USD 300 million (Hodge *et al.* 2018). The value of landings for the hake and sole directed inshore trawl fishing was an estimated R180 million in 2021 (around 6-7 million USD) (Fiandeiro *et al.* 2019).

There is limited overlap between Block 11B/12B and demersal hake inshore demersal trawl fishery of South Africa. For the deep-sea trawl area, the production area overlaps with 0.87% deep-sea fishing area, and this area is only fished 50% of the time (2009-2019). Landings of hake from the area of overlap have a total of value of USD 121 800 per annum.

7.7.2 DEMERSAL HAKE LONGLINE

Like the trawl fisheries, the demersal hake longline fishery targets shallow water hake *Merluccius capensis*, and deep-water hake *M. paradoxus* (the "Cape hakes"). Kingklip *Genypterus capensis* is an important and valuable "bycatch" (as it may be targeted) of this fishery, constituting 3-5% by mass of the catch (DAFF, 2016). The hake longline fishery lands at least 17 species as bycatch, including Chondrichthyans (0.73%) and teleosts (2.13%), with the majority released alive (when possible) or discarded, and only about five of these (jacopever *Helicolenus dactylopterus*, panga *Pterogymnus laniarius*, skate *spp. Rajida*e, and Cape dory *Zeus capensis*) being retained despite their relatively low commercial value (Greenstone et al. 2016).

A demersal longline is comprised of a mainline or groundline, plus a series of shorter lines called gangions or snoods to which baited hooks are attached. Anchor lines are attached to the mainline and have surface floats. In the South African fishery, the mainline tends to be weighed down at regular intervals and can be up to 40 km long. The South African hake longline sector uses the Spanish double-longline system in which a top and bottom line is set between two anchor lines, with the number of hooks deployed varying from 6000-7000 for smaller vessels and 9000-14 000 for longer vessels. The lines are on average 30 km long and deployed around depths of 200-400 m (Sink et al. 2019). The gear is vulnerable to fouling and fouling by trawlers is common, with conflict occurring between the sectors (Norman et al. 2018).

The South African hake-directed demersal longlining fishery developed relatively recently, starting in the early 1990's (Norman *et al.* 2018). Like the deep-sea trawl fishery, hake longlining occurs between Namibia and East London, with effort concentrated along the shelf edge (Hutchings & Turpie 2019b, Sink *et al.* 2019). The hake longline fishery operates in almost the same areas as the demersal trawl, although the longline fishery can also operate in hard (reef and/or high profile) grounds inaccessible to the trawlers and does not have the MSC ringfence restrictions that apply to the trawl fishery (Norman *et al.* 2018). Along the west coast, 90% of catches are deep water hake, while shallow water hake make up 70% of the catches on the south coast. The hake longline fishery is allocated 6.6% of the overall hake TAC, with the deep-sea trawl sector allocated 84% (Hutchings & Turpie 2019b). Most of the hake longline catches (more than 95% in recent years) are made on the West Coast of South Africa and 40-60% is made up of shallow-water hake (DFFE 2021).

Amongst the hake fishing sectors, the hake longline fishery has the greatest number of rights holders, with 109 operational rights holders (DFFE 2021). These right holders do not all operate vessels with catch agreements and other arrangements resulting in an estimated 40-50 operational vessels in the sector at any one time (DFFE 2021). The latest rights allocation list (2022) indicates that 89 right holders share a TAC of 8621,155 tonnes.

The South African hake longlining vessels are 10-20 m long wooden or fibreglass displacement hull decked vessels. Nearly all are "wetfish" vessels, i.e., the catch is iced at sea and sold fresh, undertaking 7–8-day trips. A single larger vessel with freezer capacity recently entered the sector and

is able to undertake longer (14-18 day) trips. Many of the vessels participate in multiple fishery sectors, particularly the tuna pole sector (Hutchings & Turpie 2019b).

The hake longline fishery provides between 1 500 and 2 000 jobs (DFF) 2021). Due to the small quotas allocated to the hake longline fishery, after 3-7 months of the year most vessels switch to targeting different species (in primarily the tuna pole and pelagic longline sectors) (DFFE 2021). Seafood processors and wholesalers typically process products from multiple sectors (including demersal trawl, squid, handline, tuna pole, etc) and employ approximately 500 full-time staff, although these jobs cannot all be attributed to the hake longline sector alone (Hutchings & Turpie 2019b). The value of the landed catch of the hake longline fishery is estimated at over R360 million per annum (DFFE 2021). **There is no perceived overlap between Block 11B/12B and demersal hake longline effort**.

7.7.3 MID-WATER TRAWL

Mid-water trawling involves dragging a trawl net through the water column. The nets tend to be much larger than those used in demersal trawling and rarely interact with the seafloor, targeting pelagic species in the water column and at the surface rather than at the seafloor (Sink et al. 2019).

The South African mid-water trawl fishery targets Cape horse mackerel *Trachurus capensis*, a semi-pelagic fish that occurs on the continental shelf from southern Angola to the Wild Coast of South Africa. This species undertakes a distinct diurnal vertical migration, rising in the water column to feed on plankton at night. The midwater trawl sector targets adult Cape horse mackerel as they migrate upwards in the water column. The fishery is focused on the Agulhas Bank, particularly on the shelf edge along the South and East Coasts and is spatially restricted to east of 20° E (Norman *et al.* 2018).

A single, large midwater trawler, the FV Desert Diamond, dominates the midwater trawl fishery, having started operating in 1997. This is the largest South African registered commercial fishing vessel (Sink *et al.* 2019, Norman *et al.* 2018). A few smaller hake trawlers that have dual hake and horse mackerel rights, occasionally and opportunistically target horse mackerel with midwater trawl gear, primarily on the West Coast. In total, there are six vessels and 34 rights holders that land 9 674 tonnes (as of 2016) (Norman *et al.* 2018). Catches have increased since 2016 and the 2019 midwater trawl horse mackerel TAC was set at 27 670 tonnes, based on the expected catch (DEFF 2020). The midwater trawl fishery is focused on the Agulhas Bank, and particularly on the shelf edge on the south and east coasts. It is only in these areas that viable catches of horse mackerel are made. **There is no perceived overlap between Block 11B/12B and mid-water trawl fishing effort**.

7.7.4 LARGE PELAGIC LONGLINE

The pelagic longline fishery targets large, predatory, highly mobile fish including bigeye tuna *Thunnus obesus*, yellowfin tuna *T. albacares*, southern bluefin tuna *T. maccoyii* and swordfish *Xiphias gladius*. The main bycatch species are albacore tuna *T. alalunga*, blue shark *Prionace glauca* and shortfin mako shark *Isurus oxyrinchus* (DEFF 2020, Sink et al. 2019). Drifting longlines can be as long as 100 km, with 700- 1500 hooks set per line, depending on the size of vessel. To reduce seabird mortality, lines are set at night. The lines are weighted and so are not visible at the surface, except at the positions of the floats and radio buoys. Longlines drift with the currents and thus have unpredictable

movement, which can mean that they can drift into areas where they become entangled with the gear of other activities (Norman et al. 2018).

The South African large pelagic longline fishery employs a significant number of people, including fishermen, crew members, and workers in associated industries such as processing, marketing, and distribution. The wholesale value of catch landed by the sector during 2017 was R155 Million, or 1.6% of the total value of all fisheries combined, with landings of 2613 tonnes (The South African Fishing Industry Handbook and Buyers' Guide 2019). The large pelagic longline fishery is highly dependent on export markets, with more than 90% of the catch destined for international markets.

The opportunity to catch larger quantities of this extremely valuable southern bluefin tuna, combined with the current under-utilisation of quotas for other important target species, emphasises the substantial development potential of South Africa's large pelagic fisheries sector, as perhaps the most promising in terms of landed value of South Africa's fisheries.

In 2017, 60 fishing rights were allocated for a period of 15 years. The total number of active longline vessels within South African waters is 15 with a vessel size range of 20-32 m and a trip duration of 1-94 days (Parker *et al.* 2021). In 2020, the 15 large pelagic longline vessels were active around south Africa. The number of hooks set in 2020 (572 461). Rights Holders in the large pelagic longline fishery 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 domestic component of the fleet historically fished out of Durban and Richards Bay Harbours, but vessels now operate predominantly out of the Cape Town and Hout Bay Harbours. The vessels currently in operation are typically small fibreglass or wooden hulled and have a maximum sea-going range of two weeks. This small size (~24m) and short range of vessels limits the extent of their operations. Sixty new large pelagic longline fishing rights were allocated in 2017, for a period of 15 years, with 34 domestic South African registered vessels and three chartered (foreign) vessels authorised by DFFE to take part in the fishery (Norman *et al.* 2018).

The fishery operates extensively within the South African EEZ, primarily along the continental shelf break and further offshore. Many vessels reported to fish near the edge of or on the continental shelf (Sink *et al.* 2019). As a result, **there is some overlap between the spatial footprint of the fishery and Block 11B/12B** (Figure 7-25). Block 11B/12B overlaps with 7.37% of large pelagic fishing area (4.56% falls with the Exploratory Priority Area). This area is fished between 40-100% of the time by the large pelagic fishery but the average for this area was 38.55% (meaning the area was fished 38.55% of the time on average, per annum).

7.7.5 TRADITIONAL/COMMERCIAL LINE FISHERY

The South African commercial line fishery is a boat-based fishery that dates to the 1500's (Thompson, 1913). By the end of the 1990s there were approximately 3 000 fishing boats ranging from 3 m dinghies to 15 m deck boats carrying a total of around 3000 crew (Griffiths 2000, Mann 2000). Currently, there are approximately 455 licenced commercial vessels with over 3 000 crew, ranging from 6-8 m ski-boats capable of surf-launching, to a few harbour-based freezer vessels (generally longer than 20 m) that can remain at sea for more than 2 weeks at a time (Hutchings & Turpie 2018a, Mann 2013).

Lines are set with no more than 10 baited hooks and boats operate mostly in inshore waters. Employing an estimated 27% of all fishers, the commercial line fishery has the largest fleet, but its catches make up only 6% of the total value of all commercial marine fisheries (DFFE 2020). Fishers are constrained in terms of what species they can target, as well as by bag and size limits, but effort is primarily limited by weather and sea conditions as ski boats generally go out only when the wind is less than 15 knots. Fishing takes place throughout the year but there is some seasonality in catches. Boats are limited to 40 NM offshore and are constrained by MPAs (e.g., Tsitsikamma MPA west of Port St Francis). Marine recreational anglers in South Africa tend to use similar gear and target similar species to their commercial counterparts. **There is no perceived overlap between the Production Right Application Area and commercial line fishing effort**.

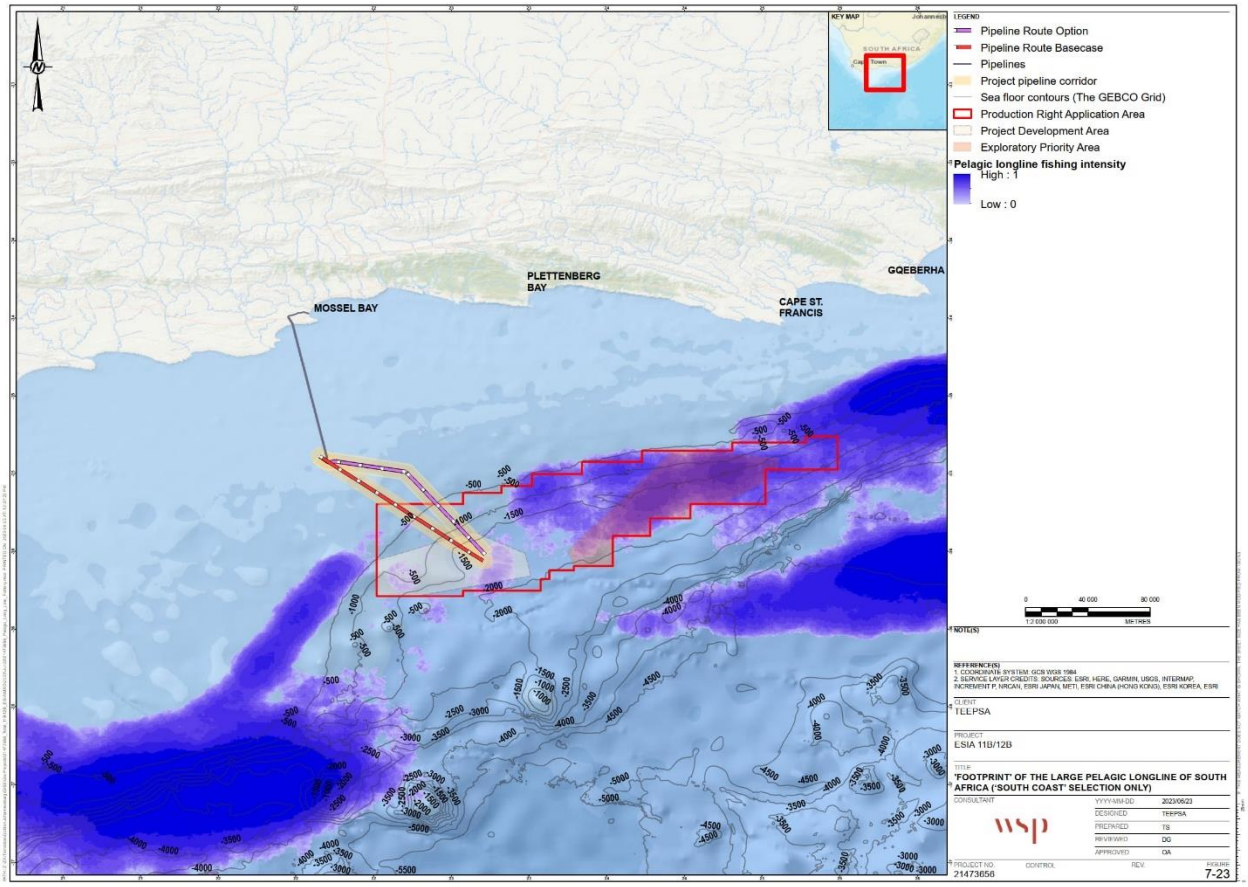


Figure 7-26 – 'Footprint' of the large pelagic longline of South Africa ('south coast' selection only). The footprint is scaled (by colour) in terms of frequency of trips being a proxy measure for relative fishing effort. Dark blue areas = most effort [(Sink et al., 2019) in Anchor Environmental, 2023]].

The line fishery lands about 250 different species annually, although only about 20 of these are commercially important (Lamberth & Joubert, 1999). The most important commercial line fish species, making up 90% of the catch, in order of annual average catch (2000-2013), include snoek (*Thyrsites atun*), geelbek (*Atractoscion aequidens*), yellowtail (*Seriola lalandi*), two sciaenid species of the genus (*Argyrosomus*) silver kob (*A. inodorus*) and (*A. japonicas*), carpenter (*Argyrozona argyrozona*), slinger (*Chrysoblephus puniceus*), hottentot (*Pachymetopon blochi*), and santer (*Cheimerius nufar*). Many species targeted in the line fishery have characteristics that make them particularly vulnerable to overfishing, including long lifespans (>20 years), estuarine-dependence, sex change, residency and aggregating behaviour (Hutchings & Turpie, 2018a). At least 11 line fish species are considered overexploited, while another 19 species have experienced stock collapse (Mann, 2013).

During the last rights allocation in 2005/2006, a total of 424 long-term traditional linefish rights were issued nationally, of which 62 licences were for the area from Cape Infanta to Port St Johns. The 2021 commercial fishing rights allocation aimed for similar numbers but has not yet been finalised (DFFE 2021). The results of DFFE stock assessments conducted in 2017 indicated that the drastic reduction of fishing effort from 2003 onwards resulted in the partial recovery of some species, including slinger, santer, hottentot seabream and carpenter. However, other important stocks such as silver kob are still being overfished (DFFE 2020).

7.7.6 SMALL PELAGIC PURSE-SEINE

Purse-seining involves rapidly sinking a wall of fishing net around a group of fish and then closing the bottom edge using purse strings, before hauling the catch onboard. Once a shoal of fish is detected, the purse seine nets are deployed using a smaller vessel to encircle the shoal (Sink *et al.*, 2019). The small pelagic purse-seine fishery is South Africa's largest fishery by landed mass and second to the hake fishery in terms of value, estimated to be worth R5.5 billion at present (DEFF 2020, DFFE 2021).

The fishery in South Africa originated in St Helena Bay on the west coast, originally targeting sardine or pilchard *S. sagax* and horse mackerel *T. capensis* (Sauer et al. 2003). These resources declined after 1962 due to overfishing, and mesh sizes were reduced to target the smaller anchovy *E. encrasicolus*. The fishery also exploits the red-eye round herring *Etrumeus whiteheadi* and the chub mackerel *S. japonicas*, which is a valuable bycatch species. These fish are Lower Trophic Level species that are near the bottom of the food chain and are food for many other commercially important species such as hake, snoek and tuna (Norman et al. 2018).

The fishery is managed through quota allocations in the form of Total Allowable Catches (TAcs) for adult sardine, anchovy, and sardine by-catch. Between 1950-2020 there has been an average annual small pelagic catch of around 380 000 tonnes, of which 80% has been anchovy and sardine (although these two species have accounted for less than 80% of the total catch in recent years).

The fishery mainly occurs inshore, predominantly on the West and South Coast (DFFE 2021, Coetzee et al. 2022). While the fishery is still concentrated on the west coast, operating from St Helena Bay, Laaiplek, Saldanha and Hout Bay, it has spread to the south coast, centred around Gaansbaai, Mossel Bay and Gqeberha (Norman et al. 2018). These ports tend to correspond to the location of canning factories and fish meal plants (Sink et al. 2019).

The251ispel pelagic purse seine fleet mainly consists of Glass Reinforced Plastic and steel-hulled vessels, with a few remaining wooden vessels. Vessels range in size from 15-39 m. The number of

active vessels has declined from 95 in 2006 to 63 in 2020 (DFFE 2021). As of 2015 there were 101 rights holders but only approximately 40% are active in the catching and processing of fish, the remaining ~60 % are either "third party quota holders" who simply receive a fee for the use of their quota, or at most "investors" in the industry and have little direct socio-economic impact in terms of providing employment or generating revenue, on the industry (Hutchings & Turpie 2018b, Norman et al. 2018). Although the latest fishing rights allocation process took place in 2021, the number of rights has not been finalised.

Approximately 5 800 people are employed by the small pelagic sector, with the majority employed full-time. The sea-going workers earn the highest salaries in the fishing industry (DFFE 2021). This employment is split between the west and south coasts.

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 Gqeberha. 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 it is most active in the period from March to September. Round herring (a 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.

On the South Coast, there is no perceived overlap between Block 11B/12B and recent small pelagic purse seine fishing effort.

7.7.7 SOUTH COAST ROCK LOBSTER

The South African longline trap fishery targets the endemic South Coast Rock Lobster (*Palinurus gilchristi*). The South Coast Rock Lobster fishing vessels are large, steel-hulled boats 30-60 m long, rigged for longline trap-fishing (Sauer *et al.,* 2003). Each vessel uses 2 000 to 6 000 barrel-shaped plastic traps that are tied to longlines in sets of 100 to 200 traps, with each line of traps being two to three nautical miles long. Up to 12 lines may be set daily (Sink *et al*., 2019 and Pollock 1989). Each line is weighted so that is lies along the seafloor and is connected at each end to a marker buoy on the sea surface. The traps set for period of 24 hours to several days (Norman *et al*., 2018).

The South Coast Rock Lobster fishery mainly operates in rocky areas 90-200 m deep between Cape Point and East London, with the highest effort recorded off Gqeberha and East London [(Sink *et al.,* 2019, Pollock, 1989 and Groeneveld & Branch, 2002). The fishery may extend up to 250 km offshore along the outer edge of the Agulhas Bank (DEFF, 2020). There are currently seven vessels operating from Cape Town and Gqeberha Ports (Norman *et al.,* 2018).

This fishery is labour intensive and as a result each vessel employs about 30 officers and crew, with a total of 300 sea-going employees. Additionally, about 100 land-based processing and administrative personnel are employed. The catch of South Coast Rock Lobster was 319 000 tonnes (tail mass) in 2016, slightly low than the TAC (Norman *et al.,* 2018). In 2012, the total export value was approximately R320 million (DEFF, 2020).

In 2005, 15-year fishing rights were allocated to 17 companies (DFFE, 2021). The latest fishing rights allocation process in 2021 has not yet been finalised.

There is no perceived overlap between the Block 11B/12B PR Application Area and south coast rock lobster fishing effort.

The West Coast rock lobster occurs from north of Walvis Bay to East London in the inshore environment. Although the distribution of the species overlaps that of the South Coast rock lobster, it is not commercially exploited east of Danger Point although it is recreationally fished up to Mossel Bay. This species is not considered in the fisheries assessment due to the limited exploitation along the south coast.

7.7.8 CHOKKA SQUID JIG

Prior to the 1980s, squid (*Loligo reynaudii*) was targeted by a mostly foreign demersal trawl fishery and landed as by-catch in the South African inshore trawl fishery. A dedicated jig fishery for squid was initiated in 1984 and the landed catch is now worth more than R480 million in good years. Fishing is undertaken off boats that range from small ski-boats to deck boats of about 20 m length, though the latter have come to dominate the fleet. The boats are equipped with powerful lights for night fishing and blast freezers. The fishery operates in depths of 20-120 m, though mostly in the shallower waters, where adult squid are targeted in spawning aggregations. The squid jig fishery usually produces in the order of 6 000 to 7 000 tons per annum, though catches of up to 12 000 tons have been recorded in the past. By-catch in the demersal trawl fishery fluctuates between 200 tons and 600 tons annually. The jig catch is exported, mostly to Europe; whilst trawl caught squid are sometimes sold on the local market.

The commercial squid jig fishery is concentrated In inshore Eastern Cape Waters between Plettenberg Bay and Gqeberha where the squid breeding aggregations occur (termed “nests”). Squid appear very sensitive, particularly during spawning, to water turbidity, suspended sediment and probably also the nature of the substratum (Sauer *et al.,* 1992). Squid only live for two years, and there is substantial inter-annual variability in stock abundance (reportedly amongst the highest for all South African fisheries) that is linked to a variety of influencing factors. There is a high level of uncertainty regarding the status of the squid stock, with initial estimates suggesting that effort levels (approximately 3.6-million-man hours per annum) were unsustainable and were placing the resource at a high risk (approximately 90%) of collapse.

Assumptions implicit in this assessment included the contention that jig-fishing has a negative impact on recruitment, invoked to account for the decline in trawl CPUE observed at the time that the jig fishery commenced. Subsequent refinements of the model led to the conclusion that spawning success is not strongly affected by jig fishing activity and that the current level of effort may in fact be sustainable, although further increases above current effort levels carry a high estimated risk of stock-collapse.

The squid jig fishery is currently regulated by means of total applied effort, which limits the number of vessels and crew allowed. The fishery currently comprises 109 rights holders, 136 vessels and 2422 crew. Since 1988, the fishery has been closed once a year for four weeks to counter the effects of “creeping effort” associated with increases in vessel efficiency and catch technology. Stock assessment results in 2013 indicated that a reduction in fishing effort was required to continue exploiting the SA squid stock without undue risk. This was achieved via the implementation of an

additional three-month closed season. The squid stock status and fishing pressure is currently considered optimal.

The Block 11B/12B PR Application Area overlaps with 1.84% of reported squid fishing grounds and includes some areas where fishing effort is reported as “high” (Figure 7-27). Since 2010, an average of 530 individual fishing trips per year have been undertaken in the north east border of Block 11B/12B, amounting to 111 fishing hours (average per annum) and yielding 218 tonnes of squid catch (average per annum). This is equivalent to 2.4 % of the overall total squid fishing effort and 2.91% of overall squid catch landed by the sector.

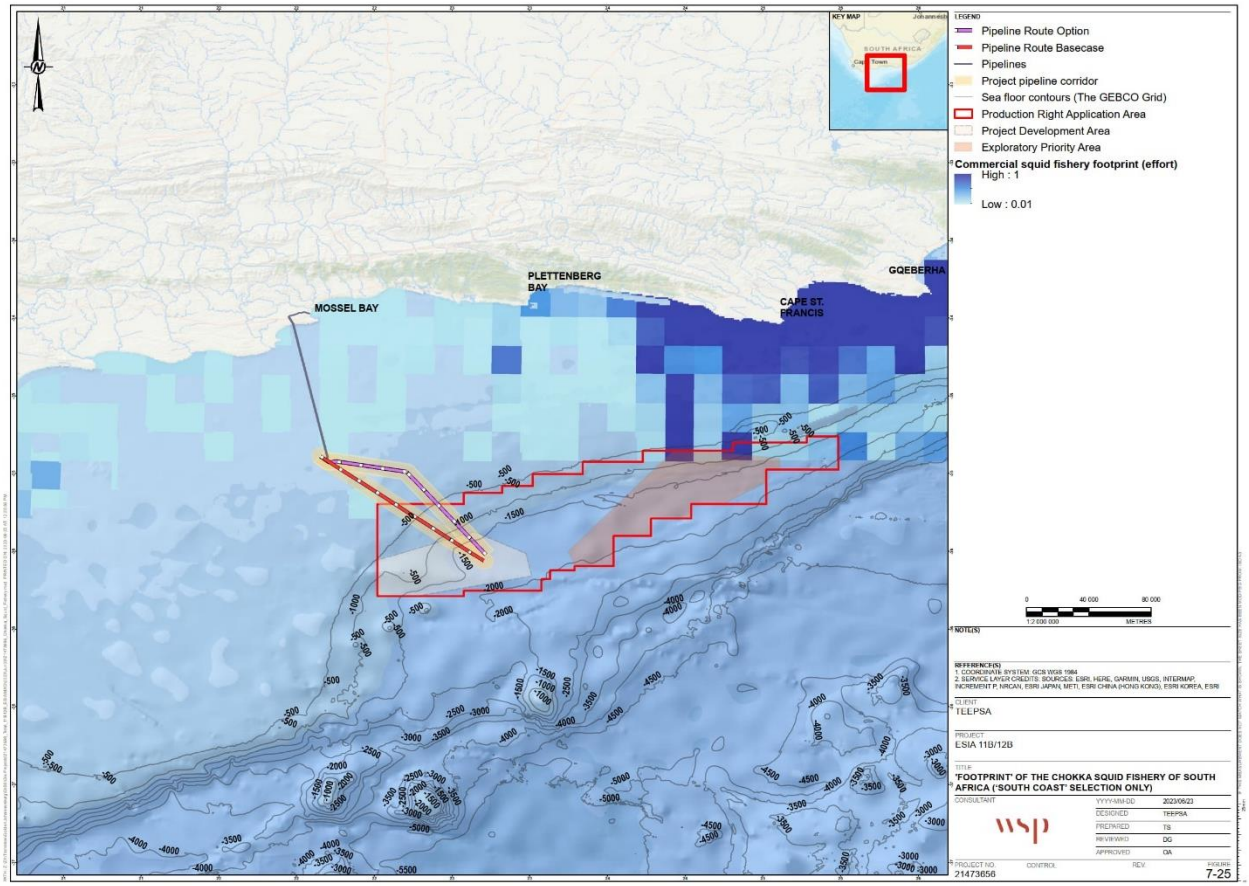


Figure 7-27–-‘‘Footprin’’ of the Chokka squid fishery of South Africa (‘south coast’ selection only). The footprint is scaled (by colour) in terms of frequency of trips being a proxy measure for relative fishing effort. Dark blue areas = most effort. Figure uses catch and effort data from DFFE for the period 2012-2019

7.7.9 SMALL SCALE AND RECREATIONAL FISHERIES

7.7.9.1 SSF

Small scale fisheries, both in South Africa and abroad, are an important source of income and food security for many thousands of people and has been so for generations (Clark et al. 2002, Sowman et al. 2014, Auld & Feris 2022). Small-scale fishing in South Africa has been considered to include various fishing methods targeting more than 30 species (Griffiths & Branch 1997) from a range of habitats (Branch et al. 2002, Clark et al. 2002). Although small-scale fisheries contribute less than 1% to South Africa's GDP, they play an important role in the provision of protein and employment for an estimated 136 coastal communities distributed along South Africa's 3 000 km coastline. The extent and spread of small-scale fishers covers the four provinces with coastlines, especially the Western Cape, where fishing has been an important source of protein among the coastal communities since the 1700s (Isaacs, 2013). Small-scale fishers are found both in urban and rural coastal areas.

Small scale fishery operations have historically not been included in the fisheries policy development in South Africa — the definition of "commercial fishing" as per the 1998 Marine Living Resources Act (MLRA) excluded small-scale and artisanal fishers who catch and sell fish to sustain livelihoods, despite commercial fisheries around South Africa spanning a wide spectrum, and in 2005, the government adopted long-term fishing policies that made no provision for small-scale fishers.

In response to an Equality Court order in 2007, South Africa's cabinet adopted the Small-Scale Fisheries Policy (SSFP) in June 2012, which sought to address imbalances of the past and ensure that small-scale fishers were accommodated and properly managed. The policy proposed that fishing rights be allocated on a group, rather than an individual, basis. The policy further aimed to support investment in community entities who could take joint responsibility for sustainably managing the fisheries resources and assist in addressing the depletion of critical fisheries stocks.

Accordingly, the MLRA was amended in 2014 (commencement date 8 March 2016) to allow the DFFE to proceed with the SSFP implementation process. As part of the amendments, a definition of 'small-scale fishers' and the communities involved was provided (Section 1) as follows:

'' '*small-scale fisher' means a member of a small-scale fishing community engaged in fishing to meet food and basic livelihood needs, or directly involved in processing or marketing of fish, who—*

traditionally operate in near-shore fishing grounds;

predominantly employ traditional low technology or passive fishing gear;

undertake single day fishing trips; and

is engaged in consumption, barter or sale of fish or otherwise involved in commercial activity, all within the small-scale fisheries sector".

'small-scale fishing community' means a group of persons who—

are, or historically have been, small-scale fishers;

have shared aspirations and historical interests or rights in small-scale fishing;

have a history of shared small-scale fishing and who are, but for the impact of forced removals, tied to particular waters or geographic area, and were or still are operating where they previously enjoyed

access to fish, or continue to exercise their rights in a communal manner in terms of an agreement, custom or law; and regard themselves as a small-scale fishing community;"

The amended MLRA also replaces any refence to 'subsistence fisheries' with 'small-scale fisheries', essentially encasing the 'subsistence' definition within the larger understanding of 'small-scale fisheries'. As such, all 'subsistence fisheries' are encompassed within the 'small-scale fisheries' group.

In terms of resource management, the amended MLRA includes 'small scale fishing" alongside 'commercial fishing' in terms of fisheries management, and explicitly includes small-scale fishing within the definition of total allowable catch alongside commercial, recreational and foreign fishing (Section 1). In this way, small-scale operations range from fulfilling food security to full-blown commercial operations.

The amended MLRA also replaces any refence to 'subsistence fisheries' with 'small-scale fisheries', essentially incorporating the 'subsistence' definition within the broader definition of 'small-scale fisheries'.

In terms of resource management, the amended MLRA includes 'small-scale fishing" alongside 'commercial fishing' in terms of fisheries management and explicitly includes small-scale fishing within the definition of total allowable catch alongside commercial, recreational and foreign fishing (Section 1). In this way, small-scale operations range from fulfilling food security to full commercial operations. The amended MLRA does not however provide a definition of 'small-scale fisheries', instead stating in Section 1 that "small-scale fishing must be interpreted accordingly".

In 2016, a Schedule pertaining to the Small-Scale Fishing Regulations in terms of Section 19 of the MLRA (as amended) was published. As per these regulations, communities wishing to be recognised as small-scale fishing communities needed to register their expression of interest with the Department, organise themselves into cooperatives, with small-scale fishing rights only being allocated to one cooperative per small-scale fishing community which includes within its membership, all the verified small-scale fishers in the community.

The 2016 Small-Scale Fishing Regulations also required that, to be considered a small-scale fisher, a person must 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." Later that same year, the former Department of Agriculture, Forestry, and Fisheries (DAFF) verified 8 488 individuals in fishing communities that had expressed interest in the small-scale fisheries sector. This was followed by the declaration of 2 802 registered small-scale fishers, but this process was considered inadequate which prompted re-evaluation. In the minutes of a 2022 meeting of the National Council of Provinces Committee Land Reform, Environment, Mineral Resources and Energy entitled, "Small-scale commercial fishery sector & aquaculture development; with Minister", there were a reported 5 335 small-scale fishers in the Eastern Cape, with 2 741 small-scale fishers in the Western Cape (the number of co-ops still under review).

In November 2019 and March 2020, the DFFE granted 15-year small-scale fishing rights to 73 small-scale fishing co-operatives in the Eastern Cape (OR Tambo, Alfred Ndzo and Amatole Municipalities) (DFFE, 2021). The basket of species granted to these fishers included squid (see below), hake hand line, traditional linefish, seaweed, South Coast Rock Lobster and abalone ranching. The majority of species applied for were linefish species, some of which required use of a vessel.

Of the estimated 30 000 small-scale fishers active along the South African coastline in 2002, 85% of them harvested linefish (Clark et al. 2002). Currently, the small-scale fishing sector will be given priority in the subsequent Linefish Rights-allocation process. Furthermore, the number of recreational angling permits may have to be limited to accommodate the newly established small-scale fisheries sector so as not to compromise resource sustainability.

Various species have been set aside for the small-scale fishing sector. Some have already been allocated to the existing small-scale fishing co-operatives in other coastal provinces as part of the 2021 Fishing Rights Allocation Process. Many species allocated to the small-scale "baskets" are primary targets of the commercial and recreational linefish sectors, and these shared resources will need to be carefully monitored given the increased fishing pressure expected. Total Allowable Effort (TAE) will be apportioned between small-scale and commercial sector when the Department allocates commercial rights in 2021 (the outcome of which has been delayed due to an ongoing appeals process expected to be completed in October 2023). In the meantime, co-operatives will be able to fish from shore using hook and line while the fishing rights allocation process (FRAP, 2021) is being concluded.

In 2021, the DFFE allocated 15% of the squid catch to the small-scale fisheries sector (with the provision that this could be increased to up to 25% in the future). Prior to this decision, squid was not in the basket of species available to the 15 co-operatives and 600 individual small scale fisher men and women who operate in the areas of the Eastern Cape where squid is harvested. Small scale allocation for hake handline in 2023 allocation was 2 081 tons (1.5% of the total TAC). There is no specific small-scale allocation for South Coast Rock Lobster (2022), with 359 tons and 2 525 Sea Days allocated across the whole fleet.

The south coast area of South Africa in closest proximity to the Application Area has a number of recognised small-scale fishing communities. These communities comprise of estuarine fishers (42%) and marine fishers (58%) which target a range of intertidal invertebrates (marine and estuarine) and fish. There will be limited overlap between small-scale fishers that operate mostly close to the shore with the Application Area.

However, there may be a handful of small-scale rights holders that operate further from shore, accessing offshore fishing grounds either through cooperative means or as crew on existing commercial linefish or squid fishing vessels. There may therefore be some overlap between the area of operation of these fishers and the Application Area. These fishers are expected to access mostly linefish and squid resources (DFFE personal communication, January 2023).

At time of writing, spatial activity and catch data for these fishers is lacking but is presumed to be similar to that of the existing fishery. The outcomes of the right allocation appeals process are also currently not known. However, it is considered likely that these offshore operations will overlap with existing spatial footprints for these resources, given that fisheries, both "traditionally commercial" and small-scale, are likely to operate where the resource is present. Given that the TAC for these small-scale offshore fisheries operations will come from the existing commercial sector, the overlap with the Application Area is considered to be suitably captured in the commercial linefishing and squid assessments, with impacts proportional to the proportion of TAC allocated to the small-scale sector in question:

- As per Section 7.7.5, there is no perceived overlap between the Application Area and commercial line fishing effort (which includes hake handline). Thus, it is unlikely that there will be any overlap with the offshore small-scale line fishery.
- As per Section 7.7.8, there is an overlap of 2.4% of the overall total squid fishing effort and 2.91% of overall squid catch landed with the Application Area. If 15% of the squid TAC is allocated to the small-scale sector, and impacts are assumed to be directly proportional, this equates to an overlap of 0.44% of the squid catch landed by the small-scale fisheries.

7.7.9.2 Recreational Fishers

Recreational fisheries in South Africa include line fisheries, rock lobster fisheries and harvesting of intertidal resources such as mussels, redbait and oysters (Griffiths *et al.* 2004, Cooke & Cowx 2006, Lewin *et al.* 2006, Winker *et al.* 2014, Maggs *et al.* 2016, Parker *et al.* 2016, Kerwath *et al.* 2019, Steyn *et al.* 2019). In the MLRA, "*recreational fishing*" means any fishing done for leisure or sport and not for sale, barter, earnings or gain. The recreational fishing sector is managed by a permitting scheme for entrants and catches are subject to TAE like the other fishing sectors. Recreational linefishing is a popular activity in South Africa and takes place along the entire coast.

Between 1994 and 1997, the first nation-wide survey was conducted to evaluate participation in South Africa's recreational shore angling fishery, and its management (Brouwer *et al.* 1997, Mann *et al.* 2003). Recreational fishing in South Africa includes participation from approximately 1.32 million fishers, of which approximately half are marine, targeting mainly linefish and rock lobster (Saayman *et al.* 2017). The MLRA legally recognises recreational fishers and along South Africa's south coast there are a number of areas where recreational fishers operate very close to shore. It is assumed this activity takes place from the shore and so impacts from the prosed development that reach the shore could have knock-on consequences for these recreational fishers.

7.7.10 MARICULTURE

Aquaculture incorporates the breeding, trading or rearing of aquatic organisms in a controlled or selected aquatic environment for recreational, commercial or subsistence purposes (DFFE 2018). It is typically divided into freshwater culture and mariculture. Mariculture species farmed in South Africa include dusky kob, abalone, Pacific oysters, Mediterranean mussels and black mussels, among others. South Africa's aquaculture sector is relatively small, contributing about 0.8% to the country's fish production, accounting for less than 0.2% of the national GDP (DFFE 2018).

South Africa is, however, one of the largest producers and exporters of abalone and is famous for its farmed premium abalone (*Haliotis midae*). The country produces about 1 700 tonnes of abalone per year (DFFE 2018). *H. midae* are one of five abalone species that are endemic to South Africa and is the only farmed abalone species in South Africa. Globally, abalone are one of the most expensive seafood products, with high demand specifically in the Asian countries because of the cultural, traditional, and medicinal qualities associated with abalone. In South Africa, the abalone industry has experienced rapid growth and development, and today is considered one of the most important and valuable species to the South African aquaculture industry. Abalone production in South Africa is found along the Eastern Cape, Western Cape and Northern Cape coastline as the ocean temperatures offer optimal production conditions for the abalone.

According to DAFF (2016), 18 abalone farms were identified in 2015, 12 of which are land-based facilities with independent hatcheries Three farms were registered as ranching operations. The

abalone farms are distributed along the Cape coastline from the Northern Cape and Western Cape to the Eastern Cape (DAFF 2016). There are four farms in the Northern Cape, twelve farms in the Western Cape and two farms in the Eastern Cape (DAFF 2016).

Together these operations produced an estimated farm gate value of US$ 42.3 million. Abalone farming (on-shore, ranching, and cages) is a potentially high-growth industry providing social upliftment, revenue, and sustainability of rural communities along the coastline of South Africa (DFFE 2018). Specifically, the use of ranching could become a substitute for the recovering, depleted natural abalone resources in South Africa, which have diminished and, as a result, until recently all abalone fishery activities were banned. The revival of the South Africa abalone fishery industry and the new abalone ranching operations could provide economic upliftment for these areas suffering from high levels of unemployment and poverty within the fishing communities, provided the introduction of such activities would include a strong buy-in from the local communities (Krohn, et al. 2016).

Since mariculture activities operate close to the shore, there is no anticipated overlap with Block 11B/12B.

7.8 COASTAL TOURISM AND RECREATIONAL ACTIVITES

The swift recovery of tourism in the Garden Route after the COVID-19 pandemic speaks to the region's popularity as a tourism destination. In the first half of 2022, passengers through George Airport grew by 49% from the same period in 2021 and reached a 94% recovery rate compared to 2019 (WESGRO, 2022). In April 2022, passenger arrivals through George Airport exceeded pre-COVID levels, increasing from 32 939 arrivals in April 2019 to 35 606 arrivals in the same month of 2022, constituting a recovery rate of 109% (WESGRO, 2022).

Visitor surveys conducted via local tourism offices in George and Wilderness confirmed that the most significant proportion of Garden Route and Klein Karoo region travellers originated from the domestic market (79,3%), particularly within the Western Cape (50,7%). Over the period, the overseas market accounted for 20,7% of visitors, led by the USA, France, Germany and the United Kingdom. Three-quarters of visitors travelled to the region for a holiday, and visiting beaches ranked as the top tourism activity. The main reason for travel to the Garden Route and the Klein Karoo was tourism, with 73.4% of respondents travelling to the region for leisure activities and holidays.

Mobile location data insights emphasised the popularity of Knysna as a holiday destination, with the Knysna Waterfront frequently visited by international, domestic and local tourists. According to mobile location data, Knysna Heads ranked second across all tourist segments in the Garden Route and the Klein Karoo, with around 2 hours of average dwell time (WESGRO, 2022). According to mobile location data, more than half of domestic tourists and nearly two-thirds of international tourists surveyed stayed overnight in Mossel Bay in the first half of 2022. Repeat visitors accounted for 45% of domestic and 25% of the international categories. Thesen Island in Knysna was also a popular destination (WESGRO, 2022).

People have a cultural relationship with the ocean and coast (i.e. nature). Coastal sporting, leisure and tourism activities have become for these communities since the activities contain strong cultural elements (i.e. social grouping, ritual practices, commensality, unique identity, shared histories, etc.).

7.8.1 CRUISE VESSEL TOURISM

According to WESGRO (2023), Cape Town and the Western Cape achieved a record-breaking cruise tourism season dominated by high-spend source markets including the USA, Germany, and the UK. Commencing in October 2022 and ending in May 2023, the past season has welcomed 145 000 cruise passengers as well as 42 000 crew members to the Cape's shores. In total, the 2022/2023 season welcomed 75 ships with 41 turnaround visits which is double the number of ship calls when compared to the last complete season in 2019/2020, which saw 39 ship visits with an estimated 42 000 arriving passengers.

Mossel Bay is a popular cruise destination. The Mossel Bay Port has had the best cruise season (2022/2022) where a total of thirteen (13) Cruise Vessels and over nine thousand cruise tourism enthusiasts (9270), the largest number to visit Mossel Bay thus far, utilised the Port as their gateway to the Garden Route's Adventure Capital[41]. The Transnet National Ports Authority has indicated that growing tourism is one of their key strategic objectives for the region and the port is positioning itself as an ideal cruise gateway to a unique Garden Route experience.

7.9 OFFSHORE MARINE AND COASTAL INFRASTRUCTURE AND ACTIVITIES

7.9.1 PETROLEUM EXPLORATION AND PRODUCTION

Several oil and gas exploration and production areas exist along the South African coast, including the Orange River Mouth (Orange Basin) offshore the west coast; the south coast (including Bredasdorp, the Outeniqua, the Gamtoos and Algoa Basins) and another two off the east coast (Durban and Zululand Basins). Within these basins, various licence blocks have been allocated to national and multinational oil and gas companies. Drilling has been conducted in some of the blocks and in others it is still proposed, but the timing of these is unknown.

The Bredasdorp Basin on the Agulhas Bank has been the focus of most oil and gas exploration and drilling activity since 1980, with the development of the Oribi, Oryx and Sable oil fields and F-O gas fields, approximately 120 km south-west of Mossel Bay. Block 9 is located the north-west of Block 11B/12B (www.petroleumagencysa.com).

In the entire South African offshore area, there are approximately 358 exploration, appraisal and production wells that have already been drilled; most (56%) of these have been drilled off the South Coast on the Agulhas Bank in relatively shallow waters (less than 250 m water depth) (www.petroleumagencysa.com).

A map depicting the petroleum exploration and production activities undertaken in South Africa as of May 2023 is provided in Figure 7-28. The map details onshore and offshore Exploration and PR areas, as well as areas under application.

[41] https://www.thegremlin.co.za/2023/04/20/over-9000-cruise-tourism-enthusiasts-visit-mossel-bay-during-the-2022-24-cruise-season/

7.9.2 PROSPECTING AND MINING OF OTHER MINERALS

Glauconite pellets (an iron and magnesium rich clay mineral) and pelletal phosphorite occur on the seafloor over large areas of the continental shelf on the west and south coasts of South Africa. An application to prospect for marine phosphate in the Outeniqua West Licence Area, offshore Mossel Bay, was submitted in June 2013 (Morant, 2013). However, there has been no further development in this regard (Vidima and von Blottnitz, 2016 and Biccard *et al*., 2018).

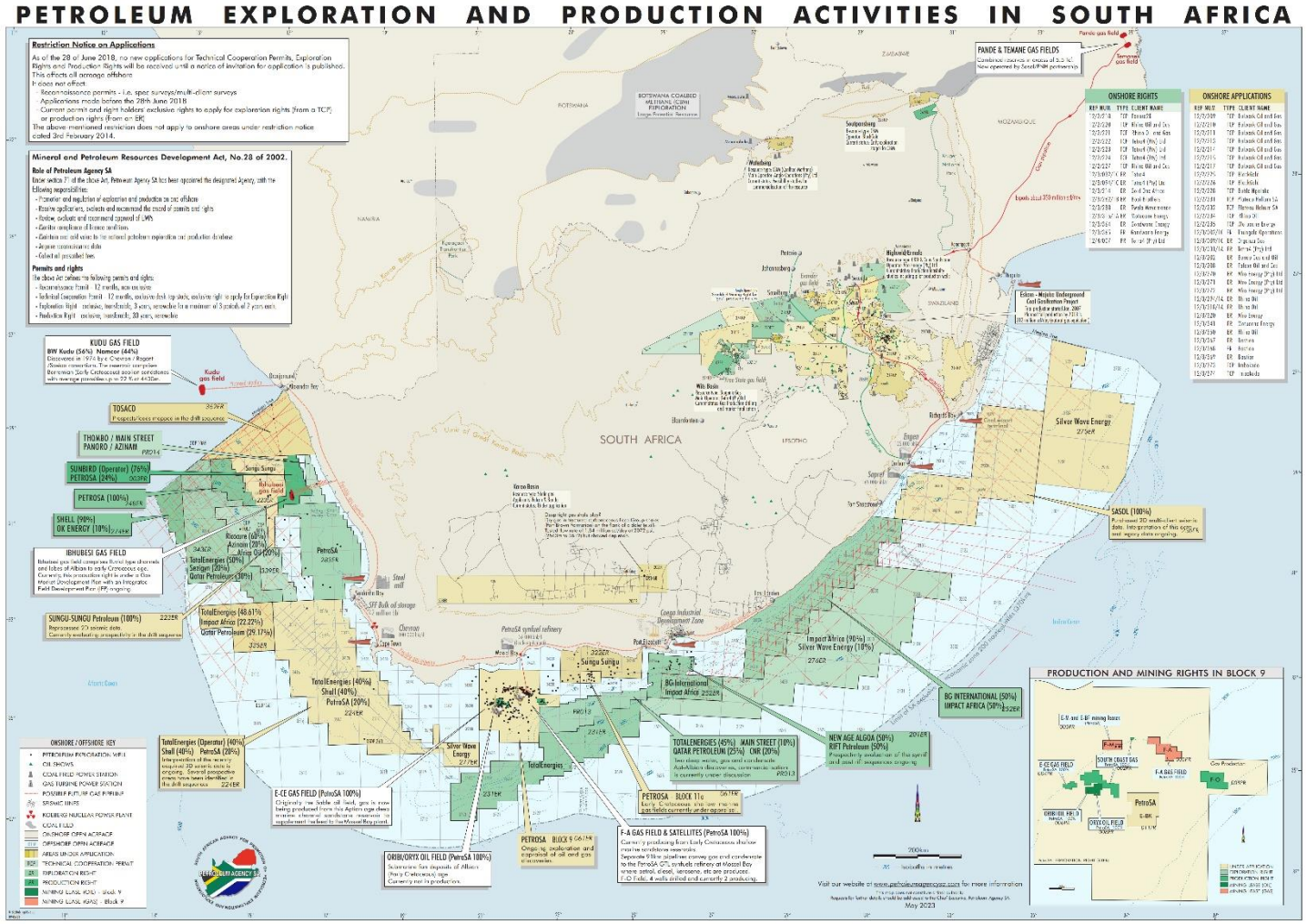


Figure 7-28–- Petroleum Exploration and Production Activities in South Africa (https://www.petroleumagencysa.com/images/pdfs/Hubmap0523)

7.9.3 SUBMARINE CABLES

A submarine telecommunications cable system called“"SAT3/SAF”" (South Atlantic Telecommunications cable No.3 / South Africa Far East) lies across the Atlantic and the Indian Ocean. It passes well to the south of the study area. A safety zone of one nautical mile extends on both sides of the telecommunication cable, in which no anchoring is permitted (WSP Group Africa (Pty) Ltd, 2023e). The SAT3 cable connects Portugal (Sesimbra) with South Africa (at Melkbosstrand) with intermediate landing points along the north African West Coast. From Melkbosstrand the cable system extends via the SAFE sub-system to Malaysia (Penang) and has intermediate landing points at Mtunzini South Africa, Saint Paul Reunion, Bale Jacot Mauritius and Cochin India [(www.safe-sat3.co.za).

A S&EIA Process was undertaken in May 2021 for a newly proposed submarine fibre optic cable system called “2AFRICA”. The submarine cable is anticipated to follow a similar route as SAT3/SAFE on the west coast of South Africa. The 37 000 km-long 2Africa cable will have around 21 landing points in 16 African countries and will carry three times the total network capacity of all the submarine cables currently serving the continent.

No existing or planned submarine cables are located within the Block 11B/12B PR Application Area.

7.9.4 PORT INFRASTRUCTURE

For the Project, support and specialised vessels will very likely operate from the Port of Mossel Bay. Onshore supply base may be located at the ports of Cape Town, Mossel Bay and/or Gqeberha. Further detail on these ports is provided below.

7.9.4.1 Port of Mossel Bay

Port of Mossel Bay is located about 400 km east of Cape Town. It is a medium-sized port, the smallest commercial harbour along the South African coast, directly adjacent to Mossel Ba’’s CBD. The port can accommodate vessels up to 189 metres in length, with a draught not exceeding 6.5 metres. The allowable deadweight is 52,318 tonnes. The catenary buoy caters for vessels up to 32 000 DWT, length of 2,904m and a draught of 12m (National Ports Authority, 2018e; Africa–- Ports & Ships, 2021a; MarineTraffic, 2021).

The port mainly caters for the import and export of petroleum products. Mossel Bay is the –nly port in South Africa with two offshore berths within the por’’s limits and can accommodate passengers and project ships.

7.9.4.2 Port of Cape Town

The port of Cape Town is a hub for ships in the southern Atlantic. Cape Town is the second largest port in South Africa and one of eight commercial seaports. The port also plays a crucial role in supporting local commercial fisheries, including several commercial fishing rights holders. In addition, the Port of Cape Town also contains the Victoria and Alfred Waterfront, a major international tourism and recreational destination. Custom clearance is also in place. The security department provides customs clearance within the port (National Ports Authority, 2018a, pp. 3, 5, 2018c, p. 4; Africa–- Ports & Ships, 2021c). Commodities accommodated within the Port of Cape Town include liquid, dry, break bulk, containers, and roll-on roll-off (vehicles).

Regarding oil and gas commodities, the Port Authority needs prior clarification on the nature and scope thereof. This information is required to manage the storage of these commodities.

7.9.4.3 Port of Gqeberha

The Port of Gqeberha (Port Elizabeth) is a multi-cargo port located on the western perimeter of Algoa Bay. The port is some 384 nautical miles (442 miles) southwest of Durban and 423 (487) east of Cape Town. The port offers multifunctional use for handling containerised cargo, bulk manganese, liquid bulk, and automotive cargo. The port also supports commercial fishing, including commercial operators of the demersal trawl, pelagic trawl, lobster, and squid industries. Berthing for commercial and recreational fishing (small craft) is provided in the harbour.

The harbour plays a limited role in tourism and recreation, with facilities such as boat charters, clubs, and restaurants. The port offers container (one of only five South African ports), breakbulk, tanker, and bulk terminals. Cruise ship facilities are provided at berths 8 and 9. A Ro-Ro terminal is available. The port supports commercial fishing, including commercial operators. The port does not offer major ship repair services. However, a slipway is available to repair vessels up to 1,200 tonnes (National Ports Authority, 2018b; Africa–- Ports & Ships, 2021b).

7.10 INTANGIBLE CULTURAL HERITAGE

Heritage is perceived to be a complex legacy and indicator of global human creativity and biological diversity. Defined as both tangible and intangible by UNESCO, heritage is said to be expressed in monuments, sites and artifacts (tangible heritage), as well as ritual, beliefs, epics, songs and cultural manifestations (intangible heritage). Since the association of culture with biodiversity and its conservation, heritage, an aspect of culture, is now perceived to be critical to sustainable development (Boswell, 2023).

South Africa has a diverse and rich intangible cultural heritage. The South African population holds a diversity of beliefs which inform daily and social interaction. The role of culture in South Africa remains a powerful force. Colonisation and modernisation have not erased cultural practices or beliefs (Boswell, 2023).

It is noted that for any site that is coastal or where people make use of the sea, there is need to consider cultural tangible and intangible heritages, since these terraqueous (territorial and watery) territories which refer to and includes sites of spiritual significance. The waters noted by community members encountered in the Project Area describe these areas as ‘living’ waters. Coastal and oceanic intangible cultural heritage is holistic. It includes a variety of waterways that ultimately lead to the sea. These include streams, rivers, pools, lakes and estuaries. These waterways are believed to play a critical role in spiritual and health management in indigenous (First Nations and Nguni) groups specifically. Specific beliefs concerning ‘living’ waters include, but are not limited to, the following (Boswell, 2023):

- Waters contain the ancestral spirits of the cultural communities.
- Waters offer a spiritual domain to which people in the present realm can travel to (intentionally or otherwise) and from which they can return if the correct ritual activities are performed to ensure safe return.
- Waters can be portals to a parallel universe, or mirror universe and that humans in our dimension cultivate relations with beings from this mirror universe.

- Waterways such as streams, rivers and pools may contain a community's specific ancestral spirits.
- Ancestral spirits in the ocean reside on the seabed or seafloor.
- Markers such as reeds, whirlpools or disturbances in the water that indicate the place and presence of ancestral or water spirits.

Extensive research was undertaken for the Project in 2022/2023. The focus of the supplementary study conducted in 2023 study (which is applicable to Block 11B/12B) was on the following (Boswell, 2023):

- Xhosa and indigenous and autochthonous ancestral beliefs and ritual practices regarding coastal and deep ocean significance. This includes Khoi-San (indigenous peoples) and small-scale fishers' cultural relations with the sea and coast.
- ICH of settler groups (English/Portuguese/other European descendants) and coastal ICH indicated by Afrikaans speaking peoples.
- Gender and generational dimensions of ICH at the coast in the selected sites.

The key findings of the study can be summarised as follows:

- There is a greater holism between land and sea in the south cape coast;
- There are cultural worlds apparent in the lives of small-scale fishers and their families;
- The receptors of cultural heritage are symbiotic;
- A racial dynamic in the South Cape Coast coastal communities makes it difficult for local communities to access the ocean and other related cultural sites, even though apartheid legislation is no longer in place;
- In the Western Cape, there is a specific Coastal By-Law (2020) to enforce public access to the coast; and
- There is a tension between contested heritage understandings of the sea and socio-economic reality in the region.

7.11 PALAEONTOLOGY

Block 11B/12B is located on the Palaeo-Agulhas Plain. Three broad geomorphic zones are located on the Palaeo-Agulhas Plain, namely the Western Section, stretching from Cape Agulhas to Cape Infanta; the Central Section, stretching from Cape Infanta to Knysna; and the Eastern Section extending eastward of Knysna [(Cawthra, et al., 2020) in (Bamford, 2023)]. Mesozoic sedimentary deposits crop out near the surface on this shelf and are covered by soils derived from the siltstone and shale bedrock. Weathered limestone dominates the substrate sequences on the Agulhas Bank. Beyond the limestones, the plain has extensive floodplains, meandering shallowly incised rivers and wetlands in a low-relief landscape. This is in line with the various stages of the Pleistocene when the sea was as much as 90 m below the present level, when the shallow Agulhas continental shelf was exposed and formed dry land. The geological map for the Palaeo-Agulhas Plain is depicted in Figure 7-29 [(Cawthra, et al., 2020) in (Bamford, 2023)].

Sedimentary and volcanic rocks of the Bredadorp Group underlie Block 11B/12B. The mostly calcareous Bredasdorp Group has the potential to be highly fossiliferous, with the formation representing at least four past ecosystems. Marine sediments preserve molluscs, brachiopods, crustaceans (barnacles, crabs, prawns, ostracods), echinoids, polychaete worm tubes, shark teeth, and fish teeth and bones of whales, dolphins, seals and sea birds. Estuarine sediments preserve bones of large land mammals. Aeolianites (cemented sand dunes) can preserve land snails,

tortoises, moles, ostrich eggshells and scattered mammal bones. Vlei, pan and spring sediments can preserve a rich assortment of mammal bones, especially bovids [(Almond & Pether, 2008) in (Bamford, 2023). Any marine fossils located in the underlying geology would be difficult to distinguish from modern marine taxa, but land fauna would be recognisable (Bamford, 2023).

Based on the geology of the area and the palaeontological record as we know it, it can be assumed that the formation and layout of the sandstones, shales and sands that occur offshore would have the same palaeosensitivity as the known onshore sediments, it can be assumed they would contain the same fossils. The offshore sediments have not been sampled so it is unknown if they have fossils, but it is likely (Bamford, 2023).

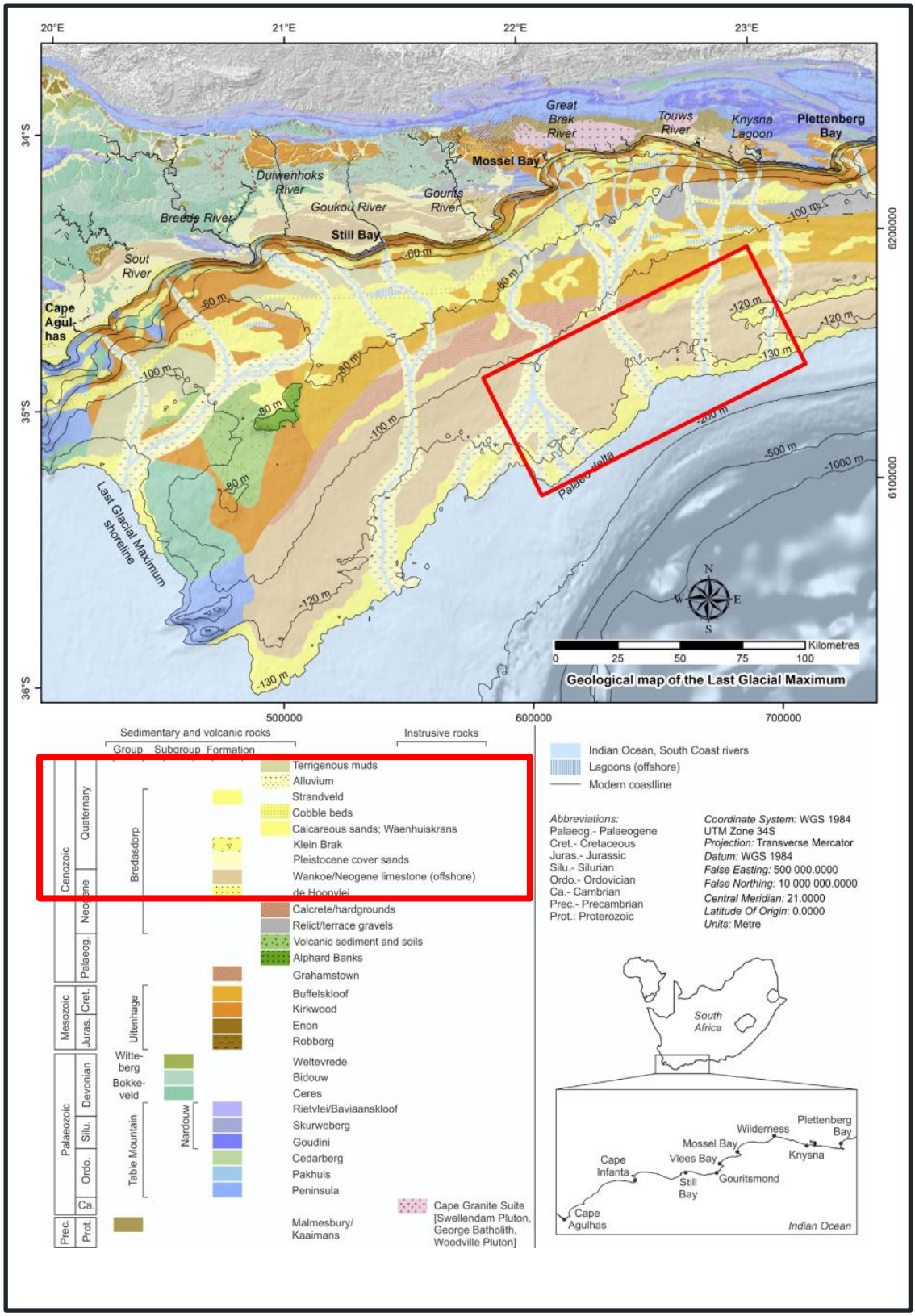


Figure 7-29–- Geological map for the Palaeo-Agulhas Plain

7.12 MARITIME ARCHAEOLOGICAL HERITAGE SITES

The information below is soured from the maritime heritage and archaeological study for the Project (ACO Associates cc, 2023).

7.12.1 MARITIME HERITAGE OF BLOCK 11B/12B

The recorded maritime history of the South African south coast dates from the first transit of these waters by Bartholemeu Dias in 1488. The Cape Route was, for centuries thereafter, the only viable maritime way of reaching the East and as indicated by Figure 5-4 above, was heavily used (Knox-Johnston, 1989). Most of the earliest traffic around the south coast was simply passing by, en route to or from other destinations, and ships only tended to call in at the numerous bays along the coast in emergencies – to take on food or water or to make repairs (see, for example, Storar, 1988).

From the late 17th and into the 18th century, the borders of the Dutch settlement at the Cape started to expand inland and along the south coast. The lack of roads within the small colony meant that easiest means of transporting goods and people to and from the Cape was by ship and small coastal settlements and harbours were established at places like Mossel Bay (1734) (which was first used by Dias in 1488), Algoa Bay (1797) and Knysna (1817) (Tapson, 1961; Inggs, 1986; Ingpen, 1979; Axelson 1987; Scheffler, 1990).

Much of this maritime traffic – both international and local–- tended to stay close to the coast rather than sailing large and out into deeper offshore waters, within which Block 11B/12B is located. As a result, the bulk of the maritime casualties recorded on the south coast in SAHRA's MUCH database and in the database maintained by ACO Associates, are located on or close to the coastline.

Figure 7-30 provides an indication of the density of wrecks along the stretch of coastline between Still Bay and Cape Recife. These wrecks range in date from the 17th to the 21st century.

According to the available records, there are no historical wrecks within Block 11B/12B; however, research undertaken for the HIA and information received from SAHRA suggests that the wreck of the Kiani Satu, which sank in 2013, may be located within the Project Development Area. Another modern wreck, the Taiwanese fishing vessel Shin Huie, which sank in July 1983 approximately 138 km south-east of Mossel Bay lies roughly 22 km north of Block11B/12B and more than 65 km east of the production pipeline corridors. Given their age, neither of these wrecks currently falls under the jurisdiction of the National Heritage Resources Act (NHRA), nor is it likely that they will do so within the estimated life of the production fields within Block 11B/12B.

The only other recorded wrecks in the vicinity of Block 11B/12B and the production pipeline corridors are the Sabor, a World War II casualty of the German U-boat offensive off the south coast and the Texanita, a Liberian registered oil tanker (Figure 7-30).

The Sabor was one of many victims of a German campaign between 1941 and 1943 to disrupt Allied shipping around the Cape. Initially conducted by armed German commerce raiders, but later by packs of U-boats (and some Italian and Japanese submarines), this campaign was responsible for the loss of an estimated 782 395 tons of Allied shipping (Turner et al, 1961).

The Sabor was a steam merchant ship of 5,212 tons built in 1920 in Hull and owned by the Royal Mail Lines Ltd of London. She was travelling, unescorted from Port Said in Egypt to Rio de Janeiro in Brazil, via the Cape, carrying a cargo of salt ballast and 63 bags of mail. She was torpedoed by U-

506 southeast of Mossel Bay at 03h09 on 7 March 1943 and eventually sank after a coup de grace from the U-boat at 05h32. Seven crew members were lost during the attack but the master, 41 crew members and nine gunners were picked up by the South African Airforce Force crash launch R-8 and landed at Mossel Bay (https://uboat.net/allies/merchants/ship/2725.html).

The position given for the sinking of the Sabor in the log of U-506 places the wreck approximately 70 km north of Block 11B/12B, south of Buffels Bay (https://uboat.net/allies/merchants/ship/2725.html). However, a position supplied by the South African Navy in a database of wreck they maintain, places the loss 3,7 km to the south-west. This discrepancy in positions is not material to this assessment, however, since the Sabor is located well outside Block 11B/12B.

The other wreck in the vicinity of Block 11B/12B and the production pipeline options is the Texanita, an approximately 100,000 tons deadweight oil tanker which sank after a collision at sea with another tanker, the Oswego-Guardian on 21 August 1972.

The Oswego-Guardian was traveling west around the Cape from the Middle East, fully loaded with crude oil, while the Texanita was in ballast, and headed in the opposite direction. The two vessels collided in thick fog and oil vapours in the Texanit''s empty tanks ignited, creating an explosion that tore the ship apart. It sank in four minutes with the loss of 47 of its 50 crew. At the time, the accident was the biggest tanker collision on record (https://en.wikipedia.org/wiki/Oswego-Guardian–Texanita_collision).

The reported position of the Texanita is approximately 60 km north-east of the PetroSA FA-Platform, where the production pipeline will connect, and more than 100 km west of the outer edge of Block 11B/12B. The wreck is also currently not old enough to be fall under the National Heritage Resources Act (NHRA).

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 Block 11B/12B or in proximity to the production pipeline corridor options. 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 (see Alves 2011).

7.12.2 ARCHAEOLOGICAL RESOURCES

The record of South Afric''s long association with the sea is also much broader and extends far back into prehistory. This element of South Afric''s maritime and underwater cultural heritage is represented around the coast by thousands of pre-colonial shell middens and large numbers of tidal fish traps, as well as large coastal cave sites such as Pinnacle Point and Cape St Blaize with deep, stratified archaeological deposits which contain a record of pre-colonial human exploitation of marine resources since at least the Middle Stone Age, more than 150 000 years.

Another largely unexplored aspect of South Afric''s maritime and underwater cultural heritage is pre-colonial terrestrial archaeological sites and paleo-landscapes, now inundated by the sea. There have been three major global sea level fluctuations in the last 900 000 years, with the most drastic

fall occurring at the height of the last glaciation, between circa 20 000 and 17 000 years ago, when the sea was more than 120 m lower than it is today (WSP Group Africa (Pty) Ltd, 2023e)..

The resultant exposure of parts of the continental shelf as dry land added a large coastal plain to the South African land mass, something that was particularly pronounced on the broad Agulhas Bank off the Southern Cape coast. This area, now sometimes referred to as the Palaeo-Agulhas-Plain was quickly populated by terrestrial flora and fauna and by our human ancestors who were dependent on these resources. As a result, for periods numbering in the tens of thousands of years on at least three occasions during the last 900 000 years, our ancestors inhabited areas of what is now the seabed around the South African coast. This means that a large part of the archaeological record of South Afric''s later early, middle and early late stone age is located on the now submerged (Figure 7-30).

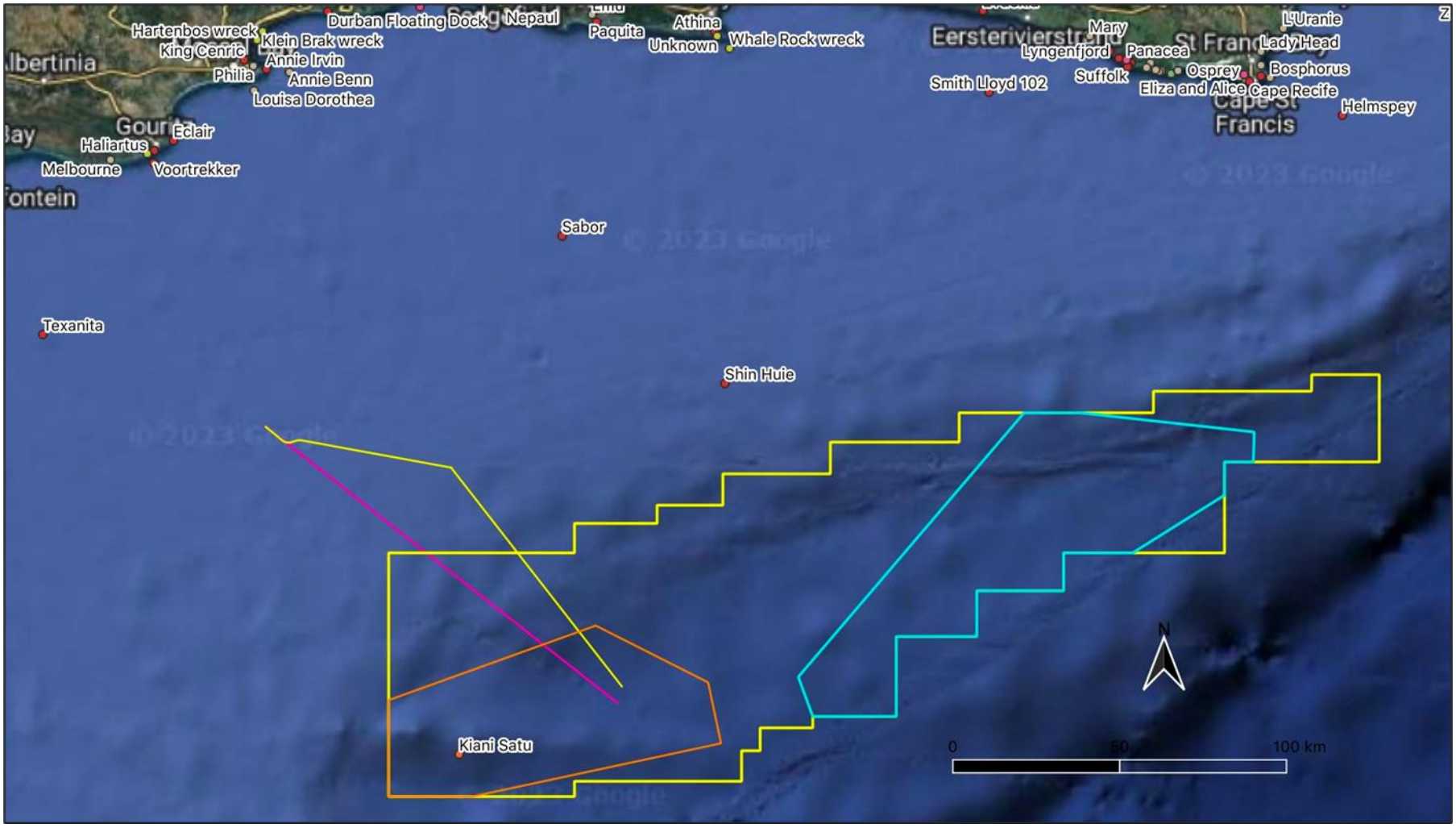


Figure 7-30–- Indication of the number of recorded shipwrecks between Still Bay in the west and Cape Recife in the east (ACO Associates cc, 2023)

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