

**APPENDIX C:
UPDATED ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)**

**ECC RENEWAL FOR EXPLORATION AND
APPRAISAL WELL DRILLING IN BLOCK 2913B,
ORANGE BASIN, NAMIBIA**

**Updated Environmental & Social
Management Plan**

Block 2913B, Orange Basin, Namibia

Prepared for: TotalEnergies EP Namibia B.V.



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ACRONYMS AND ABBREVIATIONS

Acronym / Abbreviation	Definition
BOP	Blow -Out Preventor
CLO	Community Liaison Officer
DST	Drill Stem Tests
EAP	Environmental Assessment Practitioner
EBSA	Ecologically or Biologically Significant Area
ECC	Environmental Clearance Certificate
EIA	Environmental Impact Assessment
ERP	Emergency Response Plan
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Programme
GIIP	Good International Industry Practice
HydroSAN	South African Navy Hydrographic Office
Navtext	Navigational Telex
IAGC	International Association for Geophysical Contractors
IBA	Important Bird Area
IMO	International Maritime Organisation
JNCC	Joint Nature Conservation Committee
LUCORC	Lüderitz upwelling cell - Orange River Cone
MARISMA	Marine Spatial and Governance Programme
MARPOL	International Convention for the Prevention of Pollution from Ships, 1973
MEFT	Ministry of Environment, Forestry and Tourism
MMO	Marine Mammal Observer
MPA	Marine Protected Area
MSDS	Material Safety Data Sheet
NADF	Non-Aqueous Drilling Fluid
NIMPA	Namibian Islands Marine Protected Area
ODS	Ozone Depleting Substances
OOC	Oil On Cutting
OSCP	Oil Spill Contingency Plan
OSRL	Oil Spill Response Limited
PAM	Passive Acoustic Monitoring
PPE	Personal Protective Equipment
ROV	Remotely Operated Vehicle
SAN	South African Navy
SBM	Synthetic Based Mud
SLR	SLR Environmental Consulting (Namibia) (Pty) Ltd
SOPEP	Shipboard Oil Pollution Emergency Plan
SSDI	Subsea Dispersant Injection kit
STDs	Sexually Transmitted Diseases
TEEPNA	TotalEnergies EP Namibia B.V.
VCT	Voluntary Counselling and Testing
VSP	Vertical Seismic Profiling
WBM	Water-based mud

1 INTRODUCTION

1.1 PROJECT BACKGROUND AND LOCATION

TotalEnergies EP Namibia B.V. (hereafter referred to as “TEEPNA”) and its partners hold an Exploration Right over Block 2913B, which is located in the deep-water Orange Basin off the coast of southern Namibia. The block is 8 215 km² in extent and is situated approximately 300 km off the coast in water depths ranging from 2 600 m to 3 300 m (see Figure 1-1).

As part of the process of applying for offshore exploration drilling activities in the Block, an Environmental and Social Impact Assessment (ESIA) process was undertaken, which culminated in the Ministry of Environment, Forestry and Tourism (MEFT) issuing an Environmental Clearance Certificate (ECC) for the proposed activities on 19 September 2019 (MEFT Ref No. ECC-00134). The ECC was issued for a period of three years, expiring on 19 September 2022.

Under the aforementioned ECC, TEEPNA drilled one exploration well (Venus-1X Well) between 30 November 2021 and 05 March 2022. This drilling campaign resulted in a significant discovery of light oil with associated gas. Based on the success of the Venus-1X well, TEEPNA is applying for an ECC renewal in order to undertake exploration and appraisal well drilling in the block beyond the current expiry date of 19 September 2022.

As part of the ECC renewal process, TEEPNA appointed SLR Environmental Consulting (Namibia) (Pty) Ltd (“SLR”) to review the existing ESIA Report and Environmental and Social Management Plan (ESMP) (AECOM 2019) and to update the ESMP, as required, in order to bring it in line with current Good International Industry Practice (GIIP).

1.2 EXPLORATION ACTIVITIES TO BE UNDERTAKEN DURING THE ECC RENEWAL PERIOD

As is noted in the existing ESIA Report (AECOM, 2019), further exploration and appraisal wells may be required if a discovery is made in order to understand the characteristics of the reservoir and its commercial interest.

Based on the recent Venus-1X well discovery, TEEPNA is proposing to undertake further exploration and appraisal well drilling in the Block in two phases. The drilling will take place as described and assessed in the existing ESIA Report (AECOM, 2019).

As part of the first phase drilling campaign, TEEPNA is proposing to drill a new well and test the Venus-1X well.

- TEEPNA proposes to drill a 2nd well (Venus-2) and undertake a Drill Stem Test (DST) (September - December 2022). This well will be drilled approximately 10-20 km to the north/north-west of the Venus-1X well at a similar water depth (i.e. 3000 m) (see Figure 1 1). The expected target drilling depth is not confirmed yet and a notional well depth of 3 500 m is assumed at this stage which is scheduled to start in September 2022.
- TEEPNA will then re-enter the Venus-1X well to undertake a DST (December 2022 - February 2023). The re-entry and DST are expected to take 57 days to complete, commencing after the completion of the Venus-2 well.

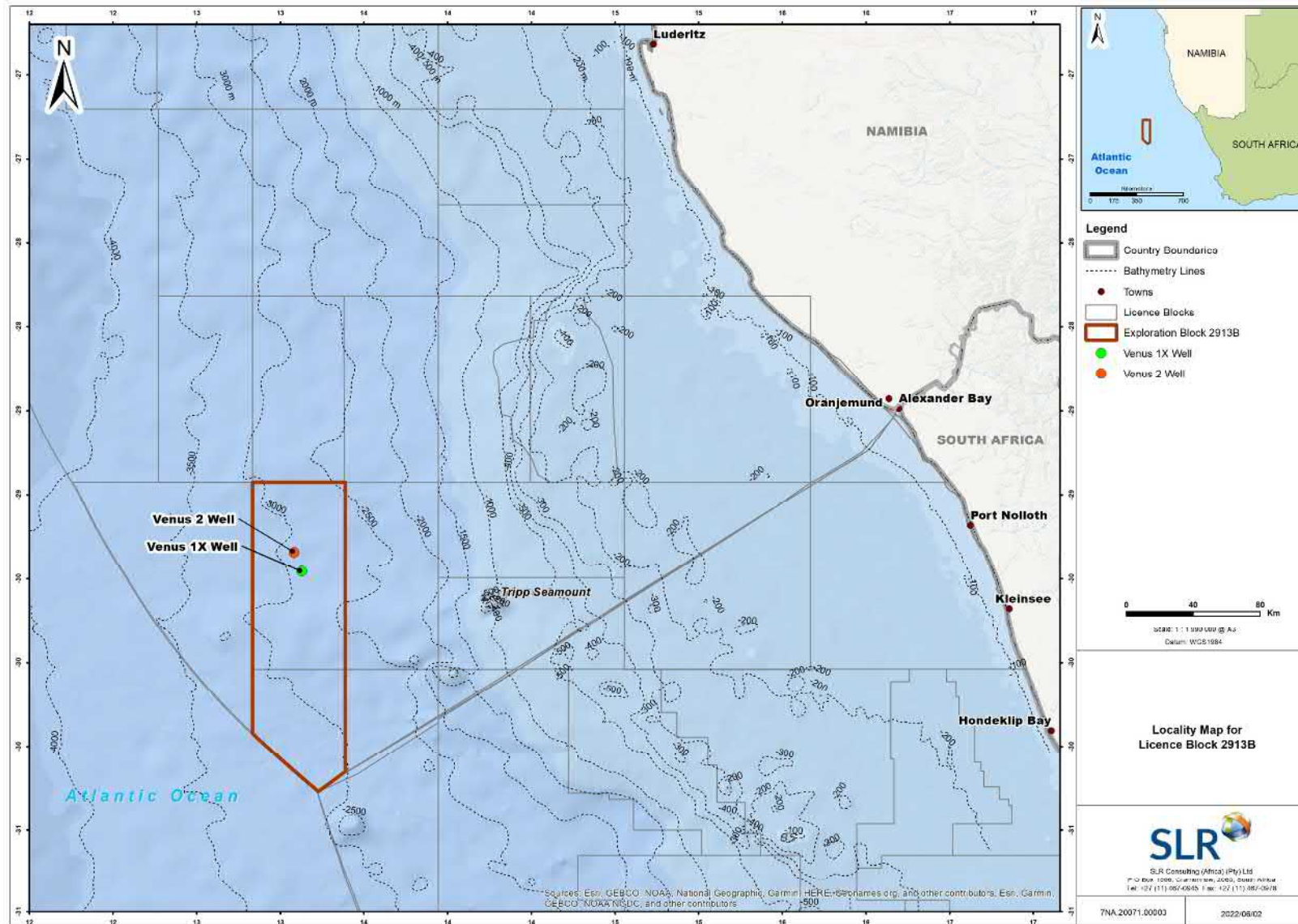


FIGURE 1-1: LOCATION OF LICENCE BLOCK 2913B AND THE VENUS-1X AND PROPOSED VENUS 2 WELLS OFF SOUTHERN NAMIBIA

Based on the results of this first drilling campaign, other appraisal drilling campaigns may be undertaken, which are anticipated to commence in the second half of 2023. The details of these drilling campaigns are currently unknown. The details of the next appraisal campaign will be provided to the Ministry of Mines and Energy (MME) and MEFT once the results of this first appraisal campaign are known and conclusive.

1.3 STRUCTURE OF THIS REPORT

An overview of the structure and content of this report is given in Table 1-1 below.

TABLE 1-1: STRUCTURE AND CONTENT OF THIS UPDATED ESMP

Section	Contents
Chapter 1	Introduction Provides a brief description of the project background and location, described the proposed exploration activities to be undertaken during the ECC renewal period, and describes the structure of the report.
Chapter 2	Approach and Methodology to the ECC renewal application process and updating of the ESMP Outlines the team members and the approach and methodology followed in updating the ESMP.
Chapter 3	Update of the Baseline Environment Presents the updated baseline information that was considered in the updating of the ESMP.
Chapter 4	Updated ESMP Specifications Lists the specific environmental management actions and procedures required to avoid, minimise manage negative impacts and maximise any potential benefits.
Chapter 5	References Provides a list of the references used in compiling this report.
Appendices	Appendix 1: Curricula Vitae of the SLR Project Team and Specialists Appendix 2: Marine Faunal Specialist Report Appendix 3: Commercial Fishing Specialist Report

2 APPROACH AND METHODOLOGY TO THE ECC RENEWAL APPLICATION AND UPDATING OF THE APPROVED ESMP

This chapter outlines the team members and the approach and methodology followed in the ECC renewal application and updating of the approved ESMP.

2.1 DETAILS OF THE SLR PROJECT TEAM AND SPECIALISTS

As noted in Section 1.1, SLR has been appointed as the independent Environmental Assessment Practitioner (EAP) to undertake the ECC renewal application. As part of this ECC renewal application process, SLR reviewed the approved ESIA Report and ESMP and updated the ESMP, where relevant, focusing in particular on the baseline description (Chapter 3 of the ESIA Report) and ESMP Specifications (Appendix A of the ESIA Report).

SLR appointed two specialists to provide marine faunal and commercial fisheries specialist input into the ECC update. The details of the SLR project team and appointed specialists are provided in Table 2-1. CVs of the SLR team and specialists are included in Appendix 1.

SLR and specialist consultants have no vested interest in the proposed project other than fair payment for consulting services rendered as part of the ECC renewal application process and the update of the approved ESMP.

TABLE 2-1: DETAILS OF THE SLR PROJECT TEAM AND SPECIALISTS

Company	Name	Qualifications	Experience (years)	Roles
ESIA Project Team				
SLR Consulting	Edward Perry	M.Sc. (Applied Hydrobiology), Cardiff University B.Sc. Hons (Environmental Science), Plymouth University	28	Project Director and QA/QC
	Jeremy Blood	MSc. (Cons. Ecol.), University of Stellenbosch	23	Project Manager - management of the ESMP update, including process review, specialist baseline study review and report compilation
	Werner Petrick	M. Env Mgt, Potchefstroom University; B. Eng, University of Pretoria	23	Associate – Process review and QA/QC (ESMP review)
Specialist Team				
Pisces Environmental Services	Andrea Pulfrich	PhD (Fisheries Biology), Christian-Albrechts University, Kiel, Germany	27	Marine Faunal Specialist Report
Capricorn Marine Environmental	Sarah Wilkinson	BSc. (Hons) (Botany), University of Cape Town	19	Commercial Fishing Specialist Report

2.2 EIA ASSUMPTIONS AND LIMITATIONS

The assumptions and limitations pertaining to this ESMP update are listed below:

- The original ESIA Report (AECOM 2019) describes and assesses the proposed and ongoing exploration activities thoroughly. As no new activities are proposed, other than those assessed and approved in the original ESIA Report (AECOM 2019), no further assessment of potential impacts is required.
- The indicative technical specifications for well drilling are as described in the existing ESIA Report (AECOM 2019).

- The drill locations are indicative and this ESMP update has considered this and the fact that the final well locations may change slightly.
- SLR assumes that all relevant project information has been provided and that it was correct and valid at the time it was provided.
- No significant changes to the project description or surrounding environment will occur between the completion of this report and implementation of the proposed project that could substantially influence findings and recommendations with respect to mitigation and management.

2.3 APPROACH AND METHODOLOGY

2.3.1 Objectives

This ESMP update has the following objectives:

- To provide confirmation on whether the baseline environment has changed since the compilation of the ESIA Report and ESMP (AECOM 2019) and Environmental Baseline Survey Report (Benthic Solutions 2019).
- Audit the effectiveness of the existing ESMP specifications based on updated baseline information and any key omissions identified in the ESMP.
- Recommend new or revised specifications, as applicable, for inclusion in an updated ESMP.

2.3.2 Approach

As noted above, it is assumed that no new activities are proposed that were not previously assessed and that the original ESIA describes and assesses the proposed / ongoing exploration activities thoroughly. As such, SLR did not re-assess any potential impacts related to the proposed drilling campaign. Specialist input was, however, obtained to review the effectiveness of the ESMP specifications based on updated baseline information and any key omissions identified in the ESMP in order to bring it in line with GIIP.

The ESMP review was undertaken in a structured and systematic manner to audit the effectiveness of the ESMP specifications and identify any shortcomings. GIIP was used as a defining benchmark of adequacy, which was determined using a number of references, including national regulations, international conventions, and recognised codes of practice. These included:

- TEEPNA's global environmental performance standards.
- Recognised industry codes of practice (e.g., International Association for Geophysical Contractors (IAGC) and Joint Nature Conservation Committee (JNCC)).
- International Conventions (e.g., MARPOL).
- TEEPNA's recent drilling operations in Block 2913B (Venus-1X well) and off the South Coast of South Africa (Luiperd well).

2.3.3 Specialist Input

Two specialist reports were prepared as part of this ESMP update. These included:

- Marine fauna (see Appendix 2).
- Commercial fishing (see Appendix 3).

The list of the specialists and their details are provided in Table 2-1. The findings of these studies have been synthesised and incorporated into this report.

3 UPDATE OF THE BASELINE ENVIRONMENT

In reviewing the original ESMP specifications and recommending any ESMP updates, the following additional information, not included in the ESIA Report (AECOM 2019), was taken into consideration.

- Upwelling cells and low oxygen zones;
- Benthic habitats and proximity to seamounts and canyons;
- Habitat and ecosystem threat status;
- Spawning areas;
- Ecologically and Biologically Significant Areas;
- Marine Important Bird Areas; and
- Commercial fishing (specifically the large pelagic longline sector).

These are briefly described below in relation to Block 2913B and the adjacent Block 2912.

3.1 UPWELLING CELLS AND LOW OXYGEN ZONES

Coastal upwelling is a major feature of the Benguela Current. Although the rate and intensity of upwelling fluctuates with seasonal variations in wind patterns, the most intense upwelling tends to occur where the shelf is narrowest and the wind strongest. Consequently, it is a semi-permanent feature off Lüderitz and areas to the north due to perennial southerly winds (Shannon 1985). The Lüderitz upwelling cell is the most intense upwelling cell in the system, with the seaward extent reaching nearly 300 km, and the upwelling water is derived from 300 -400 m depth (Longhurst 2006). The Lüderitz / Orange River region forms a major environmental barrier between the northern and southern Benguela sub-systems (Ekau & Verheye 2005) (see Figure 3-1). Off central and northern Namibia, several secondary upwelling cells occur. Upwelling in these cells is perennial, with a late winter maximum (Shannon 1985). Block 2913B lies well offshore of these upwelling cells, and therefore primary productivity and plankton abundance are thus expected to be low.

3.2 BENTHIC HABITATS AND PROXIMITY TO SEAMOUNTS AND CANYONS

The benthic and coastal habitats of Namibia were mapped as part of the Benguela Current Commission's Spatial Biodiversity Assessment (Holness *et al.* 2014) to develop assessments of the ecosystem threat status and ecosystem protection level. Submarine canyons were also mapped as biodiversity features, although descriptions of their geographical situations were not sufficiently accurate to include them in the benthic habitat map (see Figure 3-2). The benthic habitats were subsequently assigned an ecosystem threat status based on their level of protection and mapped (see Section 3.3 and Figure 3-3).

3.3 HABITAT AND ECOSYSTEM THREAT STATUS

The benthic fauna of the abyss, lower and upper continental slope, and outer shelf (beyond ~450 m depth) are very poorly known, largely due to limited opportunities for sampling. Benthic habitats along the 500 m depth contour have been assigned a threat status of 'Endangered' by the Benguela Current Commission (BCC) Spatial Biodiversity Assessment (Holness *et al.* 2014), but further offshore in Block 2913B, the benthic habitat type is considered 'Least Threatened' (see Figure 3-3).

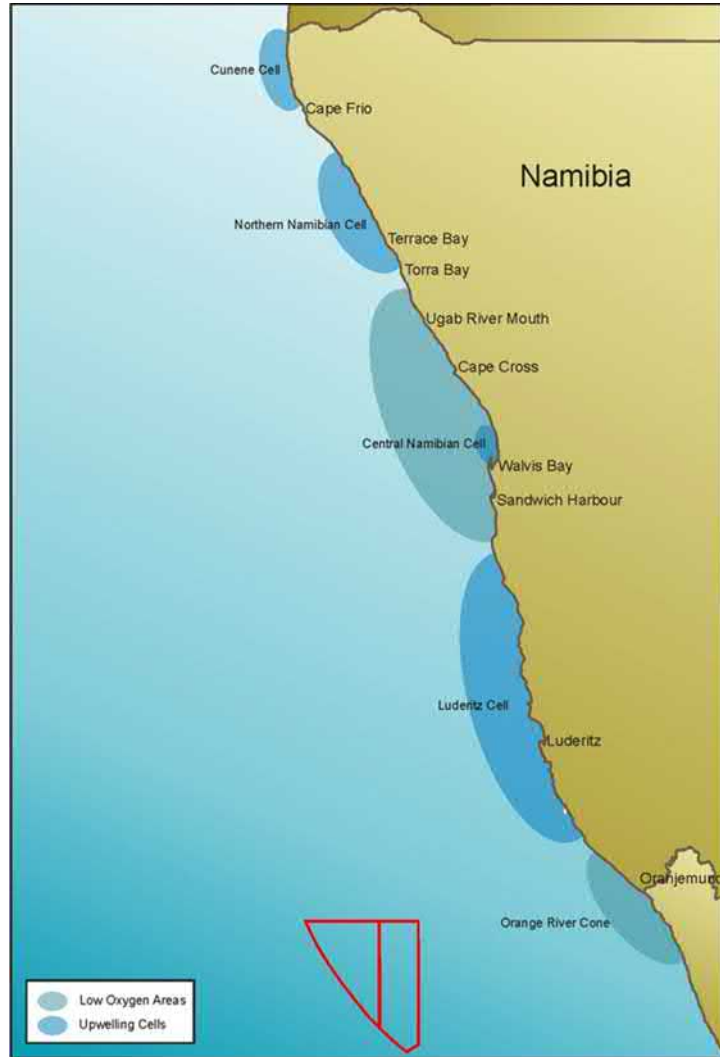


FIGURE 3-1: BLOCKS 2912 AND 2913B IN RELATION TO UPWELLING CENTRES AND LOW OXYGEN AREAS OFF THE WEST COAST OF NAMIBIA

Adapted from Shannon 1985

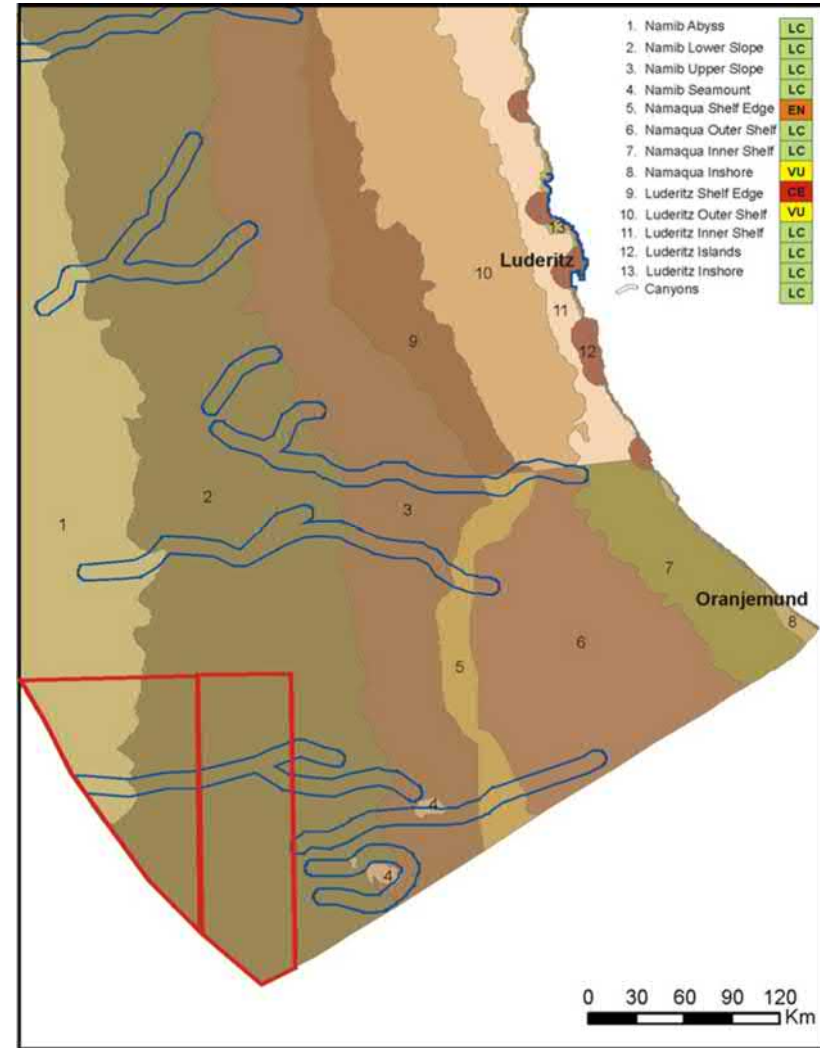


FIGURE 3-2: BLOCKS 2912 AND 2913B (RED POLYGONS) IN RELATION TO THE NAMIBIAN BENTHIC AND COASTAL HABITATS

Note: the positions of potential submarine canyons are shown as blue lines

Adapted from Holness *et al.* 2014

3.4 SPAWNING AREAS

Ichthyoplankton constitutes the eggs and larvae of fish. As the preferred spawning grounds of numerous commercially exploited fish species are located off central and northern Namibia (see Figure 3-4), their eggs and larvae form an important contribution to the ichthyoplankton in the region.

The Lüderitz upwelling cell - Orange River Cone (LUCORC) area, south of the Lüderitz upwelling cell, is considered to be an environmental barrier to the transport of ichthyoplankton from the southern to the northern Benguela upwelling ecosystems. Areas of powerful upwelling are considered unfavourable spawning habitats, with pelagic fish species, such as anchovy, redeye round herring, horse mackerel, and shallow-water hake, reported as spawning on either side of the LUCORC area, but not within it (see Figure 3-4). The area is characterised by diminished phytoplankton biomass due to high turbulence and deep mixing in the water column. A deficiency of phytoplankton results in poor feeding conditions for micro-, meso- and macro-zooplankton and for ichthyoplankton, and successful survival and recruitment of these species in the area is considered unlikely (Lett *et al.* 2007). Due to their location far offshore and beyond the influence of upwelling, the abundance of phytoplankton, zooplankton and ichthyoplankton in Block 2913B, is thus expected to be comparatively low.

3.5 ECOLOGICALLY AND BIOLOGICALLY SIGNIFICANT AREAS (EBSAS)

Of the eight identified EBSAs off Namibia, two fall solely within Namibian national jurisdiction (Namib Flyway and Namibian Islands), while one is shared with Angola (Namibe) and two are shared with South Africa (Orange Shelf Edge and Orange Cone). The Benguela Upwelling System transboundary EBSA extends along the entire southern African West Coast from Cape Point to the Kunene River and includes a portion of the high seas beyond the Angolan EEZ.

Although the proposed zonation of the EBSAs is still under discussion, the management objective in the zones marked for 'conservation' is "strict place-based biodiversity protection aimed at securing key biodiversity features in a natural or semi-natural state, or as near to this state as possible". The management objective in the zones marked for 'Impact Management' is "management of impacts on key biodiversity features in a mixed-use area to keep key biodiversity features in at least a functional state". In the list of sea-use activities provided for this EBSA, the marine spatial planning zone for petroleum activities recommends that non-destructive exploration (e.g., seismic acquisition) and localised destructive exploration (e.g., exploration drilling) is "conditionally permissible" within the biodiversity conservation zone (or Critical Biodiversity Area, CBA). Conditional activities are defined as activities that "are recommended to be managed as 'Consent Activities', which are those that can continue in the zone subject to specific regulations and controls, e.g., to avoid unacceptable impacts on biodiversity features, or to avoid intensification or expansion of impact footprints of uses that are already occurring and where there are no realistic prospects of excluding these activities" (MARISMA Project 2019). The eastern boundary of Block 2913B overlaps slightly (0.01%) with the Orange Seamount and Canyon Complex transboundary EBSA.

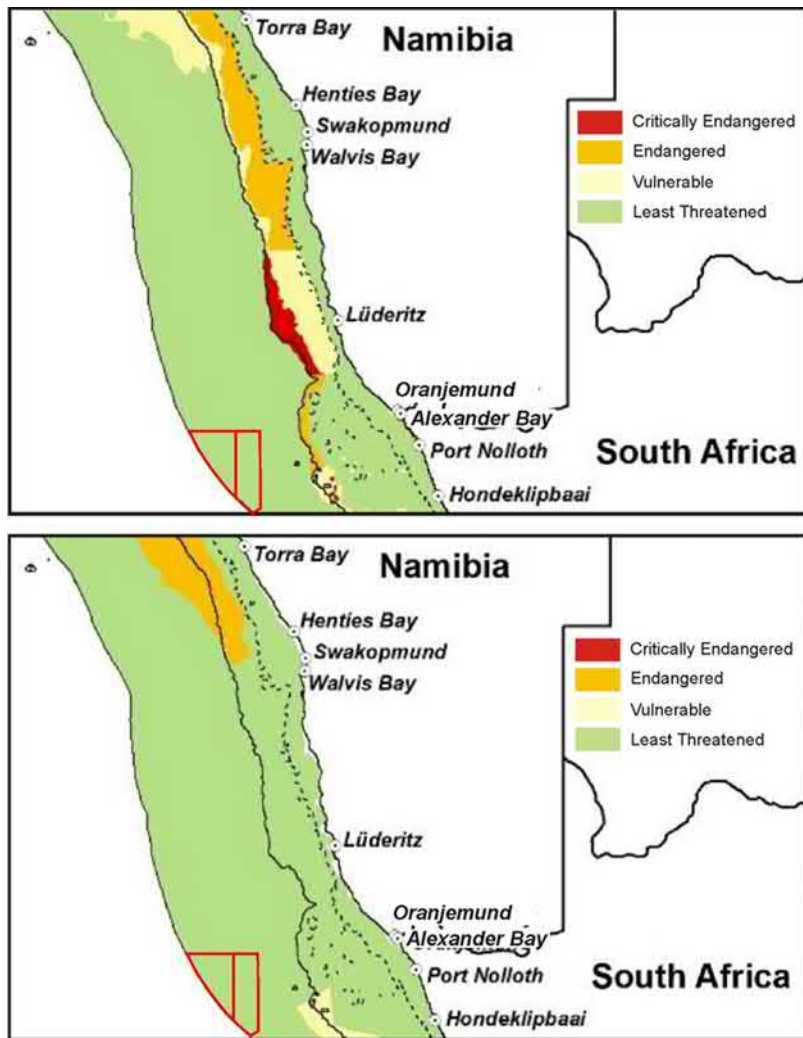


FIGURE 3-3: BLOCKS 2912 AND 2913B IN RELATION TO ECOSYSTEM THREAT STATUS FOR OFFSHORE BENTHIC HABITAT TYPES (TOP) AND OFFSHORE PELAGIC HABITAT TYPES (BOTTOM)

Adapted from Holness *et al.* 2014

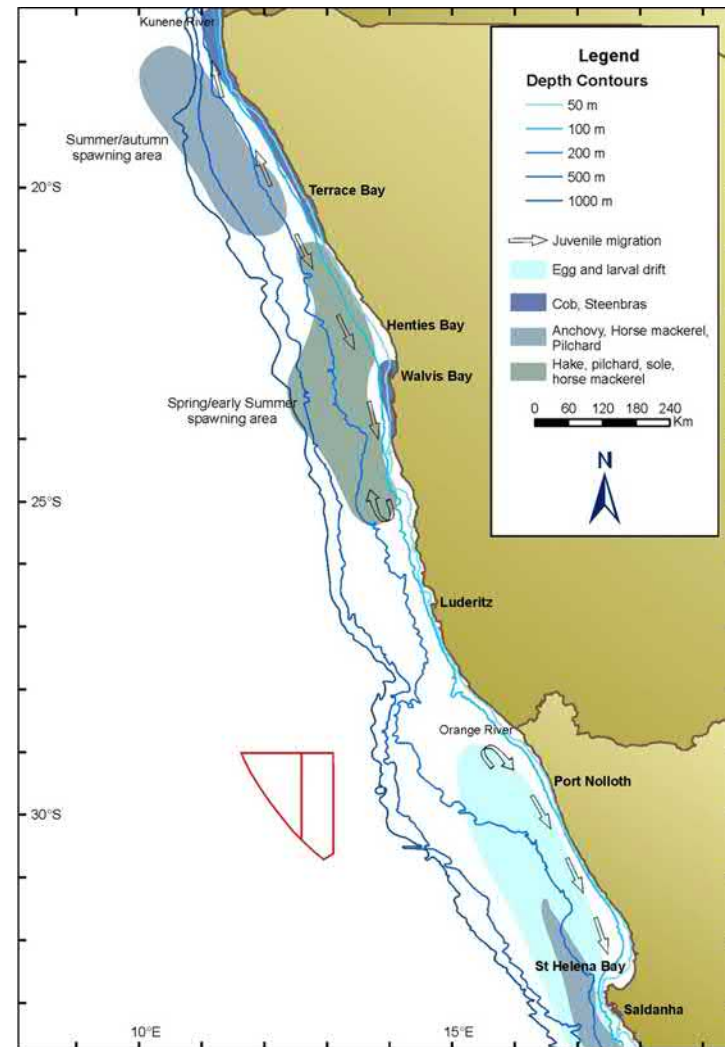


FIGURE 3-4: BLOCKS 2912 AND 2913B IN RELATION TO MAJOR SPAWNING AREAS IN THE BENGUELA REGION

Adapted from Cruikshank 1990; Hampton 1992

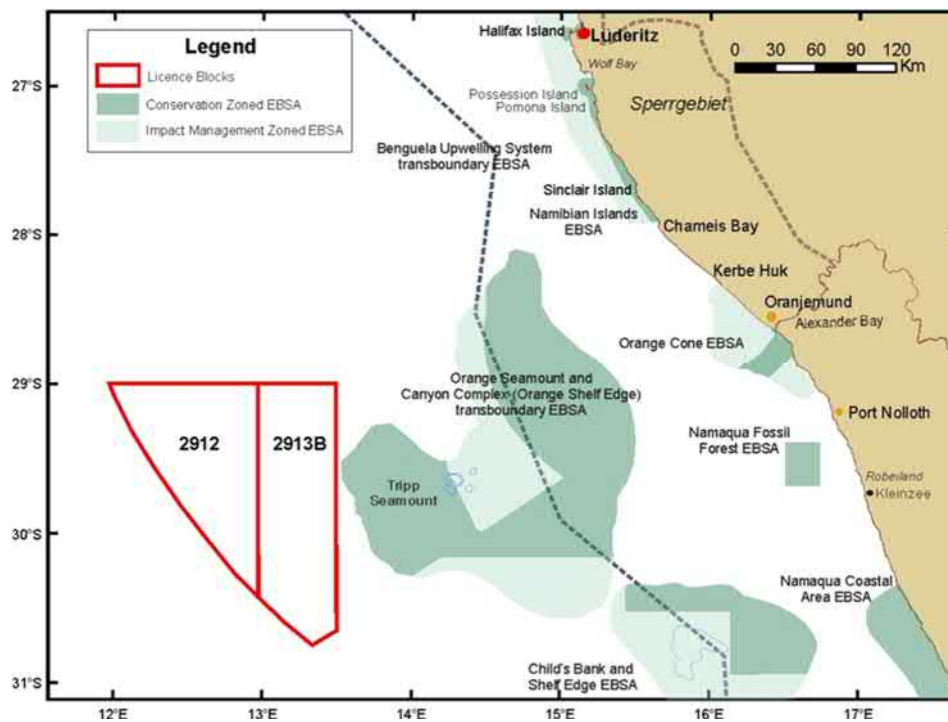


FIGURE 3-5: BLOCKS 2912 AND 2913B IN RELATION TO ECOLOGICALLY AND BIOLOGICALLY SIGNIFICANT AREAS (EBSAS) AND THE MARINE SPATIAL PLANNING ZONES WITHIN THESE

Source: MARISMA Project 2019

3.6 MARINE IMPORTANT BIRD AREAS (IBAS)

Various marine IBAs have also been proposed in Namibian territorial waters, with a candidate trans-boundary marine IBA suggested off the Orange River mouth. Blocks 2912 and 2913B lie offshore of these marine and coastal IBAs (see Figure 3-6). The Atlantic Southeast 21 IBA specifically targets the protection of Atlantic Yellow-nosed Albatross, Black-browed Albatross, and White-chinned Petrels.

3.7 COMMERCIAL FISHING

The only commercial fishing sector that overlaps with Block 2913B is the large pelagic longline fishery (see Figure 3-7). This sector makes use of surface longlines to target migratory pelagic species, including yellowfin tuna (*Thunnus albacares*), bigeye tuna (*T. obesus*), swordfish (*Xiphias gladius*) and various pelagic shark species.

Long-line vessels targeting pelagic tuna species and swordfish operate extensively around the entire coast along the shelf-break and into deeper waters. The spatial distribution of fishing effort is widespread and may be expected predominantly along the shelf break (approximately along the 500 m isobath) and into deeper waters (2 000 m). The entire area of Block 2913B coincides with the fishing grounds utilised by this sector. Over the period 2003 to 2019, an average of 7.01 tons of catch per year was taken within the Block (i.e., 0.23% of total national landings). The area's average annual effort amounted to 6 400 hooks (0.22% of total national effort). Catch and effort within the area have fluctuated dramatically by year, and the highest figures for this time series were recorded in 2014 at 27.66 tons (23 600 hooks). Based on this value, the catch taken within the Block amounted to a maximum of 0.86% of the annual landings during this time period. Effort occurs year-round with a slight peak over the period from March to May.

Refer to Appendix 3 for a summary of the other commercial fishing sectors.



FIGURE 3-6: BLOCKS 2912 AND 2913B IN RELATION TO COASTAL AND MARINE IBAS IN NAMIBIA

Source: <https://maps.birdlife.org/marineIBAs>

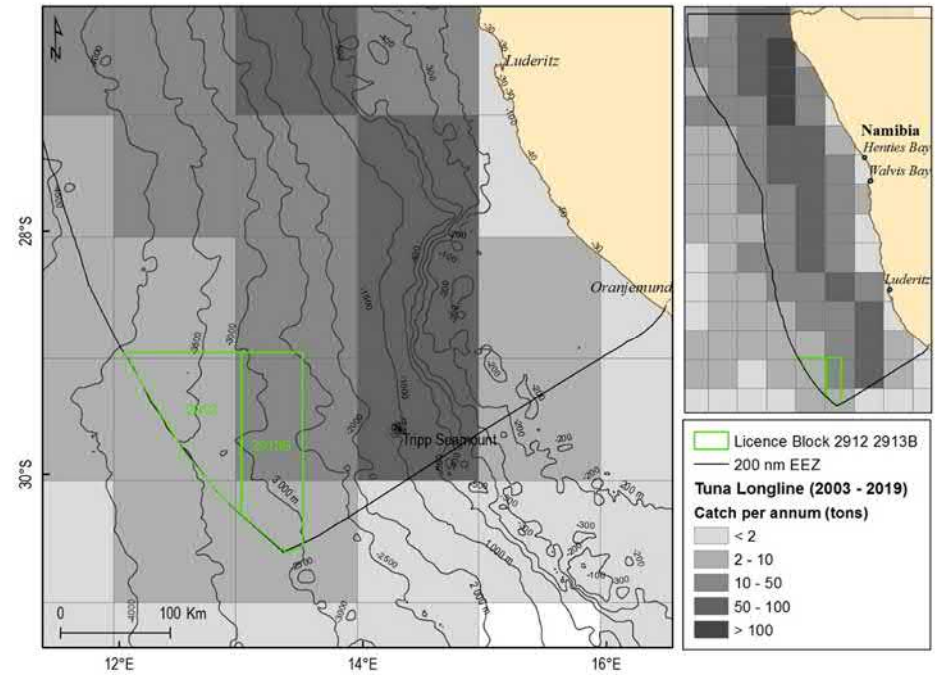


FIGURE 3-7: BLOCKS 2912 AND 2913B IN RELATION TO SPATIAL DISTRIBUTION OF CATCH RECORDED BY THE PELAGIC LONG-LINE FISHERY (2003 TO 2019)

Source: CapMarine

4 UPDATED ESMP SPECIFICATIONS

This chapter lists the specific environmental management actions and procedures required to avoid, minimise, manage negative impacts and maximise any potential benefits from exploration well drilling in Block 2913B.

Table 4-1 is an update of the approved ESMP (AECOM 2019). All key changes are indicated in **green font for additions** and **red font for deletions** in the table. It is important to note that while this ESMP review has identified some specificaitons, which require updating to bring them into alignment with GIIP, the overall effectiveness of the original ESMP in terms of impact avoidance and mitigation is not affected.

TABLE 4-1: ESMP SPECIFICATIONS (ADAPTED FROM AECOM 2019)

Aspect	Potential Impact	Phase	Activities	Mitigation / Management Measure	Documentation / Records Reviews	Responsibility
Staff Mobilisation	Inadequate project planning	Mobilisation	Project mobilisation	<ul style="list-style-type: none"> All plans / procedures and specifications as described in this ESMP are to be developed and accepted for use prior to commencement of the project. All staff who are mobilised on the project are to receive induction training prior to commencing with work and regular environmental awareness training thereafter. 	<u>Plans addressing:</u> <ul style="list-style-type: none"> External communication with stakeholders / public Shipboard Oil Pollution Emergency Plan (SOPEP) Oil Spill Contingency Refuelling / Bunkering Emergency response Monitoring programmes Maintenance programmes Accident and incident reporting Waste management (including hazardous materials) Ballast water management plan Environmental reporting Environmental training Site decommissioning and rehabilitation 	TEEPNA / Contractor

Aspect	Potential Impact	Phase	Activities	Mitigation / Management Measure	Documentation / Records Reviews	Responsibility
Required workforce	Employment creation	Mobilisation and exploration operations	All project activities	<ul style="list-style-type: none"> Maximise and monitor local recruitment & procurement (incl. using local skills and small-business databases). Tender criteria should require training and skills development of the contractor workforce by the contractor. Promote skills development and training for workforce. Procurement of materials, goods and services from local suppliers where feasible. Encourage indirect employment creation in the informal sector where feasible. 	<ul style="list-style-type: none"> Procurement policies Or contractual obligations with major service providers 	TEEPNA / Contractor
Project / financial spend	Multiplier effect on the local economy	Mobilisation and exploration operations	All project activities, which involving capital and operational expenditure	<ul style="list-style-type: none"> Give preference first to capable local service providers. Develop local service provision capacity. Monitoring of sub-contractors' procurement. Development of a register of local service providers in consultation with Government and other Oil and Gas companies. Local procurement targets should be formalised in TEEPNA's procurement policy for the Project. 	<ul style="list-style-type: none"> Procurement policies Or contractual obligations with major service providers For longer-term drilling campaigns: <ul style="list-style-type: none"> Register of local service providers Local procurement targets 	TEEPNA / Contractor
Project-/ financial spend	Fiscal impacts	Mobilisation and exploration operations	All project activities which are necessary to ensure a functional Project. The Project as a whole will pay royalty and taxes	Private companies such as TEEPNA generally have limited to no input in directing government expenditure of revenue from private sector projects.	None	TEEPNA/ Contractor
Required workforce	Presence of foreign workforce	Mobilisation and exploration operations	All project activities	<ul style="list-style-type: none"> In order to reduce the risk of conflict or competition between locals and newcomers, it is recommended that the recruitment policy used to employ people on the projects must be fair and transparent. Recommended measures to combat HIV/AIDS and other social ills include the following: <ul style="list-style-type: none"> Implementing HIV/AIDS, alcohol abuse, drug abuse, and gender-based violence prevention and awareness campaigns among workforce and relevant communities; The contractor should make HIV/AIDS and Sexually Transmitted Diseases (STDs) awareness and prevention 	<ul style="list-style-type: none"> Recruitment Policy HIV Policy 	TEEPNA / Contractor

Aspect	Potential Impact	Phase	Activities	Mitigation / Management Measure	Documentation / Records Reviews	Responsibility
				<p>programmes a condition of contract for all suppliers and sub-contractors;</p> <ul style="list-style-type: none"> o If appropriate medical facilities are available, consider introducing a voluntary counselling and testing (VCT) programme through all the phases of the project and continued during operations. 		
Project activities	Physical intrusion and nuisance impacts	Mobilisation and exploration operations	All project activities. Most project activities will contribute to nuisance impacts	<ul style="list-style-type: none"> • Stakeholder engagement planning. • Community liaison and continuous communication. 	<ul style="list-style-type: none"> • Stakeholder Engagement Plan • Grievance Management Procedure 	TEEPNA / Contractor
Project perceptions	Stakeholder opposition	Mobilisation and exploration operations	All project activities	<ul style="list-style-type: none"> • Communicate commitments regarding employment and procurement. • Transparency regarding employment practices. • Monitor community attitudes to anticipate/prevent active opposition. • Opening a line and e-mail to collect comments and grievances from stakeholders. • Appointment of a Community Liaison Officer (CLO) to enhance communication, if required. 	<ul style="list-style-type: none"> • Stakeholder Engagement Plan • Appointment of CLO, if required • Grievance management procedure 	TEEPNA / Contractor
Emergency situations	Emergencies can result severe environmental damage as well as loss of human lives and property	Mobilisation Operation Demobilisation	Fires, spills, explosions, collisions, etc.	<ul style="list-style-type: none"> • All relevant staff must receive training on emergency procedures and disaster management • Regular emergency drills must be undertaken • Contact details of role-players (Contractors, TEEPNA, authorities, stakeholders, emergency services etc.) must be kept available and included in the Emergency Response Plan and SOPEP. • Request, in writing, the South African Navy Hydrographic Office (HydroSAN) to broadcast a navigational warning via Navigational Telex (Navtext), Lüderitz Port Control and Walvis Bay radio for the duration of the drilling campaign. • Notify key stakeholders of (1) the co-ordinates of the drilling area, (2) an indication of the operational timeframes, (3) the dimensions of the safety zone around the drilling unit (500 	<ul style="list-style-type: none"> • Emergency Response Plan • SOPEP • Training records • Notifications - Copies of all correspondence and list of those to whom it was sent 	TEEPNA / Contractor

Aspect	Potential Impact	Phase	Activities	Mitigation / Management Measure	Documentation / Records Reviews	Responsibility
				<p>m – 2 km), and (4) details on the movements of support vessels servicing the project:</p> <ul style="list-style-type: none"> ○ Fishing industry / associations: Association of Namibian Fishing Industries, and the Namibian Large Pelagic Longlining Association. ○ Directorate of Maritime Affairs. ○ Namibian Ports Authority. ○ MFMR Monitoring, Control and Surveillance Unit in Walvis Bay. <ul style="list-style-type: none"> ● Notify any fishing vessels at a radar range of 5 nm from the drilling unit via radio regarding the safety requirements around the vessel. ● Implement a grievance mechanism in case of disruption to fishing or navigation. 		
Generation and release of air emissions	<p>Physiological effects on marine fauna</p> <p>Greenhouse gas emissions</p>	Mobilisation Demobilisation	<ul style="list-style-type: none"> – Exhaust gas emissions produced by the combustion of gas or liquid fuels – Fugitive emissions associated with leaking tubing, valves, connections, flanges etc. – Vent or flaring off some of the oil and gas. – Incineration of waste. 	<ul style="list-style-type: none"> ● Implement a maintenance plan to ensure all emission causing infrastructure receives regular maintenance to minimise emissions released into the atmosphere. ● Implement leak detection on emissions generating infrastructure. ● Identify all Ozone Depleting Substances (ODS) and implement controls to prevent or minimise release into the atmosphere – this includes: <ul style="list-style-type: none"> ○ Replacing ODS generating equipment with non-ODS generating equipment; ○ Minimising the use of ODS generating equipment; ○ Maintaining ODS generating equipment to prevent leaks; and ○ Repairing leaking equipment within a suitable timeframe. ● Drilling schedules to be optimised to ensure that energy consumption is minimised. ● Use a high-efficiency burner for flaring to maximise combustion of the hydrocarbons in order to minimise emissions and hydrocarbon ‘drop-out’ during well testing. 	<ul style="list-style-type: none"> ● Maintenance Plan ● Maintenance Registers ● ODS Register ● Waste Manifest ● Recording daily flare and cumulative flare volumes 	TEEPNA / Contractor

Aspect	Potential Impact	Phase	Activities	Mitigation / Management Measure	Documentation / Records Reviews	Responsibility
				<ul style="list-style-type: none"> • Optimise well test programme to reduce flaring as much as possible during the test. • Commence with well testing during daylight hours, as far as possible, and operational monitoring. • Maximise flare combustion efficiency by controlling and optimising flare fuel/air/stream flow rates. • Monitor flare (continuous) for any malfunctioning, interruption, etc. (including any drop-out). • Ensure no incineration of waste occurs within the port limits. • Incineration of waste to be restricted outside of ports and to specific items. This should be detailed in the Waste Management Plan. 		
Discharge of waste to sea	Reduction of water quality Impacts on marine fauna Introduction of exotic marine species	Mobilisation Operation Demobilisation	<ul style="list-style-type: none"> - Normal vessel discharge - Ballast water discharge - Discharge of cuttings, drilling fluid and cement 	<ul style="list-style-type: none"> • Develop the following plans which address all wastes generated during the various activities: <ul style="list-style-type: none"> ○ SOPEP; ○ Waste Management Plan; and ○ Ballast Water Management Plan. • These plans should discuss waste management strategies for drilling fluids, domestic wastes, sanitary wastes, radioactive wastes, produced water, drill cuttings, hydrocarbons and any other waste stream identified on site. These strategies should involve both sustainable production and consumption. • Waste must be segregated before storage and appropriate disposal. This should be clearly outlined in the waste management plan. • Waste storage must be available, secure and not open to the elements. • Disposal of general and hazardous waste should occur onshore in accordance with the appropriate laws and ordinances – this methodology must be outlined in the Waste Management Plan. Where waste cannot be disposed of onshore the conditions of MARPOL must be adhered to. 	<ul style="list-style-type: none"> • Shipboard Oil Pollution Emergency Plan (SOPEP) • Waste Management Plan • Ballast Water Management Plan • Waste Manifests • Fuel and Oil Use records • Inspection Reports • Spill Records 	TEEPNA / Contractor

Aspect	Potential Impact	Phase	Activities	Mitigation / Management Measure	Documentation / Records Reviews	Responsibility
				<ul style="list-style-type: none"> • Incineration of waste to be restricted outside of ports and to specific items. This should be detailed in the Waste Management Plan. • Ships: Discharge of food waste less than 3 nm offshore must be comminuted to particle sizes smaller than 25 mm. • Ships: Discharge of food waste which is not comminuted may only be disposed of between 3 nm and 12 nm. • Offshore platforms more than 12 nm from land and ships within 500 m of said platforms: Discharge of comminuted food waste is permitted. Discharge of food waste which is not comminuted is not permitted. • The discharge of sewage into the sea is prohibited, except when the ship has in operation an approved sewage treatment plant or when the ship is discharging comminuted and disinfected sewage using an approved system at a distance of more than three nautical miles from the nearest land. Sewage which is not comminuted or disinfected may be discharged at a distance of more than 12 nautical miles from the nearest land when the ship is en route and proceeding at not less than 4 knots. • Sewage effluent must be discharged more than 5 m below the water surface. • Sewage and grey water will be treated using a marine sanitation device to produce an effluent with: <ul style="list-style-type: none"> ○ A biological oxygen demand (BOD) of <25 mg/l (if the treatment plant was installed after 1/1/2010) or <50 mg/l (if installed before this date). ○ Minimal residual chlorine concentration of 0.5 mg/l. ○ No visible floating solids or oil and grease. • Prohibit operational discharges when transiting through the Namibian Islands Marine Protected Area (NIMPA). • Waste discharges must be controlled where fauna are observed being attracted to the area. 		

Aspect	Potential Impact	Phase	Activities	Mitigation / Management Measure	Documentation / Records Reviews	Responsibility
				<ul style="list-style-type: none"> Oil spills must be cleaned immediately using the appropriate oil absorbents with low to no toxicity. All relevant staff must be trained in spill identification and remediation. Implement an awareness programme that addresses reduced water usage and waste generation at the various sites, shore-based and marine. Leak, spill detection and maintenance programmes must be undertaken on all infrastructure which has the potential to leak and create waste (liquid, gas, solid etc.). Implement leak detection and repair programmes for valves, flanges, fittings, seals, etc. Use a low-toxicity biodegradable detergent for the cleaning of all the deck and any spillages. Use drip trays to collect run-off from equipment that is not contained within a bunded area and route contents to the closed drainage system. Dispose of residual oily waste onshore in accordance with the appropriate laws and ordinances. 		
Ballast Water Management	Introduction of alien invasive marine species	Mobilisation Operation Demobilisation	Discharge of ballast water	<ul style="list-style-type: none"> Each vessel which carries ballast water is to have a ballast water management plan which complies with the requirements set out in the International Convention for the Control and Management of Ships Ballast Water and Sediments, 2004. All ships will also have to carry a ballast water record book and an international ballast water management certificate Ships need to comply with Regulation D1 and D2 of the IMO Ballast Water Management Convention. Ships performing Ballast Water exchange shall do so with an efficiency of 95 per cent volumetric exchange of Ballast Water. For ships exchanging ballast water by the pumping-through method, pumping through three times the volume of each ballast water tank shall be considered to meet the standard described. Pumping through less than three times 	<ul style="list-style-type: none"> Ballast Water Management Plan Ballast Water Record System (including coordinates, times, durations, etc.) 	TEEPNA / Contractor

Aspect	Potential Impact	Phase	Activities	Mitigation / Management Measure	Documentation / Records Reviews	Responsibility
				<p>the volume may be accepted provided the ship can demonstrate that at least 95 percent volumetric exchange is met.</p> <ul style="list-style-type: none"> • Ships conducting ballast water management shall discharge less than 10 viable organisms per cubic metre greater than or equal to 50 micrometres in minimum dimension and less than 10 viable organisms per millilitre less than 50 micrometres in minimum dimension and greater than or equal to 10 micrometres in minimum dimension; and discharge of the indicator microbes shall not exceed the specified concentrations. • Ballast Water exchange must take place at least 200 nautical miles from the nearest land and in water at least 200 metres in depth where possible, taking into account the guidelines developed by the IMO. No ballast water is to be exchanged within ports or harbours. • All ships shall remove and dispose of sediments from spaces designated to carry ballast water in accordance with the provisions of the ship’s ballast water management plan. • Avoid the unnecessary discharge of ballast water. • Use filtration procedures during loading in order to avoid the uptake of potentially harmful aquatic organisms, pathogens and sediment that may contain such organisms. • Ensure that routine cleaning of the ballast tank to remove sediments should be carried out, where practicable, in mid-ocean or under controlled arrangements in port or dry dock, in accordance with the provisions of the ship’s Ballast Water Management Plan. • Officers and crew shall be familiar with their duties in the implementation of ballast water management particular to the ship on which they serve and shall, appropriate to their duties, be familiar with the ship’s ballast water Management plan. 		

Aspect	Potential Impact	Phase	Activities	Mitigation / Management Measure	Documentation / Records Reviews	Responsibility
				<ul style="list-style-type: none"> Ballast water management plans must be approved by the relevant authorities. Ensure all infrastructure (e.g., wellheads, BOPs and guide bases) that has been used in other regions is thoroughly cleaned prior to deployment. 		
Discharge of cuttings, drilling fluid or cement	<p>Smothering of seabed habitat and associated benthic fauna</p> <p>Physiological effects on marine fauna</p> <p>Reduction of water quality</p>	Operation	<ul style="list-style-type: none"> Riserless drilling phase Cementing of well casing Discharge of cuttings overboard 	<ul style="list-style-type: none"> Undertake pre-drilling site surveys (with ROV) to ensure there is sufficient information on seabed habitats, including the mapping of potentially vulnerable habitats within 1 000 m of a proposed well site. Ensure that, based on the pre-drilling site survey and expert review of ROV footage, well sites are not located within a 1 000 m radius of any vulnerable habitats (e.g., hard grounds), species (e.g., cold corals, sponges) or structural features (e.g., rocky outcrops). Review Remotely Operated Vehicle (ROV) footage of pre-drilling surveys to identify potential vulnerable habitats within 150 m of the well location. Ensure drill site is located more than 500 m from any identified vulnerable habitats. Use WBMs for drilling, as far as possible. Minimize use of non-aqueous drilling fluid (NADF) drilling fluids and additives, especially biocides. Use high efficiency solids control equipment to reduce the need for fluid change out and minimise the amount of residual fluid on drilled cuttings. Ensure regular maintenance of the on-board solids control package. In instances where NADFs are used, treat cuttings to reduce oil content to <6.9% Oil On Cutting (OOC) before being discharged overboard. Discharge cuttings at least 10 m below sea level. Ensure all recovered synthetic based drilling mud is taken to shore for treatment and reuse. Ensure that all responsible staff receive adequate training 	<ul style="list-style-type: none"> ROV footage Discharge volumes Discharge material content records Additives in drilling fluid Oil content of synthetic based drill cuttings Waste manifest Records of training Emergency Response Plan 	TEEPNA / Contractor

Aspect	Potential Impact	Phase	Activities	Mitigation / Management Measure	Documentation / Records Reviews	Responsibility
				<ul style="list-style-type: none"> • Report emergency situations to the relevant authorities and initiate the relevant emergency procedures. • Prioritize low-toxicity and partially biodegradable additives in drilling fluid and cement. • The discharges of deck drainage that is contaminated with hydrocarbons, fuels, oils and lubricants, and all bilge water must be treated before being discharged into the sea. • Prioritize low-toxicity and partially biodegradable additives in drilling fluid and cement. • Monitoring requirements: <ul style="list-style-type: none"> ○ Monitor (using ROV) cement returns and if significant discharges are observed on the seafloor terminate cement pumping. ○ Monitor (using ROV) hole wash out to reduce discharge of fluids as far as possible. 		
Disturbance to the seabed and association sediments	Elimination or disturbance of benthic fauna Reduction of water quality	Operation	<ul style="list-style-type: none"> - Pre-drilling surveys - Penetration of the seabed by drill bit - removal of the BOP 	<ul style="list-style-type: none"> • Undertake pre-drilling site surveys (with ROV) to ensure there is sufficient information on seabed habitats, including the mapping of potentially vulnerable habitats within 1 000 m of a proposed well site. • Ensure that, based on the pre-drilling site survey and expert review of ROV footage, well sites are not located within a 1 000 m radius of any vulnerable habitats (e.g., hard grounds), species (e.g., cold corals, sponges) or structural features (e.g., rocky outcrops). • Do not land ROVs on the seabed as part of normal operations. • Review Remotely Operated Vehicle (ROV) footage of pre-drilling surveys to identify potential vulnerable habitats within 150 m of the well location. • Ensure drill site is located more than 500 m from any identified vulnerable habitats. • Minimize use of NADF drilling fluids and additives, especially biocides 	<ul style="list-style-type: none"> • ROV footage • MSD's of drilling fluids and additives • Maintenance Registers • Records of noise monitoring • Observation reports for marine mammal observations 	TEEPNA / Contractor

Aspect	Potential Impact	Phase	Activities	Mitigation / Management Measure	Documentation / Records Reviews	Responsibility
				<ul style="list-style-type: none"> • Use high efficiency solids control equipment to reduce the need for fluid change out and minimise the amount of residual fluid on drilled cuttings. • Ensure regular maintenance of the on-board solids control package. • In instances where NADFs are used, treat cuttings to reduce oil content to <6.9% Oil On Cutting (OOC) before being discharged overboard. • Discharge cuttings at least 10 m below sea level. • Ensure all recovered synthetic based drilling mud is taken to shore for treatment and reuse. • Ensure that all responsible staff receive adequate training • Report emergency situations to the relevant authorities and initiate the relevant emergency procedures. • Monitoring requirements: <ul style="list-style-type: none"> ○ Monitor (using ROV) cement returns and if significant discharges are observed on the seafloor terminate cement pumping. • Monitor (using ROV) hole wash out to reduce discharge of fluids as far as possible. 		
Generation of marine noise	Behavioural impact on marine fauna	Operation	<ul style="list-style-type: none"> - Semi-submersible rig positioning - Drilling - VSP Airgun Operations 	<ul style="list-style-type: none"> • Employees must be provided with adequate Personal Protective Equipment (PPE). • The plant and all equipment must be properly maintained to avoid creation of unnecessary additional noise. • Noisy operations should, wherever possible run concurrently in order to minimise the duration of high noise levels. • Implement a maintenance plan to ensure all diesel motors and generators receive adequate maintenance to minimise noise emissions. • Noise levels shall be monitored to comply with the relevant health and safety requirements. • Ensure vessel transit speed between the survey / drill area and port is a maximum of 12 knots (22 km/hr), except 	<ul style="list-style-type: none"> • Maintenance Registers • Records of noise monitoring • Observation reports for marine mammal observations 	TEEPNA / Contractor

Aspect	Potential Impact	Phase	Activities	Mitigation / Management Measure	Documentation / Records Reviews	Responsibility
				<p>within 25 km of the coast where it is reduced further to 10 knots (18 km/hr).</p> <ul style="list-style-type: none"> All works that deviate from normal operating conditions shall be reported and actions initiated to mitigate against to prevent recurrence of the incident. <p><u>VSP operations:</u></p> <ul style="list-style-type: none"> Appoint a minimum of two dedicated Marine Mammal Observer (MMO), with a recognised MMO training course, on board for marine fauna observation (360 degrees around drilling unit), distance estimation and reporting. One MMO should also have Passive Acoustic Monitoring (PAM) training should a risk assessment, undertaken ahead of the VSP operation, indicate that the PAM equipment can be safely deployed considering the metocean conditions (specifically current). Subject to the risk assessment, ensure the drilling unit vessel is fitted with PAM technology (one or more hydrophones), which detects animals through their vocalisations, should it be possible to safely deploy PAM equipment. Commence VSP profiling, as far as possible, during daylight hours with good visibility. However, if this is not possible due to prolonged periods of poor visibility (e.g., thick fog) or unforeseen technical issue which results in a night-time start, refer to "periods of low visibility" below. Undertake a 1-hr (as water depths >200 m) pre-shoot visual and possible acoustic scan (subject to risk assessment) prior to soft-starts / airgun tests within the 500 m 30-minute pre-start scan (prior to soft-starts) within the 3 km radius mitigation zone in order to confirm there is no cetacean, turtles, penguins and shoaling large pelagic fish activity within 500 m of the source. Implement a "soft start" procedure of a minimum of 20 minutes' duration when initiating the VSP acoustic source (except if testing a single airgun on lowest power). This 		

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				<p>requires that the sound source be ramped from low to full power rather than initiated at full power, thus allowing a flight response by marine fauna to outside the zone of injury or avoidance.</p> <ul style="list-style-type: none"> • Delay “soft-starts” if cetaceans, turtles and shoaling large pelagic fish are observed / detected within the mitigation zone during the pre-shoot visual / acoustic scan. A “soft-start” should not begin until 20 minutes after cetaceans depart the mitigation zone or 20 minutes after they are last seen or acoustically detected by PAM in the mitigation zone. In the case of penguins, shoaling large pelagic fish and turtles, delay the “soft-start” until animals are outside the 500 m mitigation zone. Commence “soft start” procedure only once it has been confirmed by a suitably trained crew member during the 30 minute pre start-up visual scan that there is no cetacean activity within 500 m of the source. • Maintain visual and possibly acoustic observations within the 500 m shut-down zone continuously during VSP operation to identify if there are any cetaceans or other sensitive faunal groups present. • Shut down the acoustic source if cetaceans, penguins, shoaling large pelagic fish or turtles are sighted within 500 m shut-down zone until such time as the animal has moved to a point more than 500 m from the source mitigation zone is clear of cetaceans for 20 minutes or in the case of penguins, shoaling large pelagic fish or turtles, the animals are outside the 500 m mitigation zone before the soft-start procedure and production may commence. • Breaks in airgun firing of less than 20 minutes: <ul style="list-style-type: none"> ○ there is no requirement for a soft-start and firing can recommence at the same power level as at prior to the break (or lower), provided that continuous monitoring was ongoing during the silent period and no cetaceans, penguins, shoaling large pelagic fish or turtles were 		

Aspect	Potential Impact	Phase	Activities	Mitigation / Management Measure	Documentation / Records Reviews	Responsibility
				<p>detected in the mitigation zone during the breakdown period.</p> <ul style="list-style-type: none"> ○ If a cetacean is detected in the mitigation zone during the breakdown period, there must be a minimum of a 20-minute delay from the time of the last detection within the mitigation zone and a soft-start must then be undertaken. In the case of penguins, shoaling large pelagic fish or turtles, the animals are outside the 500 m mitigation zone within the 20-minute period. • Breaks in airgun firing of longer than 20 minutes: <ul style="list-style-type: none"> ○ If it takes longer than 20 minutes to restart the airguns, a full pre-watch and soft-start process should be carried out before the survey re-commences. If an MMO/PAM operator has been monitoring during the breakdown period, this time can contribute to the 60-minute pre-watch time. • Ensure that during periods of low visibility (where the mitigation zone cannot be clearly viewed out to 500 m 3 km), including night-time, the VSP source is only used if PAM technology is in place to detect vocalisations (subject to a risk assessment indicating that the PAM equipment can be safely deployed considering the metocean conditions) or during the preceding 24-hour period: <ul style="list-style-type: none"> ○ there have not been three or more occasions where cetaceans, penguins, shoaling large pelagic fish or turtles have been sighted within the 500 m mitigation zone during the preceding 24-hour period cetacean-instigated shut-down situations; ○ a two-hour period of continual observation was undertaken during a period of good visibility prior to the period of low visibility (to the extent of the observation zone) and no cetaceans, penguins, shoaling large pelagic fish or turtles were sighted within the 500 m mitigation zone; and 		

Aspect	Potential Impact	Phase	Activities	Mitigation / Management Measure	Documentation / Records Reviews	Responsibility
				<ul style="list-style-type: none"> MMOs to use a thermal camera during hours of darkness for cetacean observations. Where possible, sensitive receptors should be forewarned before noisy VSP operations commence. 		
Generation of airborne noise	Behavioural impact on marine and coastal fauna	Operation	Helicopter operations	<ul style="list-style-type: none"> Ensure that all flight paths avoid the Lüderitz Lagoon and offshore islands (including Halifax and Possession) by at least 1 852 m (i.e. 1 nm) and seal colonies (including Atlas Bay, Wolf Bay and Long Islands). Avoid extensive low-altitude coastal flights. Maintain a flight altitude >1 000 m at all times within the NIMPA and a cruising altitude of greater than 300 m, except when taking off and landing or in a medical emergency. Comply fully with aviation and authority guidelines and rules. Brief all pilots on the ecological risks associated with flying at a low level along the coast or above marine mammals. 	<ul style="list-style-type: none"> Copy of set flight path (including altitude) Helicopter logs Deviations from set flight paths 	Contractor
Collision of vessels with marine fauna	Faunal collisions with project vessels	Operation	Transit of support vessels to and from port	<ul style="list-style-type: none"> Ensure all vessel operators keep a constant watch for marine mammals and turtles in the path of the vessel. Ensure vessel transit speed between the survey area and port is a maximum of 12 knots (22 km/hr), except in the NIMPA where it is reduced further to 10 knots (18 km/hr). 	<ul style="list-style-type: none"> None 	Contractor
Spills	Oil entering the marine environment because of an unplanned oil event or minor on board spillages	Operation	Unforeseen events	<ul style="list-style-type: none"> Engineer wells according to best practices (BOP, etc.) Develop and implement a Oil Spill Contingency Plan (OSCP) that summarises reactionary measures in the unlikely event of a subsea release well-specific response strategy and plans (OSCP and BOCP), aligned with the national OSCP, for each well location that identifies the resources and response required to minimise the risk and impact of oiling (shoreline and offshore). This response strategy and associated plans must take cognisance to the local oceanographic and meteorological seasonal conditions, local environmental receptors and local spill response resources. The development of the site-specific response strategy and plans must include the following: 	<ul style="list-style-type: none"> Shipboard Oil Pollution Emergency Plan (SOPEP) Stakeholder Engagement Plan Oil Spill Contingency Refuelling / Bunkering Emergency response Monitoring programmes Spills Register Fuel and Oil Record Book 	TEEPNA / Contractor

Aspect	Potential Impact	Phase	Activities	Mitigation / Management Measure	Documentation / Records Reviews	Responsibility
				<ul style="list-style-type: none"> ○ Assessment of onshore and offshore response resources (equipment and people) and capabilities at time of drilling, location of such resources (in-country or international), and associated mobilisation / response timeframes. ○ Selection of response strategies that reduce the mobilisation / response timeframes as far as is practicable. Use the best combination of local and international resources to facilitate the fastest response. ● Schedule regular joint oil spill exercises including TEEPNA and local departments / organisations to test the Tier 1, 2 & 3 responses. ● Use low toxicity dispersants that rapidly dilute to concentrations below most acute toxicity thresholds. Dispersants should be used cautiously and only with the permission of MFMR. ● As far as possible, and whenever the sea state permits, attempt to control and contain the spill at sea with suitable recovery techniques to reduce the spatial and temporal impact of the spill. ● In the event of a large spill, use drifter buoys and satellite-borne Synthetic Aperture Radar (SAR)-based oil pollution monitoring to track the behaviour and size of the spill and optimise available response resource. ● Ensure adequate resources are provided to Oil Spill Contingency Plan (including collect and transport oiled birds to a cleaning station). ● Ensure contract arrangements and service agreements are in place to implement the OSCP: <ul style="list-style-type: none"> ○ Capping stack in Saldanha Bay and other international locations. ○ Subsea Dispersion Injection (SSDI) kit. 		

Aspect	Potential Impact	Phase	Activities	Mitigation / Management Measure	Documentation / Records Reviews	Responsibility
				<ul style="list-style-type: none"> ○ surface response equipment (e.g., booms, dispersant spraying system, skimmers, etc.), dispersants, response vessels, etc. ● Ensure that the following aspects are included in insurance cover to financially manage the consequences of any unplanned event pollution on environmental and social aspects: <ul style="list-style-type: none"> ○ Damages and compensation to Third-Parties. ○ Evidence to be provided to MME. ● Develop and implement a SOPEP that summarises the reactionary measures in the event of on-board oil spills. ● Develop and implement a refuelling procedure for bunkering. <ul style="list-style-type: none"> ○ Submit an application for the transfer of oil at sea (outside a harbour but within 50 nm of the Namibian coast) to Ministry of Works and Transport. ○ Ensure offshore bunkering is not undertaken in the following circumstances: <ul style="list-style-type: none"> - Wind force and sea state conditions of ≥ 6 on the Beaufort Wind Scale; - During any workboat or mobilisation boat operations; - During helicopter operations; - During the transfer of in-sea equipment; and - At night or times of low visibility. ● Oil spill response training must be implemented. Ensure personnel are adequately trained in both accident prevention and immediate response, and resources are available on each vessel. ● As far as possible, and whenever the sea state permits, attempt to control and contain the spill at sea with suitable recovery techniques to reduce the spatial and temporal impact of the spill. ● Ensure adequate resources are provided to collect and transport oiled birds to a cleaning station. 		

Aspect	Potential Impact	Phase	Activities	Mitigation / Management Measure	Documentation / Records Reviews	Responsibility
				<ul style="list-style-type: none"> • Ensure all staff receive training on handling and storage of liquid hazardous materials. • Where options exist for variation in hazardous chemical products, the product with the lowest toxicity must always be selected. • Ensure all liquid hazardous substances are stored within secondary containment. • Ensure all liquid hazardous substances are appropriately labelled and that the relevant Material Safety Data Sheet (MSDS's) for their safe use are kept on record. • All hazardous materials containment areas must be regularly inspected. • Suitable firefighting equipment must be stored in close proximity and all staff must be made aware of the dangers of burning chemicals/smoke inhalation. • Ensure drainage water passes through oil screening processes in order to remove oils prior to discharge. • All staff are to be provided with appropriate Personal Protective Equipment (PPE). • Engage with appropriate governmental agencies. 		
Radioactive devices and explosives	Radioactive contact	Operation	Survey Activities	<ul style="list-style-type: none"> • Transportation and storage of radioactive devices to be in secure containers with limited access. • Procedures for handling and use of devices to be developed. • All staff involved in radioactive device use to be issued with the appropriate PPE. • Test radioactive devices at manufacturer recommended intervals to detect leaks. • Incident and emergency response plans to include radioactive devices and procedures for their loss, theft or potential exposure to crew or the environment. 	<ul style="list-style-type: none"> • Radioactive device use procedures • Incident and emergency response plan 	TEEPNA / Contractor

Aspect	Potential Impact	Phase	Activities	Mitigation / Management Measure	Documentation / Records Reviews	Responsibility
Lighting	Increased mortality of fauna and seabirds and interference with ecosystem diurnal patterns	Mobilisation Operation Demobilisation	All project activities	<ul style="list-style-type: none"> Reduce lighting to a minimum compatible with safe operations whenever and wherever possible to reduce the incidence of stranded pelagic seabirds on the vessel(s) at night. Use lighting only where absolutely necessary. The number and strength of lighting are to be appropriate for the activities taking place. Light sources should be placed appropriately for the task taking place and be positioned to ensure emissions to the surrounding environment can be minimised. Keep disorientated, but otherwise unharmed, seabirds in dark containers (e.g., cardboard boxes) for subsequent release during daylight hours. Ringed birds should be reported to the details found on the ring. 	<ul style="list-style-type: none"> Record of fauna sightings and fatalities 	TEEPNA / Contractor
Abandonment of Infrastructure	Increased habitat for marine fauna and benthic organisms	Demobilisation	Abandonment of infrastructure	<ul style="list-style-type: none"> Seal the well by inserting cement plugs in the well bore. Well integrity must be tested. Remove all BOP infrastructure. Notify the relevant authorities and key stakeholders (as listed above) that the drilling unit and support vessels are off location and provide details of wellhead abandonment of the project closure. Ensure abandoned wellheads are surveyed and accurately charted with the SAN Hydrographer. Distribute a "Notice to Mariners" and "Notice to Fishers" of the location of abandoned wellheads. In the event that equipment is lost during the operational stage, assess safety and metocean conditions before performing any retrieval operations. Scan sea floor for dropped equipment and retrieve items where practicable and safe to do so. Ensure containers are sealed / covered during transport and loads are lifted using the correct lifting procedure and within the maximum lifting capacity of crane system. Minimise the lifting path between vessels. 	<ul style="list-style-type: none"> Well integrity test results ROV footage Register of abandoned items Correspondence records 	TEEPNA / Contractor

Aspect	Potential Impact	Phase	Activities	Mitigation / Management Measure	Documentation / Records Reviews	Responsibility
				<ul style="list-style-type: none"> Maintain an inventory of all equipment and undertake frequent checks to ensure these items are stored and secured safely on board each vessel. Establishing a hazards database listing the type of gear left on the seabed and/or in the licence area with the dates of abandonment/loss and locations, and where applicable, the dates of retrieval. Undertake a post drilling ROV survey to scan seafloor for any dropped equipment and other removable features (e.g., some excess cement) around the well site. In the event that equipment is lost during the operational stage, assess safety and metocean conditions before performing any retrieval operations. Notify SAN Hydrographer of any hazards left on the seabed or floating in the water column, and request that they send out a Notice to Mariners with this information the relevant authorities where items could not be retrieved. 		
Demobilisation	Demobilisation phase impacts	Demobilisation	All project activities	<ul style="list-style-type: none"> Maximise use of local labour in decommissioning activities. Adequate notification of pending decommissioning. Provide staff with references so that they can pursue work with other companies. If feasible, assist staff in finding employment at other operations. 	<ul style="list-style-type: none"> Procurement policy Stakeholder Engagement Plan 	TEEPNA / Contractor

5 REFERENCES

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APPENDIX 1:

CURRICULA VITAE OF THE SLR PROJECT TEAM AND SPECIALISTS



ED PERRY

OPERATIONS MANAGER

Environmental Management Planning & Approvals,
South Africa

QUALIFICATIONS

Postgrad Cert.	2016	Postgraduate Certificate in Occupational Health and Safety, University of Cape Town
Postgrad Cert.	2012	Postgraduate Certificate in Environmental Law, Centre for Environmental Management, Potchefstroom
Postgrad Cert.	2008	Postgraduate Certificate in Environmental Assessment, Oxford Brookes University
MSc	1994	MSc Applied Hydrobiology, Cardiff University
BSc (Hons)	1990	BSc (Hons) Environmental Science, Plymouth University

EXPERTISE

- Environmental and Social Impact Assessments
- EHSS Auditing
- Environmental Compliance
- Management Systems
- Due Diligence

Ed Perry joined SLR as the Operations Manager for the Environmental Management Planning and Approvals (EMPA) team in Africa (offices in South Africa, Namibia, and Ghana). He has worked in environmental consultancy for over twenty years for a wide range of public and private sector clients.

Ed is a registered Environmental Auditor with the Institute for Environmental Management and Assessment and a Lead Auditor with the International Cyanide Management Institute. Prior to moving to South Africa in 2011 Ed worked in the UK on a wide range of projects including EIAs and Integrated Pollution and Prevention Permits. This included permitting the first hazardous waste landfill in the UK under the new integrated permitting mechanism and undertaking a study for the European Commission on the implementation of the Landfill Directive in 15 European countries.

Since moving to South Africa, Ed has been involved with ESIA's and environmental authorisations throughout Africa. Ed has been Project Director / Partner in Charge of EIAs for a wide range of facilities including: New Mines and Extensions to Mines, Renewable Energy Facilities; Metal Extractive Industries; Large Water Storage Schemes, and Oil and Gas Projects;

Ed has also undertaken a wide range of environmental audits including; due diligence audits, EMPR audits, and over 20 international cyanide code audits of mines throughout Africa. These audits include assessing ESHIAs, RAPs and associated documentation against the requirements of the IFC Performance Standards. Ed is a registered Environmental Assessment Practitioner with the Environmental Assessment Practitioners Association of South Africa (EAPASA).

PROJECTS

A sample of Ed's project experience, summarised by sector, is provided below.

Oil and Gas

Total E&P South Africa - South Coast, South Africa

Ed is the Project Director for the EIA for additional exploration well drilling and associated exploration activities in Block 5/6/7, offshore South Coast, South Africa.

Shell – South Africa	Ed was the Project Manager for various environmental authorisations in South Africa associated with the Shell GUESS program. This program related to the closure and clean up of Shell service stations.
Vopak – Richards Bay, South Africa	Ed was the Project Manager for an ESIA for a new terminal operated by Vopak at Richards Bay for the handling and storage of Liquid Petroleum Gas and Clean Petroleum Products.
Vopak – Durban, South Africa	Ed was the Project Manager for an ESIA for the expansion of the Vopak terminal at Durban Docks for the handling and storage of Liquid Petroleum Gas and Clean Petroleum Products.
Bidvest – Durban South Africa	Ed was the Project Manager for an ESIA for the expansion of the Bidvest terminal at Durban Docks for the handling and storage of Liquid Petroleum Gas and Clean Petroleum Products.
ENI – East Coast, South Africa	Ed provided technical support for the EIA for regarding ENI's exploration activities off the KZN coast.
	Mining
Lucara Diamonds – Karowe Diamond Mine, Botswana	Ed is part of the SLR team acting as the Independent Technical Expert (ITE) on behalf of the lender to assess a project to expand the mine. Ed undertook the environmental and social assessment against the requirements of the Equator Principles and the IFC Performance Standards.
Kefi Minerals – Tulu Kapi Gold Mine, Ethiopia	Ed is the Technical Reviewer for an Environmental and Social Due Diligence review of the ESHIA and associated documents against the requirements of the IFC Performance Standards, local legislation, and best practice. This includes liaison with the Environmental Assessment Practitioners producing the ESHIA and the Lender's representatives.
Swakop Uranium – Heap Leach Project, Namibia	Ed is the Technical Reviewer and Project Director for the heap leach project, undertaking screening and subsequent ESIA for the location of a new heap leach.
Nampower – Biomass Power Plant, Namibia	Ed is the Project Director for an ESIA as part of a financing arrangement with the European Development Bank for Nampower to construct a new Power Plant using biomass from encroaching bush.
West Wits Gold Mine – South Africa	Ed is the Technical Reviewer and Project Director for an ESIA for a new gold mine in South Africa including open cast and underground mining. The application for a mining right was successful with an Environmental Authorisation being issued. A Water Use Licence is currently being applied for.
Maamba Collieries Limited – Maamba Coal Mine, Zambia	Ed was the lead auditor leading the creation and implementation of an integrated management system in accordance with the requirements of the IFC performance standards, ISO 14001, ISO 9001, and OHSAS 18001.
Eramet - Senegal	Lead Auditor for a due diligence audit of a mineral sands mining operation. The operation was the subject of a possible joint venture. The environmental audit, which included 3 days on site, was to establish if what environmental risks were involved with the project, which was just about to enter the construction phase.

Continental Coal Limited – Penumbra, South Africa	Ed was the Lead Auditor undertaking review of EIA, EMP and site procedures against the requirements of the IFC Procedures.
Eurasian Natural Resources Corporation – Kakanda Mine, DRC	Ed was the Project Manager for the review of a Safety, Health, Environment and Community Management System for Kakanda Mine in the DRC.
Anglo-American – Polokwane Smelter, Polokwane	Ed was the Project Manager responsible for undertaking an external compliance audit for the Anglo-American Polokwane Smelter as stipulated in the slag stockpile permit for the Polokwane Metallurgical Complex. This included a review of the permit for the temporary stockpile of ash as part of the expansion of the Complex.
Ruighoek Mine, South Africa	Ed was the Project Manager for an ESIA associated with the expansion of this chromium mine in South Africa.
AngloGold Ashanti – Yatela, Sadiola, Siguri Gold Mines, Mali and Guinea	Ed was the Lead Auditor and Project Manager undertaking a re-certification audit against the requirements of the International Cyanide Code for three gold mines.
Freda Rebecca Gold Mine - Zimbabwe	Ed was the Lead Auditor and Project Manager for a gap audit to ascertain the status of the gold mine with regards to its ability to comply with the International Cyanide Code
Gold Fields Ghana – Tarkwa and Damang Gold Mines	Ed was the Lead Auditor and Project Manager undertaking a re-certification audit against the requirements of the International Cyanide Code for the two gold mines.
Goldfields, Harmony, AngloGold Ashanti – South Africa	Ed was the Lead Auditor and Project Manager undertaking a re-certification audit against the requirements of the International Cyanide Code for 5 gold mines for AngloGold Ashanti, 4 gold mines for Harmony, and a gold mine for Gold Fields.
Riversdale Capital – Zambeze Coal Mine, Zambia	Ed was the Technical Reviewer for an ESHIA for the development of the Zambeze Coal Mine on behalf of Riversdale Capital.
Confidential – proposed mine, South Africa	Ed was the Project Manager for an ESIA for a new proposed iron ore mine in South Africa. This application was withdrawn following baseline studies by specialist showing the existence of fatal flaws with regards to water use and location of the TSF.
	Industry
Dundee Precious Metals – Tsumeb Smelter, Namibia	Ed is the Project Director of an Agricultural Assessment to provide a consolidated management plan for improved agricultural land management, long term monitoring and mitigation of potential impacts.
Distell – South Africa	Ed was Project Manager for a number of projects for Distell in order to obtain various environmental authorisations for their brewing facilities including the one for the siting of a new waste water treatment works.
SPAR – South Africa	Ed was Project Manager for a number of energy projects undertaken for SPAR in South Africa including looking at Science Based Targets, Internal Carbon Pricing, and an ISO 50001 Energy Management System.

SCAW – South Africa.	Ed was the Project Manager for a range of Environmental Authorisations, including ESIA's, Air Emissions Licences, Water Use Licences and contaminated land assessments. These studies were undertaken for SCAW at a number of their smelter sites in Gauteng over a 5 year period.
Confidential – South Africa	Ed lead an EHS audit of a cable tie manufacturer using plastic extrusion as part of a due diligence project.
Pfizer – South Africa	Ed was the Project Manager and Lead Auditor for an EHS audit of the head offices of Pfizer in South Africa.
Sasol - Sasolburg	Ed was the Project Manager and Lead Auditor for International Cyanide Code recertification audit for the Sasol cyanide production facility at Sasolburg.
Sohar Aluminium - Oman	Ed was the Lead Auditor of Sohar Aluminium's environmental management system auditing the system against the requirements of ISO 14001 and benchmarking this facility against international requirements.
Confidential – KZN, South Africa	Lead Auditor for a due diligence audit of a white goods manufacturing company in Kwa-Zulu Natal.
Sasol – Secunda	Ed was the Lead Auditor for a third party audit of waste contractors operating on behalf of Sasol. The audit investigated compliance with South African environmental legislation and environmental best practice.
Confidential – South Africa, Kenya, UAE	Ed was the project manager for a due diligence audit of a packaging company's facilities in South Africa, Kenya and UAE.
	Infrastructure
Lesotho Highlands Development Agency - Lesotho	Ed took over as Project Manager undertaking an ESIA for the Polihali Reservoir and Western Access Road in Lesotho on behalf of the Lesotho Highlands Development Agency.
Freight Forwarders Group – Kenya and Tanzania	Ed was the Lead Auditor undertaking a re-certification audit against the requirements of the International Cyanide Code for the Freight Forwarders transportation group of companies.
Transnet Pipelines – South Africa	Ed was the Project Manager responsible for the creation and implementation of an Energy Management System for all of the pumps stations, workshops and offices for Transnet Pipelines, who pump crude oil and petroleum products from Durban to Johannesburg.
Interwaste – South Africa	Ed was the Technical Reviewer for the EIA for a new integrated waste management facility including a new landfill in South Africa against the requirements of NEMA and NEM:WA.
	Power
Nampower - Namibia	Ed is the Technical Reviewer for an ESIA for a biomass power plant that will use wood from encroacher bush in Namibia. This project is being funded by the European Investment Bank and it is therefore required to comply with the IFC Performance Standards.

<p>Department for International Development – UK Government</p>	<p>The UK Department for International Development is providing support to medium sized renewable energy facilities (mainly hydroelectric power plants) in Uganda through the Global Energy Transfer Feed in Tariff programme (GET FIT). The project was to assess how local communities in the vicinity of these facilities could obtain power and how environmental and social safeguards for these types of facilities could be improved in the future. Ed was the lead environmental and social advisor undertaking a review of the environmental and social safeguards.</p>
<p>Confidential - Angola</p>	<p>Ed was Project Manager for a project undertaking a Strategic Environmental Assessment of locations for renewable energy facilities in Angola.</p>
<p>Confidential - Mozambique</p>	<p>Ed was the Project Manager for an ESIA to be submitted to the Mozambican authorities for the development of a unique renewable energy pilot facility.</p>
<p>MEMBERSHIPS</p>	
<p>IEMA</p>	<p>Practitioner for the Institute of Environmental Management and Assessment</p>
<p>IEMA</p>	<p>Registered Environmental Auditor</p>
<p>EAPSA</p>	<p>Registered Environmental Assessment Practitioner</p>
<p>PUBLICATIONS</p>	
	<ul style="list-style-type: none"> • The Role of Socio-Economic Factors, Seasonality and Geographic Differences on Household Waste Generation and Composition in the City of Tshwane. 2016 (Wastcon).
	<ul style="list-style-type: none"> • EMS as a Tool for Integrated Business Risk Management. 2005 (various journals).
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	<ul style="list-style-type: none"> • New Approaches to Management of Waste. 2002 (various journals)
	<ul style="list-style-type: none"> • Minimise the Waste – Maximise the Message. 2001
	<ul style="list-style-type: none"> • Guide to Waste Reduction on Construction Sites. 1999. Construction Confederation



JEREMY BLOOD

ASSOCIATE ENVIRONMENTAL CONSULTANT

Environmental Management, Planning & Approvals,
South Africa

QUALIFICATIONS

MSc	2006	Masters in Conservation Ecology (Stellenbosch University). Cum Laude.
BSc (Hons)	1995	Honours in Botany (Rhodes University). Academic colours.
BSc	1994	Majors in Botany and Zoology (Rhodes University).

EXPERTISE

- Environmental & Social Impact Assessment
- Environmental Legislation
- Environmental Management Programmes
- Stakeholder Engagement
- Environmental compliance & monitoring
- Rehabilitation Planning
- Environmental Control Officer

Jeremy is a Senior Environmental Consultant and has been working as an Environmental Assessment Practitioner since 1999 and has project managed a number of large-scale projects covering a range of environmental disciplines, including Environmental Impact Assessments, Environmental Management Programmes, Stakeholder Engagement, Environmental Compliance and Monitoring and Environmental Control Officer related work in South Africa, Namibia, Mozambique and Kenya. Jeremy has also recently been involved in an Environmental and Social Due Diligence for a wind energy facility.

He has expertise in a wide range of projects relating to oil / gas and mining (heavy mineral mining and borrowpits), housing/industrial developments, renewables (solar PV) and infrastructure projects (e.g. roads, railway line, power lines and pipelines).

PROJECTS

	Environmental and Social Due Diligence
Client confidential – ESDD for a Wind Energy Facility, South Africa (2018)	ESDD for a 102 MW Wind Energy Facility near Copperton in the Northern Cape, South Africa. Jeremy's role included reviewing project-related and legislative information and report writing.
Anadarko South Africa (Pty) Ltd - Environmental Due Diligence, Block 2C, West Coast, South Africa (2011)	Environmental Due Diligence for Licence Block 2C, West Coast, South Africa. Jeremy's role included project management, review / auditing and report writing.
Anadarko South Africa (Pty) Ltd - Environmental Due Diligence, Block 5/6, South-West Coast, South Africa (2011)	Environmental Due Diligence for Licence Block 5/6, South-West Coast, South Africa. Jeremy's role included project management, review / auditing and report writing.

	Oil and Gas
Searcher Geodata UK Limited – 2D/3D seismic surveys, West Coast, South Africa (2021)	EMP for speculative 2D and 3D seismic surveys off the West Coast of South Africa. Jeremy was the assistant project manager and responsible for the public participation process, specialist report review and EMP report writing.
Tullow Namibia Ltd – 3D seismic survey in PEL 90, Namibia (2021 - 2022)	EIA for a 3D seismic survey in Petroleum Exploration Licence 90 (PEL 90) in the Orange Basin off the coast of Namibia. Jeremy's role included managing the EIA process and public participation process, specialist report review and EIA report writing.
Total E&P Moçambique Area 1, Limitada – Management of Change (MOC) Procedure for Piling, Cabo Delgado Province, Mozambique (2021)	Implement MOC Procedure and prepare Screening Framework and Technical Note for the expansion of the Diver Exclusion Zone for piling. Jeremy's role included managing the MOC process, specialist input and report writing.
Total E&P South Africa B.V. Exploration well drilling in Block 11B/12B, offshore South Coast, South Africa (2020 - 2021)	EIA for additional exploration well drilling and associated exploration activities (CSEM and wave buoys) in Block 11B/12B, offshore South Coast. Jeremy's role included specialist report review and EIA report writing.
Total E and P Namibia BV – 3D seismic survey in Blocks 2912 /2913B, Namibia (2020)	EIA for a 3D seismic survey in Blocks 2912/2913B in the Orange Basin off the coast of southern Namibia. Jeremy's role included managing the EIA process and public participation process, specialist report review and EIA report writing.
Total E&P Moçambique Area 1, Limitada – Management of Change (MOC) Procedure for expansion of Resettlement Village, Cabo Delgado Province, Mozambique (2020)	Implement MOC Procedure and undertake EIA Addendum for the expansion of the Resettlement Village. Jeremy's role included managing the EIA Addendum process, specialist input and report writing.
Total E&P Moçambique Area 1, Limitada – Onshore Environmental Monitoring, Afungi Peninsula, in Palma District, Cabo Delgado Province, Mozambique (2020)	Execute environmental field surveys and manage the subsequent data for a period of one year in the onshore environment in the vicinity of the Project. Jeremy's role included overall project management.
Shell Namibia Upstream BV - Exploration well drilling in Petroleum Exploration Licence 39, Namibia (2020)	Environmental Clearance Certificate (ECC) amendment application for exploration well drilling in Petroleum Exploration Licence 39 off the coast of southern Namibia. Jeremy's role included managing the ECC amendment process and public participation process, specialist report and legal register review and EIA amendment report writing.

Total E&P South Africa B.V. Social Baseline and SIA related to exploration activities in Block 11B/12B, offshore South Coast, South Africa (2019 - 2020)	Social Baseline Study and Social Impact Assessment related to the impacts that exploration activities in Block 11B / 12B would have on the Mossel Bay area. Project management and review.
Windhoek PEL23 BV - Exploration well drilling in Petroleum Exploration Licence 82, Namibia (2019)	EIA for the drilling of up to two exploration wells in Petroleum Exploration Licence 82 (PEL82) in the Walvis Basin off the coast of Namibia. Jeremy's role included managing the EIA process and public participation process, specialist report review and EIA report writing.
Windhoek PEL28 BV - Exploration well drilling in Petroleum Exploration Licence 83, Namibia (2019)	EIA for the drilling of up to two exploration wells in Petroleum Exploration Licence 83 (PEL83) in the Orange Basin off the coast of Namibia. Jeremy's role included managing the EIA process and public participation process, specialist report review and EIA report writing.
Anadarko Moçambique Área 1, Lda (AMA1) – Update Area 1 EMP for the Liquefied Natural Gas Project in Cabo Delgado, Mozambique (2018-2019)	In June 2014 AMA1 received approval to develop the proposed LNG Project in offshore Area 1 and at the Afungi Peninsula of Cabo Delgado Province in northern Mozambique. Following project approval, the development of the project design continued through a process of optimization, resulting in further refinements to the Project Description. SLR was appointed to evaluate proposed project changes, to determine / confirm impact significance, and to update the approved EMP accordingly. Jeremy's role included the screening of project changes through an internal Management of Change Procedure to identify and evaluate the environmental implications of any changes arising from the design optimisation process, specialist report review and EMP report writing.
Shell Namibia Upstream BV - Exploration well drilling in Petroleum Exploration Licence 39, Namibia (2017-2018)	EIA for the drilling of up to two deep water exploration wells in Petroleum Exploration Licence 39 off the coast of southern Namibia. Jeremy's role included managing the EIA process and public participation process, specialist report review and EIA report writing.
Spectrum Geo Limited – 3D seismic survey in the Walvis Basin, Namibia (2017)	EIA for a 3D seismic survey in the Walvis Basin of the coast of northern Namibia. Jeremy was the project manager and responsible for the public participation process, specialist report review and EIA report writing.
Afro Energy (Pty) Ltd - Coal bed methane exploration, Free State and Mpumalanga Provinces (2016)	Scoping Phase of an EIA for an Exploration Right application for Petroleum and Natural Gas (Coal Bed Methane) on various farms in a portion of the Free State and Mpumalanga Provinces. Jeremy was responsible for the management and undertaking of the scoping phase, which involved managing the public participation process and writing the scoping report.
Spectrum Geo Ltd - 2D seismic survey, Namibia (2016-2017)	EIA for a 2D seismic survey in the Orange Basin off the coast of southern Namibia. Jeremy was the project manager and responsible for the public participation process, specialist report review and EIA report writing.

BHP Billiton Petroleum (South Africa 3B/4B) Limited - Relinquishment of Licence Block 3B/4B, West Coast, South Africa (2016)	Application for a Closure Certificate and consolidated Environmental Risk Report and Closure Plan for the relinquishment of Licence Block 3B/4B (ER 12/3/23) off the West Coast of South Africa. Jeremy's role included managing the relinquishment process, report writing and liaison with the competent authority.
Rhino Oil & Gas Exploration South Africa (Pty) Ltd – Oil and gas exploration in Licence Blocks 3617 and 3717, South-West Coast, South Africa (2015-2016)	Scoping and EIA for exploration activities in offshore Licence Blocks 3617 and 3717 off the South-West Coast of South Africa. Exploration activities included multi-beam bathymetry and 2D/3D seismic surveys. Jeremy was the project manager and responsible for the public participation process, specialist report review and report writing.
Rhino Oil & Gas Exploration South Africa (Pty) Ltd – Oil and gas exploration in various inshore licence blocks, South Africa (2015-2016)	Scoping and EIA for exploration activities in various inshore licence blocks off the South-West Coast of South Africa. Exploration activities included multi-beam bathymetry and 2D/3D seismic surveys. Jeremy was responsible for quality control and report review.
PGS Exploration (UK) Ltd - 2D seismic survey, South Coast, South Africa (2015-2016)	EMP Addendum for a speculative 2D seismic survey off the South Coast of South Africa. Jeremy was the project manager and responsible for the public participation process, specialist report review and EMP report writing.
Thombo Petroleum Ltd - Exploration well drilling in Block 2B, West Coast, South Africa (2014-2016)	EIA and EMP Addendum for the drilling of up to five exploration wells in Block 2B off the West Coast of South Africa. Jeremy's role included managing the EIA process and public participation process, specialist report review and EIA report writing.
Murphy Oil Corporation - Exploration well drilling in Licence Blocks 2613A and 2613B, Namibia (2014-2016)	EIA for the drilling of up to two exploration wells in Licence Blocks 2613A and 2613B off the coast of Namibia. Jeremy was the project manager and responsible for the public participation process, specialist report review and report writing.
Cairn South Africa - Exploration well drilling in Licence Block 1, West Coast, South Africa (2013-2016)	EIA and EMP Addendum for the drilling of up to five exploration wells in Block 1 off the West Coast of South Africa. Jeremy was the project manager and responsible for the public participation process, specialist report review and report writing.
Sunbird Energy Ltd – Ibhubesi Gas Project (2013-2017)	EIA and EMP Addendum for the proposed Ibhubesi Gas Project, Western and Northern Cape, South Africa. The project involved the development of the gas field in Block 2A, which included a 430 km production pipeline (offshore and onshore) to the Ankerlig Power Station. Jeremy was the project manager and responsible for the public participation process, specialist report review and report writing.

PGS Exploration (UK) Ltd – 2D seismic survey compliance, South Coast, South Africa (2015-2016)	EMP Compliance and audit services for a speculative 2D seismic survey off the South Coast of South Africa. Jeremy's role included managing the audit process and compiling the survey close-out report, which outlined the implementation of the EMP (compliance) and highlighted any problems and non-compliance issues that arose during the survey.
ExxonMobil Exploration and Production South Africa Ltd – Well drilling Roadmap and Permitting Plan, South Africa (2015)	SLR was appointed to develop a high level Regulatory Roadmap and Permitting Plan for offshore exploration well drilling and associated onshore activities for ExxonMobil's South African licence areas, focusing on the Tugela South licence area off the East Coast. Jeremy was the project manager and responsible for the legal review and report writing.
Anadarko South Africa (Pty) Ltd - Exploration Right renewal for Licence Blocks 5, 6 & 7, South-West Coast, South Africa (2015)	SLR was appointed to prepare an Environmental Compliance Report as part of the Exploration Right renewal for Licence Blocks 5, 6 & 7 (ER 12/3/224) off the South-West Coast of South Africa. Jeremy's role included managing the audit process and compiling the Environmental Compliance Report.
Anadarko South Africa (Pty) Ltd - Relinquishment of a portion of Licence Blocks 5, 6 & 7, South-West Coast, South Africa (2016)	Application for a Closure Certificate and Consolidated Environmental Risk Report and Closure Plan for the relinquishment of Licence Blocks 5, 6 & 7 (ER 12/3/224) off the South-West Coast of South Africa. Jeremy's role included managing the relinquishment process, report writing and liaison with the competent authority.
Nabirm Energy Services - 2D seismic survey compliance, Block 2113, Namibia (2014-2015)	EMP Compliance and audit services for a 2D seismic survey in the offshore portion of Block 2113A in the Walvis Basin off the coast of Namibia. Jeremy's role included managing the audit process and compiling the survey close-out report, which outlined the implementation of the EMP (compliance) and highlighted any problems and non-compliance issues that arose during the survey.
ExxonMobil Exploration and Production South Africa Limited - Relinquishment of a portion of the Tugela South Block, East Coast, South Africa (2014)	Application for a Closure Certificate and Consolidated Environmental Risk Report and Closure Plan for the relinquishment of a portion of the Tugela South Block off the East Coast of South Africa. Jeremy's role included managing the relinquishment process, report writing and liaison with the competent authority.
CGG Services SA - 2D seismic survey compliance, East Coast, South Africa (2014)	EMP Compliance and audit services for a speculative 2D seismic survey off the East Coast of South Africa. Jeremy's role included managing the audit process and compiling the survey close-out report, which outlined the implementation of the EMP (compliance) and highlighted any problems and non-compliance issues that arose during the survey.
Murphy Oil Corporation and TGS-Nopec Geophysical Company ASA – 3D seismic survey, Licence Blocks 2613A and 2613B, Namibia (2013-2014)	EIA for a proposed 3D seismic survey in Licence Blocks 2613A and 2613B, Lüderitz Basin, off the coast of Namibia. Jeremy was the project manager and responsible for the public participation process, specialist report review and EMP report writing.

Tullow Kudu Ltd - 3D seismic survey, Licence Blocks 2012B and 2112A, Namibia (2013-2014)	EIA for a proposed 3D seismic survey in Licence Blocks 2012B and 2112A, Walvis Basin, off the Coast of Namibia. Jeremy was the project manager and responsible for the public participation process, specialist report review and EMP report writing.
Shell South Africa Upstream BV - Exploration well drilling in the Orange Basin Deepwater Licence Area, West Coast, South Africa (2013-2015)	EIA for the drilling of up to two deep water exploration wells in the northern portion of the Orange Basin Deepwater Licence Area off the West Coast of South Africa. Jeremy's role included managing the EIA process and public participation process, specialist report review and EIA report writing.
CGG Veritas Services (UK) Ltd – 2D seismic survey compliance, East Coast, South Africa (2013)	EMP Compliance and audit services for a 2D seismic off the East Coast of South Africa. Jeremy's role included managing the audit process and compiling the survey close-out report, which outlined the implementation of the EMP (compliance) and highlighted any problems and non-compliance issues that arose during the survey.
Petroleum Geo-Services ASA – 2D seismic survey, South Coast, South Africa (2013)	EMP for the proposed speculative 2D seismic survey off the South Coast of South Africa. Jeremy's role included managing the EMP and public participation process, specialist report review and EMP report writing.
Anadarko South Africa (Pty) Ltd - Seafloor geochemical sampling programme, Licence Blocks 5/6 & 7, South-West Coast, South Africa (2013)	EMP Addendum for a seafloor geochemical sampling programme in Petroleum Licence Blocks 5/6 & 7 off the South-West Coast of South Africa. The sampling programme consisted of seafloor sampling (piston coring), seafloor heat flow measurements and a possible multi-beam bathymetry survey to refine target locations for seafloor sampling. Jeremy was the project manager and responsible for the public participation process, specialist report review and EMP report writing.
Anadarko South Africa (Pty) Ltd - Exploration programme, Licence Block 2C, West Coast, South Africa (2012-2013)	EMP for a proposed exploration programme in Block 2C off the West Coast, South Africa. The exploration programme included 2D/3D seismic surveys, multi-beam bathymetry survey, seafloor sampling and seafloor heat flow measurements. Jeremy was the project manager and responsible for the public participation process, specialist report review and EMP report writing.
Impact Africa Limited - Exploration programme, Tugela North, East Coast, South Africa (2012-2013)	EMP for a proposed exploration programme in the Tugela North area off the East Coast of South Africa. The exploration programme included Airborne geophysical acquisition (gravity and magnetics), 2D/3D seismic surveys, seafloor heat flow measurements, multi-beam bathymetry survey and seafloor sampling. Jeremy was the project manager and responsible for the public participation process, specialist report review and EMP report writing.
Sasol Petroleum International (Pty) Ltd – 2D seismic survey, Durban and Zululand Basins, East Coast, South Africa (2012)	EMP for a proposed 2D seismic survey programme in the Durban and Zululand Basins off the East Coast of South Africa. Jeremy was the project manager and responsible for the public participation process, specialist report review and EMP report writing.
Petroleum Geo-Services ASA – 2D seismic survey, South and East Coasts, South Africa (2012)	EMP for the proposed speculative 2D seismic survey off the South and East Coast of South Africa. Jeremy's role included managing the EMP and public participation process, specialist report review and EMP report writing.

PetroSA (Pty) Ltd – 3D seismic survey, Block 1, West Coast, South Africa (2012)	EMP Amendment for the 3D seismic survey campaign in Block 1 off the West Coast of South Africa. Jeremy's role included managing the EMP and public participation process, specialist report review and EMP report writing.
Spectrum Geo Ltd - 2D seismic survey, Lüderitz and Walvis Basin, Namibia (2012)	EIA for a 2D seismic survey in various Blocks in the Lüderitz and Walvis Basin offshore areas, Namibia. Jeremy's role included managing the EIA process and public participation process, specialist report review and EIA report writing.
Bayfield Energy Ltd – 2D seismic survey, Pletmos Inshore Area, South Coast, South Africa (2012)	EMP Amendment for a 2D seismic survey in the Pletmos Inshore Area off the South Coast of South Africa. Jeremy's role included managing the EMP and public participation process, specialist report review and EMP report writing.
CGG Veritas Services (UK) Ltd - 2D seismic survey, East Coast, South Africa (2012)	EMP for a speculative 2D seismic survey off the East Coast of South Africa. Jeremy was the project manager and responsible for the public participation process, specialist report review and EMP report writing.
Spectrum Geo Ltd - 2D seismic survey, West Coast, South Africa (2012)	EMP for a speculative 2D seismic survey off the West Coast of South Africa. Jeremy was the project manager and responsible for the public participation process, specialist report review and EMP report writing.
Signet Petroleum Ltd - 2D/3D seismic survey, Block 2914B, Namibia (2011)	EIA for a proposed 2D and 3D seismic survey in Block 2914B off the coast of Namibia. Jeremy's role included managing the EIA process and public participation process, specialist report review and EIA report writing.
PetroSA (Pty) Ltd - 2D/3D seismic survey, Blocks 5 & 6, South Africa (2011)	EMP for a 2D/3D seismic survey campaign in Blocks 5 & 6 off the South-West Coast of South Africa. Jeremy's role included managing the EMP process and public participation process, specialist report review and EMP report writing.
UNX Energy Corp – 3D seismic survey, Licence Blocks 2713A/2713B and 2815, Namibia (2010-2011)	EIA (including EMP for a proposed 3D seismic survey programme in the southern Orange Basin (Licence Blocks 2713A/2713B and 2815) off the coast of Namibia. Jeremy's role included managing the EIA process and public participation process, specialist report review and EIA report writing.
HRT Oil Gas Ltd - 3D seismic survey, Licence Blocks 2112B/2212A and 2813A/2814B, Namibia (2010-2011)	EIA for a proposed 3D seismic survey programme in the central Walvis Basin (Licence Blocks 2112B/2212A) and southern Orange Basin (Licence Blocks 2813A/2814B) off the coast of Namibia. Jeremy's role included managing the EIA process and public participation process, specialist report review and EIA report writing.
PetroSA (Pty) Ltd – Exploration well drilling, Block 1, West Coast, South Africa (2010-2011)	Basic Assessment and EMP for the drilling of up to six exploration wells in Block 1 (ER83) off the West Coast of South Africa. Jeremy's role included managing the Basic Assessment process and public participation process, specialist report review and report writing.

Bayfield Energy Ltd – 2D seismic survey, Pletmos Inshore Area, South Coast, South Africa (2010)	EMP for a 2D seismic survey in the Pletmos Inshore Area off the South Coast of South Africa. Jeremy's role included managing the EMP and public participation process, specialist report review and EMP report writing.
Silver Wave Energy (Pte) Ltd– 2D seismic survey, Tugela South, East Coast, South Africa (2010)	EMP for a 2D seismic survey in the Tugela South area (Blocks 2931C, 2931D, 2932A and 2932C) off the East Coast of South Africa. Jeremy's role included managing the EMP and public participation process, specialist report review and EMP report writing.
BHP Billiton Petroleum – Seismic surveys and well drilling, Block 3A/4A, West Coast, South Africa (2009-2010)	EMP amendment for conducting seismic surveys and exploration well drilling in Petroleum Licence Block 3A/4A, West Coast, South Africa. Jeremy's role included managing the EMP and public participation process, specialist report review and EMP report writing.
PetroSA (Pty) Ltd – Performance Assessments, South Coast, South Africa (2009)	Compilation of offshore performance assessments for Block 9, Block 11a, F-A Gas Field, E-M Gas Field, South Coast Gas (SCG) Gas Field, Sable Oil Field and Oripi (E-BT)/Oryx (E-AR) Oil Fields. Jeremy's role included managing the audit process and compiling the Performance Assessment report, which outlined the implementation of the EMP (compliance) and highlighted any problems and non-compliance issues.
PetroSA (Pty) Ltd – F-O Gas Field development, South Coast, South Africa (2008-2012)	EIA and EMP for the development of the F-O Gas Field in Petroleum Licence Block 9, South Coast, South Africa. The project included the drilling of up to 14 production wells in the F-O Gas Field and connecting the gas field to the existing F-A Platform via a new approximately 39 km subsea production pipeline. Jeremy's role included managing the EIA/EMP and public participation process, specialist report review and EIA report writing.
PetroSA (Pty) Ltd – 3D seismic survey, Block 1, West Coast, South Africa (2008)	EMP for a 3D seismic survey in Block 1 (ER83) off the West Coast of South Africa. Jeremy's role included managing the EMP and public participation process, specialist report review and EMP report writing.
Forest Exploration International (SA) (Pty) Ltd - Ibhubesi Gas Field development (2006-2007)	EIA and EMP for the proposed development of the Ibhubesi Gas Field and associated infrastructure in License Block 2A off the west coast of South Africa. The project involved the drilling of 99 wells and a 110 km production pipeline to an onshore gas receiving facility. Jeremy's role included managing the EIA/EMP and public participation process, specialist report review and report writing.
PetroSA (Pty) Ltd – Well close-out report, E-M Gas Field, South Coast, South Africa (2005)	Close-out report for a workover on well E-M03P in the E-M mining lease off the South Coast of South Africa. Jeremy was responsible for report writing.
PetroSA (Pty) Ltd – South Coast Gas development project, Licence Block 9, South Coast, South Africa (2004-2006)	EIA and EMP for the development of the South Coast Gas project in Petroleum License Block 9 off the South Coast of South Africa. Jeremy was responsible for specialist report review and report writing.

	Mining
Gecko Cobalt Mining (Pty) Ltd - Opuwo Cobalt Project, Opuwo, Kunene Region, Namibia (2019)	EIA for the proposed Opuwo Cobalt Project Near Opuwo in the Kunene Region of Namibia. Based on the results of exploration drilling undertaken since 2017, Gecko is proposing to apply for a Mining Licence (ML) to mine the ore (copper and cobalt mineralisation) through a combined open-pit and underground mine and to process this material on site within the proposed ML area, which is located within EPL 4346. Jeremy's role included managing the EIA and public participation process, specialist report review and EIA / EMPr report writing.
Belton Park Trading 127 (Pty) Ltd - Offshore diamond mining in Sea Concessions 2c and 3c, the West Coast, South Africa (2018)	Amendment application to expand the approved diamond mining target area within Sea Concession 2C, as well as the Mining Right area to include Sea Concession 3C. Jeremy's role included managing the EIA and public participation process, specialist report review and EIA / EMPr report writing.
Velddrift Salt Company (Pty) Ltd - Salt mine, Velddrift, South Africa (2018)	Update the Financial Provision for the salt mine on Portion 69 of Farm 110 near Velddrift, Western Cape, South Africa. Jeremy's role included project management, client liaison and report review.
Alexkor RMC Pooling and Sharing Joint Venture - EMP amendment for mining rights, West Coast, South Africa (2017-2018)	EMP Amendment for Mining Rights 554MRC, 10025MR, 512MRC and 513MRC (diamonds) located off the West Coast of South Africa, situated roughly between Kleinzee and Port Nolloth. Jeremy's role included managing the EMP and public participation process, specialist report review and EMP report writing.
Velddrift Salt Company (Pty) Ltd - Salt mine, Velddrift, South Africa (2012)	EMP amendment for a salt mine on Portion 69 of Farm 110 near Velddrift, Western Cape, South Africa. Jeremy's role included managing the EMP and public participation process, specialist report review and EMP report writing.
Green Flash Trading 251 & 257 (Pty) Ltd - Mineral prospecting, West and South-West Coasts, South Africa (2012)	EMP amendment for the prospecting for minerals off the West and South-West Coast of South Africa. Jeremy was responsible for report writing.
Umhlaba Environmental Consulting CC - Sand mine rehabilitation, Macassar, South Africa (2011)	EMP for the rehabilitation of Afrisam's Sand Mine in Macassar, Western Cape, South Africa. Jeremy's role included managing the EMP process, specialist report review and EMP report writing.
White Water Resources Limited - Heavy mineral prospecting, Namaqualand, South Africa (2009)	EMPs for ten prospecting applications in an area north of the Olifants River. Namaqualand, South Africa. Jeremy's role included managing the EMP process, specialist report review and EMP report writing.
Coega Brick - Brickworks, Eastern Cape, South Africa (2003)	EMP amendment for operations at the Coega Brick brickworks. Jeremy was responsible for report writing.

Corridor Sand Limitada - Corridor Sands Heavy Mineral Mining Project, Gaza Province, Mozambique (1999-2002)	EIA and EMP for the Southern Mining Corporation's Corridor Sands Heavy Mineral Mining Project, Gaza Province, Mozambique. Jeremy's role included managing the EIA/EMP and public participation process, specialist report review and report writing.
Kenmare Resources - Moma Titanium Minerals Project in Nampula Province, Mozambique (2002)	EMP for the Kenmare Moma Titanium Minerals Project in Nampula Province, Mozambique. Jeremy was responsible for EMP report writing.
Southern Mining Corporation Ltd - Corridor Sands Heavy Mineral Mining Project, Gaza Province, Mozambique (1999-2002)	Vegetation and floristics specialist report for the Corridor Sands EIA, Gaza Province, Mozambique. Jeremy undertook the baseline assessment and compiled the vegetation and floristics report.
BESC Consulting - Quarry, Willowvale, Transkei (1999)	Biological survey for a quarry near Willowvale in the Transkei. Jeremy compiled the biological survey report.
	Roads and related infrastructure
HHO Africa for the City of Cape Town - Broadway Boulevard Dualling Project, Western Cape, South Africa (2016)	Basic Assessment for stormwater infrastructure required as part of the Broadway Boulevard Dualling Project, Strand, Western Cape. Jeremy's role included managing the Basic Assessment and public participation process, specialist report review and report writing.
HHO Africa for WCG: Dept. of Transport and Public Works - Gansbaai-Bredasdorp Road Upgrade Project, Western Cape, South Africa (2016-2017)	Closure application for seven borrowpits used during Phase 3 of the Gansbaai-Bredasdorp Road Upgrade Project, Western Cape. Jeremy's role included managing the closure application process, report writing and liaison with the competent authority.
HHO Africa for WCG: Dept. of Transport and Public Works - Phase 3 of the Gansbaai-Bredasdorp Road Upgrade Project, Western Cape, South Africa (2013-2015)	ECO for the third phase of construction (km 7.8 to km 36.0) of the road between Gansbaai and Bredasdorp, Western Cape. Jeremy acted as the ECO and was responsible for ensuring the contractor complied with the Construction EMP.
HHO Africa for WCG: Dept. of Transport and Public Works - Gansbaai-Bredasdorp Road Upgrade Project, Western Cape, South Africa (2014)	Basic Assessment for a causeway near Elim and a box culvert near Baardskeedersbos / Pearly Beach Intersection, Western Cape. Jeremy's role included managing the Basic Assessment and public participation process, specialist report review and report writing.

EFG Engineers (Pty) Ltd for WCG: Dept. of Transport and Public Works – Hermanus – Stanford Road Upgrade Project, Western Cape, South Africa (2013-2014)	Basic Assessment for the upgrading of Trunk Road 28 Section 2 (TR28/2) between Hermanus and Stanford, Western Cape. Jeremy's role included managing the Basic Assessment and public participation process, specialist report review and report writing.
HHO Africa (Pty) Ltd – Borrowpits for the Gansbaai-Bredasdorp Road Upgrade Project, Western Cape, South Africa (2012)	Screening, Basic Assessment and EMP for nine proposed borrowpits for Phase 3 of the Gansbaai-Bredasdorp Road Upgrade Project, Western Cape. Jeremy's role included managing the Screening, Basic Assessment and public participation process, specialist report review and report writing.
Bergstan South Africa for WCG: Dept. of Transport and Public Works – Repair of flood damaged bridges, Western Cape, South Africa (2010)	Basic Assessment for the repair of two flood damaged bridges in the Worcester and De Doorns area. Jeremy's role included managing the Basic Assessment process and report review.
HHO Africa for WCG: Dept. of Transport and Public Works –Phase 3 of the Gansbaai-Bredasdorp Road Upgrade Project, Western Cape, South Africa (2010)	EMP for Phase 3 borrowpits required for the Gansbaai-Bredasdorp Road Upgrade Project. Jeremy acted as the project manager and was responsible for compiling the EMP.
HHO Africa for WCG: Dept. of Transport and Public Works – Phase 2 of the Gansbaai-Bredasdorp Road Upgrade Project, Western Cape, South Africa (2009-2010)	ECO for the second phase of construction (km 0 to km 7.8) of the road between Gansbaai and Bredasdorp, Western Cape. Jeremy acted as the ECO and was responsible for ensuring the contractor complied with the Construction EMP.
PD Naidoo & Associates (Pty) Ltd for WCG: Dept. of Transport & Public Works – Borrowpit development, Overberg District, South Africa (2006-2008)	EMP for the development of 17 strategic borrowpits for the regravelling of trunk-, main- and divisional roads in the Overberg District. Jeremy's role included managing the EMP and public participation process, specialist report review and report writing.
BKS (Pty) Ltd / Goba (Pty) Ltd JV for WCG: Dept. Transport and Public Works – Bridge and culvert rehabilitation, Western Cape, South Africa (2006-2008)	ECO for the rehabilitation of bridges and major culverts in the Calitzdorp, Oudtshoorn and De Rust area. Jeremy acted as the ECO and was responsible for ensuring the contractor complied with the Construction EMP.

HHO Africa for WCG: Dept. of Transport and Public Works –Phase 2 of the Gansbaai-Bredasdorp Road Upgrade Project, Western Cape, South Africa (2010)	EMP for Phase 2 of Gansbaai-Bredasdorp Road Upgrade Project. Jeremy acted as the project manager and was responsible for compiling the EMP.
BKS (Pty) Ltd / Goba (Pty) Ltd JV for WCG: Dept. Transport and Public Works – Bridge and culvert rehabilitation, Western Cape, South Africa (2005)	Construction EMP for the rehabilitation of bridges and culverts in the Calitzdorp, Oudtshoorn and De Rust area. Jeremy acted as the project manager and was responsible for compiling the EMP.
HHO Africa for WCG: Dept. of Transport and Public Works – Phase 1 of the Gansbaai-Bredasdorp Road Upgrade Project, Western Cape, South Africa (2009-2010)	ECO for the first phase of construction of the road between Gansbaai and Bredasdorp, Western Cape. Jeremy acted as the ECO and was responsible for ensuring the contractor complied with the Construction EMP.
HHO Africa for WCG: Dept. of Transport and Public Works –Phase 1 of the Gansbaai-Bredasdorp Road Upgrade Project, Western Cape, South Africa (2010)	EMP for Phase 1 borrowpits required for the Gansbaai-Bredasdorp Road Upgrade Project. Jeremy acted as the project manager and was responsible for specialist report review and compiling the EMP.
MBB Engineers – Kat River Causeway, Eastern Cape, South Africa (2000)	Scoping study for the upgrading of a causeway over the Kat River, Fairbairn, Eastern Cape. Jeremy's role included managing the Scoping and public participation process, specialist report review and report writing.
Prestedge, Retief, Dresner & Wijnberg – Ngqura harbour dune stabilisation, Eastern Cape, South Africa (1999)	Stabilisation specifications for work areas and roads within the proposed Ngqura (ex Coega) harbour area. Jeremy was responsible for report writing.
	Renewables
Kokerboom Solar Generation (Pty) Ltd – Kokerboom Solar Project, Keetmanshoop, Namibia (2016)	Scoping study for a solar (photovoltaic) power plant, near Keetmanshoop, Namibia. Jeremy's role included managing the Scoping and public participation process, specialist report review and report writing.
Solarhybrid AG, Germany - Skeyfontein Photovoltaic Power Plant, Northern Cape, South Africa (2011-2012)	Scoping study for the proposed Development of Skeyfontein Photovoltaic power plant and power lines near Postmasburg, Northern Cape. Jeremy's role included managing the Scoping and public participation process, specialist baseline report review and report writing.

Business Venture Investments 1421 (Pty) Ltd - De Aar Photovoltaic Power Plant, Northern Cape, South Africa (2011-2012)	EIA for the proposed Development of a Photovoltaic power plant and power line near De Aar & Prieska, Northern Cape. Jeremy's role included managing the EIA process and public participation process, specialist report review and EIA report writing.
IlangaPower (Pty) Ltd - Solar Cell Manufacturing Factory, Western Cape, South Africa (2008)	Basic Assessment for a proposed Solar Cell Manufacturing Factory, Sacks Circle, Bellville. Jeremy's role included managing the Basic Assessment process and public participation process, specialist report review and report writing.
	Landfill sites and waste water treatment works
V3 Consulting Engineers - Bedford sewage works upgrade, Eastern Cape, South Africa (1999)	Scoping study for Phase II of the upgrading of the Bedford reticulation system and current sewage works. Jeremy's role included managing the Scoping and public participation process, specialist report review and report writing.
V3 Consulting Engineers - Bedford sewerage reticulation system, Eastern Cape, South Africa (1999)	Scoping study for the construction of a waterborne sewerage reticulation system in Nyarha and Goodwin Park, Bedford, and for the rehabilitation and upgrading of the sewerage treatment works. Jeremy's role included managing the Scoping and public participation process, specialist report review and report writing.
Department of Public Works - Hole-in-the-Wall car park and ablution facilities, Eastern Cape, South Africa (1999)	Scoping study for the proposed car park and ablution facilities at Hole-in-the-Wall. Jeremy's role included managing the Scoping and public participation process, specialist report review and report writing.
Department of Public Works - Coffee Bay car park and ablution facilities, Eastern Cape, South Africa (1999)	Scoping study for the proposed car park and ablution facilities at Coffee Bay. Jeremy's role included managing the Scoping and public participation process, specialist report review and report writing.
	Water and sewage pipelines
SAB Maltings (Pty) Ltd - Water Supply Augmentation Project, Caledon, South Africa (2020)	ECO for the SAB water pipeline to augment the supply of water to the SAB Maltings plant in Caledon. Jeremy was responsible for overall project management and QA/QC.
SAB Maltings (Pty) Ltd - Water Supply Augmentation Project, Caledon, South Africa (2019)	Basic Assessment for water supply augment project to ensure continued uninterrupted operation at the maltings plant. The project included a borehole and 12 km pipeline. Jeremy's role included managing the Basic Assessment and public participation process, specialist report review and report writing.

Velddrift Salt Company (Pty) Ltd - Seawater Augmentation Project, Velddrift, South Africa (2003-2009)	Scoping study, EMP and ECO for a seawater pump station and pipeline to augment water supply to the Velddrift Salt Company's operation north of Laaipelek, Western Cape. Jeremy's role included managing the Scoping and public participation process, specialist report review and report writing. Jeremy also acted as the ECO and was responsible for ensuring the contractor complied with the Construction EMP.
City of Cape Town: Tygerberg Region - Durbanville North Bulk Water Supply Project, Western Cape, South Africa (2004-2005)	ECO for the Durbanville North Bulk Water Supply (Gravity Main Phase 2). Jeremy acted as the ECO and was responsible for ensuring the contractor complied with the Construction EMP.
	Rivers, dams and wetlands
Royal HaskoningDHV (Pty) Ltd for City of Cape Town - Phase 1H of the Lourens River Flood Alleviation Project, Western Cape, South Africa (2016-2018)	ECO for Phase 1H of the Lourens River Flood Alleviation project, Western Cape. Jeremy acted as the project manager.
Royal HaskoningDHV (Pty) Ltd for City of Cape Town - Phase 1G of the Lourens River Flood Alleviation Project, Western Cape, South Africa (2015)	ECO for Phase 1G of the Lourens River Flood Alleviation project, Western Cape. Jeremy acted as the project manager.
Royal HaskoningDHV (Pty) Ltd for City of Cape Town - Lourens River Stormwater Outlets, Litter Traps and Detention Pond, Western Cape, South Africa (2015)	Basic Assessment for Lourens River Stormwater Outlets, Litter Traps and Detention Pond, Somerset West. Jeremy's role included managing the Basic Assessment and public participation process, specialist report review and report writing.
SSI Engineers and Environmental Consultants (Pty) Ltd for City of Cape Town- Phase 1E of the Lourens River Flood Alleviation Project, Western Cape, South Africa (2011-2012)	ECO for Phase 1E of the Lourens River Flood Alleviation project, Western Cape. Jeremy acted as the ECO and was responsible for ensuring the contractor complied with the Construction EMP.

SSI Engineers and Environmental Consultants (Pty) Ltd for City of Cape Town- Phase 1E of the Lourens River Flood Alleviation Project, Western Cape, South Africa (2008-2010)	ECO for Phase 1D of the Lourens River Flood Alleviation project, Western Cape. Jeremy acted as the ECO and was responsible for ensuring the contractor complied with the Construction EMP.
Sujean Investments (Pty) Ltd - Kuils River Flood Alleviation Project, Western Cape, South Africa (2010-2011)	Basic Assessment for the proposed Kuils River flood alleviation measures for Erf 38771, Bellville. Jeremy's role included managing the Basic Assessment and public participation process, specialist report review and report writing.
Nsele Trading 44 (Pty) Ltd – Retention ponds, Western Cape, South Africa (2004-2006)	Scoping study for the proposed diversion of a canalised stream into three new retention ponds on the remainder of farm 1407, Sunnysdale (Noordhoek). Jeremy's role included managing the Scoping and public participation process, specialist report review and report writing.
	General industries
Mortar SA (Pty) Ltd – Premixed dry mortar facility, Western Cape, South Africa (2018-2019)	SLR was appointed to facilitate the Atmospheric Emission Licence (AEL) application process to the West Coast District Municipality and associated public participation process. Jeremy's role included managing the AEL and public participation process, specialist report review (Atmospheric Impact Report) and compilation of the Public Participation Report.
Irvin & Johnson Limited - Abalone Processing Facility, Western Cape, South Africa (2017-2019)	Basic Assessment for an abalone processing facility at Danger Point near Gansbaai. Jeremy acted as the project manager and was responsible for report review.
Irvin & Johnson Limited - Abalone Expansion Project, Gansbaai, Western Cape, South Africa (2017-2019)	EIA for an abalone expansion project at Danger Point near Gansbaai. The project involved expanding the facility's production from 500 tons per annum (t/a) to 1 700 t/a. Jeremy's role included managing the EIA process and public participation process, specialist report review and EIA report writing.
Clay Industry cc - Atmospheric Emission Licence application (2015)	Atmospheric Emission Licence amendment application in terms of the National Environmental Management: Air Quality Act. Jeremy acted as the project manager and was responsible for compiling the amendment application.
Irvin & Johnson Limited – Offshore aquaculture Project, Western Cape, South Africa (2007-2009)	Basic Assessment for an aquaculture project in Mossel Bay. The project involved the develop of 18 floating flexible type cages within a concession area off the coast of Mossel Bay to produce indigenous line fish (namely yellow tail, dusky cob and silver cob). Jeremy's role included managing the Basic Assessment process and public participation process, specialist report review and report writing.

Eskom Holdings Limited - Atlantis and Mossel Bay Open Cycle Gas Turbines, Western Cape, South Africa (2006-2008)	Environmental compliance audits for the Atlantis and Mossel Bay Open Cycle Gas Turbines. Jeremy's role included managing the audit process and compiling the audit report, which outlined the implementation of the EMP (compliance) and highlighted any problems and non-compliance issues that arose during construction.
Velddrift Salt Company (Pty) Ltd –Mining Right conversion application, Western Cape, South Africa (2006-2009)	Conversion application from an old order mining right from the Velddrift Salt Company's saltworks. Jeremy acted as the project manager and was responsible for the conversion application and EMP report writing.
PetroSA (Pty) Ltd – Refinery Conversion Project, Western Cape, South Africa (2003-2005)	EIA for the conversion of the PetroSA Refinery, near Mossel bay, for 100% unleaded fuel production. Jeremy's role included managing the EIA process and public participation process, specialist report review and EIA report writing.
East London Development Zone Corporation - East London IDZ, Eastern Cape (2000-2001)	EIA for the rezoning of land from Agriculture to General Industry for the establishment of the East London Industrial Development Zone. Jeremy was responsible for managing the public participation process, specialist report review and report writing.
East London Development Zone Corporation - East London IDZ, Eastern Cape (2001)	Vegetation survey and sensitivity map of the land on the West Bank for the East London Industrial Development Zone. Jeremy undertook the baseline assessment and compiled the vegetation and floristics report.
Coega Development Corporation - Coega IDZ, Eastern Cape (1999-2000)	EIA for the Rezoning of the Core Development Area from Agriculture to Special Purposes for the establishment of the Coega Industrial Development Zone. Jeremy was responsible for managing the public participation process, specialist report review and report writing.
	Power lines
Electricity Supply Corporation of Malawi – Mwanza to Pombeya Power line, Malawi (2003)	Scoping study for the Mozambique – Malawi 220km interconnection 220 / 400kV power line from Mwanza to the substation at Pombeya, Malawi. Jeremy's role included managing the Scoping and public participation process, specialist report review and report writing.
Eskom. East London IDZ power line, Eastern Cape, South Africa (2002)	Scoping study for construction and operation of the East London Industrial Development Zone power line. Jeremy's role included managing the Scoping and public participation process, specialist report review and report writing.
Eskom. Trollip power line, Eastern Cape, South Africa (2002)	Scoping study for construction and operation of Eskom's Trollip scheme (22kV power line), Cape St. Francis, Eastern Cape. Jeremy's role included managing the Scoping and public participation process, specialist report review and report writing.
Kenmare Resources. Kenmare Moma Power line (2002)	Vegetation and floristics specialist report: Kenmare Moma Power line Environmental Impact Assessment, Nampula Province, Mozambique. Jeremy undertook the baseline assessment and compiled the vegetation and floristics report.

Corridor Sands Limitada. Corridor Sands Power Line, Gaza Province, Mozambique (2001-2002)	EIA for the SMC Corridor Sands Power Line from Chibuto to Maputo, Gaza Province, Mozambique. Jeremy was the project manager and responsible for the EIA and public participation process, specialist report review and EIA report writing.
Corridor Sands Limitada. Corridor Sands Power Line, Gaza Province, Mozambique (2001)	Corridor Sands Limitada. Vegetation and floristics specialist report: Corridor Sands Power line Environmental Impact Assessment, Mozambique. Jeremy undertook the baseline assessment and compiled the vegetation and floristics report.
Eskom. Poseidon - Albany power line, Eastern Cape, South Africa (2002)	Vegetation survey of the corridor for the proposed Eskom 400kV power line between Poseidon and Albany substations, Eastern Cape. Jeremy undertook the baseline assessment and compiled the vegetation and floristics report.
	Railways
Corridor Sands Limitada - Corridor Sands Railway line, Gaza Province, Mozambique (2001)	EIA for the Corridor Sands Rail link from Chibuto to Barragem, Gaza Province, Mozambique. Jeremy was the project manager and responsible for the EIA and public participation process, specialist report review and EIA report writing.
Corridor Sands Limitada - Corridor Sands Railway line, Gaza Province, Mozambique (2001)	Vegetation survey of the Corridor Sands Rail link from Chibuto to Barragem, Gaza Province, Mozambique. Jeremy undertook the baseline assessment and compiled the vegetation and floristics report.
	Housing Developments
South African Dutch Development (Pty) Ltd - Beverley Estate and Jubilee Park residential developments, Western Cape, South Africa (2012)	ECO services for the residential development on Erf 1366 (Beverley Estate) and Erf 5540 (Jubilee Park), Eerste River. Jeremy acted as the ECO and was responsible for ensuring the contractor complied with the Construction EMP.
Cape Town Community Housing Company (Pty) Ltd - Morgen's Village 3 and Westcape residential developments, Western Cape, South Africa (2012)	ECO services for the Morgen's Village 3 and Westcape Precincts, Mitchell's Plain. Jeremy acted as the ECO and was responsible for ensuring the contractor complied with the Construction EMP. Jeremy acted as the ECO and was responsible for ensuring the contractor complied with the Construction EMP. Jeremy acted as the ECO and was responsible for ensuring the contractor complied with the Construction EMP.
City of Cape Town (Human Settlements) – Phase 2 to 4 of the Bardale Housing Scheme, Western Cape, South Africa (2009-2012)	ECO for the construction of the Bardale Housing Scheme (Phases 2 to 4) on the Remainder of the Farm Stellenbosch No. 451 (Bardale), Mfuleni. Jeremy acted as the ECO and was responsible for ensuring the contractor complied with the Construction EMP.

Sovereign Seekers Investments 77 (Pty) Ltd – Karbonkelberg Housing Development, Western Cape (2007-2012)	Basic Assessment for the proposed rezoning and subdivision of Erf 4870, Karbonkelberg, Hout Bay. Jeremy's role included managing the Basic Assessment process and public participation process, specialist report review and report writing.
Hope of Africa Foundation – Eerste River housing development, Western Cape, South Africa (2007-2008)	Basic Assessment for the proposed rezoning and subdivision of Erf 5540, Eerste River. Jeremy's role included managing the Basic Assessment process and public participation process, specialist report review and report writing.
City of Cape Town (Directorate: Human Settlements) – Driftsands Housing Project (2006-2012)	EIA for the proposed rezoning and subdivision a portion of the Driftsands Nature Reserve to consolidate and upgrade the existing informal settlements of Green Park and Los Angeles. Jeremy was the project manager and responsible for the EIA and public participation process, specialist report review and EIA report writing.
Tech-Sure Fin cc – Eerste River rezoning and subdivision, Western Cape, South Africa (2006-2007)	Basic Assessment for the proposed rezoning and subdivision of Erf 1366, Eerste River. Jeremy's role included managing the Basic Assessment process and public participation process, specialist report review and report writing.
City of Cape Town (Human Settlements) – Phase 1 of the Bardale Housing Scheme, Western Cape, South Africa (2005-2007)	Construction EMP and ECO for the construction of the Bardale Housing Scheme on the Remainder of the Farm Stellenbosch No. 451 (Bardale), Mfuleni. Jeremy compiled the EMP and acted as the ECO and was responsible for ensuring the contractor complied with the Construction EMP.
Target Shelf 151 cc – Hout Bay rezoning and subdivision, Western Cape, South Africa (2005-2006)	EIA for the proposed rezoning and subdivision of Erf 1480, Hout Bay. Jeremy was the project manager and responsible for the EIA and public participation process, specialist report review and EIA report writing.
Ahmed Janahi Architects – Hout Bay hotel development, Western Cape (2004-2005)	EIA for the proposed rezoning and consolidation of Erf 1126, 1127 and 1128 for the development of a hotel, Hout Bay. Jeremy was the project manager and responsible for the EIA and public participation process, specialist report review and EIA report writing.
Hope of Africa Foundation – Eerste River housing development, Western Cape, South Africa (2004-2005)	Scoping Study for the proposed rezoning and subdivision of Erf 5540, Eerste River. Jeremy's role included managing the Scoping and public participation process, specialist report review and report writing.
Lezmin cc – Hout Bay rezoning and subdivision, Western Cape, South Africa (2003-2005)	EIA for the proposed rezoning and subdivision of Erf 1156, Hout Bay. Jeremy was the project manager and responsible for the EIA and public participation process, specialist report review and EIA report writing.

Bellemar Properties - Hout Bay rezoning, Western Cape, South Africa (2003-2004)	EIA for the proposed rezoning of Erf 1127 and 1128, Hout Bay. Jeremy was the project manager and responsible for the EIA and public participation process, specialist report review and EIA report writing.
SRK Consulting – Sanderling Development, Western Cape, South Africa (1999)	Biological survey of the wetland on the Sanderlings residential development site, Plettenberg Bay. Jeremy undertook the baseline assessment and compiled the vegetation report.
	Resort and Tourism
Van Horsten Property Holdings Pty Ltd - elephant park resort, Maputo Special Reserve, Mozambique (2003)	Pre-feasibility assessment for the proposed elephant park resort, Maputo Special Reserve, Mozambique. Jeremy compiled the pre-feasibility assessment report.
	Other
Attfund Limited - Willowbridge Shopping Centre, Western Cape, South Africa (2011)	EMP for Willowbridge North and South shopping centre, Kenridge, Bellville. Jeremy acted as the project manager and was responsible for EMP report writing.
Brights Hardware – Brights Hardware car park, Western Cape, South Africa (2006-2007)	Basic Assessment for the proposed rezoning of Portion of Erf 10565 (Public Open Space) for the development of a car park, Boston, Cape Town. Jeremy acted as the project manager and was responsible for report review.
Mini-Cape Developments (Pty) Ltd – Bowling Club relocation, Western Cape, South Africa (2005-2006)	Scoping Checklist and EMP for the proposed relocation of the Old Oak Bowling Club to a portion of public open space on Erf 2225, Bellville. Jeremy acted as the project manager and was responsible for compiling the Scoping Checklist and EMP.
Attfund Limited - Willow Village Lifestyle Centre, Western Cape, South Africa (2005-2007)	EMP and ECO for the construction and operation of the Willow Village Lifestyle Centre on Erf 1201 (portion of Erven 975 & 976) Kenridge, Bellville. Jeremy compiled the EMP and acted as the ECO and was responsible for ensuring the contractor complied with the Construction EMP.
Mini-Cape Developments (Pty) Ltd - Willow Village Lifestyle Centre, Western Cape, South Africa (2004-2007)	ECO for the construction of the Willowbridge Shopping Centre, Kenridge, Bellville. Jeremy acted as the ECO and was responsible for ensuring the contractor complied with the Construction EMP.
PUBLICATIONS	
	Parsons, R., Eichstadt, L., Crowther, J. & Blood, J. (2008). "Application Procedure for the Development and Use of Groundwater". WRC Report No. 1510/1/08.

	Blood, J.R., Van Schalkwyk, S.J., Cloete, S.W.P. & Brand, Z. (1998). Embryonic deaths in relation to water loss of artificially incubated ostrich eggs. Proceedings of the Second International Ratite Congress.
	Salih, M.E., Brand, T.S., Van Schalkwyk, S.J., Blood, J., Brand, Z. & Akbay, R. (1998). The effect of dietary fibre level on the production of growing ostriches. Proceedings of the Second International Ratite Congress.
	Salih, M.E., Brand, T.S., Van Schalkwyk, S.J., Blood, J.R., Pfister, B. & Akbay, R. (1998). Number of cellulolytic bacteria in the gastro-intestinal tracts of ostriches fed diets with different fibre levels. Proceedings of the Second International Ratite Congress.
	Brand, Z., Van Schalkwyk, S.J., Cloete, S.W.P. & Blood, J.R. (1998). The effect of pre-heating of ostrich eggs prior to storage and setting in commercial hatcheries. Proceedings of the Second International Ratite Congress.
	Van Schalkwyk, S.J., Brand, Z., Cloete, S.W.P. & Blood, J.R. (1998). The influence of different disinfection protocols on the hatching performance of ostrich eggs. Proceedings of the Second International Ratite Congress.
MEMBERSHIPS	
EAPASA	Registered Environmental Assessment Practitioner: Number 2019/1368
Pr.Sci.Nat.	Registered as a Professional Natural Scientist - Environmental Scientist (Reg. no. 400164/06)
IAIAsa	Member of the International Association for Impact Assessment South Africa



WERNER PETRICK

ENVIRONMENTAL ASSESSMENT PRACTITIONER

Environmental Management Planning & Approvals,
Africa

QUALIFICATIONS

B.Eng	1995	Civil Engineering
Masters	2004	Environmental Management

EXPERTISE

- Environmental Management
- Environmental (and Social) Impact Assessments (EIA's)
- Environmental Feasibility Studies
- Stakeholder Management
- Environmental Management Systems (EMS)
- Environmental Auditing
- Environmental Training and capacity building
- Mine Closure

Werner has over 24 years of work experience. He started out as a Civil Engineer (first 3 years) but soon became involved with environmental related projects. The following 19 years (+) he has been working in the environmental field with experience in Environmental Impact Assessments (EIA's), general environmental management and implementation, Environmental Management Systems (EMS), waste management, environmental compliance, training, stakeholder engagement and capacity building, mine closure and rehabilitation, environmental auditing and monitoring as well as due diligence.

Werner's experience is based on work conducted as a consultant (current position) as well as working for industry (i.e. implementing environmental requirements, etc.).

Sectors of his experience include: Exploration phase for onshore and offshore mining, production phase of large mining projects, power generation including renewable power initiatives and hybrid power plants, transmission lines, water supply & sanitation, petrochemical industry, linear infrastructure including roads and rail, port related projects, chemical handling and storage, large irrigation projects and other.

PROJECTS (EXCERPT)

Windhoek PEL23 B.V. & Windhoek PEL28 B.V. (Galp) - EIA for proposed offshore explorations well drilling in PEL82 and PEL 83 (2019 – 2020)	Parallel EIA processes for offshore exploration wells in PEL 82 (Walvis Basin) and PEL 83 (Orange Basin). PEL 82 is located between 80 km and 300 km from the coastline in water depths ranging from approximately 200 m to 1 800 m. PEL 83 is located between 130 km and 250 km from the coastline in water depths ranging from approximately 500 m to 2 500 m. Werner was the Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, PPP and report review).
Swakop Uranium Amendment – EIA for new PV Power Plant (2019)	Swakop Uranium proposed to develop an on-site PV power plant at their Husab Mine. Werner was the Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, PPP and report review).
Shell Namibia Upstream BV – EIA for proposed offshore well drilling (2017 -2018)	Shell Namibia Upstream BV holds PEL 39, which is located adjacent to the southernmost Namibian offshore border with South Africa. Shell is proposing to drill one or possibly two exploration wells in the northern portion of the licence area. Werner was the Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, PPP and report review).
NamParks Bridges - EIA Scoping (2018-2019)	EIA Scoping process for the the proposed construction of channel crossings. The proposed construction of 22 channel crossings in the Nkasa Rupara National Park (NRNP) forms part of the Namparks IV park infrastructure developments. Werner was the Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, PPP and report review).
Gecko Cobalt Mining - Environmental and Social Screening process (2018)	Gecko Cobalt Mining (Pty) Ltd conducted reconnaissance drilling over a stretch of 24 km length over the cobalt and copper mineralisation in EPL 4346, located approximately 25 km northwest of Opuwo. Depending on the outcome of further exploration activities and the feasibility study, GCM and CR are proposing to apply for a ML to ultimately mine the ore and process it on site. Gecko appointed SLR (Namibia) to conduct an Internal Environmental (and Social) Screening exercise. Lead Environmental Assessment Practitioner managing an internal Environmental and Social Screening process.

Manila Investments – Kombat Copper Mine EIA (2017 - 2018)	<p>Manila Investments (Pty) Ltd holds Mining Licences 73B, 16, 9 (collectively the old Kombat Copper mine, which is currently under care and maintenance). The mine is a past-producing copper, lead and silver mine. Manila is considering implementing the following activities upon completion of the Environmental Impact Assessment process and acquiring the relevant permits and approvals for:</p> <p>Open pit (surface) mining in ML 73B (also referred to as “Asis”) and associated activities;</p> <p>Processing of the ore at the existing process plant, currently being refurbished, and associated activities; and</p> <p>Dewatering the “Asis Far West” (AFW) Shaft and conducting further underground exploration activities in ML 16.</p> <p>Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, PPP and report review).</p>
Swakop Uranium Waste Rock Dump Amendment and Incinerator - EIA amendment (2017 - 2018)	<p>Swakop Uranium owns and operates the Husab Mine in the Erongo Region of Namibia; they propose amendment to their Waste Rock dump and also to implement a new on-site waste incinerator – for improved waste management on site.</p> <p>Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, PPP and report review).</p>
EIB and NamPower Encroacher Bush Biomass Power Project – EIA (2017 – 2020)	<p>European Investment Bank and NamPower: Environmental Impact Assessment (EIA) for the proposed Encroacher Bush Biomass Power Project in Namibia.</p> <p>Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, managing specialists, etc.) and compiling reports.</p>
Igneous Mining (Pty) Ltd – Application for Environmental Clearance (2016)	<p>Igneous Mining (PTY) LTD Environmental is seeking a Clearance Certificate (ECC) Renewal for small scale mining activities on ML 135 in Sarusus Area, Skeleton Coast Park.</p> <p>Lead Environmental Assessment Practitioner managing the ECC Renewal Process.</p>
City of Windhoek Gammams Waste Water Treatment Works Upgrade EIA (2017)	<p>The Gammams Waste Water Treatment Plant (GWWTWP) located in the Wanaheda suburb of Windhoek, is the City of Windhoek’s (CoW) largest wastewater treatment plant. The CoW appointed SLR to develop an environmental Scoping Report (including Impact Assessment) for the planned GWWTWP upgrade.</p> <p>Lead Environmental Assessment Practitioner managing the completion of the EIA process, report compilation / review.</p>
NAMPARKS Facility Amendments at Mudumu NP – EIA amendment (2016 - 2018)	<p>NAMPARKS Environmental Scoping Report for Infrastructure Development: Amendment for the proposed addition of an Entrance Gate, Tourist Reception and Staff Housing at Mudumu National Park.</p> <p>Lead Environmental Assessment Practitioner for the EIA amendment process required for infrastructure development. Report review.</p>

NamParks IV - Environmental Evaluation Memorandum and Management Plan for the proposed development of Park Management Infrastructure (in the Tsau //Khaeb National Park in the /Karas Region (2017)	<p>Environmental Evaluation Memorandum and Management Plan for the proposed development of Park Management Infrastructure (Park Signage Walls, Concessionaire’s Gates and Park Entrance Gates) in the Tsau //Khaeb National Park in the /Karas Region.</p> <p>Lead Environmental Assessment Practitioner.</p>
Swakop Uranium’s Husab Mine Waste Management Strategy (2016)	<p>Coordination of the Planning and Development Phase of the Husab Mine’s waste management strategy Develop the Swakop Uranium Husab Mine.</p> <p>Environmental Assessment Practitioner, SLR Project Manager.</p>
Gecko Salt (Pty) Ltd Cape Cross Salt Project - EIA (2016 - 2018)	<p>Gecko Salt (Pty) Ltd Environmental Impact Assessment for the proposed Cape Cross Salt Project.</p> <p>Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, managing specialists, etc.) and review reports.</p>
Namibia Rare Earths – Proposed Lofdal Mine and linear infrastructure – EIA (2015 - 2016)	<p>NRE holds the EPL at Lofdal located west of Khorixas, exploring for rare earth. They wish to apply for a mining license in 2016, for which an EIA would be required.</p> <p>Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, managing specialists, etc.) and compiling reports.</p>
Rössing Uranium – Impacts of the TSF on biota and desert ecology – Management of study (2015 - 2016)	<p>Impacts of the TSF at Rössing Uranium and related dust dispersion on biota and desert ecology.</p> <p>Managing the process and coordinating various specialists for input into the study (i.e. vegetation, air quality, biological soil crust, invertebrates and hyperspectral work). Compiling consolidated report summarising all the findings.</p>
High Speed Railway Lines – Environmental Screening Process (2015 - 2016)	<p>Feasibility studies for a railway line between Windhoek and Katutura, as well as a study for a railway line between Windhoek and Okahandja.</p> <p>Lead Environmental Assessment Practitioner managing the environmental Screening process (including limited stakeholder engagement, managing specialists, etc.) and compiling reports.</p>
Swakop Uranium Reagents – EIA for storage at the Manica facilities (2015)	<p>Swakop Uranium is developing the Husab Mine in the Erongo Region of Namibia (70 km north-east of the Walvis Bay port). The reagents and chemicals that will be used in the processing plant will be imported through the port of Walvis Bay. It will be sourced in advance and stored in Manica warehouse facility (on a temporary basis – “phase 1 project”) and container yard in the industrial area of Walvis Bay.</p> <p>Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, managing specialists, etc.) and compiling reports</p>

<p>Sand Miners Association of Swakopmund – EIA for sandmining in the Swakop River (2015)</p>	<p>The members of the Sand Miners Association have been mining sand from the Swakop River, within the Swakopmund Municipal boundaries, for many years. The sand they mine supplies Swakopmund, Long Beach and Walvis Bay with sand for construction purposes. The Sand Miners Association has had to look for an alternate source of sand for construction activities in their area and EIA had to be done.</p> <p>Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, managing specialists, etc.) and compiling reports.</p>
<p>Swakop Uranium Reagents storage at a new facility in the Port of Walvis Bay – EIA (2015)</p>	<p>Swakop Uranium is developing the Husab Mine in the Erongo Region of Namibia (70 km north-east of the Walvis Bay port). The reagents and chemicals that will be used in the processing plant will be imported through the port of Walvis Bay. It will be sourced in advance and stored in a warehouse facility within the boundaries of NamPort's harbour area (long term – "phase 2" project).</p> <p>Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, managing specialists, etc.) and compiling reports.</p>
<p>Namibia Rare Earths – Lofdal mine – Environmental baseline development (2015)</p>	<p>NRE holds the EPL at Lofdal located west of Khorixas, exploring for rare earth. They wish to apply for a mining license in 2016, for which an EIA would be required. The baseline environment needs to be described in detail to feed into such an EIA process.</p> <p>Compile the environmental baseline project plan. Manage specialists and develop Baseline data/report with input from various specialists.</p>
<p>Swakop Uranium – Husab Mine amendments - EIA (2015)</p>	<p>Swakop Uranium is developing the Husab Mine in the Erongo Region of Namibia (70 km north-east of the Walvis Bay port). The EMP needs to be implemented during construction Swakop Uranium and their contractors. It further needs to be rolled out into a management system for operations.</p> <p>Lead Environmental Assessment Practitioner managing the various EIA processes and compiling reports. Provide guidance and support to Environmental Control Officer(s), training to ECOs and contractors. Develop EMS procedures and other relevant documentation.</p>
<p>B2Gold – Otjikoto Gold Mine landfill site - EIA (2013 – 2014)</p>	<p>B2Gold is developing the Otjikoto (gold mine) Project, located approximately 70 km north-east of Otjiwarongo in the Otjozondjupa Region of Namibia. B2 Gold proposed to develop a landfill site (waste disposal facility) on site to cater for non-hazardous waste. They also proposed to construct and operate an on-site (heavy fuel oil) Power Plant.</p> <p>Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, managing specialists, etc.) and compiling reports.</p>
<p>B2Gold – Otjikoto Gold Mine development - EIA (2012 – 2013)</p>	<p>B2Gold applied for Mining Licence (ML 169) to develop the Otjikoto (gold mine) Project, located approximately 70 km north-east of Otjiwarongo in the Otjozondjupa Region of Namibia. As part of the ML application process, a detail EIA process needs to be conducted.</p> <p>Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, managing specialists, etc.) and compiling reports. The Scoping phase was already completed by another company. SLR (in corporation with the other company) completed the EIA process – i.e. assessment phase. Develop Mine Closure Framework.</p>

<p>Arandis Power Plant - EIA amendment (2014)</p>	<p>Arandis Power proposed to construct and operate a 'hybrid' thermal/PV plant with the maximum output capacity of 120 MW.</p> <p>Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, managing specialists, etc.) and compiling reports.</p>
<p>EPL's for exploration activities – various EIA's (2013 – 2015)</p>	<p>Various exploration companies planning to conduct exploration activities on the EPLs they hold. Prior the activities commencing, and EIA process needs to be conducted.</p> <p>Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, managing specialists, etc.) and compiling reports. Also review of reports.</p>
<p>Commissiekraal Coal Mine – EIA Scoping Report (2015)</p>	<p>Development of the proposed Commissiekraal Coal Mine including services and associated infrastructure in South Africa.</p> <p>Compiled EIA Scoping Report.</p>
<p>Various Mining and Exploration companies - various services (2012 – 2015)</p>	<p>Various Mining and exploration companies across Namibia sought assistance.</p> <p>Provided various services and support to various mining and exploration companies, including amongst others external audits, training, rehabilitation planning, compiling EMS procedures and other relevant documents, compile environmental performance reports, etc.</p>
<p>Various Mining, Exploration and Infrastructure Projects – various services (2012 – 2015)</p>	<p>Various Mining and exploration projects as well as infrastructure projects across Namibia sought assistance with EIAs, EMPs and review processes.</p> <p>Review process and reports for various projects managed by other SLR environmental practitioners, including amongst others rail sidings; Nanomill which will produce 150,000 tons rebar's and billets per year from scrap steel; Okorusu Fluorspar Mine expansion; Offshore exploration drilling (Murphy); water and waste water treatment facilities EIA and EMPs; Dundee Precious Metal Tsumeb Hazardous Waste Site expansion; Walvis Bay Salt Holdings Expansion; and others.</p>
<p>Pietersite Mining License – EIA (2013)</p>	<p>Mining Pietersite (gemstone) on Mining License (ML) 57 in the Kunene Region, north-central Namibia.</p> <p>Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, managing specialists, etc.) and compiling reports.</p>
<p>TransNamib – sulphuric acid transport – EIA (2014)</p>	<p>TransNamib plans to transport sulphuric acid by rail from Dundee Precious Metals (Tsumeb) to Rössing Uranium Mine and to Walvis Bay.</p> <p>Lead Environmental Assessment Practitioner managing the EIA processes and compiling reports.</p>
<p>Rössing Uranium Z20 deposit – EIA (2012 – 2014)</p>	<p>It is envisaged that the Z20 uranium deposit would be mined as a satellite open pit as it contains uranium bearing alaskite rocks, utilising conventional blast, load and haul methodology. An infrastructure corridor would need to be established to link the Z20 site to the existing Rössing Uranium Mine across the Khan River.</p> <p>Managing the EIA processes and compiling reports in a 'joint venture' with Aurecon.</p>

Desalination Plant – Managing SEIA processes (2014)	<p>A new Desalination Plant (located approximately 6 km north of Swakopmund, at the premises of the existing Swakopmund Salt Works.) to supply water to the for Rössing Uranium Mine. The plant will have a design capacity of 8,800 m³/day.</p> <p>Managing the SEIA processes and compiling reports in a 'joint venture' with Aurecon.</p>
Coal Storage at Walvis Bay Harbour – EIA (2012)	<p>Environmental Screening/ fatal flaw analysis for the proposed expansion of coal storage at the Walvis Bay Harbour.</p> <p>Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, managing specialists, etc.) and compiling reports.</p>
Arandis Power HFO and recycled oil power plant - EIA (2012)	<p>Arandis Power proposes to develop an independent power generation plant east of the town of Arandis, located in the Erongo Region, Namibia. Arandis Power is proposing a power station with a nominal output capacity of approximately 120MW which utilises reciprocating engines. Arandis Power will utilise a residual fuel known as heavy fuel oil (HFO) and recycled oil from a waste oil recycling plant.</p> <p>Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, managing specialists, etc.) and compiling reports.</p>
Langer Heinrich Uranium Mine – expansion projects – Specialist environmental support (2009 – 2012)	<p>Langer Heinrich is an operational Uranium Mine in Namibia Naukluft National Park.</p> <p>Specialist environmental support to ensure EIAs for expansion projects are correctly managed and implemented. Also to provide support, guidance and management in terms of environmental management implementation at the mine i.e. EMS development and implementation; mine closure and restoration strategy; environmental training; etc.).</p>
Port Expansion Projects in SA – Project environmental management (2008 - 2009)	<p>Port expansions and development (Port Elizabeth, Coega and Richards Bay).</p> <p>Project Environmental Manager - managing the EIA process (including stakeholder engagement, managing specialists, etc.) and compiling reports.</p>
Gautrain Rapid Rail Link - EIA (2006 - 2007)	<p>Development of the Gautrain Rapid Rail Link.</p> <p>Appointed (on contract basis) to provide specialist input into the very challenging EIA processes and EMP development for the project. Also appointed as the Environmental Manager for the Bombela Turnkey Contractor, the managing contractor, for the Gautrain Rapid Rail Link Project.</p>
MEMBERSHIPS	
EAPAN	<p>Certified as a Lead Environmental Practitioner and a Reviewer under the Environmental Professionals of Namibia (Membership No. 114)</p>
PUBLICATIONS	
	<p>Paper on the integration of the EIA process with the project execution model through the University of Pretoria.</p>

Curriculum Vitae

Dr Andrea Pulfrich

Dr Andrea Pulfrich is the founder, director, sole employee and share holder of Pisces Environmental Services (Pty) Ltd. The company was established in January 1998 to help fill the growing need for an expert interface between users of the coastal and marine environment and the various national and provincial management authorities. Since then, PISCES has been providing a wide range of information, analyses, environmental assessments, advice and management recommendations to these user groups, particularly the South African and Namibian marine diamond mining and hydrocarbon industries.

Personal Details

Born: Pretoria, South Africa on 11 August 1961
Nationality and Citizenship: South African and German
Languages: English, German, Afrikaans
ID No: 610811 0179 087

Address: 20 Plein Street, McGreogor 6708, South Africa
PO Box 302, McGreogor, 6708, South Africa

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Academic Qualifications

- BSc (Zoology and Botany), University of Natal, Pietermaritzburg, 1982
- BSc (Hons) (Zoology), University of Cape Town, 1983
- MSc (Zoology), University of Cape Town, 1987
- PhD, Department of Fisheries Biology of the Institute for Marine Science at the Christian-Albrechts University, Kiel, Germany, 1995

Membership in Professional Societies

- South African Council for Natural Scientific Professions (Pr.Sci.Nat. No: 400327/06)
- South African Institute of Ecologists and Environmental Scientists
- International Association of Impact Assessment (South Africa)
- Registered Environmental Assessment Practitioner (Certification Board for Environmental Assessment Practitioners of South Africa).

Employment History and Professional Experience

1998-present: Director: Pisces Environmental Services (Pty) Ltd. Specifically responsible for environmental impact assessments, baseline and monitoring studies, marine specialist studies, and environmental management programme reports.

1999: Senior researcher at the University of Cape Town on contract to Namdeb Diamond Corporation and De Beers Marine South Africa; investigating and monitoring the impact

of diamond mining on the marine environment and fisheries resources; experimental design and implementation of dive surveys; collaboration with fishermen and diamond divers; deep water benthic sampling, sample analysis and macrobenthos identification.

1996-1999: Senior researcher at the University of Cape Town, on contract to the Chief Director: Marine and Coastal Management (South African Department of Environment Affairs and Tourism); investigating and monitoring the experimental fishery for periwinkles on the Cape south coast; experimental design and implementation of dive surveys for stock assessments; collaboration with fishermen; supervision of Honours and Masters students.

1989-1994: Institute for Marine Science at the Christian-Albrechts University of Kiel, Germany; research assistant in a 5 year project to investigate the population dynamics of mussels and cockles in the Schleswig-Holstein Wadden Sea National Park (employment for Doctoral degree); extensive and intensive dredge sampling for stock assessments, collaboration with and mediation between, commercial fishermen and National Park authorities, co-operative interaction with colleagues working in the Dutch and Danish Wadden Sea, supervision of Honours and Masters projects and student assistants, diving and underwater scientific photography. Scope of doctoral study: experimental design and implementation of a regular sampling program including: (i) plankton sampling and identification of lamellibranch larvae, (ii) reproductive biology and condition indices of mussel populations, (iii) collection of mussel spat on artificial collectors and natural substrates, (iv) sampling of recruits to the established populations, (v) determination of small-scale recruitment patterns, and (vi) data analysis and modelling. Courses and practicals attended as partial fulfilment of the degree: Aquaculture, Stock Assessment and Fisheries Biology, Marine Chemistry, and Physical and Regional Oceanography.

1988-1989: Australian Institute of Marine Science; volunteer research assistant and diver; implementation and maintenance of field experiments, underwater scientific photography, digitizing and analysis of stereo-photoquadrats, larval culture, analysis of gut contents of fishes and invertebrates, carbon analysis.

1985-1987: Sea Fisheries Research Institute of the South African Department of Environment Affairs and Tourism: scientific diver on deep diving surveys off Cape Agulhas; censusing fish populations, collection of benthic species for reef characterization.

South African National Research Institute of Oceanography and Port Elizabeth Museum: technical assistant and research diver; quantitative sampling of benthos in Mossel Bay, and census of fish populations in the Tsitsikamma National Park.

University of Cape Town, Department of Zoology and Percy Fitzpatrick Institute of African Ornithology; research assistant; supervisor of diving survey and collection of marine invertebrates, Prince Edward Islands.

1984-1986: University of Cape Town, Department of Zoology; research assistant (employment for MSc Degree) and demonstrator of first year Biological Science courses. Scope of MSc study: the biology, ecology and fishery of the western Cape linefish species *Pachymetopon blochii*, including (i) socio-economic survey of the fishery and relevant fishing communities, (ii) collection and analysis of data on stomach contents, reproductive biology, age and growth, (iii) analysis of size-frequency and catch statistics, (iv) underwater census, (v) determination of hook size selectivity, (vi) review of historical literature and (vii) recommendations to the Sea Fisheries Research Institute of the South African Department of Environment Affairs and Tourism for the modification of existing management policies for the hottentot fishery.

Projects Undertaken

Since establishment in 1998, Pisces Environmental Services have successfully completed the following projects, either independently or in collaboration with various associates and partners.

Hydrocarbon Industry

- Marine Faunal Assessments for proposed exploration well-drilling by Cairn, Shell and Thombo on the South African West Coast, with CCA Environmental.
- Marine Faunal Assessments for proposed exploration well-drilling by Murphy Oil on the Namibia Coast, with CCA Environmental.
- Marine Faunal Assessments for proposed exploration well-drilling by Shell off the Namibia Coast, with SLR Environmental Consulting (Namibia) (Pty) Ltd.
- Marine Faunal Assessments for proposed exploration well-drilling by Eni off the KwaZulu-Natal Coast, with ERM Southern Africa Limited.
- Marine Faunal Assessments for proposed seismic, Controlled Source Electromagnetic surveys and hydrocarbon exploration activities (seismic surveys, multibeam bathymetry, seabed sampling, surface heat-flow measurements, well drilling) off the West, South West, South and East Coasts of South Africa, and off northern, central and southern Namibia, for CCA Environmental/SLR Consulting.
- Marine Faunal Assessments for proposed seismic surveys and hydrocarbon exploration off the West, South and East Coasts of South Africa for ERM.
- Marine Faunal Assessments for proposed seismic surveys off the West, South and East Coasts of South Africa for EIMS.
- Marine Faunal Assessments for proposed seismic surveys off the South and West Coasts of South Africa for SRK.
- Marine Faunal Assessments for proposed hydrocarbon exploration off the West, South and East Coasts of South Africa for Jeffares & Green.
- Baseline Marine Ecological Assessment and post-ESHIA monitoring for the proposed Anadarko LNG Development, Palma Bay, Northern Mozambique with Lwandle Technologies (Pty) Ltd for ERM (Pty) Ltd.
- Marine Faunal Assessment for proposed well stimulation in the F-O Field offshore of Mossel Bay, with WorleyParsons.
- Marine Faunal Assessment for the proposed development of the iBhubezi Gas Field and installation of a subsea gas transfer pipeline, with CCA Environmental.
- Marine ecology and fisheries assessment for the Potential Impacts of the Operation of a LNG Power Generating facility in Walvis Bay, for Xaris Energy Namibia (Pty) Ltd with EnviroDynamics cc.
- IFC PS6 Critical Habitats Assessment for proposed LNG developments by Anadarko Mozambique Area I Lda, with Lwandle Technologies.
- Baseline Marine Ecological Surveys for the proposed Sasol Development Project for Liquid hydrocarbon Export, Inhassaro Province, Mozambique with Lwandle Technologies (Pty) Ltd for ERM (Pty) Ltd.

Diamond Mining

- Evaluation of deepwater benthic community composition changes and recovery rates in the Atlantic 1 Mining Licence Area off Namibia, for De Beers Marine.
- Evaluation of the impact of nearshore diver-operated diamond mining on rock-lobster and benthic communities near Lüderitz, Namibia, for Namdeb Diamond Corporation.

- Evaluation of the effects of shore-based contractor mining and fines deposition from the Elizabeth Mine on rock-lobster abundance, and intertidal and subtidal communities, for Namdeb Diamond Corporation.
- Review of the interactions between the rock-lobster fishery and marine diamond mining along the southern African West Coast, for GOPA-Consultants/GTZ.
- Environmental Management Program Reports for South African west coast (a), (b), (c) and (d) marine diamond mining concessions, for Benguela Operations, Trans Hex Group, Namagroen Prospecting and Investments, GeoMining and Wealth 4 U.
- Environmental impact assessment for proposed beach terrace mining at Karoetjies Kop by De Beers Namaqualand Mines for Metago Environmental Engineers.
- Beach macrofaunal survey to assess the impacts of beach mining operations by Trans Hex Operations.
- Specialist reviews of the potential effects of sediments derived from proposed pocket-beach and off-beach mining operations in Namibia on intertidal and subtidal benthic communities, for Namdeb Diamond Corporation and De Beers Marine.
- Baseline marine survey of intertidal and subtidal rocky shore habitats in the Brand-se-Baai Complex and associated EIA and EMP for surf-zone, diver-operated diamond mining for De Beers Namaqualand Mines.
- Baseline marine survey and annual monitoring of intertidal and subtidal rocky shores and beaches at Elizabeth Bay, Namibia, for Namdeb Diamond Corporation (ongoing).
- Macrofaunal sample analysis and baseline and monitoring reports on Benthic Communities in the De Beers ML3/2003 Mining Licence Area, for De Beers Marine South Africa.
- Macrofaunal sample analysis and report on Benthic Communities in ML-43, ML-44, ML-45, ML-47 and ML-128 off Namibia, for Namdeb Diamond Corporation.
- Compilation of a Scoping Report, EIA and EMP for marine dredging operations in the Chameis Bay and the Atlantic 1 Mining Licence areas, for De Beers Marine Namibia.
- Reports on the recovery and rehabilitation of marine diamond mining operations off the southern African West Coast, for De Beers Marine South Africa, De Beers Marine Namibia and Namdeb Diamond Corporation.
- Specialist input to an EIA on proposed pocket-beach mining by Namdeb Diamond Corporation, for EnviroScience.
- Review of the potential effects of increased sediment disposal from the Elizabeth Bay mine (Namibia) on shallow water marine communities, for CSIR.
- Identification of deepwater benthic organisms collected in seabed benthic community surveys in mined areas off Namibia, for De Beers Marine Namibia.
- Compilation of a scoping report reviewing the EIA and EMP for De Beers South African Sea Areas Prospecting and Mining Concessions along the West Coast, for De Beers Marine South Africa.
- Assessment the potential effects of dredging-related suspended sediments on intertidal and subtidal communities in the Chameis Bay area, for De Beers Marine Namibia.
- Study on the cumulative impacts of scouring of sub-tidal areas and kelp cutting by diamond divers in near-shore areas of the BCLME region (BEHP/CEA/03/04), for the BCLME Task Group on Management of Mining and Petroleum Exploration and Production Activities.
- Data gathering and gap analysis for assessment of cumulative effects of marine diamond mining activities on the BCLME region (BEHP/CEA/03/02).
- Assessment of the cumulative effects of sediment discharges from on-shore and near-shore diamond mining activities on the BCLME (BEHP/CEA/03/03), with CSIR Environmentek.

- Baseline and monitoring surveys of the effects of Pocket Beach mining at Site 11/12 on nearshore reef habitats in the Bogenfels Licence Area for Namdeb Diamond Corporation.
- Compilation of an EIA and EMPR for proposed Wet Overburden Mining in Namdeb's Mining Area 1, with Anchor Environmental Consultants.
- Baseline and monitoring surveys of the effects of fine-tailings discharges and shoreline accretion on rocky-shore and sandy-beach communities in Mining Area 1, for Namdeb Diamond Corporation (ongoing).
- Baseline and monitoring surveys of sandy beach and intertidal rocky shore habitats of the pocket beaches in the Bogenfels Licence Area for Namdeb Diamond Corporation, with Anchor Environmental Consultants.
- Development of a medium- to long-term benthic sampling program to ascertain the recovery rate of the macrofaunal benthic communities after disturbance through mining in De Beers Marine's SASA ML3, for De Beers Marine (Pty) Ltd.
- Compilation of EIAs and EMPRs for Namdeb's Inshore and Inner Shelf Projects, for Namdeb Diamond Corporation (Pty) Ltd.
- Review and compilation of EIAs and EMPRs for Namdeb's offshore mining licence areas mined under exclusive contract by De Beers Marine Namibia, with CSIR Environmentek.
- Preparation and submission of a Letter of Intent and Draft Basic Assessment Report for land-based aspects associated with proposed dredging operations in Namagroen's concessions 8(a) and 9(a), for GeoMining.
- Compilation of an EMPR for vessel and shore-based diving by Diamond Fields Namibia in the Lüderitz concessions, with Jeremy Midgley & Associates.
- Specialist Assessment of tailings plumes from De Beers' Horizontal Mining Vessel Operating in South African Sea Areas Mining Licence Area ML3/2003, with Dr Robin Carter, for De Beers Marine.
- Review of, and input into De Beers Marine's Biodiversity Action Plan, for De Beers Marine (Pty) Ltd.
- Review of, and input into Namdeb's Biodiversity Action Plan, for Namdeb Diamond Corporation (Pty) Ltd.
- EIA-Amendment and EMPR for Namdeb's Elizabeth Bay Optimisation Study.
- Basic Assessment Report and Stakeholder Engagement for Namdeb's Southern Coastal Unconstrained Accretion (SCUBA) Project.
- Risk Assessment and final closure report for MPT 25/2011 diamond mining licence held by De Beers Consolidated Mines. Compiled for De Beers Marine.
- Stakeholder Engagement and EMPR for prospecting application off the South African West Coast for Belton Park Trading 127 (Pty) Ltd.
- Marine Specialist studies for exploration, prospecting and bulk sampling off the South African West Coast for Belton Park Trading 127 (Pty) Ltd.
- Marine Ecology Specialist Study for Exploration activities by LK Mining (Pty) Ltd in EPL 5965 near Lüderitz for SLR Consulting Namibia.
- Revision and update of Namdeb's EMPRs for ML-43, ML-44, ML-45 and ML-128 with EnviroScience (in progress).
- Marine Ecology Specialist Study for proposed cofferdam mining by West Coast Resources along the Namaqualand coast for Myezo Environmental Management Services.
- Marine and Coastal Ecology Assessment as part of the EIA for the Amendment of Environmental Management Programmes for Mining Rights 554MRC, 10025MRC, 512MRC and 513MRC held by Alexkor RMC Pooling and Sharing JV.
- Baseline and impact monitoring of marine and coastal communities in response to cofferdam mining by West Coast Resources along the Namaqualand coast (ongoing).

- Specialist statement for proposed nearshore diamond mining utilizing mass flow excavation technology for Rapid Mining cc.

Other Minerals

- Prospecting permit application and EMPR compilation for the extraction of heavy mineral sands in the Geelwal Karoo area for the Australian-based company Mineral Sands Resources Ltd.
- Marine Specialist Study and EIA Review for the proposed Tormin heavy mineral sands mining north of the Olifants River mouth for GCS.
- Marine Specialist Report for the EIA and EMP for proposed prospecting for shell and sand off Richard's Bay, with AGES (Pty) Ltd.
- Marine Baseline Report for the proposed Cacata Phosphate Project in Cabinda Province, Angola, with Prime Resources (Pty) Ltd.
- Marine Specialist Report for the EIA and EMP for shore-based operations associated with the proposed Namibian Marine Phosphates project, with EnviroDynamics cc.
- Marine Specialist Statement on the potential benthic impacts of proposed offshore sampling for heavy minerals, with CCA Environmental.
- Marine Specialist Statement on the potential effects of the discharge of bitterns from the proposed Cape Cross Salt Works, for Gecko Salt Namibia.
- Marine Ecology Specialist Statement on the potential effects of blasting at the Wlotzkasbaken Ridge Quarry, for Gecko Salt Namibia.
- Marine ecology Specialist Assessment for Environmental Screening Study for the proposed Development of a Bittern Beneficiation pond and Associated Infrastructure at the Walvis Bay Salt Works, Walvis Bay, Namibia, for SLR Environmental Consulting (Namibia) (Pty) Ltd.
- Marine ecology Specialist Statement as part of the Environmental Impact Assessment and Environmental Management Plan for Salt Mining at Mile 68 within EPL 4426, Erongo Region, for Gecko Salt Namibia.

Desalination and Power Plants

- Assessment of a proposed cooling water discharge from the Kudu Power Plant near Oranjemund, into the marine environment, for CSIR Environmentek.
- Assessment of a cooling water discharge on the marine environment, from the proposed 2400 MW gas-fired combined cycle power generator at Coega, for CSIR Environmentek.
- Assessment of an effluent discharge from proposed Reverse Osmosis Plants at the Multipurpose Terminal in Saldanha Bay and Swakopmund Namibia on the marine environment, for CSIR Environmentek.
- Specialist Marine Environmental Impact Assessment Study, baseline survey and Environmental Management Plan for the proposed Reverse Osmosis Plant for the Trekopje Uranium Mine, Namibia, for Turgis Consulting (Pty) Ltd.
- Specialist Marine Environmental Impact Assessment Study, Baseline Survey and Environmental Management Plan for the proposed NamWater Reverse Osmosis Plant near Swakopmund, Namibia, for CSIR Environmentek.
- Marine Specialist Study for the proposed Saldanha Bay Desalination Plant, with CSIR Environmentek.
- Environmental Screening for Reverse Osmosis Plants in KwaZulu-Natal, with Aurecon South Africa (Pty) Ltd.

- Environmental Risk Analysis and Marine Specialist Study as part of the Environmental Impact Assessment for Reverse Osmosis Plants in KwaZulu-Natal, with CSIR Environmentek (in progress).
- Environmental Screening for Reverse Osmosis Plant in the greater Cape Town area, with CSIR Environmentek and Steffani Marine Environmental Consultant.
- Marine Specialist Study for the proposed Desalination Plant at Volwaterbaai, with SRK.
- Marine Specialist Study for the proposed Frontier Saldanha Regional Marine Outfall, with CSIR Environmentek.
- Marine Specialist Study for the proposed Rössing Mine Desalination Plant at the Swakopmund Saltworks, with SLR Namibia.

Harbour, Industrial and Coastal Developments

- Intertidal beach and rocky-shore specialist study for Dollas Downs EIA, for CSIR Environmentek.
- Compilation of an EIA and EMPR for the construction of a new jetty in Lüderitz Bay Harbour.
- Specialist study on the potential impacts on marine ecosystems in Table Bay of the expansion of the container storage terminal in Cape Town harbour, for CSIR Environmentek.
- Preparation of national launchsites database in support of prospective launchsite applications for the SA Deep Sea Angling Association.
- Marine Ecology Specialist Study and EIA for the development of Eden Island in Republic of Seychelles.
- Marine Specialist input into the Basic Assessment for the proposed marine lift facility in the Small Boat Harbour, Saldanha Bay, for CCA Environmental (Pty) Ltd.
- Compilation of a Marine Specialist Study for the Feasibility Assessment for the proposed expansion of the Port of Lüderitz, for Aurecon Namibia.
- Marine environmental risk assessment for an industrial park near Swakopmund, with CSIR Environmentek.
- Marine Specialist Study for the AfriSam Saldanha Cement Project, for Aurecon South Africa.
- Marine Specialist Assessment for the upgrade of the waste water treatment facility on Robben Island, for WSP Environmental, South Africa.
- Marine Monitoring Report and Assessment for the Chlorine disinfection pilot project at Three Anchor Bay, for Jeffares & Green through Ma-Re.
- Baseline monitoring and marine ecological assessment for the proposed Vision Industrial Park near Swakopmund Namibia, for Gecko Namibia.
- Marine ecology Specialist Assessment for the proposed development of the West Bank WWTW marine outfall pipeline, East London for WSP Environmental.
- Marine ecology Specialist Assessment for the proposed installation of a submarine fibre-optics cable off East London, for ERM Southern Africa Limited.
- Marine ecology Specialist Assessment for the proposed installation of a submarine fibre-optics cable off Amamzimtoti, KwaZulu-Natal, for ERM Southern Africa Limited.

Marine Living Resources

- Population dynamics and stock assessment of giant periwinkles *Turbo sarmaticus*, *Turbo cidaris* and *Oxysteles sinensis*, in the southwestern Cape for M&CM.
- Evaluation of coastal fauna community composition and pesticide contamination levels in northern False Bay, Cape Town for AECI Operations Services.
- Economic study of the South African pelagic longline and abalone fishing sectors, for EFA.
- Evaluation of shark by-catches in southern African shark longline fisheries, for EFA.
- A review of information relevant to development of effective co-operative arrangements for the management of shared fish stocks in the SADC region, for EFA.
- Economic Assessment of the South African Abalone Fishery, with EFA.
- Conducting of a benthic community baseline diving survey in the Cape Peninsula National Park marine zone, for SA National Parks.
- Conducting of Fisheries Independent Abalone Surveys (FIAS) for Marine & Coastal Management, and comparative abalone diving survey for the abalone industry.
- Development and management of a Fisheries Independent Monitoring Survey (FIMS), and small-scale mark-and-recapture experiment for rock lobsters off the southern Namibian coastline, for De Beers Marine Namibia.
- Management of an infra-red aerial photographic survey of the southern Namibian kelp beds, for De Beers Marine Namibia.
- Marine Specialist inputs into technical report on the Environmental Flow Requirements of the Fish River and the Orange-Senqu River Mouth with CSIR Environmentek.
- Marine Specialist Report and risk assessment for a proposed abalone ranching pilot project along the Northern Cape Coast, with Steffani Marine Environmental Consultant.
- Risk Assessment as part of an application for restricted activities involving listed threatened or protected turtle species, for NMMU.
- Marine Specialist Report for the proposed Saldanha Bay Aquaculture Development zone, with CapMarine Environmental and SRK Consulting.
- Strategic Environmental Assessment for Mariculture Development in South Africa, with CSIR (in progress).
- Specialist Statement on the impacts of beach driving in the Arniston area, for SLR Consulting.
- Specialist study for the proposed expansion of the I&J Abalone farm at Danger Point, for SLR Consulting (South Africa) (Pty) Ltd.

CURRICULUM VITAE

SARAH WILKINSON SACNASP-Registered Professional Natural Scientist (Membership number 115666)

Geographical information systems, mapping and data analysis of southern African fisheries

Date of Birth: 20 June 1979

Nationality: South African / British

Academic Record: University of Cape Town, South Africa; BSc Honours (2001)
University of Cape Town; BSc (Oceanography and Botany 1998 – 2000)

Employment Record: Capricorn Marine Environmental (Pty) Ltd (2003 – 2019)
Institute of Plant Conservation, University of Cape Town (2002)

Languages: English (First language); Afrikaans & French (Basic written & spoken)

Key Experience:

- Geographical information systems, mapping and data analysis with focus on fisheries, oil and gas specialist assessments.
- Specialist assessments on the impact of offshore hydrocarbon exploration and installation activities on fisheries in South Africa, Namibia, Mozambique and Angola (in accordance with scoping and EIA requirements). **A selection of projects over the last five years is listed overleaf and a full list of project reports is available on request.**
- Management of Marine Mammal Observer (MMO), Passive Acoustic Monitoring (PAM) and Fisheries Liaison Services for seismic survey vessels in the offshore sub-Saharan region (a full list of over 100 deployments is available on request).
- Management of the industry-funded ship-based scientific observer programmes for the South African Pelagic Fishing Industry Association (SAPFIA) and the SA Deepsea Trawling Industry Association (SADSTIA).
- GIS support and analysis of the South African fishery catch and effort for use in the Offshore Marine Protected Area Project - contracted by the South African National Biodiversity Institute (SANBI).
- A review on the effects of trawling on benthic habitat in part fulfilment of the Marine Stewardship Council certification of the South African hake trawl fishery (Client: South African Deepsea Trawling Industry Association (SADSTIA)).
- Spatial mapping of the proposed expanded Saldanha Bay Aquaculture Development Zone (ADZ) in line with the goals of operation Phakisa.
- Offshore Marine Protected Areas Project: spatial distribution/ mapping of South Africa's commercial fisheries for the South African National Biodiversity Institute
- Hake longline sector footprint: Spatial distribution of fishing effort and overlap with benthic habitats of the South African Exclusive Economic Zone (2002 – 2012) for WWF South Africa
- "Ringfencing the trawl footprint":- Desktop study for the South African Deepsea Trawling Industry Association

A complete list of Fisheries Impact Assessment Reports and Environmental Monitoring Close-Out Reports is available on request.

SOUTH AFRICA EXPERIENCE : Selected projects undertaken over the past five years

Client	Activity	Area	Date
Total E&P South Africa	Well Drilling	Block 11B/12B	Jun 2020
Total E&P South Africa	Seismic Survey/Well drill	South Outeniqua	Jun 2020
ACER / Equiano Cable System	Subsea Cables (Telecommunications)	Melkbosstrand, West coast, South Africa	Nov 2019
Total E&P South Africa	Seismic Survey	Block 11B/12B	Oct 2019
Total E&P South Africa	Well Drilling	Southeast Coast	Jul 2019
METISS Cable System	Subsea Cables (Telecommunications)	East Coast	Mar 2019
Petroleum Geo-Services	Seismic Survey	West & Southwest Coasts	Oct 2018
Belton Park Trading 127 (Pty) Ltd	Marine Mining	2C & 3C	Sep 2018
IOX	Subsea Cables	South Coast	Jun 2018
De Beers Marine	Marine Mining	6C	Jun 2018
ENI	Well Drilling	East Coast	Jun 2018
Petroleum Geo-Services	Seismic Survey	East & South Coasts	Jan 2018
Alexkor	Marine Mining	1A-C,2A,3A,4A-B	Sep 2017
Impact Africa Ltd	Seismic Survey	Orange Basin	Jul 2017
Sungu Sungu Oil (Pty) Ltd	Seismic Survey	Pletmos Basin	Mar 2017
PetroSA (Pty) Ltd	Subsea Pipeline	E-BK, Block 9	Feb 2017
ACE Cable / MTN (Pty) Ltd	Subsea Cables	West Coast	Sep 2016
West Coast Resources (Pty) Ltd	Marine Mining	6A-8A	Jul 2016
Belton Park Trading 127 (Pty) Ltd	Marine Mining	2C	May 2016
Spectrum ASA	Seismic Survey	West Coast	Jan 2016
Schlumberger	Seismic Survey	East Coast	Nov 2015
Rhino Oil & Gas Exploration	Seismic Survey	Blocks 3617/3717	Nov 2015
Belton Park Trading 127 (Pty) Ltd	Marine Mining	2C-5C	Jan 2015
Aquaculture development zone	Identification of suitable areas for expansion of aquaculture within Saldanha Bay		

NAMIBIAN EXPERIENCE : Selected projects undertaken over the past five years

Client	Activity	Area	Date
Total E&P Namibia	Seismic Survey	2912 & 2913B	Jul 2020
ACER / Equiano	Subsea Cable	Regional	Jun 2020
GALP/Windhoek PEL 23 & 28 B.V.	Well Drilling	PEL82 & PEL83	Jul 2019
Shell Namibia B.V.	Seismic Survey	PEL39	May 2018
Shell Namibia B.V.	Well Drilling	PEL39	Oct 2017
Spectrum Geo Ltd	Seismic Survey	Regional (North)	Jun 2017
GALP	Seismic Survey	PEL82 & PEL83	May 2017
Spectrum Geo Ltd	Seismic Survey	Regional (South)	Oct 2016
LK Mining	Marine Mining	EPL5965	May 2016
Murphy Lüderitz Oil Co. Ltd	Well Drilling	2613A & 2613B	Jul 2015
Xaris Energy Namibia	Subsea Pipeline Installation	Walvis Bay	Jul 2015
Nabirm Energy Services (Pty) Ltd	Seismic Survey	2113A	Jan 2015
Namdeb	Mapping of benthic habitat types, Southern Namibia inshore and nearshore region		

Courses and Symposia :

- 7th and 5th International Symposia on GIS/Spatial Analyses in Fishery and Aquatic Sciences, Hakodate, Japan & Wellington, New Zealand. International Fishery GIS Society
- Joint Nature Conservation Committee-certified Marine Mammal Observer Training (Intelligent Ocean Training Services)

- Passive Acoustic Monitoring Training (Intelligent Ocean Training and Consultancy Services and Seiche Measurements Ltd)
- Bureau of Ocean Energy Management, Regulation and Enforcement Gulf of Mexico: Protected Species Observer Training
- ArcGIS I, II and Spatial Analyst (GIMS: ESRI South Africa)
- Maxsea Navigational Software (TimeZero)
- Marine Stewardship Council Chain of Custody Training Course (Moody Marine Ltd)
- SAQA-approved learning facilitator

Publications:

Massie, P, Wilkinson S & D Japp 2015. Hake longline sector footprint: Spatial distribution of fishing effort and overlap with benthic habitats of the South African Exclusive Economic Zone (2002 – 2012). Capricorn Marine Environmental, Cape Town 15 pages.

Sink KJ, Wilkinson S, Atkinson LJ, Leslie RW, Attwood CG and McQuaid KA 2013. Spatial management of benthic ecosystems in the South African demersal trawl fishery. South African National Biodiversity Institute, Pretoria. 22 pages.

Sink K, Wilkinson S, Atkinson L, Sims P, Leslie R and C Attwood 2012. The potential impacts of South Africa's demersal trawl fishery on benthic habitats: Historical perspectives, spatial analyses, current review and potential management actions. South African National Biodiversity Institute (SANBI).

Technical Report: Spatial/data layers of South African commercial fisheries (May 2009). Prepared for South African National Biodiversity Institute.

Wilkinson, S. and D. Japp. 2009. Spatial boundaries of the South African hake-directed trawling industry: trawl footprint estimation prepared for the South African Deepsea Trawling Industry Association (SADSTIA) - unpublished

Benguela Current Large Marine Ecosystem State of Stocks Review: Report No.1 (2007). Eds D.W. Japp, M.G. Purves and S. Wilkinson, Cape Town.

Description and evaluation of hake-directed trawling intensity on benthic habitat in South Africa: Prepared for the South African Deepsea Trawling Industry Association in fulfilment of the Marine Stewardship Council certification of the South African hake-directed trawl fishery; condition 4. December 2005. Fisheries & Oceanographic Support Services cc, Cape Town

Purves, MG, Wissema J, Wilkinson S, Akkers T & D. Agnew. 2006. Depredation around South Georgia and other Southern Ocean fisheries. Presented at the Symposium: 'Fisheries Depredation by Killer and Sperm Whales: Behavioural Insights, Behavioural Solutions', Pender Island, British Columbia, Canada from Oct. 2-5, 2006.

Gremillet D., Pichegru L., Kuntz G., Woakes A.G., Wilkinson S., Crawford, R.J.M. and P.G. Ryan. 2007. A junk-food hypothesis for gannets feeding on fishery waste. Proc. R. Soc. B. doi:10.1098/rspb.2007.1763. Online publication.

APPENDIX 2:
MARINE FAUNAL SPECIALIST REPORT

**ECC Renewal for Offshore Exploration Drilling in Block 2913B, Orange Basin,
Namibia**

Review and amendment of Environmental and Social Management Plan (ESMP): Marine Faunal
Specialist Report

Prepared by

Andrea Pulfrich
Pisces Environmental Services (Pty) Ltd

Prepared for the Environmental Assessment Practitioner:
SLR Environmental Consulting (Namibia) (Pty) Ltd



On behalf of the Applicant:
TotalEnergies EP Namibia B.V.

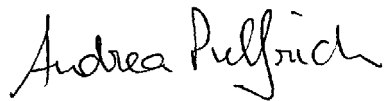
April 2022

EXPERTISE AND DECLARATION OF INDEPENDENCE

This report was prepared by Dr Andrea Pulfrich of Pisces Environmental Services (Pty) Ltd. Andrea has a PhD in Fisheries Biology from the Institute for Marine Science at the Christian-Albrechts University, Kiel, Germany.

As Director of Pisces since 1998, Andrea has considerable experience in undertaking specialist environmental impact assessments, baseline and monitoring studies, and Environmental Management Programmes relating to marine diamond mining and dredging, hydrocarbon exploration and thermal/hypersaline effluents. She is a registered Environmental Assessment Practitioner and member of the South African Council for Natural Scientific Professions, South African Institute of Ecologists and Environmental Scientists, and International Association of Impact Assessment (South Africa).

This audit report was compiled for SLR Environmental Consulting (Namibia) (Pty) Ltd on behalf of TotalEnergies EP Namibia B.V. I do hereby declare that Pisces Environmental Services (Pty) Ltd is financially and otherwise independent of the Applicant and SLR.



Dr Andrea Pulfrich

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1 INTRODUCTION

TotalEnergies EP Namibia B.V. (herein referred to as TEEPNA) is the current operator of Block 2913B. The block is situated approximately 300 km off the southern coast of Namibia in water depths between 2 600 m and 3 300 m.

As part of the process of applying for the initial Exploration Licence for the block, an Environmental and Social Impact Assessment (ESIA) process was undertaken for offshore exploration drilling activities. In September 2019, the Ministry of Environment, Forestry and Tourism (MEFT) issued an Environmental Clearance Certificate (ECC) for the proposed offshore exploration drilling activities (MEFT Ref No. ECC-00134). As part of this ECC, TEEPNA drilled the Venus 1X Well between 30 November 2021 and 05 March 2022.

As part of the ECC renewal process, SLR Environmental Consulting (Namibia) (Pty) Ltd (SLR) appointed Pisces Environmental Services (Pty) Ltd to review the existing Environmental and Social Impact Assessment (ESIA) report and Environmental and Social Management Plan (ESMP) (AECOM 2019) and to provide marine faunal specialist input into the ECC amendment process.

2 TERMS OF REFERENCE

The terms of reference for the audit of the ESIA report and the ESMP are as follows:

- Provide confirmation as to whether the baseline environment has changed since compilation of the original ESIA Report and ESMP and Environmental Baseline Survey Report compiled in May 2019.
- Audit the effectiveness of the ESMP specifications based on updated baseline information and any key omissions identified in the ESMP.
- Recommend new or revised specifications, as applicable, for inclusion in an amended ESMP.

3 METHODOLOGY

3.1 Approach and Checklist

The ESIA and ESMP review was undertaken in a structured and systematic manner. A checklist was developed to audit the effectiveness of the ESMP specifications and to identify any shortcomings. Good International Industry Practice (GIIP) was used as a defining benchmark of adequacy. GIIP was defined using several references including national regulations, international conventions and recognised codes of practice, which included:

- TEEPNA's global environmental performance standards;
- Recognised industry codes of practice (e.g. International Association for Geophysical Contractors (IAGC) and Joint Nature Conservation Committee (JNCC));
- International Conventions (e.g. MARPOL); and
- Recent drilling operations in Block 2913B and off the south coast of South Africa.

3.2 Audit Assessment

The adequacy rating was developed to evaluate each ESMP specification to determine if it provides adequate avoidance, management and mitigation of potential impacts with reference to GIIP. The specifications provided in the ESMP have been rated according to the criteria presented in the table below.

Table 1: Adequacy Ratings used during this audit.

Adequacy	Rating Definition
Adequate (A)	Measure is considered adequate to provide avoidance, management and mitigation of potential impacts and is aligned with GIIP.
Adequate with Recommendations (AR)	Measure is considered adequate to provide avoidance, management and mitigation with recommendations for modifications to meet GIIP.
Inadequate (I)	Measure is not considered adequate to provide avoidance, management and mitigation of potential impacts. Additional measures are required to meet GIIP.

3.3 Documents Reviewed

Documents reviewed in preparation of this report included:

- Original ESIA Report and ESMP (AECOM 2019) compiled in May 2019;
- Environmental Baseline Survey Report (Benthic Solutions 2019a) compiled in May 2019;
- MMO Close-out reports (Benthic Solutions 2019b, 2019c);
- Underwater noise propagation study Memo (O'Connor 2019); and
- MetOcean conditions and cuttings discharge modelling study (Merzi 2019).
- Oil Spill modelling (Livas 2020).

3.4 Assumptions and Limitations

It is assumed that TEEPNA has ensured that all data and relevant project information provided are valid and true.

4 REVIEW OF BASELINE ENVIRONMENT

4.1 Baseline Description in ESIA

The baseline description in the ESIA is lacking in certain details. In particular, mapping of Block 2913B in relation to seabed bathymetry and geological features such as seamounts and canyons, upwelling centres, sea surface temperatures, benthic and coastal habitats and ecosystem threat status as provided in Holness et al. (2014), major spawning areas and egg and larval drift, post-nesting distribution and migration corridors of turtles (Harris et al. 2018), foraging areas of gannets (Grémillet et al. 2008) or core usage areas of pelagic seabirds (BirdLife South Africa 2021), distribution and

movement of cetaceans (from MMO close-out reports (Benthic Solutions 2019b, 2019c), Purdon et al. 2020), ‘whale superhighways’ (Johnson et al. 2022), Ecologically and Biologically Significant Areas and the conservation zones therein (EBSAs) and Marine Protected Areas (MPAs), marine Important Bird Areas (IBAs) and other users of the marine environment, is not described or presented in the ESIA Report. Such maps are important to put the project area into context with the occurrence and distribution of identified sensitive receptors in the region and their potential overlap with direct and indirect impacts resulting from the proposed exploration drilling operations.

The sections in the baseline description for turtles, seabirds and marine mammals are also lacking and rely primarily on information provided in the environmental baseline survey report (Benthic Solutions 2019a), with additional information from the scientific literature being omitted altogether. Although the environmental baseline survey report provides important information on benthic communities in the area, this detail was not included in the ESIA Report. Information in the ESIA on marine mammals in particular is inadequate. The cetacean fauna of southern Namibia comprises 33 species of whales and dolphins known or likely to occur. No information is provided for the hearing frequencies of the various species, their seasonality in the project area, or IUCN conservation status, all of which are important when considering the potential impacts of underwater drilling noise and VSP, aircraft noise, vessel strikes etc.

Since compilation of the ESIA, there have been numerous changes and updates to Conservation and Marine Protected Areas, and new information on pelagic seabird core usage areas, ‘whale superhighways’, Important Marine Mammal Areas (IMMAs) and marine IBAs has become available. Furthermore, offshore MPAs, EBSAs and Critical Biodiversity Areas (CBAs) have been established in adjacent South African waters (Harris et al. 2020).

These sensitive receptors are briefly described in Section 4.2 below.

4.2 Update of Baseline Environment

In reviewing the original ESMP specifications and recommending any amendments, the following information was taken into consideration.

- Upwelling cells and low oxygen zones,
- Benthic habitats and proximity to seamounts and canyons,
- Habitat and ecosystem threat status,
- Spawning areas,
- Ecologically and Biologically Significant Areas (EBSAs) and Marine Protected Areas (MPAs) and
- Marine Important Bird Areas (IBAs).

These are mapped in relation to Block 2913B and the adjacent Block 2912 and briefly described below.

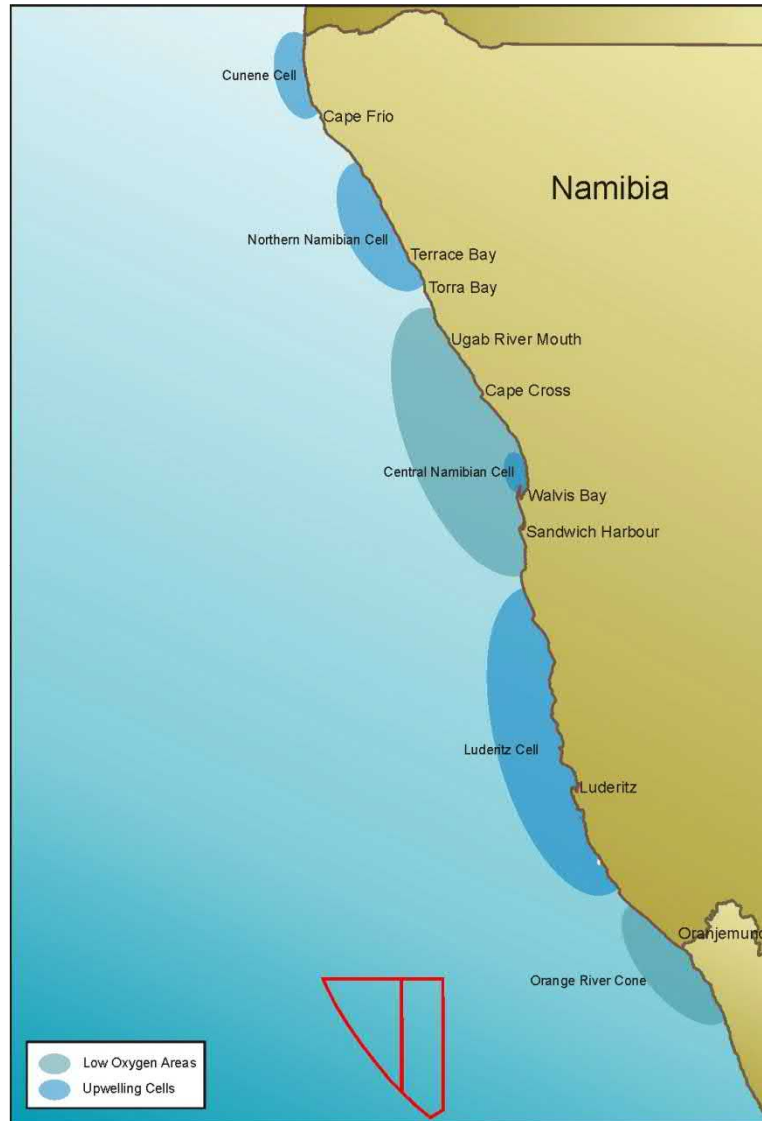


Figure 1: Blocks 2912 and 2913B in relation to upwelling centres and low oxygen areas off the West Coast of Namibia (adapted from Shannon 1985).

Coastal upwelling is a major feature of the Benguela Current. Although the rate and intensity of upwelling fluctuates with seasonal variations in wind patterns, the most intense upwelling tends to occur where the shelf is narrowest and the wind strongest. Consequently, it is a semi-permanent feature at Lüderitz and areas to the north due to perennial southerly winds (Shannon 1985). The Lüderitz upwelling cell is the most intense upwelling cell in the system, with the seaward extent reaching nearly 300 km, and the upwelling water is derived from 300-400 m depth (Longhurst 2006). The Lüderitz / Orange River region forms a major environmental barrier between the northern and southern Benguela sub-systems (Ekau & Verheye 2005) (Figure 1). Off central and northern Namibia, several secondary upwelling cells occur. Upwelling in these cells is perennial, with a late winter maximum (Shannon 1985). Block 2913B lies well offshore of these upwelling cells and primary productivity and plankton abundance are thus expected to be low.

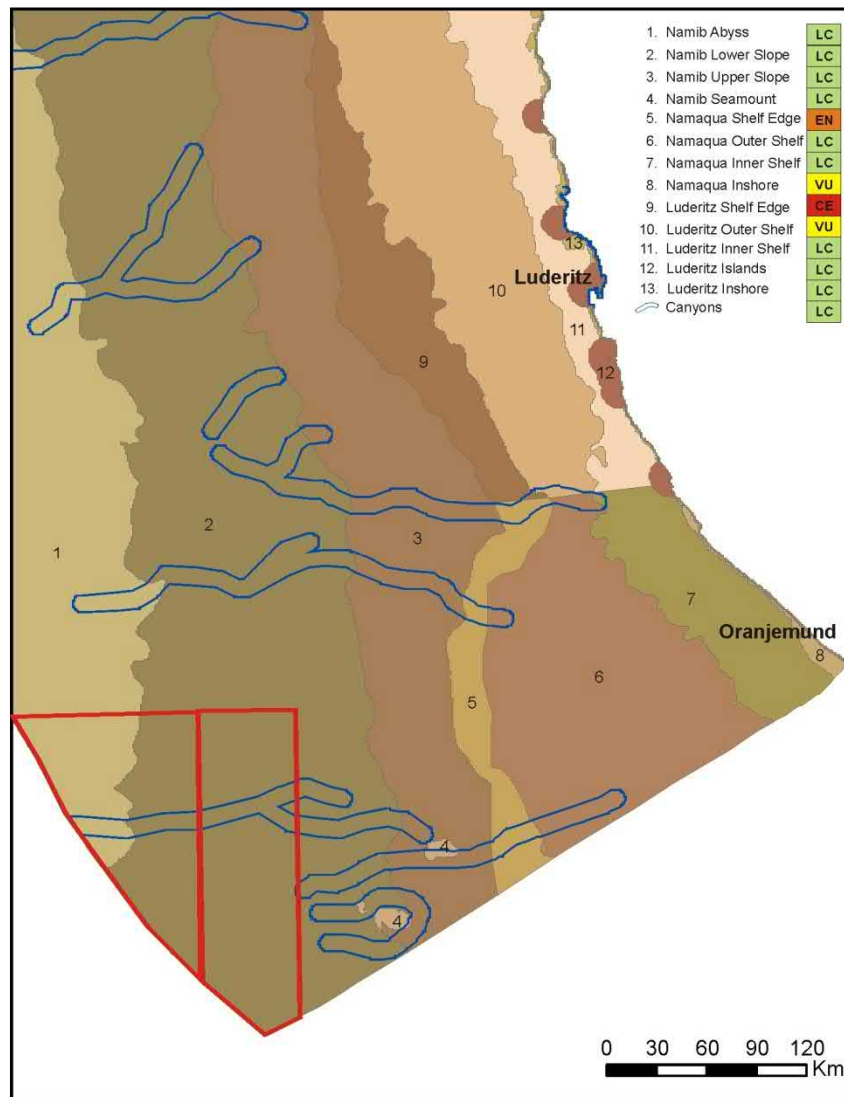


Figure 2: Blocks 2912 and 2913B (red polygons) in relation to the Namibian benthic and coastal habitats. The positions of potential submarine canyons are also shown (blue lines) (adapted from Holness *et al.* 2014).

The benthic and coastal habitats of Namibia were mapped as part of the Benguela Current Commission's Spatial Biodiversity Assessment (BCC-SBA) (Holness *et al.* 2014) to develop assessments of the ecosystem threat status and ecosystem protection level. Submarine canyons were also mapped as biodiversity features, although descriptions of their geographical situations were not sufficiently accurate to include them in the benthic habitat map¹ (Figure 2). The benthic habitats were subsequently assigned an ecosystem threat status based on their level of protection and mapped (Figure 3).

¹ Possible marine canyons identified by the international Deep Ocean project mapped them as lines. The lines were buffered by 5 km to ensure that both the canyon and its associated adjacent ecosystems were included.

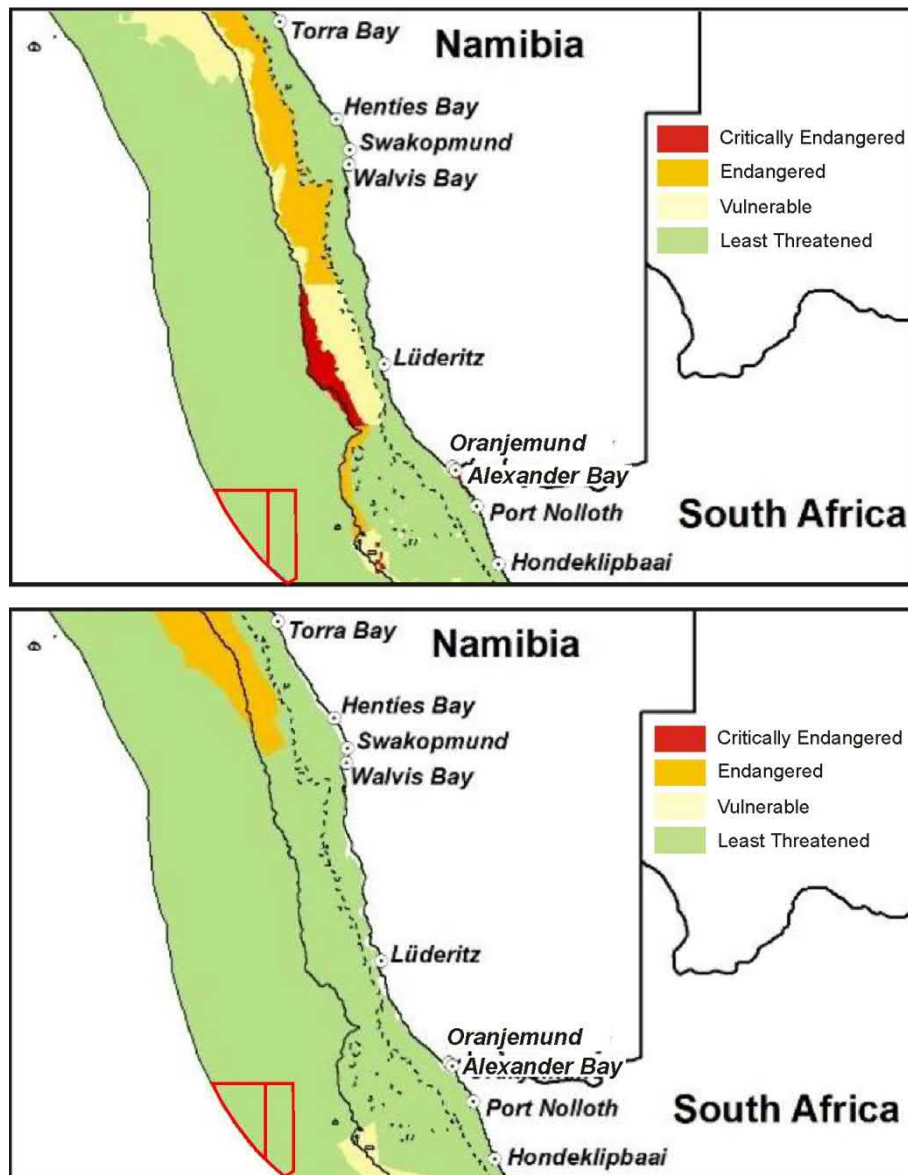


Figure 3: Blocks 2912 and 2913B (red polygons) in relation to ecosystem threat status for offshore benthic habitat types (top), and offshore pelagic habitat types (bottom) off southern Namibia (adapted from Holness *et al.* 2014).

The benthic fauna of the abyss, lower and upper continental slope and outer shelf (beyond ~450 m depth) are very poorly known largely due to limited opportunities for sampling as well as the lack of access to Remotely Operated Vehicles (ROVs) for visual sampling of hard substrata. To date very few areas of the continental slope off the southern African West Coast have been biologically surveyed. Benthic habitats along the 500 m depth contour have been assigned a threat status of 'Endangered' by the Benguela Current Commission (BCC) Spatial Biodiversity Assessment (Holness *et al.* 2014) but further offshore in Blocks 2912 and 2913B the benthic habitat type is considered 'Least Threatened' (Figure 3).

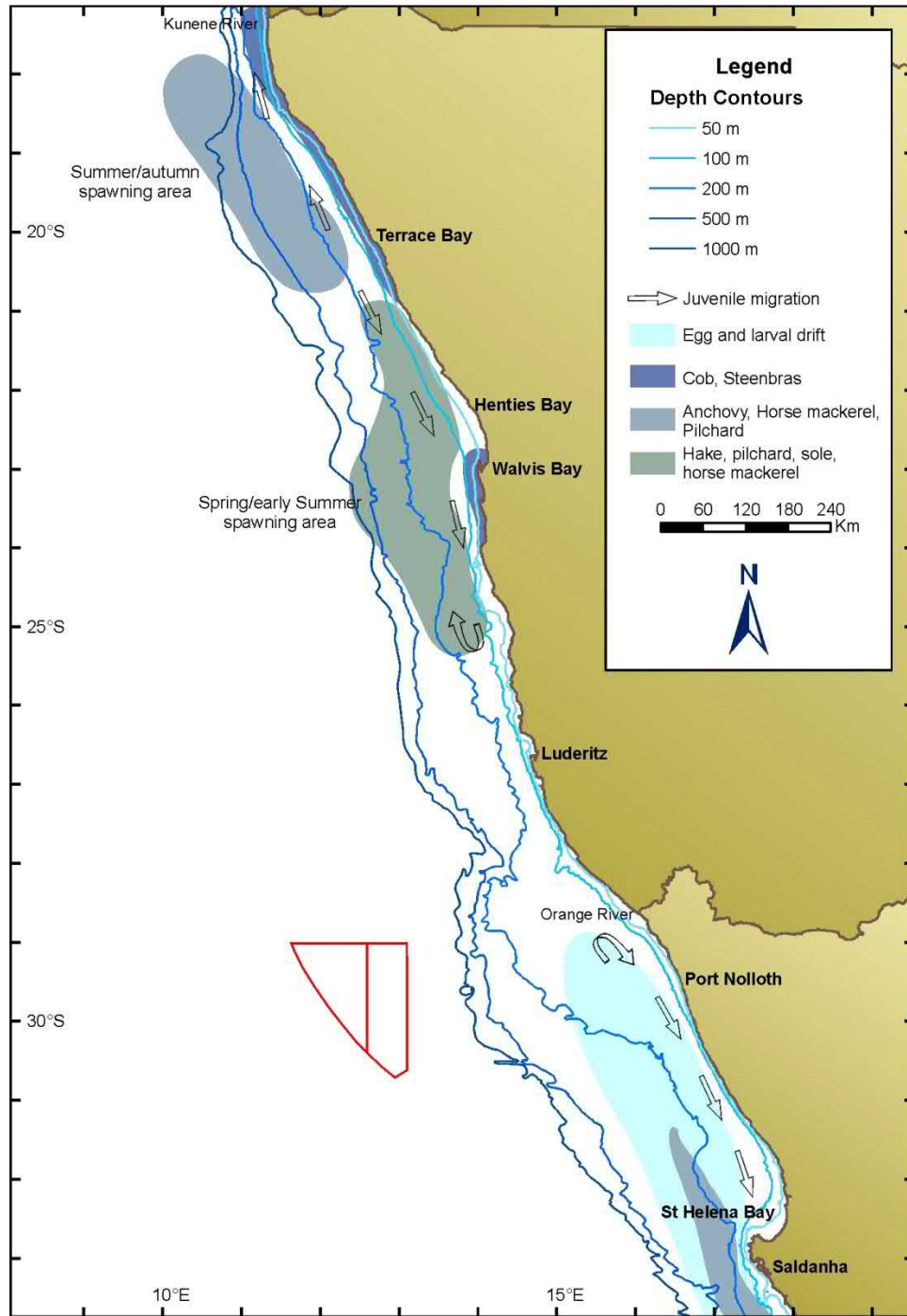


Figure 4: Blocks 2912 and 2913B (red polygons) in relation to major spawning areas in the Benguela region (adapted from Cruikshank 1990; Hampton 1992).

Ichthyoplankton constitutes the eggs and larvae of fish. As the preferred spawning grounds of numerous commercially exploited fish species are located off central and northern Namibia (Figure 4), their eggs and larvae form an important contribution to the ichthyoplankton in the region. The Lüderitz upwelling cell - Orange River Cone (LUCORC) area, south of the Lüderitz upwelling cell, is considered to be an environmental barrier to the transport of ichthyoplankton from the southern to the northern Benguela upwelling ecosystems. Areas of powerful upwelling are considered

unfavourable spawning habitats, with pelagic fish species, such as anchovy, redeye round herring, horse mackerel and shallow-water hake, reported as spawning on either side of the LUCORC area, but not within it (Figure 4). The area is characterised by diminished phytoplankton biomass due to high turbulence and deep mixing in the water column. A deficiency of phytoplankton results in poor feeding conditions for micro-, meso- and macrozooplankton and for ichthyoplankton, and successful survival and recruitment of these species in the area is considered unlikely (Lett *et al.* 2007). Due to their location far offshore and beyond the influence of upwelling, the abundance of phytoplankton, zooplankton and ichthyoplankton in Blocks 2912 and 2913B, is thus expected to be comparatively low.

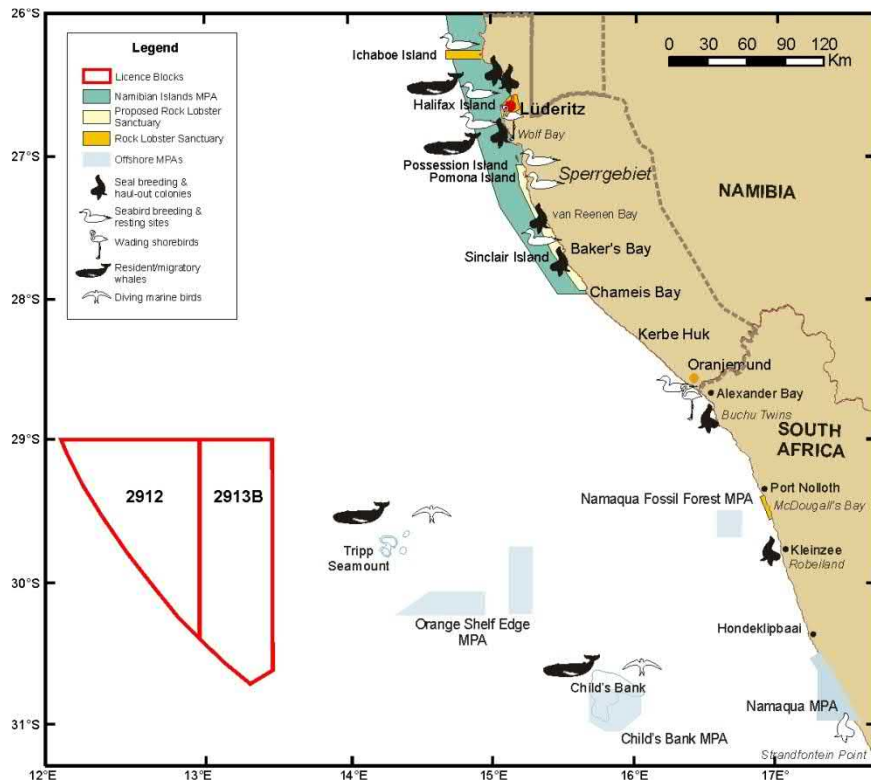


Figure 5: Blocks 2912 and 2913B (red polygons) in relation to project - environment interaction points on the Namibian coast, illustrating seabird and seal colonies, conservation areas and marine protected areas (MPAs).

The **Namibian Islands' Marine Protected Area (NIMPA)** spans an area of 9 555 km², and includes a rock-lobster sanctuary constituting 478 km² between Chameis Bay and Prince of Wales Bay. The offshore islands, whose combined surface area amounts to only 2.35 km², have been given priority conservation and the highest protection status (Currie *et al.* 2009). The area has been further zoned into four degrees of incremental protection. These are detailed in Currie *et al.* (2009).

There are a number of smaller conservation areas, namely the Lüderitz Bay and the Ichaboe Island Rock-Lobster Sanctuaries.

Those MPAs closest to Block 2913B are the Orange Shelf Edge MPA in South African waters.

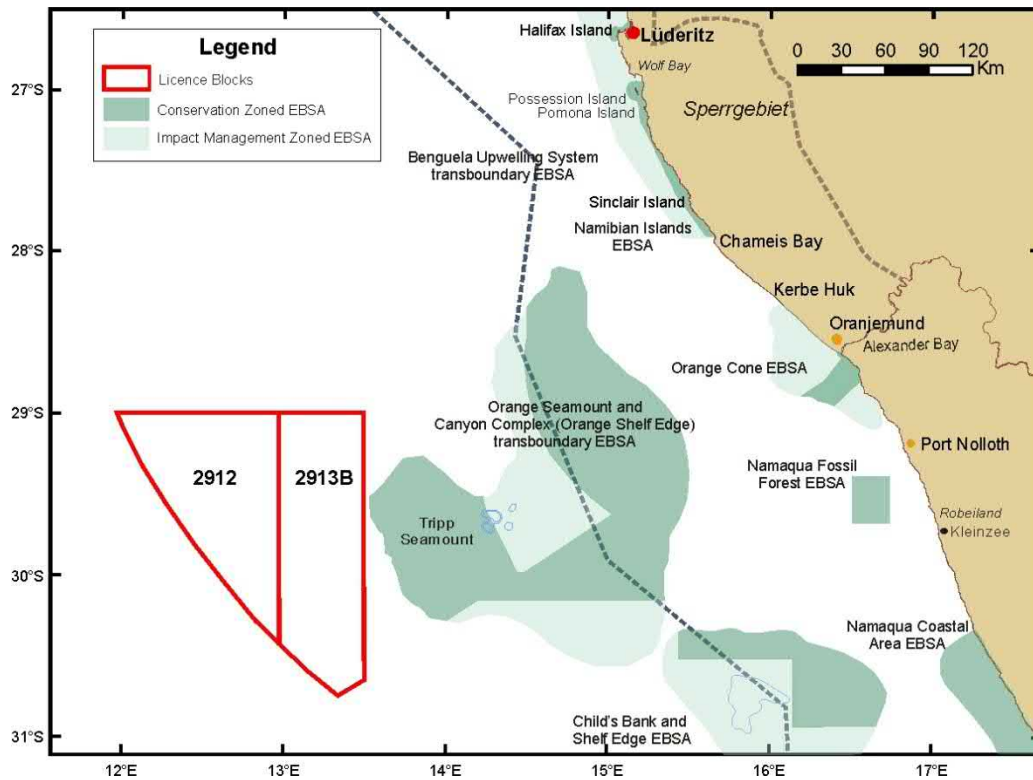


Figure 6: Blocks 2912 and 2913B (red polygons) in relation to Ecologically and Biologically Significant Areas (EBSAs) and the marine spatial planning zones within these (MARISMA Project 2019).

Of the eight identified EBSAs off Namibia, two fall solely within Namibian national jurisdiction (Namib Flyway and Namibian Islands), while one is shared with Angola (Namibe) and two are shared with South Africa (Orange Shelf Edge and Orange Cone). The Benguela Upwelling System transboundary EBSA extends along the entire southern African West Coast from Cape Point to the Kunene River and includes a portion of the high seas beyond the Angolan EEZ.

Although the proposed zonation of the EBSAs is still under discussion, the management objective in the zones marked for 'conservation' is "*strict place-based biodiversity protection aimed at securing key biodiversity features in a natural or semi-natural state, or as near to this state as possible*". The management objective in the zones marked for 'Impact Management' is "*management of impacts on key biodiversity features in a mixed-use area to keep key biodiversity features in at least a functional state*". In the list of sea-use activities provided for this EBSA, the marine spatial planning zone for petroleum activities recommends that non-destructive exploration (e.g. seismic acquisition) and localised destructive exploration (e.g. exploration drilling) is conditionally permissible within the biodiversity conservation zone (or Critical Biodiversity Area, CBA). Conditional activities are defined as activities that "*are recommended to be managed as Consent activities, which are those that can continue in the zone subject to specific regulations and controls, e.g. to avoid unacceptable impacts on biodiversity features, or to avoid intensification or expansion of impact footprints of uses that are already occurring and where there are no realistic prospects of excluding these activities*" (MARISMA Project 2019). There is a slight overlap (0.01%) of the Orange Seamount and Canyon Complex transboundary EBSA with the eastern boundary of Block 2913B.

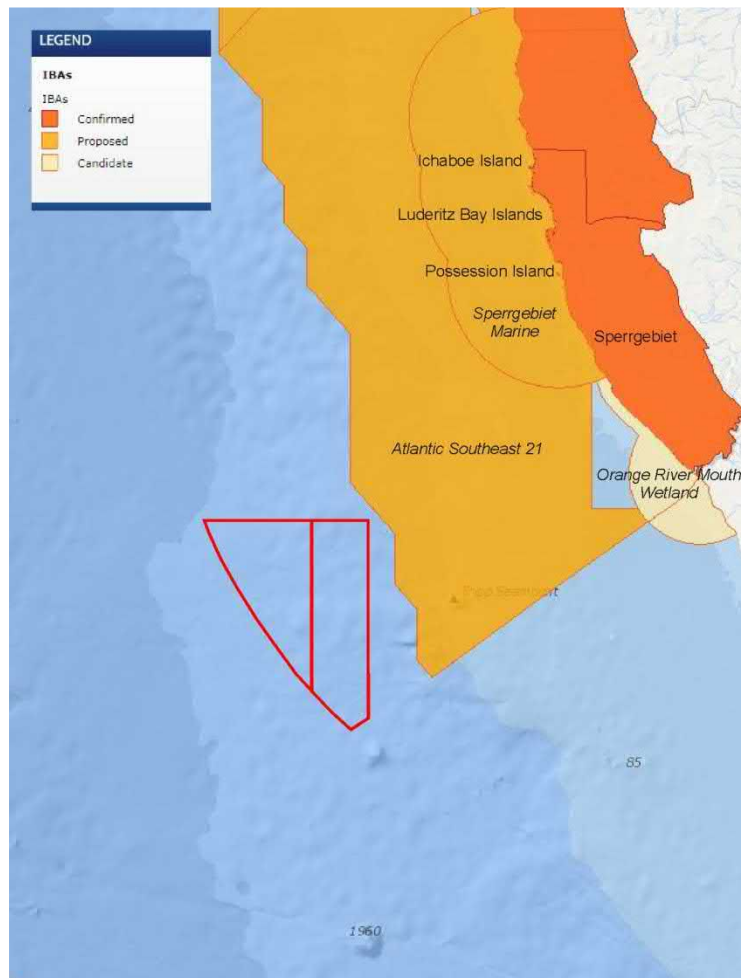


Figure 7: Blocks 2912 and 2913B in relation to coastal and marine IBAs in Namibia (Source: <https://maps.birdlife.org/marineIBAs>).

Of the 19 Important Bird Areas (IBAs) designated by BirdLife International in Namibia, those located along the southern Namibian coastline are listed in Table 2. Blocks 2912 and 2913B lie offshore of these marine IBAs.

Table 2: List of Important Bird Areas (IBAs) and their criteria listings.

Site Name	IBA Criteria
Ichaboe Island	A1, A4i, A4ii, A4iii
Lüderitz Bay islands	A1, A4i, A4iii
Possession Island	A1, A4i, A4ii, A4iii
Sperrgebiet	A1, A2, A3, A4i

Various marine IBAs have also been proposed in Namibian territorial waters, with a candidate trans-boundary marine IBA suggested off the Orange River mouth (Figure 7). The Atlantic Southeast 21 IBA specifically targets the protection of Atlantic Yellow-nosed Albatross, Black-browed Albatross and White-chinned Petrels. Blocks 2912 and 2913B lie offshore of these marine IBAs.

5 ADEQUACY OF ESMP SPECIFICATIONS TO PROVIDE FOR AVOIDANCE, MANAGEMENT AND MITIGATION OF ENVIRONMENTAL IMPACTS

The findings of the audit indicate the extent of the ability of the ESMP measures to adequately provide for the avoidance, management and mitigation of potential impacts; and report on any changes to the measures contained in the ESMP. The measures considered either 'Adequate', 'Adequate with Recommendations' or 'Inadequate', based on the adequacy rating shown in Table 1, are presented in Table 3. Green text refers to recommended additions, red strikethrough text refers to deleted text, and black text denotes the original text.



Table 3: Summary of audit with findings for the mitigation measures.

ESMP (Aecom 2019)			Adequacy Rating	Evaluation	Additional / Amended Mitigation
Activities	Mitigation Objective	Mitigation / Management Measure			
Vent or flaring off some of the oil and gas	Reducing heat and light emissions and air-borne noise. Reducing hydrocarbon 'drop-out'	<ul style="list-style-type: none"> – Use a high-efficiency burner for flaring to maximise combustion of the hydrocarbons in order to minimise emissions and hydrocarbon 'drop-out' during well testing. – Maximise flare combustion efficiency by controlling and optimising flare fuel/air/stream flow rates. 	AR	Limiting lighting to reduce potential impacts to pelagic seabird is considered GIIP	<p>Measures to be updated to include:</p> <ul style="list-style-type: none"> – Optimise well test programme to reduce flaring as much as possible during the test. – Commence with well testing during daylight hours, as far as possible, and operational monitoring. – Monitor flare (continuous) for any malfunctioning, interruption, etc. (including any drop-out).
Discharge of waste to sea	Managing reduced water quality	<p>Develop the following plans which address all wastes generated during the various activities:</p> <ul style="list-style-type: none"> – Shipboard Oil Pollution Emergency Plan (SOPEP); – Waste Management Plan; – Ballast Water Management Plan <p>These plans should discuss waste management strategies for drilling fluids, domestic wastes, sanitary wastes, radioactive wastes, produced water, drill cuttings, hydrocarbons and any other waste stream identified on site. These strategies should involve both sustainable production and consumption.</p>	A	The mitigation measures are aligned with GIIP	

ESMP (Aecom 2019)			Adequacy Rating	Evaluation	Additional / Amended Mitigation
Activities	Mitigation Objective	Mitigation / Management Measure			
Normal vessel discharges	Managing reduced water quality	<ul style="list-style-type: none"> - Waste must be segregated before storage and appropriate disposal. This should be clearly outlined in the waste management plan. - Waste storage must be available, secure and not open to the elements. - Disposal of general and hazardous waste should occur onshore in accordance with the appropriate laws and ordinances – this methodology must be outlined in the Waste Management Plan. Where waste cannot be disposed of onshore the conditions of MARPOL must be adhered to. - Incineration of waste to be restricted outside of ports and to specific items. This should be detailed in the Waste Management Plan. - Ships: Discharge of food waste less than 3 nm offshore must be comminuted to particle sizes smaller than 25mm. - Ships: Discharge of food waste which is not comminuted may only be disposed of between 3 nm and 12 nm. - Offshore platforms more than 12 nm from land and ships within 500 m of said platforms: Discharge of comminuted food waste is permitted. Discharge of food waste which is not comminuted is not permitted. - The discharge of sewage into the sea is prohibited, except when the ship has in operation an approved sewage treatment plant or when the ship is discharging comminuted and disinfected sewage using an approved system at a distance of more 	AR	The mitigation measures are aligned with GIIP and MARPOL	<p>Measures to be updated to include:</p> <ul style="list-style-type: none"> – Sewage and grey water will be treated using a marine sanitation device to produce an effluent with: <ul style="list-style-type: none"> ○ A biological oxygen demand (BOD) of <25 mg/l (if the treatment plant was installed after 1/1/2010) or <50 mg/l (if installed before this date). ○ Minimal residual chlorine concentration of 0.5 mg/l. ○ No visible floating solids or oil and grease. – Prohibit operational discharges when transiting through the NIMPA. – Implement an awareness programme that addresses reduced water usage and waste generation at the various sites, shore-based and marine. – Implement leak detection and repair programmes for valves, flanges, fittings, seals, etc.

ESMP (Aecom 2019)			Adequacy Rating	Evaluation	Additional / Amended Mitigation
Activities	Mitigation Objective	Mitigation / Management Measure			
		<p>than three nautical miles from the nearest land. Sewage which is not comminuted or disinfected may be discharged at a distance of more than 12 nm from the nearest land when the ship is en route and proceeding at not less than 4 knots.</p> <ul style="list-style-type: none"> - Sewage effluent must be discharged more than 5 m below the water surface. - Waste discharges must be controlled where fauna are observed being attracted to the area. - Oil spills must be cleaned immediately using the appropriate oil absorbents with low to no toxicity. - The discharges of deck drainage that is contaminated with hydrocarbons, fuels, oils and lubricants, and all bilge water must be treated before being discharged into the sea. - All relevant staff must be trained in spill identification and remediation. - Leak, spill detection and maintenance programmes must be undertaken on all infrastructure which has the potential to leak and create waste (liquid, gas, solid etc.) - Use a low-toxicity biodegradable detergent for the cleaning of all deck spillages. - Use drip trays to collect run-off from equipment that is not contained within a bunded area and route contents to the closed drainage system. - Dispose of residual oily waste onshore in accordance with the appropriate laws and ordinances. 			

ESMP (Aecom 2019)			Adequacy Rating	Evaluation	Additional / Amended Mitigation
Activities	Mitigation Objective	Mitigation / Management Measure			
Ballast water discharges	Reducing/avoiding risks to biodiversity through introduction of invasive marine species	<ul style="list-style-type: none"> - discharge less than 10 viable organisms per m³ greater than or equal to 50 µm in minimum dimension and less than 10 viable organisms per ml less than 50 µm in minimum dimension and greater than or equal to 10 µm in minimum dimension; and discharge of the indicator microbes shall not exceed the specified concentrations. - Ballast Water exchange must take place at least 200 nm from the nearest land and in water at least 200 m in depth where possible, taking into account the guidelines developed by the IMO. No ballast water is to be exchanged within ports or harbours. - All ships shall remove and dispose of sediments from spaces designated to carry ballast water in accordance with the provisions of the ship's ballast water management plan. - Ensure all infrastructure (e.g. wellheads, BOPs and guide bases) that has been used in other regions is thoroughly cleaned prior to deployment - Use filtration procedures during loading in order to avoid the uptake of potentially harmful aquatic organisms, pathogens and sediment that may contain such organisms. - Ensure that routine cleaning of the ballast tank to remove sediments should be carried out, where practicable, in mid-ocean or under controlled arrangements in port or dry dock, in accordance with the 	A	<p>The mitigation measures are aligned with GIIP and MARPOL.</p> <p>The mitigation measure on allowable concentrations of organisms discharged needs clarification of how this is to be achieved.</p>	<p>Measures to be updated to include:</p> <p>– Avoid the unnecessary discharge of ballast water.</p>

ESMP (Aecom 2019)			Adequacy Rating	Evaluation	Additional / Amended Mitigation
Activities	Mitigation Objective	Mitigation / Management Measure			
		provisions of the ship's Ballast Water Management Plan - Officers and crew shall be familiar with their duties in the implementation of ballast water management particular to the ship on which they serve and shall, appropriate to their duties, be familiar with the ship's ballast water Management plan. - Ballast water management plans must be approved by the relevant authorities.			
Discharge of cuttings, drilling fluid and cement	Managing the smothering of seabed habitats and associated benthic communities, physiological and biochemical effects on marine fauna and reduced water quality due to drilling solids discharge	<ul style="list-style-type: none"> - Review Remotely Operated Vehicle (ROV) footage of pre-drilling surveys to identify potential vulnerable habitats within 150 m of the well location. - Ensure drill site is located >500 m from any identified vulnerable habitats. - Minimize use of drilling fluids and additives, especially biocides. - Use high efficiency solids control equipment to reduce the need for fluid change out and minimise the amount of residual fluid on drilled cuttings. - Ensure regular maintenance of the on-board solids control package. - Ensure all recovered synthetic based drilling mud is taken to shore for treatment and reuse. - Ensure that all responsible staff receive adequate training. - Report emergency situations to the relevant authorities and initiate the relevant emergency procedures. - Prioritize low-toxicity and partially biodegradable additives in drilling fluid and cement. 	AR	<p>Measures to avoid disturbance of vulnerable habitats are not aligned with published guidance.</p> <p>A set-back distance of 610 m (2 000 ft) for sea surface discharge of drilling wastes from sensitive deep-water communities is mandated in US territorial waters (see Cordes et al. 2016).</p> <p>If the drill site is to be located >500 m from identified VMEs, then the pre-drilling ROV survey would need to cover a greater distance than 150 m from the well location</p>	<ul style="list-style-type: none"> - Measures to be updated to exclude/include: - Review Remotely Operated Vehicle (ROV) footage of pre-drilling surveys to identify potential vulnerable habitats within 150 m of the well location. - Ensure drill site is located >500 m from any identified vulnerable habitats. - Meticulous design of pre-drilling site surveys to provide sufficient information on seabed habitats, and to map potentially vulnerable habitats thereby preventing potential conflict with the well site. - Pre-drilling site surveys should ensure that drilling locations are not located within a 1 km radius of any vulnerable habitats (e.g. hard grounds), species (e.g. cold corals, sponges) or structural features (e.g. rocky outcrops). Expert review of ROV footage of pre-drilling surveys

ESMP (Aecom 2019)			Adequacy Rating	Evaluation	Additional / Amended Mitigation
Activities	Mitigation Objective	Mitigation / Management Measure			
					<p>to identify potential vulnerable habitats within 1 000 m of the drill site.</p> <ul style="list-style-type: none"> – Ensure drill site is located more than 1 000 m from any identified vulnerable habitats. – Minimize use of drilling fluids NADFs and additives, especially biocides. – In instances where NADFs are used, treat cuttings to reduce oil content to <6.9% Oil On Cutting (OOC) before being discharged overboard. – Discharge cuttings at least 10 m below sea level. – Monitoring requirements: <ul style="list-style-type: none"> ○ Monitor (using ROV) cement returns and if significant discharges are observed on the seafloor terminate cement pumping. ○ Monitor (using ROV) hole wash out to reduce discharge of fluids as far as possible.
Disturbance to the Seabed and associated sediments	Avoiding/minimising disturbance of seabed sediments and Associated Biota by ROV Surveys, drilling and cuttings discharges	<ul style="list-style-type: none"> - Review ROV footage of pre-drilling surveys to identify potential vulnerable habitats within 150 m of the well location. - Ensure drill site is located more than 500 m from any identified vulnerable habitats. - Minimize use of drilling fluids and additives, especially biocides - Use high efficiency solids control equipment to reduce the need for fluid 	AR	<p>Measures to avoid disturbance of vulnerable habitats are not aligned with published guidance.</p> <p>A set-back distance of 610 m (2 000 ft) for sea surface discharge of drilling wastes from sensitive deep-water communities is mandated in US territorial waters (see Cordes et al. 2016).</p>	<p>Measures to be updated to include:</p> <ul style="list-style-type: none"> – Do not land ROVs on the seabed as part of normal operations. – Design of pre-drilling site surveys to ensure there is sufficient information on seabed habitats, including the mapping potentially vulnerable habitats thereby

ESMP (Aecom 2019)			Adequacy Rating	Evaluation	Additional / Amended Mitigation
Activities	Mitigation Objective	Mitigation / Management Measure			
		change out and minimise the amount of residual fluid on drilled cuttings. - Ensure regular maintenance of the on-board solids control package. - Ensure all recovered synthetic based drilling mud is taken to shore for treatment and reuse. - Ensure that all responsible staff receive adequate training - Report emergency situations to the relevant authorities and initiate the relevant emergency procedures.		If the drill site is to be located >500 m from identified VMEs, then the pre-drilling ROV survey would need to cover a greater distance than 150 m from the well location	preventing potential conflict with the well site. See also recommended changes above.
Generation of marine noise	Avoiding/minimising disturbance, behavioural changes and avoidance of feeding and/or breeding areas in seabirds, seals, turtles and cetaceans due to drilling and vessel noise	- The plant and all equipment must be properly maintained to avoid creation of unnecessary additional noise. - Noisy operations should, wherever possible run concurrently in order to minimise the duration of high noise levels. - Noise levels shall be monitored to comply with the relevant health and safety requirements. - All works that deviate from normal operating conditions shall be reported and actions initiated to mitigate against to prevent recurrence of the incident.	AR	Measures to avoid acoustic disturbance are not aligned with published guidance.	Measures to be updated to exclude /include: — The plant and all equipment must be properly maintained to avoid creation of unnecessary additional noise. — Implement a maintenance plan to ensure all diesel motors and generators receive adequate maintenance to minimise noise emissions — Noisy operations should, wherever possible run concurrently in order to minimise the duration of high noise levels. — Ensure vessel transit speed between the survey / drill area and port is a maximum of 12 knots (22 km/hr), except within 25 km of the coast where it is reduced further to 10 knots (18 km/hr)

ESMP (Aecom 2019)			Adequacy Rating	Evaluation	Additional / Amended Mitigation
Activities	Mitigation Objective	Mitigation / Management Measure			
VSP Operations	Avoiding/minimising disturbance, behavioural changes and avoidance of feeding and/or breeding areas in seabirds, seals, turtles and cetaceans due to VSP	<p>- Undertake a 30-minute pre-start scan (prior to soft-starts) within the 3 km radius observation zone in order to confirm there is no cetacean activity within 500 m of the source.</p> <p>- Ensure that observations “soft start” are planned:</p> <ul style="list-style-type: none"> • Implement a “soft-start” procedure of a minimum of 20 minutes’ duration when initiating the VSP acoustic source. This requires that the sound source be ramped from low to full power rather than initiated at full power, thus allowing a flight response by marine fauna to outside the zone of injury or avoidance. • Commence “soft-start” procedure only once it has been confirmed by a suitably trained crew member during the 30-minute pre start-up visual scan that there is no cetacean activity within 500 m of the source. <p>- Maintain visual observations within the 500 m shut-down zone continuously during VSP operation to identify if there aren’t any cetaceans present.</p> <p>- Shut down the acoustic source if a cetacean is sighted within 500 m shut-</p>	I	<p>The pre-shoot watch is aligned with the recommendations of the following published guidance:</p> <ul style="list-style-type: none"> – JNCC Guidelines, 2010. – JNCC Guidelines, 2017 <p>However, the time periods proposed are not aligned to the above-mentioned published guidance, which states that prewatch period should be 60 minutes in water greater than 200m. While it is acknowledge that the reduction in pre-watch time (30 minutes rather than 60 minutes) takes into account the use of PAM, given that deep diving species (e.g. sperm whale) have the potential to be present in the area all year round a 60 minute duration is strongly recommended. This allows for detection of deep diving species which are known to dive for longer than 30 minutes.</p> <p>A 3 km radius observation zone is usually also not achievable in the typical sea conditions along the southern African West Coast.</p>	<p>Measures to be updated/replaced by:</p> <ul style="list-style-type: none"> – Appoint a minimum of two dedicated Marine Mammal Observer (MMO), with a recognised MMO training course, on board for marine fauna observation (360 degrees around drilling unit), distance estimation and reporting. One MMO should also have Passive Acoustic Monitoring (PAM) training should a risk assessment, undertaken ahead of the VSP operation, indicate that the PAM equipment can be safely deployed considering the metocean conditions (specifically current). – Ensure drilling unit vessel is fitted with PAM technology (one or more hydrophones), which detects animals through their vocalisations, should it be possible to safely deploy PAM equipment. – VSP profiling should, as far as possible, only commence during daylight hours with good visibility. However, if this is not possible due to prolonged periods of poor visibility (e.g. thick fog) or

ESMP (Aecom 2019)			Adequacy Rating	Evaluation	Additional / Amended Mitigation
Activities	Mitigation Objective	Mitigation / Management Measure			
		<p>down zone until such time as the animal has moved to a point more than 500 m from the source.</p> <p>- Ensure that during periods of low visibility (where the observation zone cannot be clearly viewed out to 3 km), including night-time, the VSP source is only used if during the preceding 24-hour period:</p> <ul style="list-style-type: none"> • there have not been three or more cetacean-instigated shut down situations, and • a two-hour period of continual observation was undertaken in good visibility (to the extent of the observation zone) and no cetaceans were sighted. <p>- Where possible, sensitive receptors should be forewarned before noisy VSP operations commence.</p>			<p>unforeseen technical issue which results in a night-time start, refer to "periods of low visibility" below.</p> <ul style="list-style-type: none"> – Undertake a 1-hr (as water depths >200 m) pre-shoot visual and possible acoustic scan (prior to soft-starts / airgun tests) within the 500 m radius mitigation zone in order to confirm there is no cetaceans, turtles, penguins and shoaling large pelagic fish activity close to the source. – Implement a "soft-start" procedure of a minimum of 20 minutes' duration when initiating the acoustic source (except if testing a single airgun on lowest power). This requires that the sound source be ramped from low to full power rather than initiated at full power, thus allowing a flight response by marine fauna to outside the zone of injury or avoidance. – Delay "soft-starts" if cetaceans, turtles and shoaling large pelagic fish are observed / detected within the mitigation zone during the pre-shoot visual / acoustic scan. A "soft-start" should not begin until 20 minutes after cetaceans depart the mitigation zone or 20 minutes after they are last seen or acoustically detected by PAM in the mitigation zone. In the case of penguins, shoaling large pelagic fish and turtles, delay the "soft-

ESMP (Aecom 2019)			Adequacy Rating	Evaluation	Additional / Amended Mitigation
Activities	Mitigation Objective	Mitigation / Management Measure			
					<p>start” until animals are outside the 500 m mitigation zone.</p> <ul style="list-style-type: none"> – Maintain visual and possibly acoustic observations within the 500 m mitigation zone continuously during VSP operation to identify if there are any cetaceans or other sensitive faunal groups present. – Shut down the acoustic source if cetaceans, penguins, shoaling large pelagic fish or turtles are sighted within 500 m shut-down zone until such time as the animal has moved to a point more than 500 m from the source. as the mitigation zone is clear of cetaceans for 20 minutes or in the case of penguins, shoaling large pelagic fish or turtles, the animals are outside the 500 m mitigation zone before the soft-start procedure and production may commence. – Breaks in airgun firing of less than 20 minutes: <ul style="list-style-type: none"> • there is no requirement for a soft-start and firing can recommence at the same power level as at prior to the break (or lower), provided that continuous monitoring was ongoing during the silent period and no cetaceans, penguins, shoaling large pelagic fish or turtles were detected in the

ESMP (Aecom 2019)			Adequacy Rating	Evaluation	Additional / Amended Mitigation
Activities	Mitigation Objective	Mitigation / Management Measure			
					<p>mitigation zone during the breakdown period.</p> <ul style="list-style-type: none"> • If a cetacean is detected in the mitigation zone during the breakdown period, there must be a minimum of a 20-minute delay from the time of the last detection within the mitigation zone and a soft-start must then be undertaken. In the case of penguins, shoaling large pelagic fish or turtles, the animals are outside the 500 m mitigation zone within the 20 minute period. <ul style="list-style-type: none"> – Breaks in airgun firing of longer than 20 minutes: <ul style="list-style-type: none"> • If it takes longer than 20 minutes to restart the airguns, a full pre-watch and soft-start process should be carried out before the survey re-commences. If an MMO/PAM operator has been monitoring during the breakdown period, this time can contribute to the 60-minute pre-watch time. – Ensure that during periods of low visibility (where the mitigation zone cannot be clearly viewed out to 500 m), including night-time, the VSP source is only used if PAM technology is in place to detect vocalisations (subject to a risk assessment indicating that the PAM equipment can be safely

ESMP (Aecom 2019)			Adequacy Rating	Evaluation	Additional / Amended Mitigation
Activities	Mitigation Objective	Mitigation / Management Measure			
					<p>deployed considering the metocean conditions) or:</p> <ul style="list-style-type: none"> • there have not been three or more occasions where cetaceans, penguins, shoaling large pelagic fish or turtles have been sighted within the 500 m mitigation zone during the preceding 24-hour period; • a two-hour period of continual observation of the mitigation zone was undertaken (during a period of good visibility) prior to the period of low visibility and no cetaceans, penguins, shoaling large pelagic fish or turtles were sighted within the 500 m mitigation zone; and • MMOs to use a thermal camera during hours of darkness for cetacean observations.
Generation of airborne noise	Avoiding/minimising disturbance, behavioural changes and avoidance of feeding and/or breeding areas in seabirds, seals, turtles and cetaceans due to helicopter noise	<i>No specifications include in ESMP</i>	I	Measures to avoid airborne noise have not been covered.	<p>Measures to be included:</p> <ul style="list-style-type: none"> – Ensure that all flight paths avoid the Lüderitz Lagoon and offshore islands (including Halifax and Possession) by at least 1 852 m (i.e. 1 nm) and seal colonies (including Atlas Bay, Wolf Bay and Long Islands). – Avoid extensive low-altitude coastal flights. – Maintain a flight altitude >1 000 m at all times within the NIMPA and a cruising altitude of greater than

ESMP (Aecom 2019)			Adequacy Rating	Evaluation	Additional / Amended Mitigation
Activities	Mitigation Objective	Mitigation / Management Measure			
					<p>300 m, except when taking off and landing or in a medical emergency.</p> <ul style="list-style-type: none"> – Comply fully with aviation and authority guidelines and rules. – Brief all pilots on the ecological risks associated with flying at a low level along the coast or above marine mammals.
Collision of vessels with marine fauna	Impacts due to ship strikes	<i>No specifications include in ESMP</i>	I	Measures covering faunal strikes have not been covered.	<p>Measures to be included:</p> <ul style="list-style-type: none"> – All vessel operators should keep a constant watch for marine mammals and turtles in the path of the vessel. – Ensure vessel transit speed between the survey / drill area and port is a maximum of 12 knots (22 km/hr), except within 25 km of the coast where it is reduced further to 10 knots (18 km/hr).
Loss of Fuel and/or hydraulic oils to sea	Managing reduced water quality and toxicity effects on marine fauna from operational spills	<ul style="list-style-type: none"> - Develop and implement a refuelling procedure for bunkering. - Oil spill response training must be implemented. - Ensure all staff receive training on handling and storage of liquid hazardous materials 	AR	<p>Measures have been collectively grouped under 'spills', which included operational hydrocarbon and chemical spills as well as an uncontrolled release during blow-out.</p> <p>Measures specific to each of these aspects have not been adequately covered.</p>	<p>Measures to be included:</p> <ul style="list-style-type: none"> – Ensure personnel are adequately trained in both accident prevention and immediate response, and resources are available on each vessel. – Use low toxicity dispersants cautiously and only with the permission of MFMR. – As far as possible, and whenever the sea state permits, attempt to control and contain the spill at sea with suitable recovery techniques to

ESMP (Aecom 2019)			Adequacy Rating	Evaluation	Additional / Amended Mitigation
Activities	Mitigation Objective	Mitigation / Management Measure			
					<p>reduce the spatial and temporal impact of the spill.</p> <ul style="list-style-type: none"> – Ensure adequate resources are provided to collect and transport oiled birds to a cleaning station. – Ensure offshore bunkering is not undertaken in the following circumstances: <ul style="list-style-type: none"> • Wind force and sea state conditions of ≥ 6 on the Beaufort Wind Scale; • During any workboat or mobilisation boat operations; • During helicopter operations; • During the transfer of in-sea equipment; and • At night or times of low visibility.
Well blow-out	Impacts on marine biodiversity through Oil spills	<p>Engineer wells according to best practices (BOP, etc.)</p> <ul style="list-style-type: none"> - Develop and implement an Oil Spill Contingency Plan (OSCP) that summarises reactionary measures in the unlikely event of a subsea release. - Develop and implement a Shipboard Oil Pollution Emergency Plan (SOPEP) that summarises the reactionary measures in the event of on-board oil spills. - Ensure all staff receive training on handling and storage of liquid hazardous materials - Where options exist for variation in hazardous chemical products, the product with the lowest toxicity must always be selected. 	I	<p>Measures have been collectively grouped under 'spills', which included operational hydrocarbon and chemical spills as well as an uncontrolled release during blow-out.</p> <p>Measures specific to a blow-out event have not been adequately covered and mitigation measures provided are not aligned with GIIP.</p>	<p>Measures to be excluded/included:</p> <ul style="list-style-type: none"> – Develop and implement an Oil Spill Contingency Plan (OSCP) that summarises reactionary measures in the unlikely event of a subsea release. – Develop a well-specific response strategy and plans (OSCP and BOCP), aligned with the National OSCP, for each well location that identifies the resources and response required to minimise the risk and impact of oiling (shoreline and offshore). This response strategy and associated plans must take cognisance to the local

ESMP (Aecom 2019)			Adequacy Rating	Evaluation	Additional / Amended Mitigation
Activities	Mitigation Objective	Mitigation / Management Measure			
		<ul style="list-style-type: none"> - Ensure all liquid hazardous substances are stored within secondary containment. - Ensure all liquid hazardous substances are appropriately labelled and that the relevant Material Safety Data Sheet (MSDS's) for their safe use are kept on record. - All hazardous materials containment areas must be regularly inspected. - Suitable firefighting equipment must be stored in close proximity and all staff must be made aware of the dangers of burning chemicals/smoke inhalation. - Ensure drainage water passes through oil screening processes in order to remove oils prior to discharge. - All staff are to be provided with appropriate Personal Protective Equipment (PPE). - Engage with appropriate governmental agencies. 			<p style="color: green;">oceanographic and meteorological seasonal conditions, local environmental receptors and local spill response resources. The development of the site-specific response strategy and plans must include the following:</p> <ul style="list-style-type: none"> ○ Assessment of onshore and offshore response resources (equipment and people) and capabilities at time of drilling, location of such resources (in-country or international), and associated mobilisation / response timeframes. ○ Selection of response strategies that reduce the mobilisation / response timeframes as far as is practicable. Use the best combination of local and international resources to facilitate the fastest response. <p style="color: green;">– Schedule joint oil spill exercises including TEEPNA and local departments / organisations to test the Tier 1, 2 & 3 responses.</p> <p style="color: green;">– Use low toxicity dispersants that rapidly dilute to concentrations below most acute toxicity thresholds. Dispersants should be used cautiously and only with the permission of MFMR.</p>

ESMP (Aecom 2019)			Adequacy Rating	Evaluation	Additional / Amended Mitigation
Activities	Mitigation Objective	Mitigation / Management Measure			
					<ul style="list-style-type: none"> – As far as possible, and whenever the sea state permits, attempt to control and contain the spill at sea with suitable recovery techniques to reduce the spatial and temporal impact of the spill. – In the event of a large spill, use drifter buoys and satellite-borne Synthetic Aperture Radar (SAR)-based oil pollution monitoring to track the behaviour and size of the spill and optimise available response resource. – Ensure adequate resources are provided to Oil Spill Contingency Plan (including collect and transport oiled birds to a cleaning station). – Ensure contract arrangements and service agreements are in place to implement the OSCP: <ul style="list-style-type: none"> • Capping stack in Saldanha Bay and other international locations. • Subsea Dispersion Injection (SSDI) kit. • surface response equipment (e.g. booms, dispersant spraying system, skimmers, etc.), dispersants, response vessels, etc. – Ensure that the following aspects are included in insurance cover to financially manage the consequences of any unplanned event pollution on environmental and social aspects:

ESMP (Aecom 2019)			Adequacy Rating	Evaluation	Additional / Amended Mitigation
Activities	Mitigation Objective	Mitigation / Management Measure			
					<ul style="list-style-type: none"> ○ Damages and compensation to Third-Parties. ○ Evidence to be provided to MME.
Lighting	Reducing light emissions	<ul style="list-style-type: none"> - Use lighting only where absolutely necessary. - The number and strength of lighting are to be appropriate for the activities taking place. - Light sources should be placed appropriately for the task taking place. - Ringed birds should be reported to the details found on the ring. 	AR	Limiting lighting to reduce potential impacts to pelagic seabird is considered GIIP	<p>Measures to be updated to exclude/include :</p> <ul style="list-style-type: none"> – Use lighting only where absolutely necessary. – The number and strength of lighting are to be appropriate for the activities taking place. – The lighting on the support vessels, and drill rig, should be reduced to a minimum compatible with safe operations whenever and wherever possible to reduce the incidence of stranded pelagic seabirds on the vessel(s) at night. – Light sources should be placed appropriately for the task taking place. – Light sources should, if possible and consistent with safe working practices, be positioned in places where emissions to the surrounding environment can be minimised. – Keep disorientated, but otherwise unharmed, seabirds in dark containers (e.g. cardboard boxes) for subsequent release during daylight hours.

ESMP (Aecom 2019)			Adequacy Rating	Evaluation	Additional / Amended Mitigation
Activities	Mitigation Objective	Mitigation / Management Measure			
Abandonment of Infrastructure, lost equipment and residual cement	Impacts on marine biodiversity through creation of artificial hard substrates	<ul style="list-style-type: none"> - Seal the well by inserting cement plugs in the well bore. - Well integrity must be tested - Remove all BOP infrastructure - Notify the relevant authorities of the project closure - Scan sea floor for dropped equipment and retrieve items where practicable and safe to do so. - Notify the relevant authorities where items could not be retrieved. 	AR	Measures are not aligned with published guidance and require revision to align with GIIP	<p>Measures to be updated to exclude/include :</p> <ul style="list-style-type: none"> – Ensure abandoned wellheads are surveyed and accurately charted with the SAN Hydrographer. – Distribute “Notice to Mariners” and “Notice to Fishers” of the location of abandoned wellheads. <p>For Lost Equipment:</p> <ul style="list-style-type: none"> – In the event that equipment is lost during the operational stage, assess safety and metocean conditions before performing any retrieval operations. – Ensure containers are sealed / covered during transport and loads are lifted using the correct lifting procedure and within the maximum lifting capacity of crane system. – Minimise the lifting path between vessels. – Maintain an inventory of all equipment and undertake frequent checks to ensure these items are stored and secured safely on board each vessel. – Establishing a hazards database listing the type of gear left on the seabed and/or in the licence area with the dates of abandonment/loss and locations, and where applicable, the dates of retrieval.

ESMP (Aecom 2019)			Adequacy Rating	Evaluation	Additional / Amended Mitigation
Activities	Mitigation Objective	Mitigation / Management Measure			
					<ul style="list-style-type: none"> – Scan sea floor for dropped equipment and retrieve items where practicable and safe to do so. – Undertake a post drilling ROV survey to scan seafloor for any dropped equipment and other removable features (e.g. some excess cement) around the well site. In the event that equipment is lost during the operational stage, assess safety and metocean conditions before performing any retrieval operations. – Notify the relevant authorities where items could not be retrieved. – Notify SAN Hydrographer of any hazards left on the seabed or floating in the water column, and request that they send out a Notice to Mariners with this information.

6 EVALUATION OF THE EFFECTIVENESS OF THE ESIA AND ESMP

The ESMP is lacking in a number of aspects outlined above.

While this ESMP review has identified some measures which are not considered to fully align with GIIP, the overall effectiveness of the ESMP is not affected. Mitigation measures will, however, need to be revised as recommended. In some cases (e.g. VSP operations) more detailed mitigation plans aligned with GIIP were drawn up prior to operations, or omissions in the ESMP were covered by project controls that ensure that operations are undertaken in a manner consistent with good international industry practice and Best Available Techniques (BAT).

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APPENDIX 3:
COMMERCIAL FISHING SPECIALIST REPORT

ECC RENEWAL FOR OFFSHORE EXPLORATION DRILLING IN BLOCK 2913B, ORANGE BASIN, NAMIBIA

REVIEW AND AMENDMENT OF ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP): COMMERCIAL FISHERIES SPECIALIST REPORT

MAY 2022

Prepared for the Environmental Assessment Practitioner:

SLR Environmental Consulting (Namibia) (Pty) Ltd:



On behalf of the applicant:

TotalEnergies EP Namibia B.V.



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20 May 2022

EXPERTISE AND DECLARATION OF INDEPENDENCE

This report was prepared by Sarah Wilkinson and David Japp of CapMarine (Pty) Ltd. David Japp has a BSc in Zoology, University of Cape Town (UCT) and an MSc degree in Fisheries Science from Rhodes University. Sarah Wilkinson has a BSc (Hons) degree in Botany from UCT. Both are professional natural scientists registered with the SA Council for Natural Scientific Professions (SACNASP).

Mr Japp has worked in the field of Fisheries Science and resource assessment since 1987 and has considerable experience in undertaking specialist environmental impact assessments relating to fishing and fish stocks. His work has included environmental economic assessments and the evaluation of the environmental impacts on fishing. Sarah Wilkinson has worked on marine resource assessments, specializing in spatial and temporal analysis (GIS) as well as the economic impacts of fisheries exploitation in the southern African region.

This specialist report was compiled for SLR Environmental Consulting (Namibia) (Pty) Ltd (SLR) for the Environmental Clearance Certificate (ECC) renewal process for Block 2913B, situated offshore Namibia. We hereby declare that we are financially and otherwise independent of TEEPNA and of SLR.

Dave Japp

Sarah Wilkinson

ACRONYMS, ABBREVIATIONS AND UNITS

AECOM	Architecture, Engineering, Construction, Operations, and Management
CapMarine	Capricorn Marine Environmental (Pty) Ltd
dB	Decibel
ECC	Environmental Clearance Certificate
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
EZ	Exclusion Zone
FAO	Food and Agricultural Organization
GDP	Gross Domestic Product
ICCAT	International Convention for the Conservation of Atlantic Tunas
ICSEAF	International Commission for South East Atlantic Fisheries
km	Kilometre
m	Metres
mm	Millimetre
nm	Nautical Miles
MFMR	Ministry of Fisheries and Marine Resources
MEFT	Ministry of Environment, Forestry and Tourism
Navtext	Navigational Telex
QMA's	Quota Management Areas
SANHO	South African Navy Hydrographic Office
SLR	SLR Environmental Consulting (Namibia) (Pty) Ltd
t	Tonnes
TAC	Total Allowable Catch
TEEPNA	TotalEnergies EP Namibia B.V.
TTS	Temporary hearing Threshold Shift
VMS	Vessel Monitoring System
VSP	Vertical Seismic Profiling

1 INTRODUCTION

1.1 BACKGROUND

TotalEnergies EP Namibia B.V. (herein referred to as TEEPNA) is the current operator for Licence Block 2913B, which is situated in the Orange Basin approximately 300 km off the coast of southern Namibia.

As part of the process of applying for the initial Exploration Licence for the block, an Environmental and Social Impact Assessment (ESIA) process was undertaken for offshore exploration drilling activities. In September 2019, the Ministry of Environment, Forestry and Tourism (MEFT) issued an Environmental Clearance Certificate (ECC) for the proposed offshore exploration drilling activities (MEFT Ref No. ECC-00134). As part of this ECC, TEEPNA drilled the Venus 1X Well between 30 November 2021 and 05 March 2022.

As part of the ECC renewal process, SLR Environmental Consulting (Namibia) (Pty) Ltd (SLR) appointed Capricorn Marine Environmental (Pty) Ltd to review the existing Environmental and Social Impact Assessment (ESIA) report and Environmental and Social Management Plan (ESMP) (AECOM 2019) and to provide commercial fisheries specialist input into the ECC amendment process.

1.2 TERMS OF REFERENCE

The terms of reference for the audit of the ESIA report and the ESMP are as follows:

- Provide confirmation as to whether the baseline environment has changed since the compilation of the original ESIA Report and ESMP and Environmental Baseline Survey Report, compiled in May 2019;
- Based on updated baseline information and any key omissions identified in the ESMP, audit the effectiveness of the ESMP specifications.; and
- Recommend new or revised specifications, as applicable, for inclusion in an amended ESMP.

1.3 PROJECT DESCRIPTION

The project description is assumed to be as originally proposed - Refer to the original ESIA Report for a full project description (AECOM 2019).

2 APPROACH AND METHODOLOGY

2.1 DATA SOURCES

Namibian commercial fisheries catch and effort data were sourced from the Namibian Ministry of Fisheries and Marine Resources (MFMR) (see Table 2.1). Data on fishing rights holdings and industrial bodies was sourced from the 2019 edition of the Fishing Industry Handbook¹. Information on species

¹ Fishing Industry Handbook South Africa, Namibia and Moçambique (2019) 47th edition George Warman Publications, Cape Town, South Africa

distribution was taken from the Benguela Current Large Marine Ecosystem (BCLME) Annual State of the Stocks Report 2011².

Table 1.1: Date range for baseline fisheries datasets.

Sector	Date Range		Comment
	Catch	Effort	
Small pelagic purse-seine	2005 – 2017	2005 – 2017	Fishery has been closed since 2018
Midwater trawl	2005 – 2018	2005 – 2018	
Demersal trawl	2005 – 2018	2005 – 2018	
Demersal longline	2005 – 2018	2005 – 2018	
Large pelagic long-line	2004 – 2019	2004 – 2019	
Tuna pole	2004 – 2019	2004 – 2019	
Line-fish	2000 – 2019	2000 – 2019	
Deep-sea crab	2013 – 2018	2013 – 2018	
Deep-water trawl	1994 – 2007	N/A	Fishery has been closed since 2007
Rock lobster	2005 – 2016	2005 – 2016	
Fisheries research	N/A	2007 – 2012	Trawl stations are fixed and unlikely to change

2.2 ASSUMPTIONS, LIMITATIONS AND INFORMATION GAPS

The study is based on a number of assumptions and is subject to certain limitations, which should be kept in mind when considering the information presented in this report. The outcome of the ESMP review is, however, not expected to be affected by these assumptions and limitations:

- The official governmental record of Namibian commercial fisheries data was used to show fishing catch and effort relative to the licence area. These data are derived from logbooks that are completed by skippers whilst at sea and then transcribed into electronic format by the Ministry of Fisheries and Marine Resources (MFMR). It is assumed that there would be a proportion of erroneous data due to inaccurate reporting and recording, but that this is likely to be minimal in comparison to the total volume of the dataset. Where obvious errors in the reporting of fishing positions were identified, these were excluded from the analysis.
- The catch and effort data for the area of interest were provided, on request, by MFMR for use in this assessment. The dataset for each fishery covers at least a ten-year period and includes the most recent available data. The time span for each sector is listed in Table 1.1.

² Benguela Current Large Marine Ecosystem State of Stocks Review 2011 (2nd Edition; Ed C. Kirchner). Benguela Current Commission.

3 DESCRIPTION OF RECEIVING ENVIRONMENT: FISHERIES BASELINE

3.1 OVERVIEW OF THE STATUS OF NAMIBIAN FISHERIES SINCE 1990

The Namibian fishing industry is the country's second largest export earner of foreign currency and the third largest economic sector in terms of contribution to the Gross Domestic Product (GDP). In terms of the value of production, Namibia ranks among the top ten fishing countries globally (Food and Agricultural Organization (FAO): <http://www.fao.com.na>). Supported by the high productivity of the Benguela upwelling ecosystem, abundant fish stocks have historically typified Namibian waters³. Fish resources in upwelling systems are typically high in biomass and relatively low in diversity (relative to non-upwelling environments). Commercial fish stocks, as found in the Benguela system, typically support intensive commercial fisheries. Although varying in importance at different times in history, Namibian fisheries have focused on demersal species, small pelagic species, large migratory pelagic fish, line-fish (caught both commercially and recreationally) and crustacean resources (e.g. lobster and crabs). Mariculture production is a developing industry based predominantly in Walvis Bay, Lüderitz Bay and surrounds. The main commercial fisheries, targeted species, and gear types are shown in Table 3.1 and recent TACs are presented in Table 3.2 below. The allocation of TACs and management of each fishing sector is the responsibility of MFMR.

Table 3.1: List of fisheries that operate within Namibian waters, targeted species and gear types.

Sector	Gear Type	Target Species
Small pelagic	Purse-seine	Sardine (<i>Sardinops sagax</i>), Horse mackerel (<i>Trachurus capensis</i>)
Mid-water trawl	Mid-water trawl	Horse mackerel (<i>Trachurus capensis</i>)
Demersal trawl	Demersal trawl	Cape hakes (<i>Merluccius paradoxus</i> , <i>M. capensis</i>), Monkfish (<i>Lophius vomerinus</i>)
Demersal long-line	Demersal long-line	Cape hakes (<i>Merluccius paradoxus</i> , <i>M. capensis</i>)
Large pelagic long-line	Pelagic long-line	Albacore tuna (<i>Thunnus alalunga</i>), Yellowfin tuna (<i>T. albacares</i>), Bigeye tuna (<i>T. obesus</i>), Swordfish (<i>Xiphias gladius</i>), shark spp.
Tuna pole	Pole and line	Albacore tuna
Deep-sea crab	Demersal long-line trap	Red crab (<i>Chaceon maritae</i>)
Deep-water trawl	Demersal trawl	Orange roughy (<i>Hoplostethus atlanticus</i>), Alfonsino (<i>Beryx splendens</i>)
Rock Lobster	Demersal trap	Rock lobster (<i>Jasus lalandii</i>)
Line-fish	Hand line	Silver kob (<i>Argyrosomus inodorus</i>), Dusky kob (<i>A. coronus</i>)
Mariculture	Long-lines, rafts	Pacific oysters, European oysters, Black mussel, Seaweed (<i>Gracilaria</i> sp.)

³ Noting that in the ICSEAF period these resources were over-exploited. The northern Benguela (Namibian waters) however remains a highly productive upwelling system resulting in proportionately (to many other countries) abundant commercial fish resources

Table 3.2: Total Allowable Catches (tons) from 2009/10 to 2021/22 (supplied by Ministry of Fisheries and Marine Resources, Namibia).

Year	Sardine (Pilchard)	Hake	Horse Mackerel	Crab	Rock Lobster	Monk
2009/10	17 000	149 000	230 000	2700	350	8 500
2010/11	25 000	140 000	247 000	2700	275	9 000
2011/12	25 000	180 000	310 000	2850	350	13 000
2012/13	31 000	170 000	310 000	3100	350	14 000
2013/14	25 000	140 000	350 000	3100	350	10 000
2014/15	25 000	210 000	350 000	3150	300	12 000
2015/16	15 000	140 000	335 000	3446	250	10 000
2016/17	14 000	154 000	340 000	3400	240	9800
2017/18	0	154 000	340 000	3400	230	9600
2018/19	0	154 000	349 000	3900	200	9600
2020/21	0	154 000	349 000	3900	180	9600
2021/22	0	154 000	330 000	4200	180	9600

Note: Deepwater trawl TAC is currently not applied for Alfonsino and Orange roughy. There is no TAC (output control) for albacore tuna – this is an effort (input) controlled sector with no restriction on catch.

Namibia has only two major fishing ports from which all the main commercial fishing operations are based, namely, Walvis Bay and Lüderitz. In central Namibia, the major port is Walvis Bay, and it is from this port that the majority of fishing vessels operate. Most of the fishing conducted from this port is, for economic and logistical reasons, directed at fishing grounds in the central and northern parts of Namibia and, to a lesser extent, the southerly fishing grounds towards the South African border. A significant amount of fishing activity also takes place from Lüderitz, from where hake trawlers and longliners operate, as well as a small rock lobster fishery based in southern Namibian waters.

There are currently 116 Namibian-registered commercial fishing vessels. The dominant fleet comprises demersal trawlers that include both large freezer vessels (up to 70 m in length), as well as a smaller fleet of monk trawlers. These vessels fish year-round, apart from a one month closed season in October and their range is the length of the Namibian EEZ. There is a 200 m fishing depth restriction (i.e. no bottom trawling is permitted shallower than 200 m). Prior to Namibian independence in 1990, a much larger fleet of trawlers existed. However, Namibia now exercises strict effort control and vessel size limits. The only other fleets of significance are the mid-water trawlers that target horse mackerel and the large pelagic tuna long-line vessels. The mid-water fleet was historically uncontrolled and comprised of many large industrial vessels, mostly of eastern origin (Ukrainian and Russian). Currently, these large midwater trawl vessels (mostly > 100 m in length) operate in the northern waters of Namibia and are restricted to fewer than 20 vessels.

The large pelagic (tunas and shark) long-line vessels operate broadly in Namibian waters, but unlike the mid-water vessels, concentrate in the south near the South African border, targeting the albacore and yellowfin tuna migrations. The numbers of these vessels vary and are dependent on the seasonal availability of tuna and tuna-like species. The tuna pole (baitboat) vessels are a small fleet⁴ and increase in numbers depending on the number of licenses issued to South African boats. The tuna long-liners

⁴ The baitboat fleet consists of up to 20 Namibian vessels. This is a small number of vessels compared to South Africa. However, because of the variable and migratory nature of tuna, the number of vessels participating in the fishery varies depending on the seasonal and inter-annual availability of tuna. Namibia also licenses South African vessels to optimise the exploitation of these resources when they are available.

are also variable, with the number of licenses issued to both Namibian flags and others (mostly Asian) fluctuating annually. The extent and number of these vessels is difficult to ascertain (as they are unpublished), although the actual numbers are limited and are less than the numbers of licensed Namibian boats.

There are few known foreign fishing vessels licensed to fish in Namibian waters, although the majority of the current mid-water fleet have permits to fish under foreign flag registration, but as a rule, all licensed fishers must reflag under Namibia. There is a possibility that licenses may have been issued to foreign tuna boats, although these would be few and they would be closely monitored by the Namibian compliance units and their Vessel Monitoring System (VMS).

3.2 STOCK DISTRIBUTION, SPAWNING AND RECRUITMENT

The distribution patterns for the Namibian commercial stocks are summarised as follows:

- **The sardine stock** ranges along the entire Namibian coast, but in recent years, predominantly from 25°S northwards to southern Angola, inshore of the 200 m bathymetric contour (i.e., inshore of Block 2913B). The southern border of this range is demarcated by the Lüderitz upwelling front, a region of cold, upwelled water located off the port of Lüderitz. Historically, spawning occurred continuously from September to April with two seasonal peaks evident – the first from October to December in an inshore area between Walvis Bay and Palgrave Point and the second from February to March near the 200 m isobath between Palgrave Point and Cape Frio (King, 1977). The fishery collapsed in the 1960's and currently the status remains overexploited with a low biomass estimate and a significantly contracted distribution pattern compared to historical levels. The fishery is currently closed following a moratorium that was implemented on 01 January 2018 due to a significant population reduction. From an estimated 11 million tonnes in the 1960s to 50 thousand tonnes in 2015, the amount has decreased by 99.5%. Scientific studies are underway to ascertain the causes (MFMR 2015 and 15 February 2019).
- **Cape horse mackerel** occurs predominantly north of 25°S, with juveniles present in the inshore pelagic regions up to the 200 m isobaths and adult horse mackerel populations extending into waters up to 500 m deep (i.e. inshore of Block 2913B). Concentrations are dense between Cape Cross and the Kunene River. Biomass estimates in this region are mostly low in summer and higher in winter and early spring. Abundance of horse mackerel is, therefore, higher at these times and increases availability of the species to the fisheries exploiting them. Spawning occurs during both summer and winter, with peak activity between January and April (Klingelhoeffer, 1994).
- **Albacore tuna, yellowfin tuna, bigeye tuna, sharks and swordfish** are large pelagic species with an extensive offshore distribution ranging along the entire Namibian coastline. Seven species occur in Namibian waters, but only two are identified as important to fisheries; albacore (*Thunnus alalunga*) dominates the pole fishery, while bigeye tuna (*T. obesus*) dominate the long-line fishery. The abundance of these species has a strong seasonal signal, resulting in increased availability to the fisheries targeting them at different periods. For albacore tuna, availability increases from the last trimester (summer) and peaks in the first trimester (late summer to early autumn). Albacore tuna spawn off Brazil just south of the equator and in the central Atlantic, where surface temperatures exceed 24°C (Manning, 1998). Bait boats using pole and line target albacore tuna primarily in southern Namibia in the first trimester (January to March). Aggregations of albacore tuna are known to occur in the vicinity of the Tripp Seamount (approximately 75 km east of the licence block) and the highest catch levels are recorded in this area. For the pelagic long-line sector targeting bigeye tuna, yellowfin tuna, and swordfish, the availability of these target species is highest in the second and third trimesters. Bigeye tuna spawn throughout the east central Atlantic, north of 5°N during the warmest season, when the surface temperature exceeds 24 °C, and in the Gulf of Guinea (Manning, 1998). It is important to note that weather conditions play an

important role in operations within the tuna fisheries (pole and line and long-line). The high market price for tuna makes up for their relatively low catches off Namibia (Manning, 1998). With the onset of summer, there is cold water upwelling as a result of increasing south-easterly winds. The availability of longfin tuna is associated with this increased biological activity and bait fish (sardine and anchovy) abundance. The longline tuna fishing season peaks two to three months later than the fishery for albacore tuna.

- **Hake** is the most commercially important Namibian fishery. Two species of hake are caught in Namibian waters: *Merluccius capensis* (Cape/ “shallow water” hake) and *M. paradoxus* (“deepwater” hake). Hake displays vertical migrations between demersal and mid-water during the day and night, respectively. Studies suggest that *M. paradoxus* does not spawn within Namibian waters rather the adults migrate back to South Africa to spawn. However, *M. capensis* has been shown to spawn within Namibian waters (Kainge et al. 2007). Within the Namibian EEZ, the hake stocks extend along the entire shelf and slope approximately between the 100 m and 1000 m isobaths (i.e., inshore of Block 2913B). Nevertheless, Cape hake displays seasonal variation in spawning; spawning peaks from July to September along the shelf break off central Namibia (Jansen *et al.*, 2015).
- **Monkfish** are found along the entire extent of the Namibian coast, with the fishery concentrated between 17°15'S and 29°30'S on the deeper continental shelf and upper slope depths of 200m to 500m (i.e., inshore of Block 2913B). Cape monkfish spawn throughout the year, with a peak between July and September (Erasmus, 2021). Cape monkfish spawn in Namibian waters, with evidence of hotspot spawning aggregation between 21° and 25° S (Erasmus, 2021).
- **Deep-sea red crab stocks** are distributed predominantly from 23°35'S northwards into Angola within a depth range of approximately 300m to 1000m (i.e., inshore of Block 2913B) with the highest densities occurring along the northern range of its distribution, the Angolan border, to 18°S. Spawning takes place throughout the year (Le Roux 1997) on the shallower waters of the continental slope, with adult females generally occurring at shallower depths than those of males.
- **Orange roughy** has a discontinuous pattern of distribution along the continental slope with concentrations of fish within four known spawning grounds (within designated Quota Management Areas) within the Namibian EEZ. The species has a short, intense spawning period of about a month from July to August (Boyer and Hampton 2001), during which individuals aggregate. As a result of overexploitation of the stock(s), the fishery (which only existed for four years) has been closed since 2007. However, the stock is currently being assessed with a view to considering the viability of re-opening the fishery.
- **Namibian Cape Rock lobster** is found from 25°S to 28°30'S at depths shallower than 100m (i.e., inshore of Block 2913B). The depth distribution of adults varies seasonally in response to changes in the concentration of dissolved oxygen in the water. Adults moult during spring (males) and late autumn/early winter (females), with egg hatching peaking in October/November. Fishing activity is greatest over January and February, with the number of active vessels declining towards the end of the fishing season in May.

The principal commercial fish species in Namibia undergo a critical migration pattern which is central to the sustainability of the small pelagic and hake fisheries. In Namibian waters, hake spawning commences north of the powerful Lüderitz upwelling centre (27°S) and continues up to the Angola–Benguela Front (16–19°S). Sardines and horse mackerel also spawn in the region between Lüderitz and the Angola–Benguela front. Circulation patterns at depth reveal complex eddying and considerable southward and onshore transport beneath the general surface drift to the north-west (Sundby *et al.* 2001). As eggs drift, hatching takes place, followed by larval development. Settlement of larvae occurs in the inshore areas. Sardine spawning peaks 30–80 km offshore during September–October off the central Namibian shelf, with larvae occurring slightly further offshore and recruits appearing close inshore, so there appears to be a simple inshore–offshore movement over the Namibian shelf. Spawning also occurs in mid-summer in the vicinity of the Angola–Benguela Front (Crawford *et al.* 1987). During late summer (December – March), warm water from the Angolan Current pushes southwards into central

Namibian waters, allowing pelagic spawning products to be brought into the nursery grounds off central Namibia. There is a high likelihood of substantial offshore transport associated with this convergent frontal region (Shannon 1985).

3.3 COMMERCIAL FISHING SECTORS

The only sector that overlaps with Block 2913B is the large pelagic longline fishery. The other sectors are, however, briefly summarised below.

3.3.1 LARGE PELAGIC LONG-LINE

This sector makes use of surface long-lines to target migratory pelagic species, including yellowfin tuna (*T. albacares*), bigeye tuna (*T. obesus*), swordfish (*Xiphias gladius*), and various pelagic shark species. Commercial landings of these species by the fishery are variable, and Namibian-reported catch from 1994 to 2018 is shown in Figure 3.1 (ICCAT, 2020). There is a provision for up to 26 fishing rights and 40 vessels (<http://www.mfmr.gov.na/>).

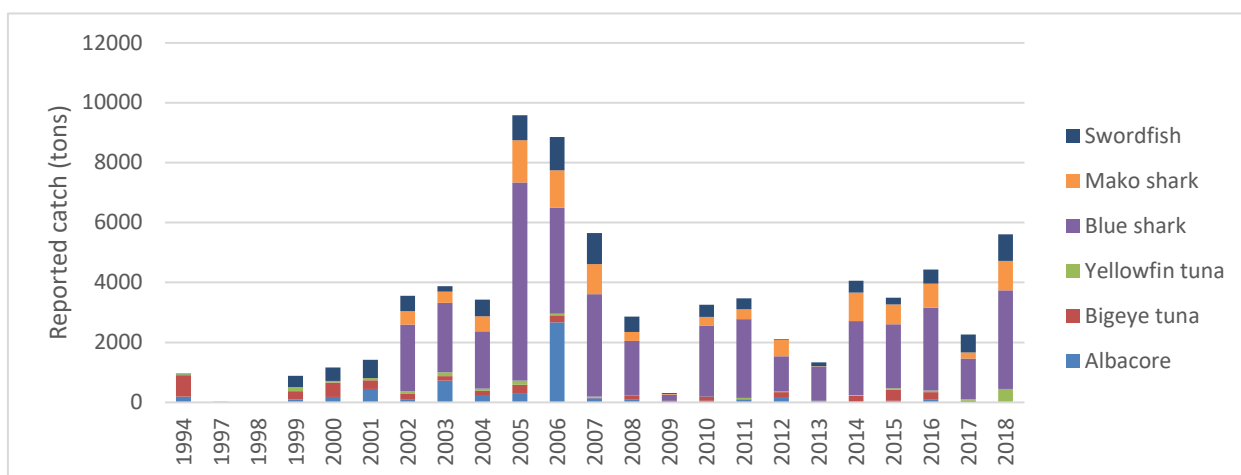


Figure 3.1: Total nominal longline catch (tons) of blue shark, shortfin mako shark, Atlantic swordfish, bigeye tuna and yellowfin tuna reported by Namibia between 1994 and 2018. Source: ICCAT statistical bulletin, 2020.

Yellowfin tuna are distributed between 10°S and 40°S in the south Atlantic, and spawn in the central Atlantic off Brazil in the austral summer (Penney *et al.* 1992). According to Crawford *et al.* (1987), juvenile and immature yellowfin tuna occur throughout the year in the Benguela system. After reaching sexual maturity, they migrate (in summer) from feeding grounds off the West Coast of southern Africa to the spawning grounds in the central Atlantic.

Bigeye tuna occur in the Atlantic between 45°N and 45°S. Spawning takes place in the Gulf of Guinea and in the eastern central Atlantic north of 5°N, and it is thought that bigeye tuna migrate to the Benguela system to feed. Swordfish spawn in warm tropical and subtropical waters and migrate to colder temperate waters during the summer and autumn months. Tuna are targeted at thermocline fronts, predominantly along and offshore of the shelf break. Pelagic long-line vessels set a drifting mainline, up to 50-100 km in length, and are marked at intervals along its length with radio buoys (Dahn) and floats to facilitate later retrieval (see Figure 3.2). Various types of buoys are used in combinations to keep the mainline near the surface and locate it should the line be cut or break for any reason. Between radio buoys, the mainline is kept near the surface or at a certain depth by means of

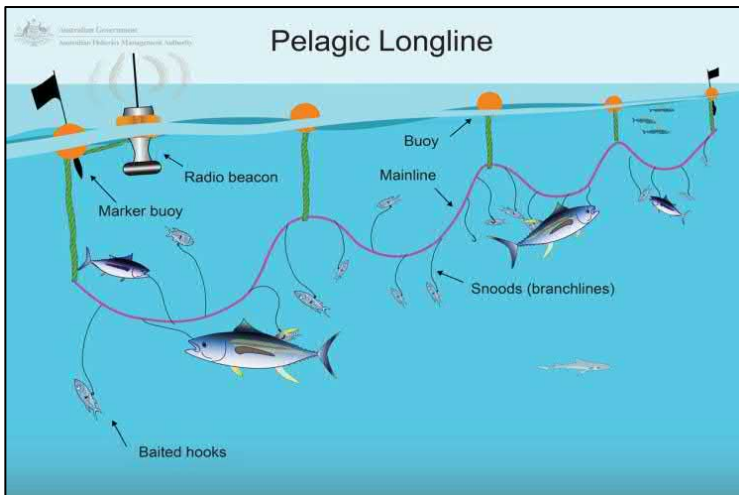


Figure 3.2: Schematic diagram of gear typically used by the pelagic long-line fishery (Source: <http://www.afma.gov.au/portfolio-item/longlining>).

of ridged hard-plastic buoys (connected via a “buoy-lines” of approximately 20 m to 30 m). The buoys are spaced approximately 500 m apart along the length of the mainline. Hooks are attached to the mainline on branch lines (droppers), which are clipped to the mainline at intervals of 20 m to 30 m between the ridged buoys. The main line can consist of twisted tarred rope (6 mm to 8 mm diameter), nylon monofilament (5 mm to 7.5 mm in diameter) or braided monofilament (~6 mm in diameter). A line may be left drifting for up to 18 hours before retrieval by means of a powered hauler at a

speed of approximately 1 knot. Refer to Figure 3.3 for a schematic diagram of pelagic long-line gear and Figure 3.4 for photographs of an example of a vessel, marker buoys, and lines.



Figure 3.3: Photographs showing marker buoys (left), radio buoys (centre) and monofilament branch lines (right) (Source: CapMarine, 2015).

Long-line vessels targeting pelagic tuna species and swordfish operate extensively around the entire coast along the shelf-break and into deeper waters. The spatial distribution of fishing effort is widespread and may be expected predominantly along the shelf break (approximately along the 500 m isobath) and into deeper waters (2 000 m). Effort occurs year-round with a slight peak over the period from March to May (see Figure 3.4). Figure 3.5 shows the spatial distribution of commercial catches along the Namibian coastline and in the vicinity of Block 2913B. The entire licence area coincides with fishing grounds utilised by the sector. Over the period 2003 to 2019, an average catch of 13.7 tons per year was taken within the licence area (0.14% of total national landings). The average annual effort in the area was 12350 hooks (0.13% of total national effort). Note that the 2019 ESIA report did not make reference to the large pelagic long-line sector or the distribution of catch and effort in relation to the licence area.

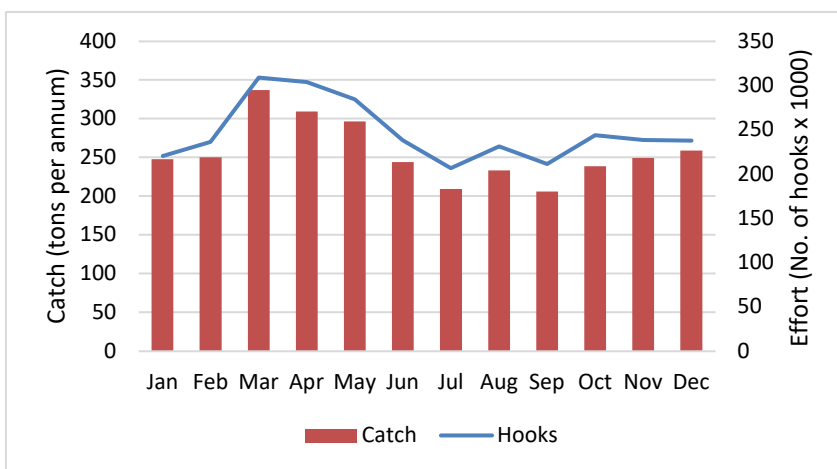


Figure 3.4: Monthly average catch and effort recorded within the large pelagic longline sector within Namibian waters (2003 – 2019).

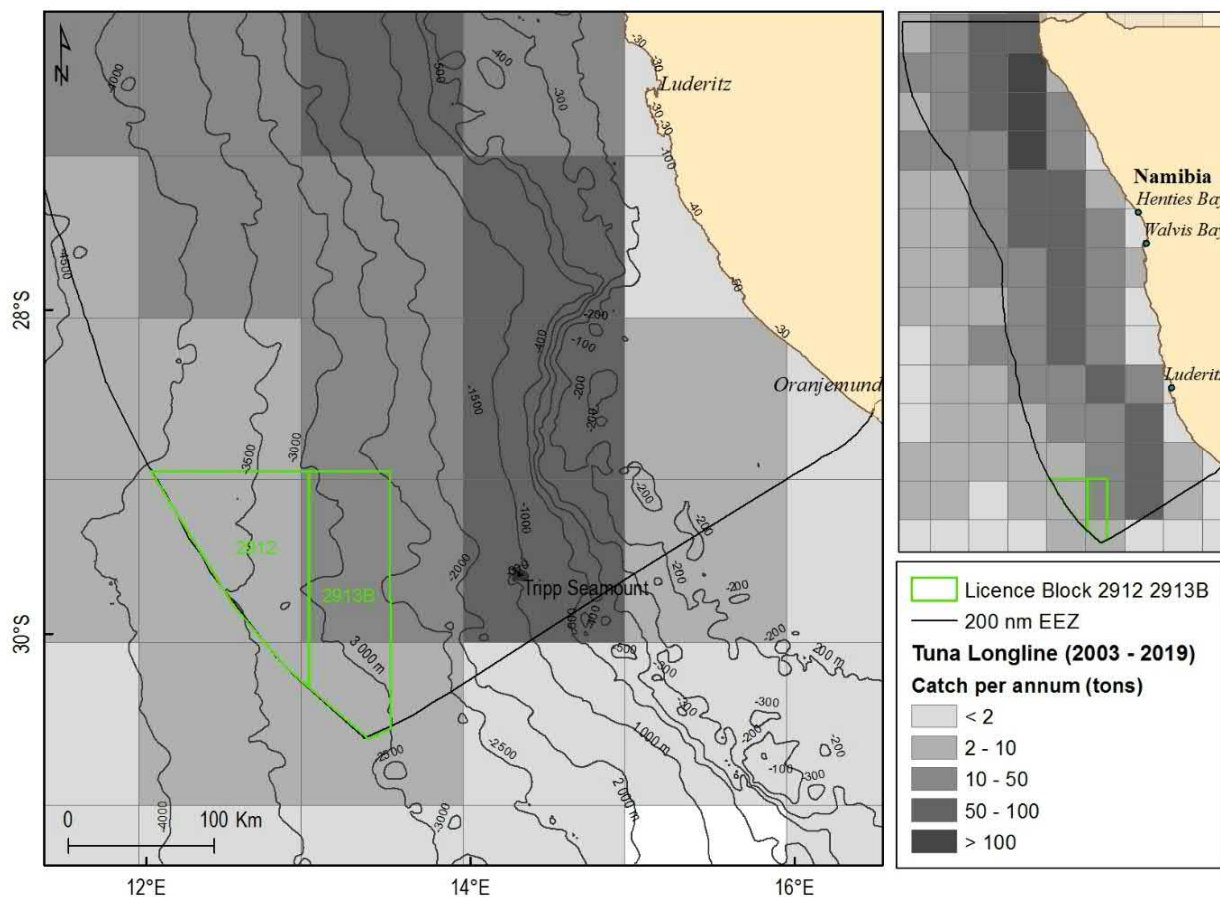


Figure 3.5: Spatial distribution of catch recorded by the pelagic long-line fishery in relation to licence blocks 2912 and 2913B. Catch is displayed on a 60 x 60 minute grid (average catch per year over the period 2003 to 2019).

3.3.2 SMALL PELAGIC PURSE-SEINE

The Namibian stock of Benguela sardine (*Sardinops sagax*) (also known as pilchard in the region) and small quantities of juvenile horse mackerel are the foundation of the pelagic purse-sein fishery. A moratorium was implemented on 01 January 2018 due to a significant population reduction, and extensive scientific studies are underway to ascertain the causes (MFMR 2015 and 15 February 2019). This fishery remains closed at present (2022). The extent of the stock distribution has effectively contracted since the stock collapse, prior to which the historical distribution was throughout the Benguela system. Recent biomass surveys have revealed small stock aggregations mostly located inshore of the 200 m isobath. Commercial fishing activity occurs primarily inshore of 200 m, northwards of 25°S to the Angolan border (see Figure 3.6). The main commercial fishing grounds are situated at least 480 km north of the licence area, and the closest fishing activity recorded at 100 km east of the licence area is incidental. **There is no overlap in fishing activity within Block 2913B.**

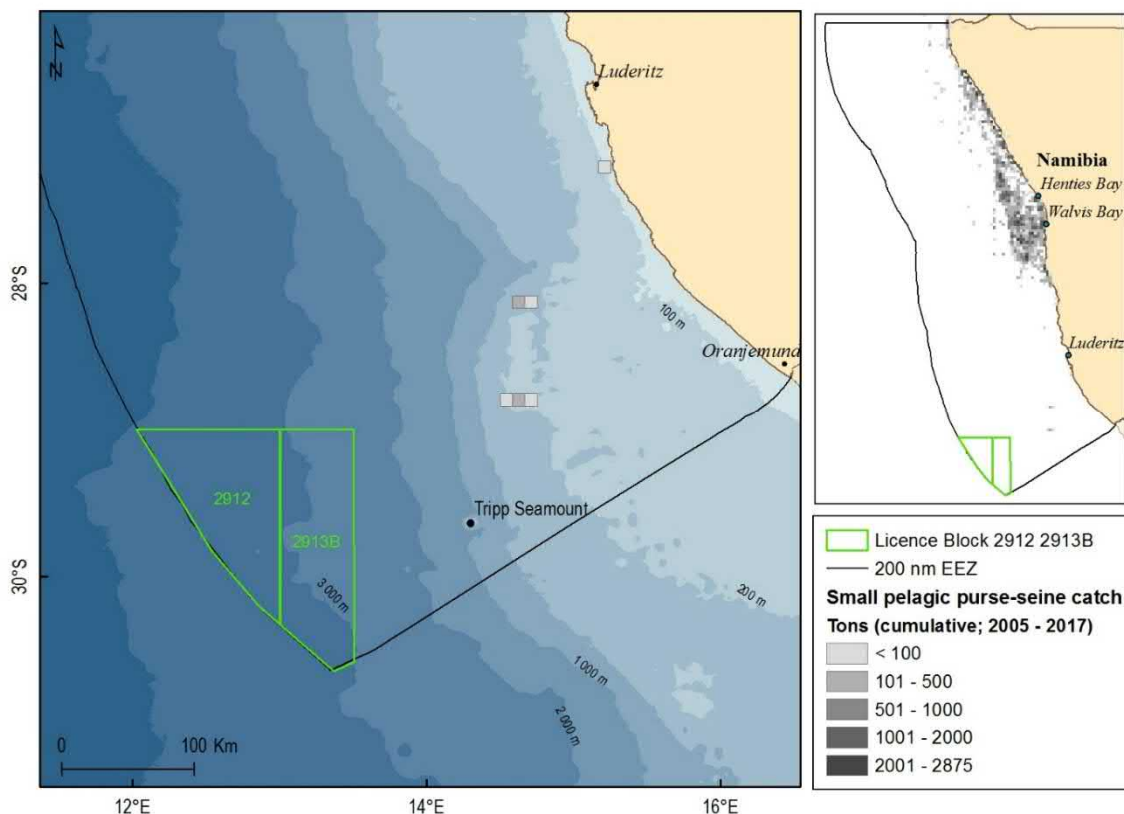


Figure 3.6: Spatial distribution of small pelagic purse-seine catch (2005 – 2017) in the vicinity of Blocks 2912 and 2913B.

3.3.3 MID-WATER TRAWL

The fishery for Cape horse mackerel (*Trachurus capensis*) is the largest contributor by volume and the second highest contributor by value to the Namibian fishing industry. The stock is caught by the mid-water trawl fishery (targeting adult horse mackerel) and the pelagic purse-seine fishery (smaller quantities of juvenile horse mackerel). The midwater fishery operates using trawls within the water column to catch schools of adult horse mackerel.

The fishery operates year-round with relatively constant catch and effort values by month. The mid-water trawl fleet operates exclusively out of the port of Walvis Bay and the fishing grounds extend north of 25°S to the border of Angola. Juvenile Cape horse mackerel move into deeper water when mature and are fished mostly between the 200 m and 500 m isobaths towards the shelf break. The distribution of horse mackerel-directed fishing grounds in relation to Block 2913B is shown in Figure 3.7. Although the main commercial fishing grounds are situated approximately 400 km north of the licence area, incidental fishing has been recorded 170 km north east of the licence area. **There is no overlap of fishing activity; however, with Block 2913B.**

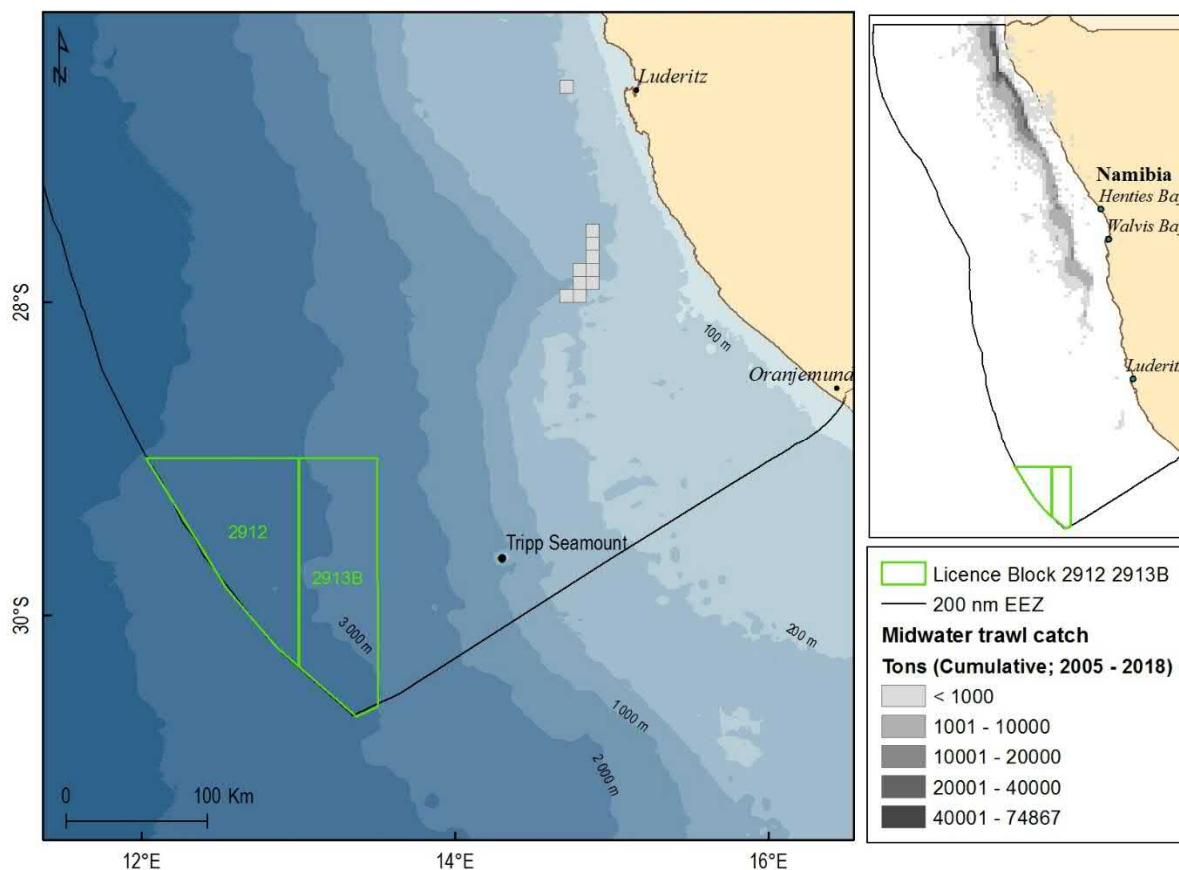


Figure 3.7: Spatial Distribution of Midwater Trawl Catch in the vicinity of Blocks 2912 and 2913B (2005 – 2018).

3.3.4 DEMERSAL TRAWL

The most economically important species in Namibia are shallow-water hake (*Merluccius capensis*) and deep-water hake (*Merluccius paradoxus*). Fishing effort is relatively constant throughout the year except for a closure for the month of October and relatively lower levels of effort expended during November and December.

Fishing grounds extend along the entire coastline following the distribution of hake and monkfish along the continental shelf at a depth range of 200 m to 850 m. The total extent of fishing grounds used by the demersal trawl fleet is approximately 78,895 km². **Demersal trawling is prohibited in waters shallower than 200 m⁵ and therefore, does not take place within licence block 2913B. The block is situated 75 km westward of the demersal trawling grounds** (see Figure 3.8).

⁵ Namibia has a designated area closed to most “offshore” fishing activities under 200 m water depth i.e. to protect potential spawning areas as well as areas of high juvenile abundance for most demersal species, including hake. Demersal trawling is prohibited in waters shallower than 200 m.

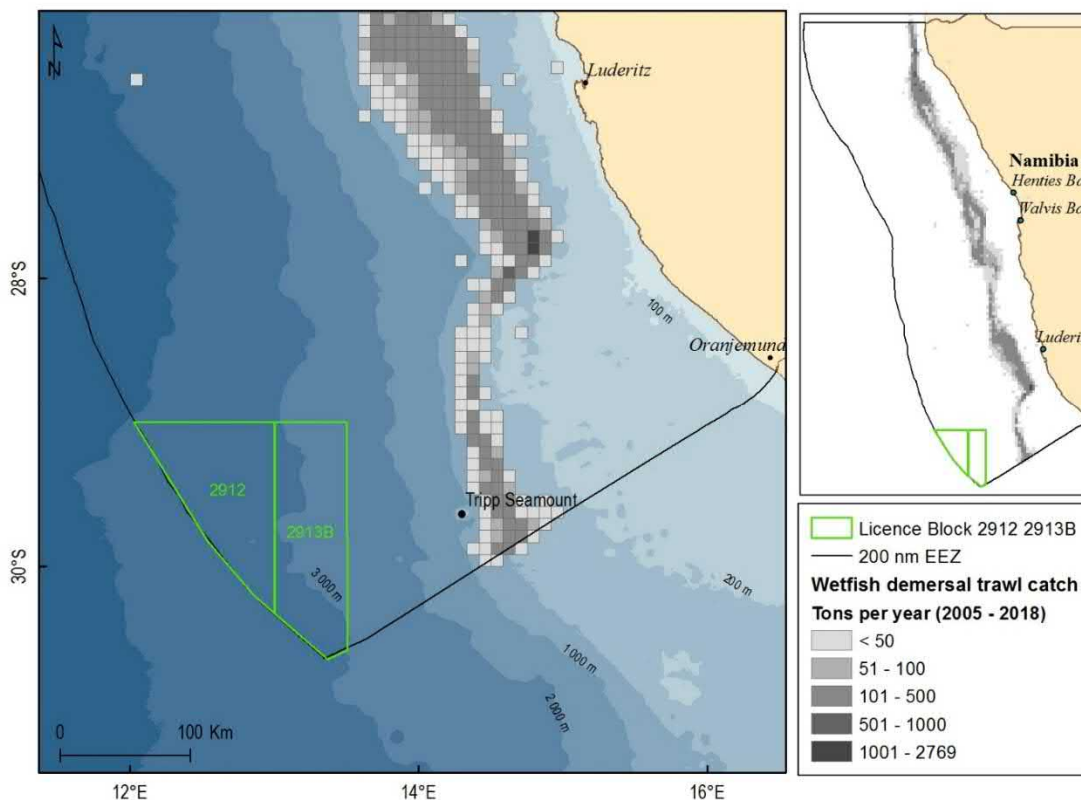


Figure 3.8: Spatial distribution of the catch of hake (2005 – 2018) by demersal trawl vessels in the vicinity of licence blocks 2912 and 2913B.

3.3.5 DEMERSAL LONG-LINE

Similar to the demersal trawl fishery, the target species of this fishery is the Cape hakes, with a small non-targeted commercial by-catch that includes kingklip. Long-line vessels fish in similar areas to those targeted by the hake-directed trawling fleet, in a broad area extending from the 200 m to 650 m contour along the full length of the Namibian coastline. Some 18 vessels operate within the sector. Those based in Lüderitz mostly work south of 26°S towards the South African border, while those based in Walvis Bay operate between 23°S and 26°S and north of 23°S. Figure 3.9 shows the distribution of catch reported in relation to Block 2913B. The **fishing grounds are situated 50 km eastward of the licence block, and there is no overlap.**

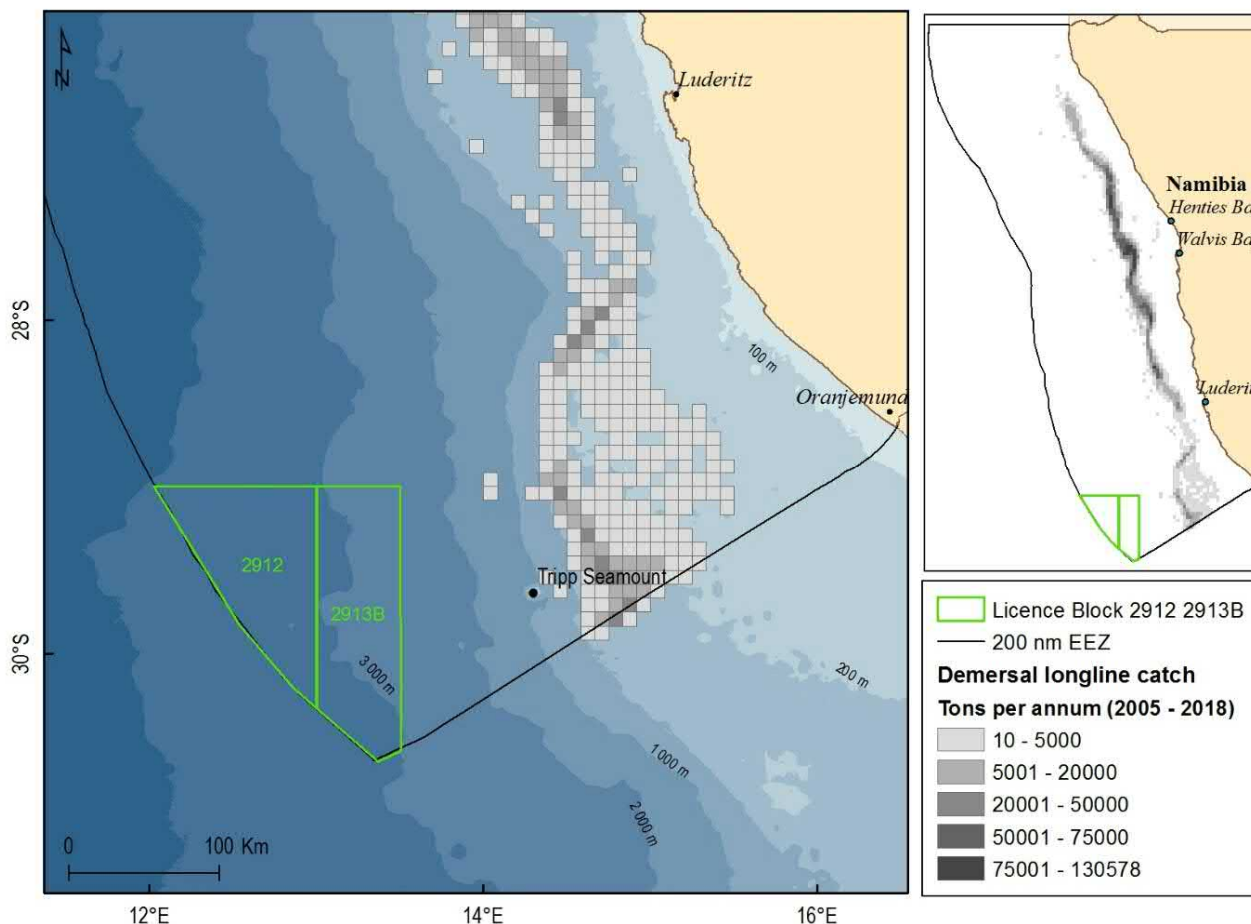


Figure 3.9: Spatial distribution of catch reported by the demersal long-line fishery targeting Cape hakes (*M. capensis*; *M. paradoxus*) in relation to licence blocks 2912 and 2913B between 2005 and 2018.

3.3.6 TUNA POLE

Poling for tuna is predominantly based on the southern Atlantic albacore (longfin tuna) stock (*T. alalunga*) and a very small amount of skipjack tuna (*Katsumonus pelamis*), yellowfin tuna, and bigeye tuna.

Approximately 36 South African pole and line vessels operate under arrangements with Namibian right holders each year. However, the number of active vessels and landed catch have recently shown a decline. The fishery is seasonal, with vessel activity mostly between December and May and peak catches in March and April. Effort fluctuates according to the availability of fish in the area, but once a shoal of tuna is located, a number of vessels will move into the area and target a single shoal, which may remain in the area for days at a time. As such, the fishery is dependent on window periods of favourable conditions relating to catch availability.

Aggregations of albacore tuna occur in specific areas, in particular the Tripp Seamount, which is situated just north of the South Africa/Namibia maritime border. Catches in this area are variable from year to year, although boats will frequent the area knowing that albacore aggregate around the seamount after migrating through South African waters. The movement of albacore between South Africa and Namibia is not clear although it is believed that the fish move northwards following bathymetric features and

generally stay beyond the 200 m depth contour. Figure 3.10 shows the spatial distribution of fishing effort in relation to Block 2913B, which is situated approximately 75 km north-west of Tripp Seamount. **Between 2004 and 2019, there were no reported catches in Block 2913B.**

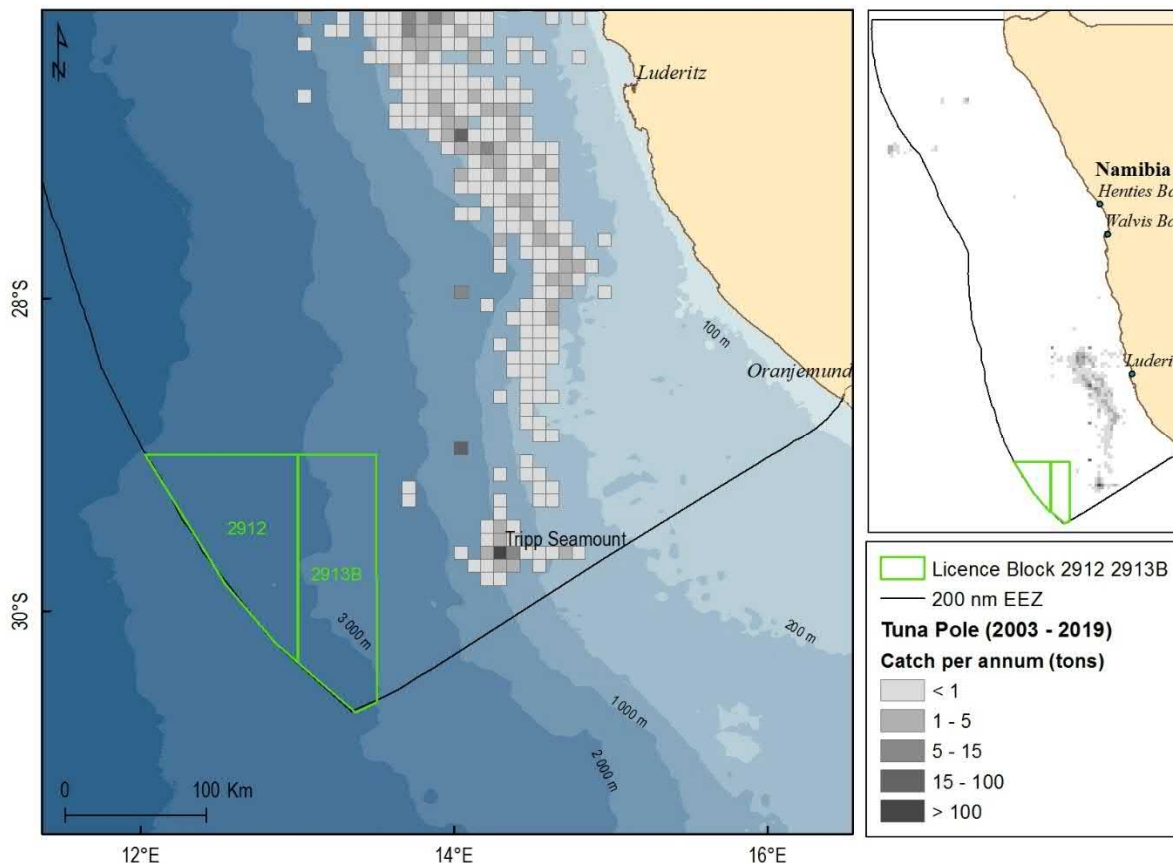


Figure 3.10: Spatial distribution of fishing effort expended by the tuna pole and line fleet along the Namibian coastline and in the vicinity of licence blocks 2912 and 2913B (2003 – 2019).

3.3.7 LINEFISH

The traditional line fishery primarily targets snoek (*Thyrsites atun*) with bycatch of yellowtail, silver kob (*Argyrosomus inodorus*), dusky kob (*A. coronus*), and shark, which are sold on the local market. Snoek availability to the fishery is seasonal. Catches peak in late summer, after the fish migrate south into South African waters. The other species caught, such as kob and shark, occur year-round, but in relatively small amounts. Operationally, the fishery is limited in extent to Walvis Bay, Swakopmund and Henties Bay and, due to the small size of the boats does not operate much further than 12 nm offshore (i.e. 22 km). There is also a small component of the fishery operating out of Lüderitz in the South.

The distribution of linefish catch in relation to the licence blocks is shown in Figure 3.11. The sector operates inshore of the 200 m depth contour with incidental reports of fishing in deeper waters⁶. The

⁶ Possibly incorrectly-reported fishing positions or errors in the transcription of records from logbooks to electronic database.

nearest fishing activity is taking place in Lüderitz, which is at least 250 km north-east of Block 2913B. Although there are incidental reports of fishing activity adjacent to the licence area, **there is no spatial overlap with the fishery.**

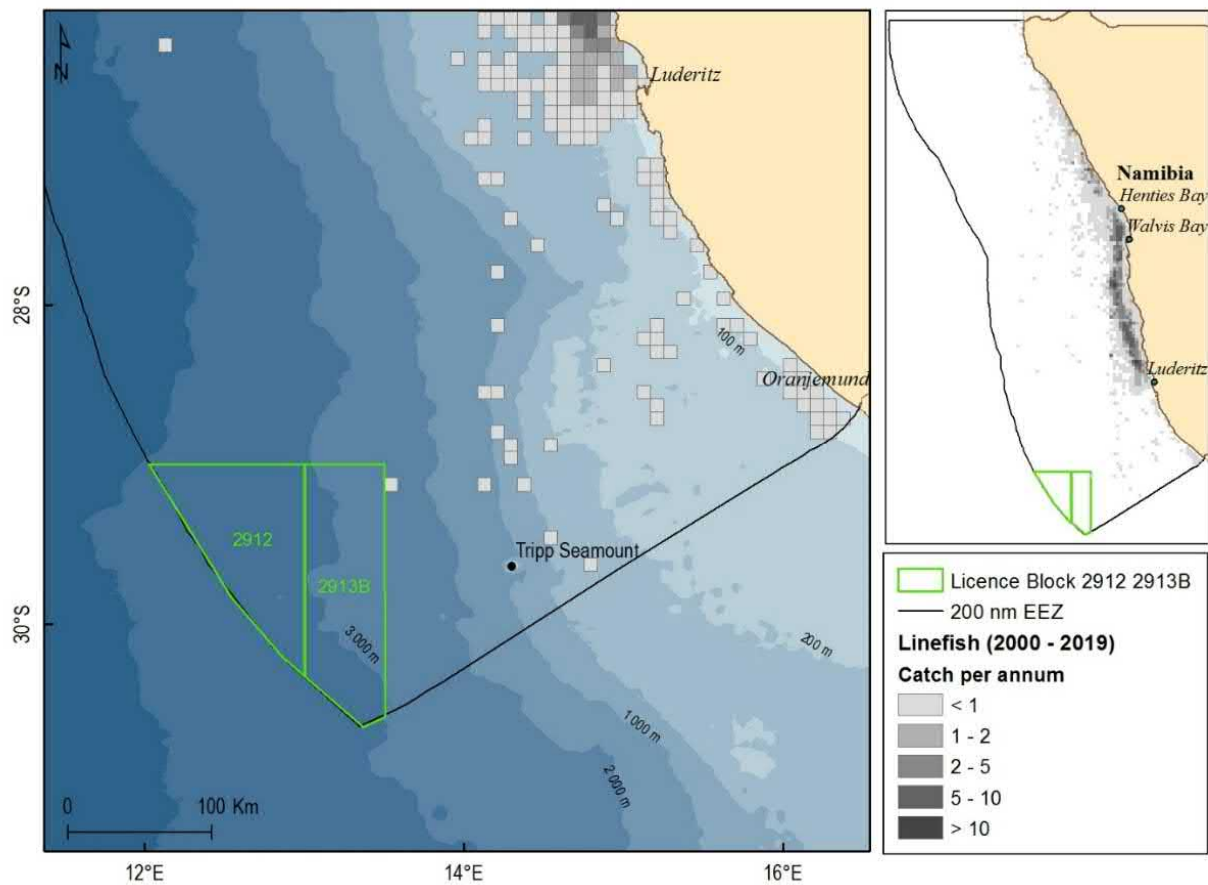


Figure 3.11: Spatial distribution of catch taken between 2000 and 2019 by ski-boats operating within the line-fish sector along the Namibian coastline in relation to licence blocks 2912 and 2913B.

3.3.8 DEEP-SEA CRAB

The Namibian deep-sea crab fishery is based on two species of crab, namely spider crab (*Lithodes ferox*) and red crab (*Chaceon maritae*).

The distribution of red crab extends from ~5°S to just south of Walvis Bay, and the commercial fishery operates in grounds extending northwards of 23°S and into Angolan waters (Figure 3.12). There is a minimum operational depth of 400 m set for the fishery, which sets traps at depths of up to 1200 m. The fishery is small, with only two vessels currently operating from the port of Walvis Bay. Vessels are active year-round but with relatively low fishing effort from November to February. Fishing grounds are located at least 730 km to the north of Block 2913B and **there is therefore no spatial overlap of the licence blocks with the sector.**

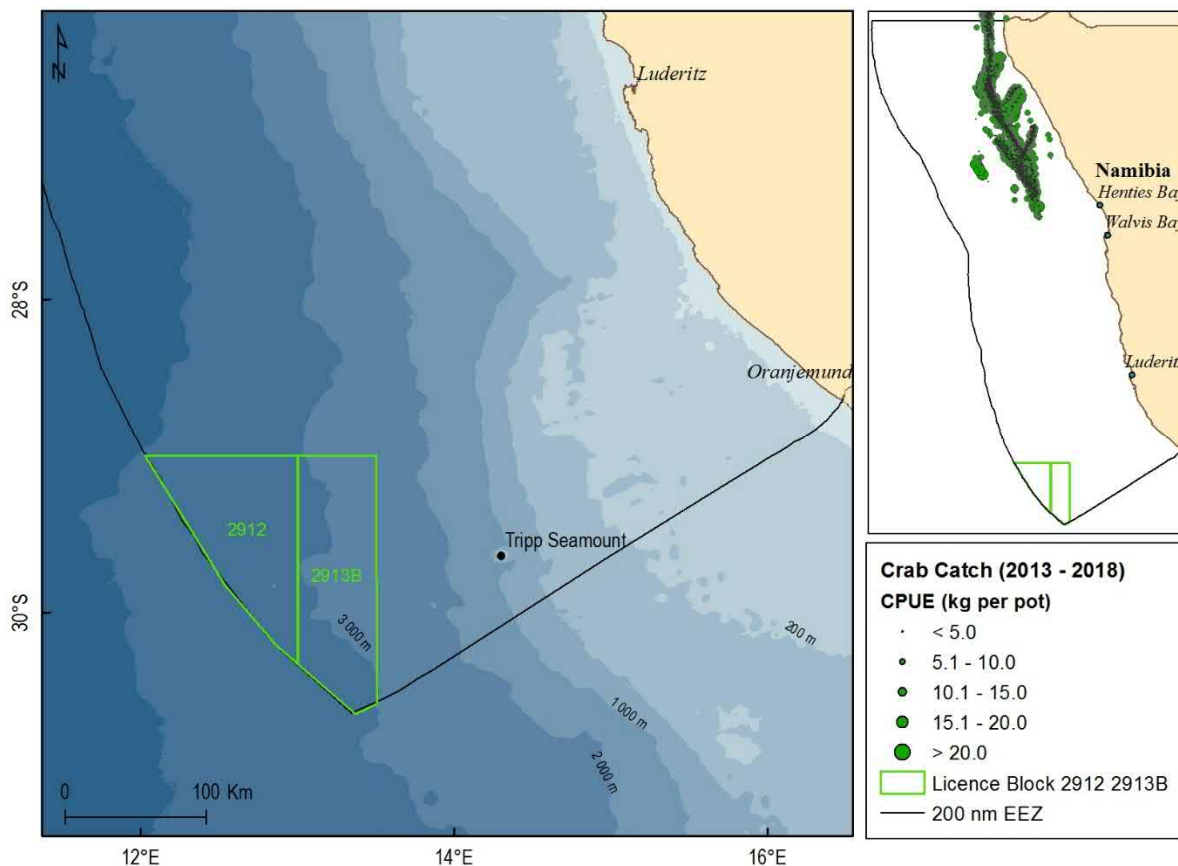


Figure 3.12: Spatial Distribution of catch taken by the Deep-Sea Crab Fishery (2013 – 2018) in relation to licence blocks 2912 and 2913B

3.3.9 DEEP-WATER TRAWL

The deep-water trawl fishery is a small but lucrative fishing sector directed at the outer Namibian shelf from 400 m to 1500 m of water depth, targeting orange roughy (*Hoplostethus atlanticus*) and alfonsino (*Beryx splendens*). Both species are extremely long-lived and aggregate densely, leading to high catch rates. General aggregations of the stock occur between June and August. Fishable aggregations are usually found on hard grounds on features such as seamounts, drop-off features, or canyons (Branch, 2001). Off Namibia, orange roughy has a restricted spawning period of less than a month in late July, when spawning takes place in dense aggregations close to the bottom in small areas typically between 10 and 100 km² in extent (Boyer and Hampton 2001).

The fishery is split into four Quota Management Areas (QMA's) referred to as "Hotspot", "Rix", "Frankies" and "Johnies" and TACs are set for each specific QMA (see Figure 3.13). **Block 2913B does not coincide with any of the QMA's with the closest being "Johnies" situated 47 km northeast of the licence area.**

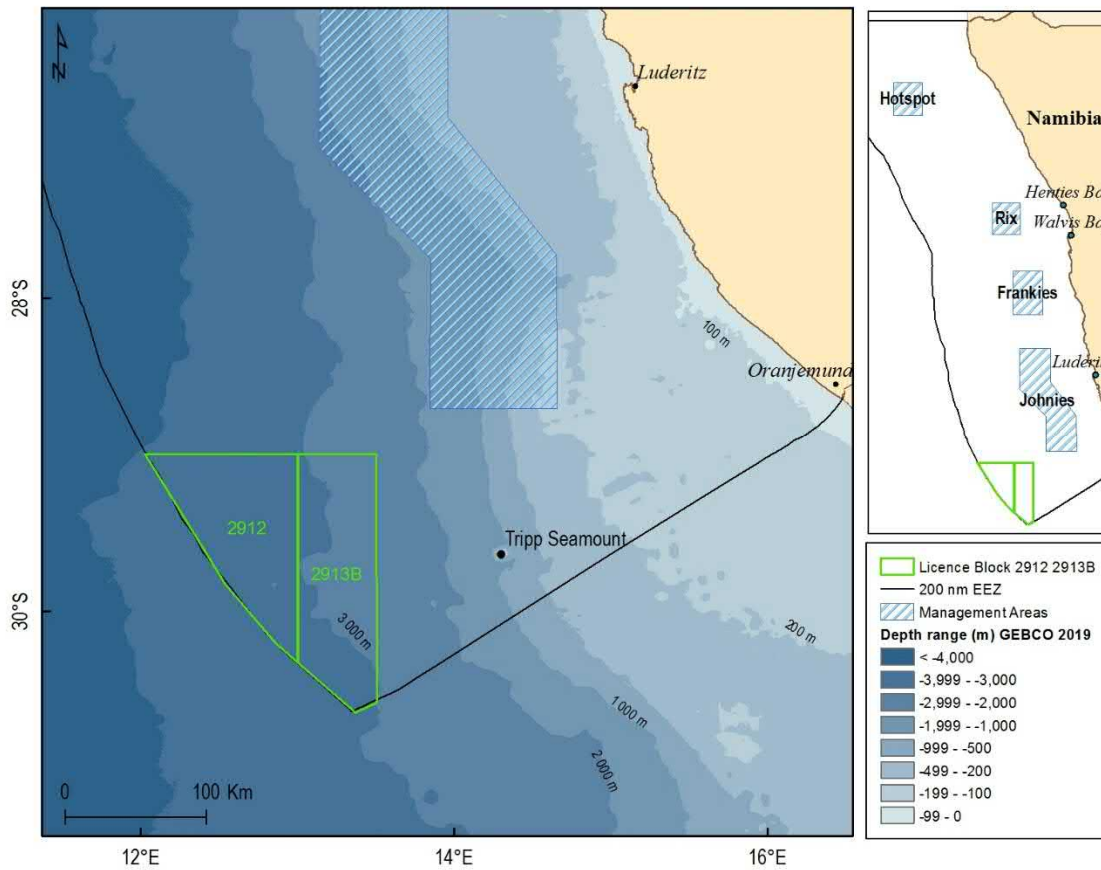


Figure 3.13: Historic catch and Management Areas Used by the Deep-Water Trawl Fishery (1994–2007) in relation to licence blocks 2912 and 2913B.

3.3.10 ROCK LOBSTER

The small but valuable fishery of rock lobster (*Jasus lalandii*) is based exclusively in the port of Lüderitz. The catch season is a six-month period with a closed period extending from 1 May to 31 October, and the highest activity levels are experienced over January and February.

The sector operates in water depths of between 10 and 80 m. Within Namibian waters, the lobster stock is commercially exploited between the Orange River border in the south to Easter Cliffs/Sylvia Hill north of Mercury Island (approximately 25°S). The fishery is spatially managed through the demarcation of catch grounds by management area (see Figure 3.14). Block 2913B are located at least 270 km from the outer depth (50 m) at which rock lobster is caught and therefore **there is no spatial overlap between the licence area and fishing grounds.**

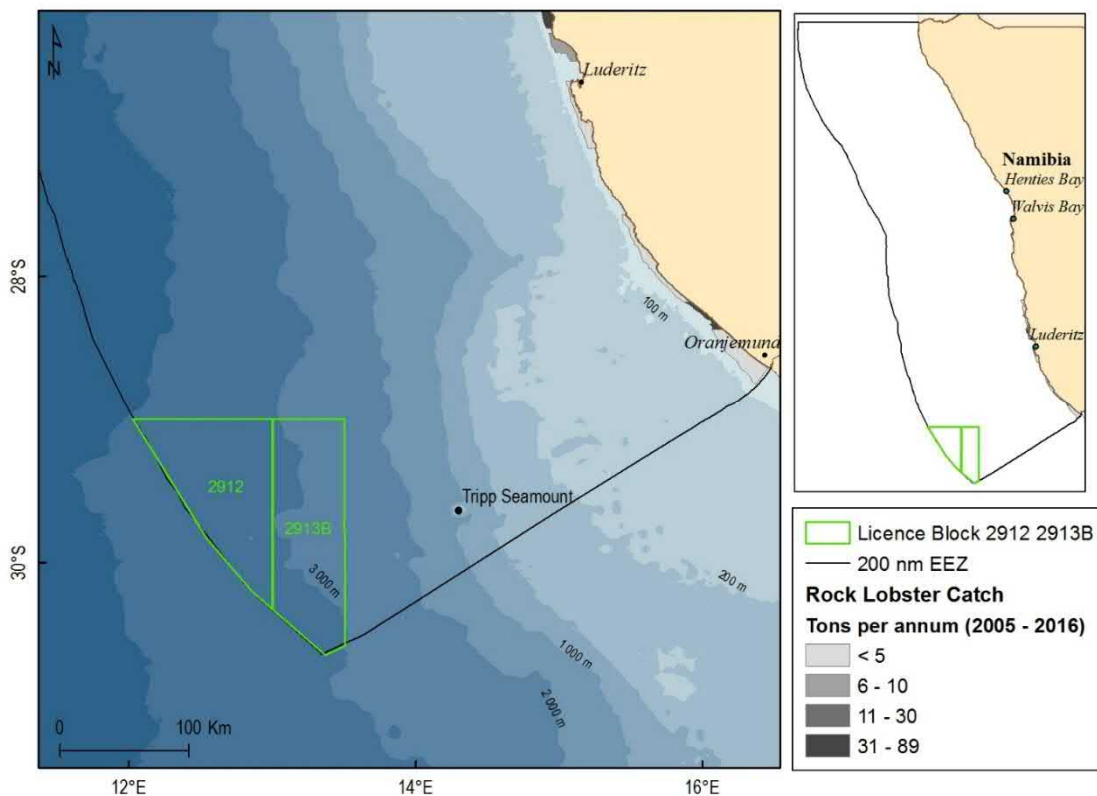


Figure 3.14: Spatial Distribution of Rock Lobster Catch (2005 – 2016) in relation to licence blocks 2912 and 2913B.

3.3.11 FISHERIES RESEARCH

MFMR conducts regular research (biomass) surveys for demersal, mid-water, and small pelagic species. In some years, the Benguela Current Commission may conduct “transboundary” surveys. Swept-area biomass surveys for hake are conducted annually to obtain an index of abundance, determine the geographical distribution and collect biological information about the stock. These surveys are normally carried out over a period of one month during January and February and cover the entire continental shelf from the Angolan to the South African maritime border. The method of abundance estimation from these surveys is based on depth stratification; trawls range in depth from 100 m to 600 m; thus, **no overlap is expected with Block 2913B**. During trawling, the vessel tows the net for a period of 30 minutes at a speed of approximately 3 knots.

Scientific acoustic surveys are carried out between February and March each year to estimate the biomass of small pelagic species (using the survey vessel F/V *Welwitchia*). The vessel surveys along pre-determined transects that run perpendicular to depth contours (East-West / West-East direction). These surveys cover the Namibian shelf from the coastline to the 500 m depth contour (and up to the 2000 m contour northwards of 18°30’ S). **Thus, no overlap is expected with Block 2913B.**

4 REVIEW AND RECOMMENDATIONS

No.	Description of the environmental aspect	Description of the potential impact	Mitigation / Management Measure	Evaluation	Recommendation for Additional Mitigation
1	NORMAL DRILLING OPERATIONS				
1.1	Discharge of cuttings, drilling fluid and cement into the marine environment	Reduction of catch / increased fishing effort due to smothering and increased turbidity	Not assessed	<p>The direct effects of an increase in sediment in the water column and sediment deposition on the seabed extend to potential smothering of benthic fauna, which could in turn affect predator–prey interactions and thus normal feeding patterns of certain fish species, thereby resulting in reduced catch and/or increased fishing effort.</p> <p>The potential impact is considered to be localised and of medium intensity in the short-term. The likelihood of the impact occurring is possible, if the well drilling is undertaken within fishing grounds. In terms of the interaction with fisheries, Licence Block 2913B overlaps only with fishing grounds of the large pelagic long-line sector.</p>	None
1.2	Noise (including drilling, vessels and vertical seismic profiling (VSP))	Reduction of catch / increased fishing effort due to changes in fish behaviour	Not assessed	<p>The noise assessment undertaken by AECOM (O'Conner, 2019), which considered a well at a water depth of 2964 m, identified exclusion zones (EZ) for different noise-generating activities based on threshold criteria for low to medium sensitivity and high sensitivity fish species.</p> <p><u>Semi-Submersible Rig Positioning</u></p> <p>Low level disturbance (behavioural effects) to fish can be expected within metres of the semi-submersible rig with the risk of disturbance is considered to be moderate to low at intermediate and greater distances. The threshold for Temporary Threshold Shift (TTS) in hearing on high sensitivity fish species could be met if they were to</p>	Ramp up of sound source during VSP operations from zero to full operating volume over a period of 20 minutes (=“soft-start” procedure)

No.	Description of the environmental aspect	Description of the potential impact	Mitigation / Management Measure	Evaluation	Recommendation for Additional Mitigation
				<p>remain within a distance of 185 m from the vessel or within 341 m of the vessel thrusters for period of 12 hours. TTS effects on low or medium sensitivity fish species are estimated to be moderate within metres of a continuous sound source, and low at intermediate and greater distances. The threshold for recoverable injury to high sensitivity fish species could be met at a distance <10 m from the vessel or within 16 m of the vessel thrusters, if they were to remain within this threshold distance for a period of 48 hours. The risk of mortal injury or mortality to fish is considered to be low.</p> <p><u>Driving of conductor pipe</u></p> <p>TTS may occur in fish if they remain within 201 m from driving activities for a period of 1 hour. For these and longer periods the likelihood is that fish will move away from a disturbing sound before any injury is likely to occur. Low level disturbance to fish may occur at distances beyond possible TTS thresholds. Mortality to eggs and larvae could be expected within <10 m and 42 m of driving activities for exposure of up to 1 hour and 24 hours, respectively.</p> <p><u>Drilling</u></p> <p>Low level disturbance (behavioural effects) to fish can be expected within metres of the semi-submersible rig. TTS effects and recoverable injury would be expected at a distance of <10 m (high sensitivity fish species) for a cumulative exposure of 12 hours and 48 hours duration, respectively. The risk of mortal injury or mortality to fish is considered to be low.</p> <p><u>Vertical Seismic Profiling (VSP)</u></p> <p>Provided that fish, eggs and larvae are not located directly below the VSP source or within the main directivity of the source, TTS may occur in fish if they remain within 26 m of VSP operations for a period of 1</p>	

No.	Description of the environmental aspect	Description of the potential impact	Mitigation / Management Measure	Evaluation	Recommendation for Additional Mitigation
				<p>hour. Low level disturbance to fish may occur at a distance of up to 14 km.</p> <p>Geographical Area:</p> <p>The licence block is situated at least 70 km offshore of Tripp Seamount, an important fishing ground targeted by the tuna pole sector. Since low level disturbance to fish is expected at a maximum distance of 14 km from VSP operations, it is expected that noise would attenuate to ambient levels before reaching Tripp Seamount. The block coincides with the fishing area of the large pelagic long-line sector only. The sound levels generated during the drilling activities would be expected to attenuate to below threshold levels for behavioural disturbance well before reaching fishing grounds of any other sector.</p>	
1.3	Implementation of the 500 m safety zone around the drilling unit and exclusion from fishing grounds / transport routes	Reduction of fishing grounds and associated loss of catch / increased fishing effort due to exclusion	Not assessed	<p>The licence block overlaps with the fishing grounds of one fisheries sector namely the large pelagic long-line sector (see section 3.3.1). During the operational phase of the project, large pelagic long-line vessels could be excluded from targeting fish in the vicinity of the drilling area due to the safety zone around the drilling unit. The affected area is considered to be localised (78.5 ha around the drilling unit) and therefore of low intensity.</p> <p>Abandonment of wellheads would not be expected to present a permanent obstruction to any Namibian fishing sectors as the demersal trawling activities do not coincide with the licence block and pelagic (surface-directed) operations would not be subject to permanent exclusion.</p>	<p>Distribute a Notice to Mariners to key stakeholders prior to the well-drilling operations. The Notice to Mariners should give notice of (1) the co-ordinates of the drilling area, (2) an indication of the proposed operational timeframes, (3) the dimensions of the safety zone around the drilling unit (500 m – 2 km), and (4) details on the movements of support vessels servicing the project. Key stakeholders include the Association of Namibian Fishing Industries, and the Namibian Large Pelagic Longlining Association.</p> <p>Notify the Directorate of Maritime Affairs, SANHO, Namibian Ports Authority and the MFMR Monitoring, Control and Surveillance Unit in Walvis Bay.</p> <p>SANHO to broadcast a navigational warning via Navigational Telex (Navtext), Lüderitz Port Control and Walvis Bay radio for the duration of the activity.</p> <p>The lighting on the drilling and support vessels should be managed to ensure that they are sufficiently illuminated to be visible to fishing vessels, as well as</p>

No.	Description of the environmental aspect	Description of the potential impact	Mitigation / Management Measure	Evaluation	Recommendation for Additional Mitigation
					<p>ensure that it is reduced to a minimum compatible with safe operations and to limit disturbance to pelagic seabirds.</p> <p>Notify any fishing vessels at a radar range of 5 nm from the drilling unit via radio regarding the safety requirements around the vessel.</p> <p>Implement a grievance mechanism in case of disruption to fishing or navigation.</p> <p>Report to SANHO any significance loss of equipment should this not be recoverable.</p>
2	UNPLANNED ACTIVITIES				
2.1	Small operational spill and release of oil (including fuel and hydraulic fluid) into the marine environment	Exclusion of fisheries from polluted areas and displacement of targeted species from normal feeding / fishing areas, as well as damage to fishing gear	Not assessed	Oil spill modelling was not undertaken during the 2019 ESIA. An oil spill modelling study in an adjacent licence area (PEL39) (Baboolal <i>et al.</i> 2017) predicted that a small diesel spill would be relatively short-lived on the water surface (< 10 days) and would have a relatively small footprint that was predicted not to reach the shore nor the sensitive nearshore environment.	<p>Ensure personnel are adequately trained in both accident prevention and immediate response, and resources are available on each vessel.</p> <p>Use low toxicity dispersants cautiously and only with the permission of MFMR.</p> <p>As far as possible, and whenever the sea state permits, attempt to control and contain the spill at sea with suitable recovery techniques to reduce the spatial and temporal impact of the spill.</p>
2.2	Large well blow-outs and release of oil (including fuel and hydraulic fluid) into the marine environment	Exclusion of fisheries from polluted areas and displacement of targeted species from normal feeding / fishing areas, as well as damage to fishing gear	Not assessed	Although unlikely to occur, a well blow-out is the greatest environmental threat from an offshore drilling operation.	<p>Ensure that Emergency Command and Control Management arrangements are in place. These range from the On-scene Commander, normally at the source of the incident, to the main Emergency Control Centre Incident Commander who takes over control. As each level is activated the level of response would equally escalate.</p> <p>Use low toxicity dispersants that rapidly dilute to concentrations below most acute toxicity thresholds. Dispersants should be used cautiously and only with the permission of MFMR.</p>

No.	Description of the environmental aspect	Description of the potential impact	Mitigation / Management Measure	Evaluation	Recommendation for Additional Mitigation
					<p>As far as possible, and whenever the sea state permits, attempt to control and contain the spill at sea with suitable recovery techniques to reduce the spatial and temporal impact of the spill.</p> <p>In the event of a spill, use satellite-borne Synthetic Aperture Radar (SAR)-based oil pollution monitoring to track the behaviour and size of the spill and optimise available response resource.</p> <p>Ensure adequate resources are provided to Oil Spill Contingency Plan (including collect and transport oiled birds to a cleaning station).</p> <p>Ensure agreement with OSRL is in place and current to ensure mobilisation and use of following in the event of a well blow-out:</p> <p>Capping stack in Saldanha Bay and other international locations.</p> <p>Subsea Dispersion Injection (SSDI) kit</p>

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