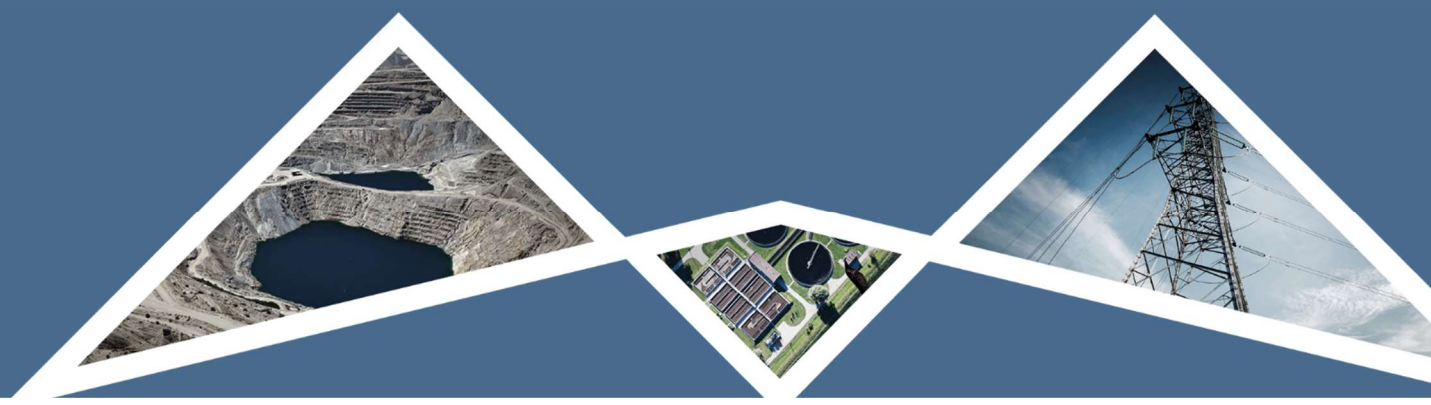
EIMS | ENVIRONMENTAL IMPACT MANAGEMENT SERVICES

T 011 789 7170 E info@eims.co.za W www.eims.co.za

# ENVIRONMENTAL MANAGEMENT PROGRAMME

## PROPOSED AFRICA OIL SOUTH AFRICA CORP BLOCK 3B/4B EXPLORATION RIGHT

PASA/DMRE REFERENCE: 12/3/339



## DOCUMENT DETAILS

| | |
|---|---|
| **EIMS REFERENCE:** | 1570 |
| **DOCUMENT TITLE:** | Environmental Management Programme: Africa Oil South Africa Corp Block 3B/4B Exploration Right |

## DOCUMENT CONTROL

| | NAME | SIGNATURE | DATE |
|---|---|---|---|
| **COMPILED:** | GP Kriel |  | 2024/05/20 |
| **CHECKED:** | Liam Whitlow |  | 2024/05/20 |
| **AUTHORIZED:** | Liam Whitlow | | 2024/05/20 |

## REVISION AND AMENDMENTS

| **REVISION DATE:** | REV # | DESCRIPTION |
|---|---|---|
| 2023/12/11 | ORIGINAL DOCUMENT | Environmental Management Programme for public review |
| 2024/04/03 | Revision 1 | Environmental Management Programme for public review |
| 2024/05/20 | Revision 2 | Environmental Management Programme |

# Table of Contents

# List of Figures



# List of Tables

# Abbreviations

| | |
|---|---|
| AOI | Areas of Interest |
| BAT | Best Available Techniques |
| Bbl | Barrel of Oil |
| BOD | Biological Oxygen Demand |
| BOP | Blow-out Preventor |
| CBA | Biodiversity Areas |
| CLO | Community Liaison Officer |
| COLREGS | Convention dealing with safety at sea |
| DFFE | Department of Forestry, Fisheries and the Environment |
| DMRE | Department of Mineral Resources and Energy |
| EAP | Environmental Assessment Practitioner |
| EBSA | Ecologically and Biologically Significant Area |
| ECO | Environmental Control Officer |
| EO | Environmental Officer |
| ERP | Emergency Response Plan |
| ISPPC | International Sewage Pollution Prevention Certificate |
| LWD | Logging While Drilling |
| MARPOL | International Convention for the Prevention of Pollution from Ships, 1973/1978 |
| MMO | Marine Mammal Observer |
| MPAs | Marine Protected Areas |
| NADF | Non-aqueous Drilling Fluid |
| NEMA | National Environmental Management Act (Act No. 107 of 1998), as amended |
| OOC | Oil On Cutting |
| OSCP | Oil Spill Contingency Plan |
| OSRL | Oil Spill Response Limited |
| SOLAS | Convention ensuring that vessels comply with minimum safety standards |
| SOPEP | Shipboard Oil Pollution Emergency Plan |
| VSP | Vertical Seismic Profiling |
| WBM | Water Based Mud |
| WCCP | Well Control Contingency Plan |

# 1 INTRODUCTION

Africa Oil SA Corp, Ricocure (Pty) Ltd and Azinam Limited (a wholly owned subsidiary of Eco Atlantic) (the Joint Venture (JV) Partners – hereafter jointly referred to as the Applicant) are the holders of the Block 3B/4B Exploration Right (ER) in terms of the Mineral and Petroleum Resources Development Act (No. 28 of 2002 – MPRDA), as amended. The licence block covers an area of approximately 17 581 $km^2$, and is situated between latitudes 31°S and 33°S on the continental shelf in water depths ranging from 300 m to 2 600 m.

The area of primary interest is in the north of this block, but this could also cover the central part of the block. As part of the process of applying for the Exploration Right, the Applicant undertook and completed the reprocessing project covering 2 000 $km^2$, which is a subset of the 10 000 $km^2$ BHP/Shell 3D seismic datasets, focussed primarily on the most northern portion of Block 3B/4B. Based on analysis of the reprocessed 3D dataset, the Applicant is now proposing to drill an exploration well in the area of primary interest in order to fully appraise the hydrocarbon potential of the geological structure or "prospect", with the option to drill up to four additional wells.

A full Scoping and Environmental Impact Assessment (S&EIA) process was undertaken to accompany the existing ER for the EIA Listing Notices listed activities applicable to the project namely: Listing Notice 2: Activity 18. The Environmental Management Programme (EMPr) has been compiled to meet the requirements for an Environmental Impact Assessment (EIA) and as stipulated in the EIA Regulations, 2014. The competent authority for this application will be the Department of Mineral Resources and Energy (DMRE).

An EMPr is an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts during the applicable phases of a development or activity are prevented, and that the positive benefits of the projects are enhanced. This EMPr has been compiled as a guideline for the mitigation and management measures to be implemented to avoid, reduce and minimise potential environmental impacts arising out of the project.

# 2 SCOPE OF THIS DOCUMENT

The purpose of the EMPr is to give effect to precautionary and mitigatory measures, which are to be put in place for controlling the activities that take place during the project. The EMPr also provides guidance to assist in ensuring compliance with relevant national legislative and regulatory requirements.

It should be borne in mind, however, that the EMPr is a working document that should be updated on a regular basis, as and when necessary. Formal risk identification forms an integral part of EMPr management and assists with prioritizing and focusing the control of risks. The EMPr thus supports this on-going proactive mitigation and the duty of care to the environment. The EMPr shall therefore allow for risk minimization, rather than just ensuring legal compliance. The purpose of this EMPr is thus also to allow the user to make minor amendments to ensure continual revision and improvement of risk mitigation through the continual re-assessment of risks associated with the activity.

# 3 DOCUMENT STRUCTURE

Table 1: EMPr Structure

| Appendix 4 Reference | Description | Section in EMPr |
|---|---|---|
| Appendix 4(1)(1)(a) | Details of –<br>(i) The EAP who prepared the EMPR; and<br>(ii) The expertise of that EAP to prepare an EMPR, including a curriculum vitae; | Section 4 |
| Appendix 4(1)(1)(b) | A detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description. | Section 5 |
| Appendix 4(1)(1)(c) | A map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that should be avoided, including buffers; | Section 5.2 |
| Appendix 4(1)(1)(d) | A description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified though the environmental impact assessment process for all phases of the development including –<br>(i) Planning and design;<br>(ii) Pre-construction activities;<br>(iii) Construction activities;<br>(iv) rehabilitation of the environment after construction and in the case of a closure activity, closure; and<br>(v) Where relevant, operation activities; | Section 12 |
| Appendix 4(1)(1)(f) | A description of proposed impact management actions, identifying the manner in which the impact management contemplated in paragraphs (d) will be achieved, and must, where applicable, include actions to –<br>(i) Avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;<br>(ii) Comply with any prescribed environmental management standards or practices; and<br>(iii) Comply with any applicable provisions of the act regarding closure, where applicable. | Section 12 |

| Appendix 4 Reference | Description | Section in EMPr |
|---|---|---|
| Appendix 4(1)(1)(g) | The method of monitoring the implementation of the impact management actions contemplated in paragraph (f); | Section 12 |
| Appendix 4(1)(1)(h) | The frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f); | Section 12 |
| Appendix 4(1)(1)(i) | An indication of the persons who will be responsible for the implementation of the impact management actions; | Section 12 |
| Appendix 4(1)(1)(j) | The time periods within which the impact management actions contemplated in paragraph (f) must be implemented; | Section 12 |
| Appendix 4(1)(1)(k) | The mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f); | Section 12 |
| Appendix 4(1)(1)(l) | A program for reporting on compliance, taking into account the requirements as prescribed by the Regulations; | Section 8.3 |
| Appendix 4(1)(1)(m) | An environmental awareness plan describing the manner in which –<br>(i) The applicant intends to inform his or her employees of any environmental risk which may result from their work; and<br>(ii) Risks must be dealt with in order to avoid pollution or the degradation of the environment; and | Section 10 |
| Appendix 4(1)(1)(n) | Any specific information that may be required by the competent authority. | N/A |

# 4 REQUIREMENTS OF AN EAP

In terms of Regulation 13 of the EIA Regulations, 2014, an independent Environmental Assessment Practitioner (EAP), must be appointed by the applicant to manage the application. EIMS has been appointed by the Applicant as the EAP and is compliant with the definition of an EAP as defined in Regulations 1 and 13 of the EIA Regulations and Section 1 of the National Environmental Management Act (Act No. 107 of 1998 – NEMA). This includes, inter alia, the requirement that EIMS is:

1) Objective and independent;
2) Has expertise in conducting EIA's;
3) Comply with the NEMA, the Regulations and all other applicable legislation;
4) Takes into account all relevant factors relating to the application; and
5) Provides full disclosure to the applicant and the relevant environmental authority.

The Curriculum Vitae (indicating the experience with environmental impact assessment and relevant application processes) of the consultants that were involved in the EMPr process, and the compilation of this report are attached as Appendix 1.

## 4.1 DETAILS OF THE EAP

EIMS was appointed by the Applicant as the EAP to compile this report. The contact details of the EIMS consultants who compiled the report are as follows:

Table 2: EAP Details

| | |
|---|---|
| **Name of Practitioner** | Mr GP Kriel |
| **Tel No.** | +27 11 789 7170 |
| **E-mail** | block3b4b@eims.co.za |

## 4.2 EXPERTISE OF THE EAP

EIMS is a private and independent environmental management-consulting firm that was founded in 1993. EIMS has in excess of 30 years' experience in conducting EIA's. Please refer to the EIMS website (www.eims.co.za) for further details of expertise and experience.

GP holds an M.Env.Sci (Water Sciences) Cum Laude from the North-West University (Potchefstroom Campus) and has been employed as an Environmental Consultant since 2007. GP is a Registered Professional Natural Scientist (South African Council for Natural and Scientific Professions) and a Registered Environmental Assessment Practitioner (Environmental Assessment Practitioner). He has delivered presentations locally and internationally concerning the use of bio-indicators for the determination of water quality, and has experience in a wide variety of environmental management projects including: Environmental Impact Assessments, Basic Assessments, Geographic Information Systems (GIS), Environmental Compliance Monitoring, Environmental Awareness Training, Aquatic Ecological Assessments, Drinking and Waste Water Treatment Process Audits, Wetland Delineation and Assessments, ISO 14001 Aspect Registers, Water Use Licence Applications, Waste Management Licence Applications, Integrated Waste and Water Management Plans (IWWMP) and Green House Gas Assessments.

The Curriculum Vitae of the EAP responsible for the compilation of this Report is included in Appendix 1.

# 5 PROJECT DESCRIPTION

This section provides an overview of the activities proposed to be undertaken as part of this project. Prior administrative decisions are also presented below.

## 5.1 DESCRIPTION OF THE PROJECT AREA

Table 3 indicates the details of the project area for the proposed project including details on the project location as well as the distance from the proposed project area to the nearest towns.

Table 3: Locality details

<table>
<tr><td>Project Area</td><td>Block 3B/4B off the West Coast of South Africa has an area of approximately 17 581 km$^2$. Two areas of interest (AOI) have been identified:<ul><li>Northern AOI; and</li><li>Central AOI.</li></ul>The primary AOI for drilling is located in the northern portion of the licence area and covers ranging in water depths between 1 000 m and 2 600 m (Figure 1). The Applicant is proposing to drill 1 exploration well, with the option to drill up to four additional wells.</td></tr>
<tr><td>Application Area</td><td>Block 3B/4B Approximately 1 758 100 ha covers an area of approximately 17 581 km$^2$.</td></tr>
<tr><td>Magisterial District</td><td>Adjacent to the Namaqualand and West Coast District Municipalities.</td></tr>
<tr><td>District Municipality</td><td>Adjacent to the Namaqualand and West Coast District Municipalities.</td></tr>
<tr><td>Local Municipalities</td><td>Adjacent to the Kamiesberg; Richtersveld; Nama Khoi; Matzikama; Cederberg; Bergrivier; Saldanha Bay; Swartland; and City of Cape Town Local Municipalities.</td></tr>
<tr><td>Application area coordinates</td><td>The application area corner coordinate points are as follows:
<table>
<tr><th>Point</th><th>Latitude</th><th>Longitude</th><th>Point</th><th>Latitude</th><th>Longitude</th></tr>
<tr><td>1</td><td>-31.00030518</td><td>14.74908447</td><td>12</td><td>-32.70800781</td><td>16.60467529</td></tr>
<tr><td>2</td><td>-31.00030518</td><td>15.94488525</td><td>13</td><td>-33.00018311</td><td>16.60467529</td></tr>
<tr><td>3</td><td>-31.45031738</td><td>15.94488525</td><td>14</td><td>-33.00030518</td><td>16.24932861</td></tr>
<tr><td>4</td><td>-31.45031738</td><td>15.96588135</td><td>15</td><td>-32.75030518</td><td>16.24932861</td></tr>
<tr><td>5</td><td>-31.88360596</td><td>15.96588135</td><td>16</td><td>-32.75030518</td><td>15.74908447</td></tr>
<tr><td>6</td><td>-31.88360596</td><td>16.2824707</td><td>17</td><td>-32.25030518</td><td>15.74908447</td></tr>
<tr><td>7</td><td>-32.41699219</td><td>16.2824707</td><td>18</td><td>-32.25030518</td><td>15.49908447</td></tr>
<tr><td>8</td><td>-32.41699219</td><td>16.41589356</td><td>19</td><td>-32.00030518</td><td>15.49908447</td></tr>
<tr><td>9</td><td>-32.60028076</td><td>16.41589356</td><td>20</td><td>-32.00030518</td><td>14.99908447</td></tr>
<tr><td>10</td><td>-32.60028076</td><td>16.54931641</td><td>21</td><td>-31.25030518</td><td>14.99908447</td></tr>
<tr><td>11</td><td>-32.70800781</td><td>16.54931641</td><td>22</td><td>-31.25030518</td><td>14.74908447</td></tr>
</table></td></tr>
</table>

The locality of the proposed exploration area is shown in Figure 1.

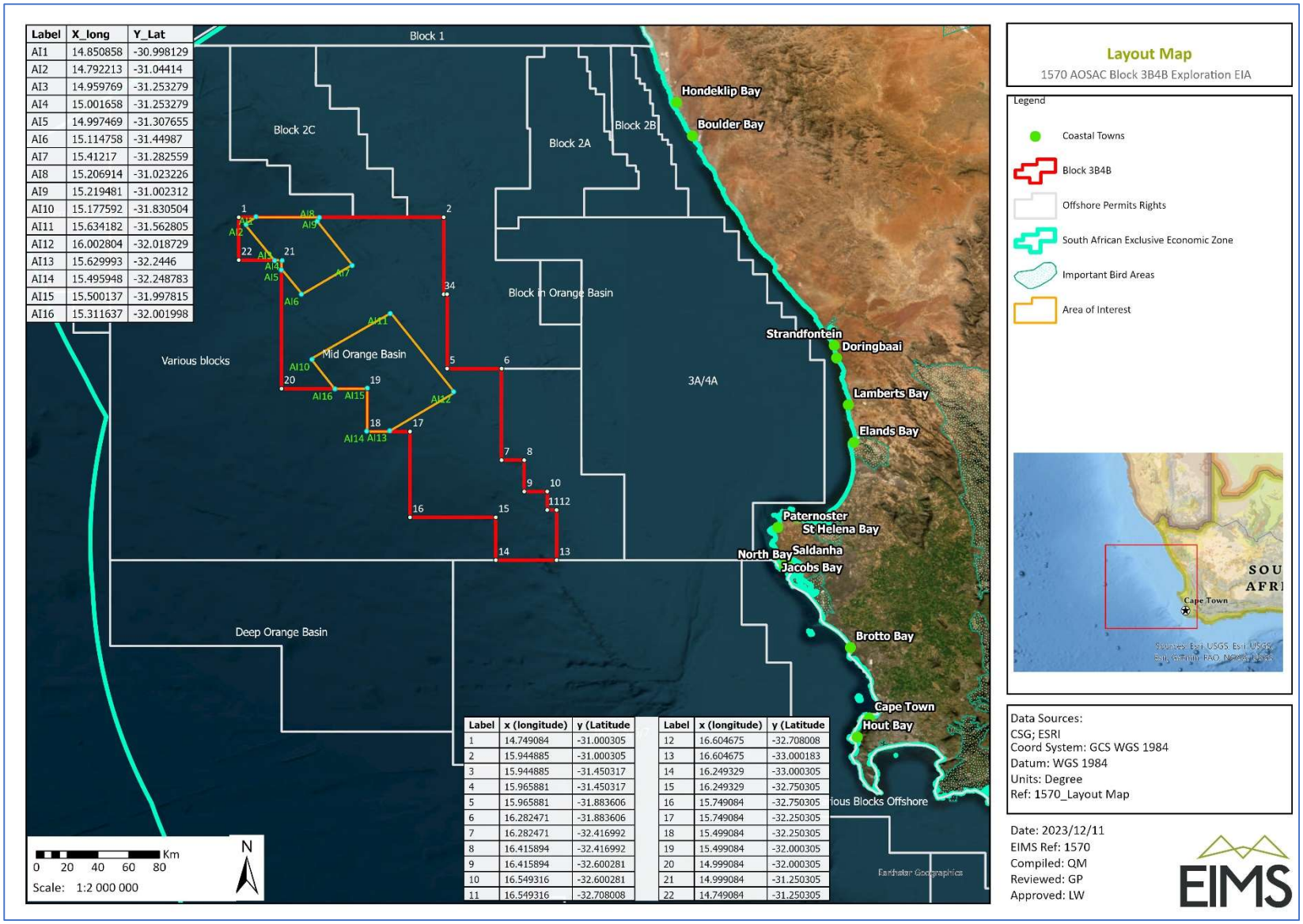



Figure 1: Locality map.

## 5.2 SENSITIVE AREAS AND ALTERNATIVE LAYOUT

Though Block 3B/4B is in close proximity to the Child's Bank and Benguela Muds Marine Protected Areas (MPAs), the proposed AOIs which, should they be authorised, can only occur within Block 3B/4B do not overlap with any proclaimed MPAs as the AOI already avoids these areas. Block 3B/4B overlaps to some extent with the Child's Bank Ecologically and Biologically Significant Area (EBSA). However, the AOIs avoid all EBSAs. For oil and gas exploration activities, although vessels are permitted to sail through these areas, no invasive exploration activities are permitted in any proclaimed MPA. Under the currently issued exploration permit, no invasive exploration activities such as the proposed exploration drilling will take place in any proclaimed MPAs.

The AOIs do, however, overlap with some Critical Biodiversity Areas (CBA), and as such, the option of avoiding these CBAs within the AOI was assessed as a layout alternative during the EIA Phase (Figure 2). No other environmental sensitivities which require further avoidance were identified in the proposed AOI. Additionally, based on the initial pre-drilling surveys and Remote Operated Vehicle surveys, further avoidance of sensitive features will be undertaken.

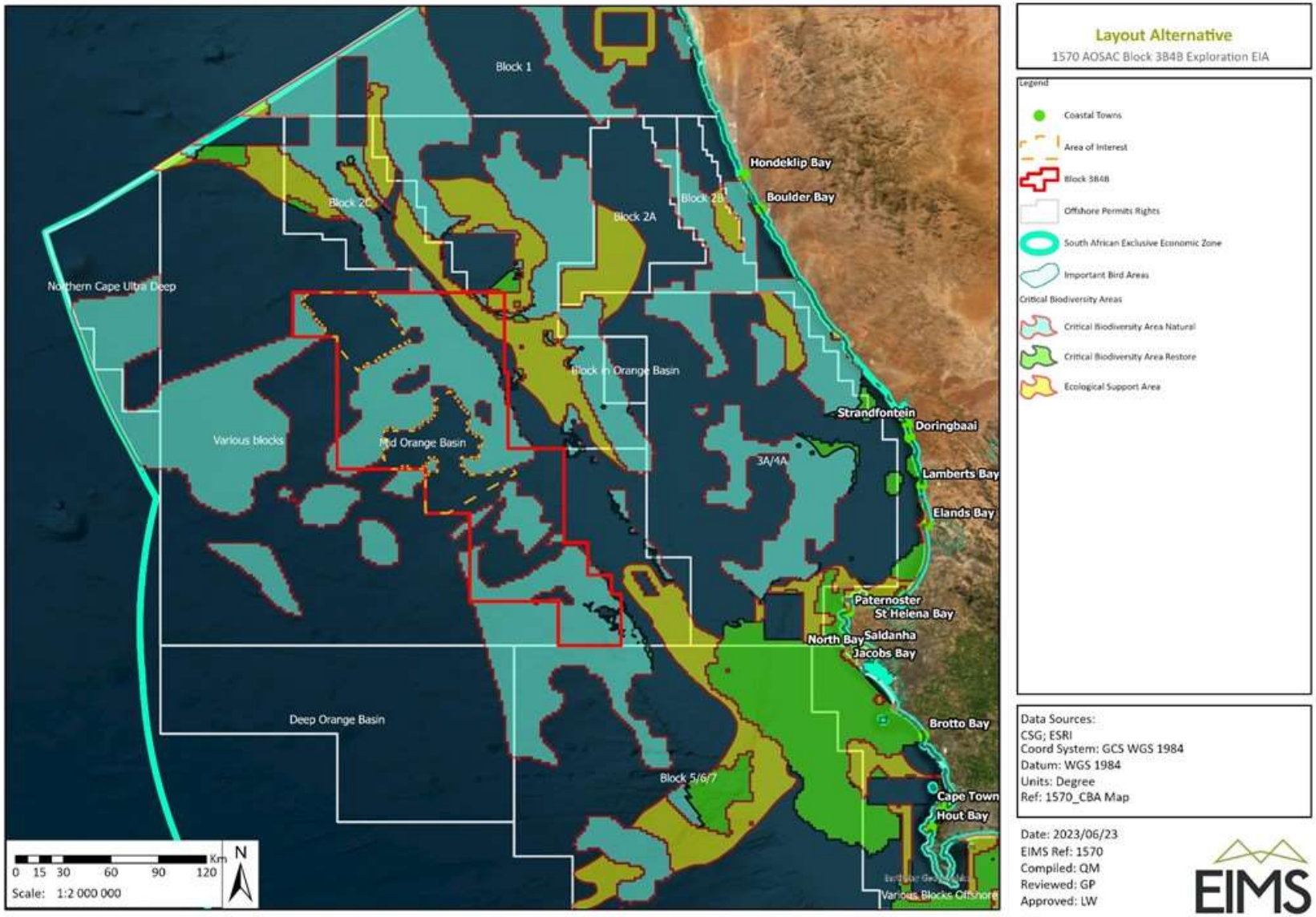



Figure 2: Locality/ sensitivity map showing the preferred site.

## 5.3 PRIOR ADMINISTRATIVE DECISIONS

On 28 November 2018, the Minister granted an environmental authorisation to Ricocure. Ricocure applied for and was granted an environmental authorisation on the basis of its final scoping because the proposed work programme commitments were of a non-invasive nature in that it entailed only desktop studies. Accordingly, the results of the final scoping report were that there were no environmental or social impacts associated with the proposed desktop studies and therefore an environmental impact assessment and an environmental management programme was not required. The Minister granted the environmental authorisation accordingly on 28 November and on 4 December 2018 all registered I&APs were notified of this decision as is required under regulation 4(2) of the Environmental Impact Assessment Regulations and on 27 March 2019 the Minister granted exploration right referenced 12/3/339 to Ricocure.

On 23 September 2022 the Director-General of the DMRE granted a renewal of the exploration right. As part of the renewal application the Applicants requested a deferment of the 20% area relinquishment obligation until such time as the Marine Protected Areas within Block 3B/4B has been finalised at which stage an appropriate relinquishment so as exclude such areas would be made. The application for deferment of the relinquishment obligation was granted by the Director-General of the DMRE on 23 September 2022 as part of granting of the renewal of the exploration right.

## 5.4 DESCRIPTION OF ACTIVITIES TO BE UNDERTAKEN

Hydrocarbon deposits occur in reservoirs in sedimentary rock layers. Being lighter than water they accumulate in traps where the sedimentary layers are arched or tilted by folding or faulting of the geological layers. Exploration drilling activities are one of the primary geophysical methods for locating such deposits. The below activities are expected to be undertaken as part of the proposed exploration for oil and gas. It should be noted that the project described in this report, relates to exploration activities only. No production activities have been assessed as part of this Scoping and EIA Process – any production related activities would be subject to a separate production right application, including a new Scoping and EIA Process.

### 5.4.1 PRE-DRILLING SURVEYS

Pre-drilling surveys may be undertaken prior to drilling in order to confirm baseline conditions at the drill site and to identify and delineate any seabed and sub-seabed geo-hazards that may impact the proposed exploration drilling operations. Pre-drilling surveys may involve a combination of sonar surveys, sediment sampling, water sampling and ROV activities.

#### 5.4.1.1 SONAR SURVEYS

Pre-drilling sonar surveys may involve multi- and single beam echo sounding and sub-bottom profiling. These surveys would not be limited to a specific time of the year but would be of short duration (around 10 days per survey) and focused on selected areas of interest within the block. The interpretation of the survey would take up to four weeks to complete.

#### 5.4.1.2 ECHO SOUNDERS

The majority of hydrographic depth/echo sounders are dual frequency, transmitting a low frequency pulse at the same time as a high frequency pulse. Dual frequency depth/echo sounding has the ability to identify a vegetation layer or a layer of soft mud on top of a layer of rock. It is proposed to utilise a single beam echo-sounder with a frequency range of 38 to 200 kHz. In addition, it is proposed to also utilise multibeam echo sounders (70 - 100 kHz range and 200 dB re 1µPa at 1m source level) that are capable of receiving many return “pings”. This system produces a digital terrain model of the seafloor.

#### 5.4.1.3 SUB-BOTTOM PROFILERS

Sub-bottom profilers are powerful low frequency echo-sounders that provide a profile of the upper layers of the ocean floor. Bottom profilers emit an acoustic pulse at frequencies ranging between 2 and 16 kHz, typically producing sound levels in the order of 200-230 dB re 1µPa at 1m.

#### 5.4.1.4 SEABED SEDIMENT CORING

Seabed sediment sampling may involve the collection of sediment samples in order to characterise the seafloor and for laboratory geochemical analyses in order to determine if there is any naturally occurring hydrocarbon seepage at the seabed or any other type of contamination prior to the commencement of drilling.

No specific target area has as yet been identified for the sediment sampling. It is currently anticipated that up to 20 samples could be taken across the entire area of interest (AOI) potentially removing a cumulative volume of ~ 35 $m^3$. The sediment sampling process would take between three to five weeks to complete, depending on weather conditions.

Piston and box coring (or grab samples) techniques may be used to collect the seabed sediment samples. These techniques are further described below.

#### 5.4.1.5 PISTON CORING

Piston coring (or drop coring) is one of the more common methods used to collect seabed geochemical samples. The piston coring rig is comprised of a trigger assembly, the coring weight assembly, core barrels, tip assembly and piston. The core barrels are 6 - 9 m in lengths with a diameter of 10 cm.

The recovered cores are visually examined at the surface for indications of hydrocarbons (gas hydrate, gas parting or oil staining) and sub-samples retained for further geochemical analysis in an onshore laboratory.

#### 5.4.1.6 BOX CORING

Box corers are lowered vertically to the seabed from a survey vessel by. At the seabed the instrument is triggered to collect a sample of seabed sediment. The recovered sample is completely enclosed thereby reducing the loss of finer materials during recovery. On recovery, the sample can be processed directly through the large access doors or via complete removal of the box and its associated cutting blade. The Applicant is proposing to take box core samples (50 cm x 50 cm) at a depth of less than 60 cm.

### 5.4.2 WELL LOCATION AND DRILLING PROGRAMME

The Applicant is proposing to drill 1 exploration well, with the option to drill up to four additional wells within an AOI within Block 3B/4B. The expected target drilling depth is not confirmed yet and a notional well depth of 3 750 m below sea floor (Water depth range 500 -1700m) is assumed at this stage. It is expected that it would take approximately three to four months to complete the physical drilling and testing of each well (excluding mobilisation and demobilisation). The applicant's strategy for future drilling is that drilling could be undertaken throughout the year (i.e. not limited to a specific seasonal window period).

The schedule for drilling the wells is not confirmed yet; however, the earliest anticipated date for commencement of drilling is third quarter of 2024 (Q3 2024) and is expected to take approximately 90 days per well.

### 5.4.3 MAIN PROJECT COMPONENTS

#### 5.4.3.1 DRILLING UNIT OPTIONS

Various types of drilling technology can be used to drill an exploration well (e.g. barges, jack-up rigs, semi-submersible drilling units (rigs) and drill-ships) depending on, inter alia, the water depth and marine operating conditions experienced at the well site. Based on the anticipated sea conditions, the Applicant is proposing to utilise a semi-submersible drilling unit or a drill-ship, both of which utilise dynamic positioning systems suitable for the harsh deep-water marine environment in the AOI. The final rig selection will be made depending upon availability and final design specifications.

A semi-submersible drilling unit (Figure 3, right) is essentially a drilling rig located on a floating structure of pontoons. When at the well location, the pontoons are partially flooded (or ballasted), with seawater, to submerge the pontoons to a pre-determined depth below the sea level where wave motion is minimised. This gives stability to the drilling vessel thereby facilitating drilling operations.

A drill-ship (Figure 3, left) is a fit for purpose built drilling vessel designed to operate in deep water conditions. The drilling "rig" is normally located towards the centre of the ship with support operations from both sides of the ship using fixed cranes. The advantages of a drill-ship over the majority of semi-submersible units are that a drill-ship has much greater storage capacity and is independently mobile, not requiring any towing and reduced requirement of support vessels.


Figure 3: Examples of drilling equipment.

#### 5.4.3.2 SUPPORT VESSELS

The drilling unit would be supported / serviced by up to three support vessels, which would facilitate equipment, material and waste transfer between the drilling unit and onshore logistics base. A support vessel will always be on standby near the drilling unit to provide support for firefighting, oil containment / recovery, rescue in the unlikely event of an emergency and support any additional equipment that may be required. Support vessels can also be used for medical evacuations or transfer of crew if needed.

#### 5.4.3.3 HELICOPTERS

Transportation of personnel to and from the drilling unit would be provided by helicopter from Springbok Airport (fixed wing trip from Cape Town) using local providers. It is estimated that there may be up to four return flights per week between the drilling unit and the helicopter support base at Springbok (i.e. 17 weeks (˜120 days) x 4 = 68 trips per well). The helicopters can also be used for medical evacuations from the drilling unit to shore (at day- or night-time), if required, in which case the flights are likely to be directly to Cape Town.

#### 5.4.3.4 ONSHORE LOGISTICS BASE

The primary onshore logistics base will most likely be located at the Port of Cape Town (preferred option), but alternatively at the Port of Saldanha. The shore base would provide for the storage of materials and equipment that would be shipped to the drilling unit and back to storage for onward international freight forwarding. The shore base would also be used for offices, waste management services, bunkering vessels, and stevedoring / customs clearance services.

### 5.4.4 MOBILISATION PHASE

The mobilisation phase will entail the required notifications, establishment of the onshore base, appointment of local service providers, procurement and transportation of equipment and materials from various ports and airports, accommodation arrangements and transit of the drilling unit and support vessels to the drilling area. The drilling unit and support vessels could sail directly to the well site from outside South African waters or from a South African port, depending on which drilling unit is selected, and where it was last used.

Core specialist and skilled personnel would arrive in South Africa onboard the drilling unit and the rest of the personnel will be flown to Cape Town. Drilling materials, such as casings, mud components and other equipment and materials will be brought into the country on the drilling unit itself or imported via a container vessel directly to the onshore logistics base from where the support vessels will transfer it to the drilling unit. Cement and chemicals will be sourced locally, where available.

## 5.4.5 OPERATION PHASE

### 5.4.5.1 FINAL SITE SELECTION AND SEABED SURVEY

The selection of the specific well locations will be based on a number of factors, including further detailed analysis of the seismic and pre-drilling survey data and the geological target. A Remote Operating Vehicle (ROV) will be used to finalise the well position based on inter alia the presence of any seafloor obstacles or the presence of any sensitive features that may become evident.

### 5.4.5.2 WELL DRILLING OPERATION

The well will be created by drilling a hole into the seafloor with a drill bit attached to a rotating drill string, which crushes the rock into small particles, called “cuttings”. After the hole is drilled, casings (sections of steel pipe), each slightly smaller in diameter, are placed in the hole and permanently cemented in place (cementing operations are described below). The hole diameter decreases with increasing depth.

The casings provide structural integrity to the newly drilled wellbore, in addition to isolating potentially dangerous high-pressure zones from each other and from the surface. With these zones safely isolated, and the formation protected by the casing, the well will be drilled deeper with a smaller drill bit, and also cased with a smaller sized casing. For the current project, it is anticipated that there will be five sets of consecutively smaller hole sizes drilled inside one another, each cemented with casing, except the last phase that will remain an open hole.

Drilling is undertaken in two stages, namely the riserless and risered drilling stages (Figure 4). A typical well design is summarised in Table 4. The final well design depends upon factors such as planned depths, expected pore pressures and anticipated hydrocarbon-bearing formations. Several types of drilling fluids with different compositions and densities would be used for drilling operations. The composition of the muds is provided in Table 4. This may vary slightly depending on the contractor’s selection and may be modified to suit operational needs.

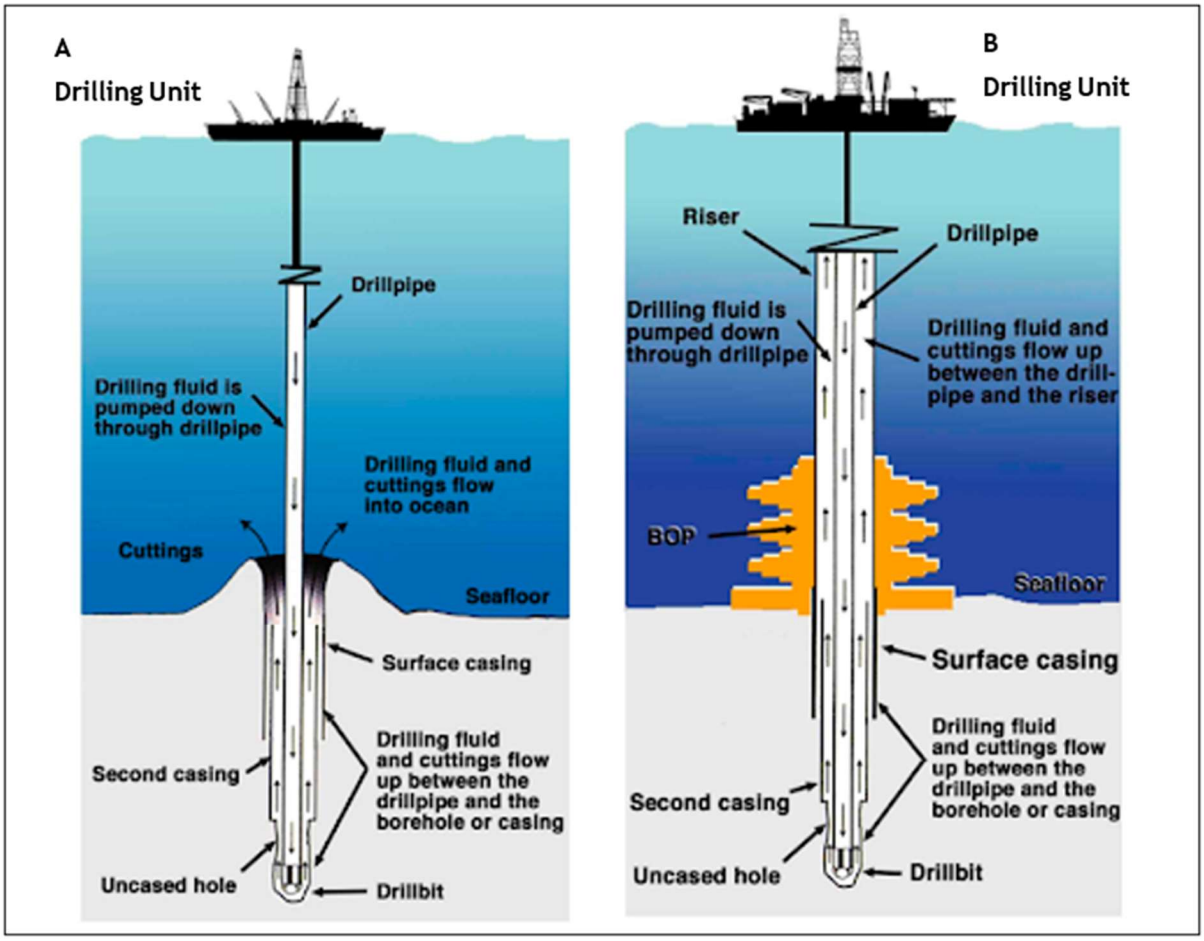



Figure 4: Drilling stages: (a) Riserless Drilling Stage; and (b) Risered Drilling Stage

Table 4: Cuttings and mud volumes per phase for notional base case well design and estimated drilling discharges.

| Drill Section | Hole diameter (inches) | Depth of section (m) | Type of drilling fluid used | Mass of drilling fluid discharged (tonnes) | Volume of cuttings released ($m^3$) | Drilling fluid and cuttings discharge location |
|---|---|---|---|---|---|---|
| **Riserless drilling stage** | | | | | | |
| 1 | 36” | 100 | Seawater, viscous sweeps & WBM | 338 | 160 | At sea bottom |
| 2 | 26” | 775 | | 541 | 879 | |
| - | Suspension / Displacement before drilling Section 3 | - | High Viscous Gel sweeps / KCl Polymer PAD mud | 1 047 | - | 1 m above seabed |
| **Total Riserless** | | 875 | | 1 926 | 1 039 | |
| **Risered drilling stage** | | | | | | |
| 3 | 17.5” | 800 | NADF | 57 | 411 | |

| Drill Section | Hole diameter (inches) | Depth of section (m) | Type of drilling fluid used | Mass of drilling fluid discharged (tonnes) | Volume of cuttings released ($m^3$) | Drilling fluid and cuttings discharge location |
|---|---|---|---|---|---|---|
| 4 | 12.25” | 1 325 | | 46 | 334 | 10 m below mean sea level |
| 5 | 8.5” | 750 | | 13 | 92 | |
| **Total Risered** | | **2 875** | | **116** | **837** | |
| **Total** | | **3 750** | | **2 042** | **1 826** | - |
| Note: * Total quantity of mud discharged including Oil On Cuttings (OOC) @ 6% by weight of cuttings (metricT) + Other constituents. | | | | | | |

5.4.5.2.1 INITIAL (RISERLESS) DRILLING STAGE

The process of preparing the first section of a well is referred to as “spudding”. Sediments just below the seafloor are often very soft and loose, thus, to keep the well from caving in and to carry the weight of the wellhead, a 30- or 36-inch diameter structural conductor pipe is drilled and cemented into place or in some cases jetted.

For the proposed wells, the drill and cement option is preferred. It is usually implemented where the nature of the seafloor sediments (hard sediments) necessitate drilling. A hole of diameter 36 inches will be drilled, and the conductor pipe will be run into the hole and cemented into place. The cement returns exit the bottom of the conductor and travel up the annular space between the conductor and the hole with some cement being deposited on the seabed around the conductor pipe.

When the conductor pipe and low-pressure wellhead are at the correct depth (depending upon substrate strength), a new drilling assembly will be run inside the structural conductor pipe and the next hole section will be drilled by rotating the drill string and drill bit.

Below the conductor pipe, a hole of approximately 26 inches in diameter will be drilled. The rotating drill string causes the drill bit to crush rock into small particles, called “cuttings”. While the wellbore is being drilled, drilling fluid is pumped from the surface down through the inside of the drill pipe, the drilling fluid passes through holes in the drill bit and travels back to the seafloor through the space between the drill string and the walls of the hole, thereby removing the cuttings from the hole. At a planned depth the drilling is stopped, and the bit and drill string is pulled out of the hole. A surface casing of 20 inch diameter is then placed into the hole and secured into place by pumping cement through the casing at the bottom of the hole and back up the annulus (the space between the casing and the borehole). The 20-inch casing will have a high-pressure wellhead on top; which provides the entry point to the subsurface and it is the connection point to the Blow-out Preventor (BOP).

These initial hole sections will be drilled using seawater (with viscous sweeps) and water-based mud (WBM). All cuttings and WBM from this initial drilling stage will be discharged directly onto the seafloor adjacent to the wellbore.

5.4.5.2.2 RISERED DRILLING STAGE

The risered drilling stage commences with the lowering of a BOP and installing it on the wellhead. The BOP is designed to seal the well and prevent any uncontrolled release of fluids from the well (a ‘blow-out’). A lower marine riser package is installed on top of the BOP and the entire unit is lowered on riser joints. The riser isolates the drilling fluid and cuttings from the external environment, thereby creating a “closed loop system”.

Drilling is continued by lowering the drill string through the riser, BOP and casing, and rotating the drill string. During the risered drilling stage, should the WBMs not be able to provide the necessary characteristics, a low toxicity Non-aqueous Drilling Fluid (NADF) will be used. Considering that the wells are planned to be drilled to a total depth of 3500-3750 m below the mud line, temperatures at the bottom of the well (BHST) are in the range of 140+C, with high Pore Pressures for downhole conditions, it is likely that only WBM’s would not be suitable.

The drilling fluid emerges through nozzles in the drill bit and then rises (carrying the rock cuttings with it) up the annular space between the sides of the hole to the drilling unit.

The cuttings are removed from the returned drill mud, sampled for analysis and the balance of the cuttings are discharged overboard. The rock cuttings are analysed and logged in terms of their depth and rock description, which forms the basis of building a stratigraphic record of the types of rocks penetrated. This information is used to build a stratigraphic column. Any fossils present in the rocks can be used to help establish a geologic age for the stratigraphic layers that are drilled. In instances where NADFs are used, cuttings will be treated to reduce oil content and discharged overboard. Operational discharges are discussed further in Section 5.4.7.

The hole diameter decreases in steps with depth as progressively smaller diameter casings are inserted into the hole at various stages and cemented into place. The expected target drilling depth is not yet confirmed but the notional well depth is approximately 3 750 m below the seafloor with a final hole diameter between of 8.5 and 12.25 inches and a casing diameter of between 7 and 9.6 inches.

#### 5.4.5.2.3 CEMENTING OPERATION

Cementing is the process of pumping cement slurry through the drill pipe and / or cement stinger at the bottom of the hole and back up into the space between the casing and the borehole wall (annulus). Cement fills the annulus between the casing and the drilled hole to form an extremely strong, nearly impermeable seal, thereby permanently securing the casings in place. To separate the cement from the drilling fluid in order to minimise cement contamination a cementing plug and/or spacer fluids are used. The plug is pushed by the drilling fluid to ensure the cement is placed outside the casing filling the annular space between the casing and the hole wall.

Cementing has four general purposes:

(i) it isolates formations and segregates the casing seat for subsequent drilling;

(ii) it protects the casing from corrosion;

(iii) it provides structural support for the casing; and

(iv) it stabilises the formation.

To ensure effective cementing, an excess of cement is often used. Until the marine riser is set, excess cement from the first two casings emerges out of the top of the well onto the seafloor. This cement does not set and is slowly dissolved into the seawater.

Offshore drilling operations typically use Portland cements, defined as pulverised clinkers consisting of hydrated calcium silicates and usually containing one or more forms of calcium sulphate. The raw materials used are lime, silica, alumina and ferric oxide. The cement slurry used is specially designed for the exact well conditions encountered.

Additives can be used to adjust various properties in order to achieve the desired results. There are over 150 cementing additives available. The volumes of these additives generally make up only a small portion (<10%) of the overall amount of cement used for a typical well. Usually, there are three main additives used: retarders, fluid loss control agents and friction reducers. These additives are polymers generally made of organic material and are considered non-toxic.

Once the cement has set, a short section of new hole is drilled, then a pressure test is performed to ensure that the cement and formation are able to withstand the higher pressures of fluids from deeper formations.

### 5.4.5.3 WELL LOGGING AND TESTING

Once the target depth is reached, the well would be logged and could be tested dependent on the drilling results. Well logging involves the evaluation of the physical and chemical properties of the sub-surface rocks, and their component minerals, including water, oil and gas to confirm the presence of hydrocarbons and the petrophysical characteristics of rocks. It is undertaken during the drilling operation using Wireline Logging or Logging While Drilling (LWD) to log core data from the well. Information from engineering and production logs, as well as mud logging, may also be used.

Vertical Seismic Profiling (VSP) is an evaluation tool used to generate a high-resolution seismic image of the geology in the well's immediate vicinity. The VSP images are used for correlation with surface seismic images and for forward planning of the drill bit during drilling. VSP uses a small airgun array with a gun pressure of 450 per square inch (psi), which is operated from the drilling unit at a depth of between 7 m and 10 m. During VSP operations, four to five receivers are positioned in a section of the borehole and the airgun array is discharged approximately five times at 20 second intervals at each station. The generated sound pulses are reflected through the seabed and are recorded by the receivers to generate a profile along a 60 to 75 m section of the well. This process is repeated for different stations in the well and may take up to six hours to complete approximately 125 shots, depending on the well's depth and number of stations being profiled.

Well or flow testing is undertaken to determine the economic potential of the discovery before the well is either abandoned or suspended. One test would be undertaken per exploration well should a resource be discovered and up to two tests per appraisal well. Each test would take up to 7 days to complete (5 days of build-up and 2 days of flowing and flaring). For well flow-testing, hydrocarbons would be burned at the well site. A high-efficiency flare is used to maximise combustion of the hydrocarbons. Burner heads which have a high burning efficiency under a wide range of conditions will be used.

The volume of hydrocarbons (to be burned) and possible associated produced water from the reservoir which could be generated during well testing cannot be reliably predicted due to variations in gas composition, flow rates and water content. Burners are manufactured to ensure emissions are kept to a minimum. The estimated volume of hydrocarbons to be burned cannot be predicted with much accuracy because the actual test requirements can only be established after the penetration of a hydrocarbon-bearing reservoir. However, an estimated 10 000 bbl oil could be flared per test, i.e. up to 20 000 bbl over the two tests associated with an appraisal well. If produced water is generated during well testing, it will be separated from the hydrocarbons.

#### 5.4.5.4 WELL SEALING AND PLUGGING

The purpose of well sealing and plugging is to isolate permeable and hydrocarbon bearing formations once drilling activities have been completed. Well sealing and plugging aims to restore the integrity of the formation that was penetrated by the wellbore. The principal technique applied to prevent cross flow between permeable formations is plugging of the well with cement, thus creating an impermeable barrier between two zones.

Once drilling and logging have been completed, the exploration wells will be sealed with cement plugs, tested for integrity and abandoned according to international best practices. Cement plugs will be set to isolate hydrocarbon bearing and / or permeable zones and cementing of perforated intervals (e.g. from well logging activities) will be evaluated where there is the possibility of undesirable cross flow. These cement plugs are set in stages from the bottom up. Up to three cement plugs would be installed: e.g. one each for isolation of the deep reservoir and the main reservoir; and a third as a second barrier for the main reservoir.

The integrity of cement plugs can be tested by a number of methods. The cement plugs will be tag tested (to validate plug position) and weight tested, and if achievable then a positive pressure test (to validate seal) and/or a negative pressure test will be performed. Additionally, a flow check may be performed to ensure sealing by the plug. Once the well is plugged, seawater will be displaced before disconnecting the riser and the BOP.

### 5.4.6 DEMOBILISATION PHASE

After wells have been plugged and tested, they may be abandoned with wellhead left in place on the seabed in line with industry practices worldwide. Where appropriate, 'over trawlable' protective equipment is applied to abandoned wellheads. The risk assessment criteria will consider factors such as the water depth and use of the area by other sectors (e.g., fishing). It is worth noting that irrespective of whether the wellhead and over trawlable protective equipment is retained the well bore itself will be plugged.

The operator may place monitoring equipment on wellheads for monitoring well properties and data collection to be used for future development scheme design and input.

With the exception of the over trawlable protective equipment (if required) over abandoned wellheads and drilling discharges deposited on the seabed, no further physical remnants of the drilling operation will be left on the seafloor. A final clearance survey check will be undertaken using an ROV. The drilling unit and support vessels

will demobilise from the offshore licence area and either mobilise to the following drilling location or relocate into port or a regional base for maintenance, repair or resupply.

### 5.4.7 DISCHARGES, WASTES AND EMISSIONS

The proposed drilling operations (including mobilisation and demobilisation) will result in various discharges to water, the generation of waste and emissions. All vessels will have equipment, systems and protocols in place for prevention of pollution by oil, sewage and garbage in accordance with International Convention for the Prevention of Pollution from Ships, 1973/1978 (MARPOL) requirements. Any oil spill related discharges would be managed by an Oil Spill Contingency Plan (OSCP). Onshore licenced waste disposal sites and waste management facilities will be identified, verified and approved prior to commencement of drilling operations.

#### 5.4.7.1 DRILLING CUTTINGS AND MUD

Drill cuttings, which range in size from clay to coarse gravel and reflect the types of sedimentary rocks penetrated by the drill bit, are the primary discharge during well drilling. Drilling discharges would be disposed at sea in line with accepted drilling practices as defined by the UK and Norway. This is in line with most countries (including South Africa) for early exploration development phases. The rationale for this is based on the low density of drilling operations in the vast offshore area and the high energy marine environment. As such, it is proposed to use the “offshore treatment and disposal” option for the drilling campaign. The same method was applied and approved for drilling other deep water exploration wells in Block 11B/12B (namely Brulpadda and Luiperd wells) off the South Coast of South Africa.

During the riserless drilling stage, all cuttings will be discharged directly onto the seafloor adjacent to the wellbore. Where NADFs are used (during the risered drilling stage, if WBMs are not able to provide the necessary characteristics), these are sometimes treated onshore and disposed, treated to recover oil and disposed offshore and sometimes re-injected into wells. For the current project, in instances where NADFs are used, cuttings will be treated offshore to reduce oil content to <6% Oil on Cutting (OOC) and discharged overboard. During this drilling stage the circulated drilling fluid will be cleaned and the cuttings discharged into the sea at least 10 m below sea level. The drill cuttings will be treated to reduce their mud content using shakers and a centrifuge. The assumed types and mass/volumes of discharges are detailed in Table 4.

Cuttings released from the drilling unit during the risered drilling stage will be dispersed by the current and settle to the seafloor. The rate of cuttings discharge decreases with increasing well depth as the hole diameter becomes smaller and penetration rates decrease. Discharge is intermittent as actual drilling operations are not continuous while the drilling unit is on location. Discharge is 10 m below sea level and cuttings then settle on the seabed below.

Further drilling fluid will be released 1 m above the seafloor during well suspension and displacement (between drilling section 2 and 3), as detailed in Table 4. The expected fall and spatial extent of the deposition of discharged cuttings have been investigated in the Drilling Discharges Modelling Study (Livas 2023a), the results of which will inform the Marine Ecology and Fisheries Assessments.

#### 5.4.7.2 CEMENT AND CEMENT ADDITIVES

Typically, cement and cement additives are not discharged during drilling. However, during the initial cementing operation (i.e. surface casing), excess cement emerges out of the top of the well and onto the seafloor in order to ensure that the conductor pipe is cemented all the way to the seafloor. During this operation a maximum of 150% of the required cement volume may be pumped into the space between the casing and the borehole wall (annulus). In the worst-case scenario, approximately 50 $m^3$ of cement could be discharged onto the seafloor (monitored by ROV).

#### 5.4.7.3 BOP HYDRAULIC FLUID

As part of routine opening and closing operations the subsea BOP stack elements will vent some hydraulic fluid into the sea at the seafloor. It is anticipated that between approximately 500 and 1 000 litres of oil-based hydraulic emulsion fluid could be vented per month during the drilling of a well. BOP fluids are completely biodegraded in seawater within 28 days.

#### 5.4.7.4 PRODUCED WATER

If water from the reservoir arises during well flow testing, these would be separated from the oily components and treated onboard to reduce the remaining hydrocarbons from these produced waters. The hydrocarbon component will be burned off via the flare booms, while the water is temporarily collected in a slop tank. The water is then either directed to:

- a settling tank prior to transfer to support vessel for onshore treatment and disposal; or
- a dedicated treatment unit on the rig where, after treatment, it is either:
    - discharged overboard if hydrocarbon content is < 30 mg/l; or
    - subject to a second treatment or directed to tank prior to transfer to support vessel for onshore treatment and disposal if hydrocarbon content is > 30 mg/l.

#### 5.4.7.5 VESSEL MACHINERY SPACES (BILGE WATER)

Vessels will occasionally discharge treated bilge water. Bilge water is drainage water that collects in a ship's bilge space (the bilge is the lowest compartment on a ship, below the waterline, where the two sides meet at the keel). In accordance with MARPOL Annex I, bilge water will be retained on board until it can be discharged to an approved reception facility, unless it is treated by an approved oily water separator to <15 ppm oil content and monitored before discharge. The residue from the onboard oil/water separator will be treated / disposed of onshore at a licenced hazardous landfill site.

#### 5.4.7.6 DECK DRAINAGE

Deck drainage consists of liquid waste resulting from rainfall, deck and equipment washing (using water and a water-based detergent). Deck drainage will be variable depending on the vessel characteristics, deck activities and rainfall amounts.

In areas of the drilling unit where oil contamination of rainwater is more likely (i.e. the rig floor), drainage is routed to an oil / water separator for treatment before discharge in accordance with MARPOL Annex I (i.e. 15 ppm oil and grease maximum). There will be no discharge of free oil that could cause either a film, sheen or discolouration of the surface water or a sludge or emulsion to be deposited below the water's surface. Only non-oily water (i.e. <15 ppm oil and grease, maximum instantaneous oil discharge monitor reading) will be discharged overboard. If separation facilities are not available (due to overload or maintenance) the drainage water will be retained on board until it can be discharged to an approved reception facility. The oily residue from the onboard oil / water separator will be treated / disposed of onshore at an approved hazardous landfill site.

#### 5.4.7.7 BRINE GENERATED FROM ONBOARD DESALINATION PLANT

The waste stream from the desalination plant is brine (concentrated salt), which is produced in the reverse osmosis process. The brine stream contains high concentration of salts and other concentrated impurities that may be found in seawater. Water chemical agents will not be used in the treatment of seawater and therefore the brine reject portion would be in a natural concentrated state. Based on previous well drilling operations, freshwater production amounts to approximately 40 $m^3$/day, which will result in approximately 35 g salt for each litre water produced (i.e. approx. 1 400 kg salt/brine per day).

#### 5.4.7.8 SEWAGE AND GREY WATER

Discharges of sewage (or black water) and grey water (i.e. wastewater from the kitchen, washing and laundry activities and non-oily water used for cleaning) will occur from vessels intermittently throughout the project and will vary according to the number of persons on board, estimated at an average of 200 litres per person. All sewage discharges will comply with MARPOL Annex IV.

Sewage and grey water will be treated using a marine sanitation device to produce an effluent with:

- 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; and

- No visible floating solids or oil and grease.

#### 5.4.7.9 FOOD (GALLEY) WASTES

The disposal into the sea of food waste is permitted, in terms of MARPOL Annex V, when it has been comminuted or ground to particle sizes smaller than 25 mm and the vessel is *en route* more than 3 nautical miles (approximately 5.5 km) from land. Disposal overboard without macerating is permitted for moving vessels greater than 12 nautical miles (approximately 22 km) from the coast. On the drilling unit, all food waste will be macerated to particles sizes <25 mm and the daily discharge is typically about seven tonnes per month.

#### 5.4.7.10 BALLAST WATER

Ballast water is used during routine operations to maintain safe operating conditions onboard a ship by reducing stress on the hull, providing stability, improving propulsion and manoeuvrability, and compensating for weight lost due to fuel and water consumption.

Ballast water is discharged subject to the requirements of the 2004 International Convention for the Control and Management of Ships' Ballast Water and Sediments. The Convention stipulates that all ships are required to implement a Ballast Water Management Plan and that all ships using ballast water exchange will do so at least 200 nautical miles (nm) (± 370 km) from nearest land in waters of at least 200 m deep when arriving from a different marine region. Where this is not feasible, the exchange should be as far from the nearest land as possible, and in all cases a minimum of 50 nm (±93 km) from the nearest land and preferably in water at least 200 m in depth. Project vessels will be required to comply with this requirement.

#### 5.4.7.11 DETERGENTS

Detergents used for washing exposed marine deck spaces will be discharged overboard. Water-based detergents are low in toxicity and are preferred for use. Preferentially biodegradable detergents should be used. Detergents used on work deck space will be collected with the deck drainage and treated as described under deck drainage above.

#### 5.4.7.12 NOISE EMISSIONS

The key sources generating underwater noise are vessel propellers (and positioning thrusters), with a contribution from the pontoons (e.g. noise originating from within the pontoons and on-deck machinery), support vessels and from drilling activities. This is expected to result in highly variable sound levels, being dependent on the operational mode of each vessel. The pre-drilling sonar surveys and VSP survey would generate a short-term noise, sonar acquisition takes 1.5 to 3 days to acquire with short bursts of the sound source and the VSP onboard between 4 to 6 hours dependent on the programme to complete, respectively.

The main sources of noise from these activities are categorised below.

- Pre-drilling sonar surveys may involve multi- and single beam echo sounding and sub-bottom profiling. These surveys would be undertaken between the 700 m and 1900 m depth ranges covering a survey area of approximately 150 $km^2$. Each wellsite survey would take up to 10 days to complete. A single beam echo-sounder operates within a frequency range of 38 to 200 kHz, whereas multibeam echo sounders operate in the 70 - 100 kHz range and have a 200dB re 1µPa at 1m source level. Sub-bottom profilers emit an acoustic pulse at frequencies ranging between 2 and 16 kHz, typically producing sound levels in the order of 200-230 dB re 1µPa at 1m.
- Drilling noise: Drilling units generally produce underwater noise in the range of 10 Hz to 100 kHz (OSPAR commission, 2009) with major frequency components below 100 Hz and average source levels of up to 190 dB re 1 µPa at 1 m (rms) (the higher end of this range from use of bow thrusters). These noise levels will be assumed as indicative for the current project.
- Propeller and positioning thrusters: Noise from propellers and thrusters is predominately caused by cavitation around the blades whilst transiting at speed or operating thrusters under load in order to maintain a vessel's position. The noise produced by a drilling unit's dynamic positioning systems can be

audible for many kilometres. Noise produced is typically broadband noise, with some low tonal peaks. The support vessels will also contribute to an overall propeller noise generation.

- Machinery noise: Machinery noise is often of low frequency and can become dominant for vessels when stationary or moving at low speeds. The source of this type of noise is from large machinery, such as large power generation units (diesel engines or gas turbines), compressors and fluid pumps. Sound is transmitted through different paths, i.e. structural (machine to hull/pontoons to water) and airborne (machine to air to hull to water) or a mixture of both. The nature of sound is dependent on a number of variables, such as the type and size of machinery operating; and the coupling between machinery and the vessel body. Machinery noise is typically tonal in nature. A ROV will be used to conduct a sweep of the drilling site to identify any debris; however, this is not expected to form a significant noise source.
- Well logging noise: If relevant, VSP will be undertaken in order to generate a high-resolution image of the geology in the well's immediate vicinity. It is expected to use a small dual airgun array, comprising a system of three 150 cubic inch airguns and three 150 cubic inch airguns with a total volume of 450 cubic inches of compressed nitrogen at about 2 000 psi. VSP source will generate a pulse noise level in the 5 to 1 000 Hz range. The volumes and the energy released into the marine environment are significantly smaller than what is required or generated during conventional seismic surveys. The airguns will be discharged approximately five times at 20 second intervals. This process is repeated, as required, for different sections of the well for a total of approximately 150 shots. A VSP is expected to take up to six hours per well to complete, depending on the well's depth and number of stations being profiled.
- Well testing noise: Flaring would produce some air-borne noise above the sea level where flaring is implemented for up to two days of flowing and flaring.
- Equipment in water: Noise is produced from equipment such as the drill string. The noise produced will be low relative to the drilling noise and the dynamic positioning system.
- Helicopter noise: Helicopters will also form a source of noise, which can affect marine fauna both in terms of underwater noise beneath the helicopter and airborne noise.

The extent of project-related noise above the background noise level may vary considerably depending on the specific vessels used and the number of support vessels operating. It will also depend on the variation in the background noise level with weather and with the proximity of other vessel traffic (not associated with the project).

An Underwater Noise Modelling Study has been undertaken to determine the underwater noise transmission loss with distance from well site and compare results with threshold values for marine fauna to determine zones of impact. These modelling results will be used in the assessment of impacts on marine fauna.

#### 5.4.7.13 LIGHT EMISSIONS

Operational lighting will be required on the drilling unit and support vessels for safe operations and navigation purposes during the hours of darkness. Where feasible, operational lights will be shielded (e.g. light cowls) in such a way as to minimise their spill out to sea.

#### 5.4.7.14 HEAT EMISSIONS

Flaring during well testing generates heat emissions from the combustion of hydrocarbons at the burner head.

## 5.5 IMPACTS IDENTIFIED

Potential impacts associated with the proposed activity at the selected site have been identified and addressed in the EMPr and are summarised in the table below:

Table 5: Potential Impacts identified in EIA Report – Planned Activities

| Discipline | Phase | Impact |
|---|---|---|
| **Marine Ecology** | Mobilisation | Routine Operational Discharges to Sea |
| **Marine Ecology** | Operation | Routine Operational Discharges to Sea |
| **Marine Ecology** | Decommissioning | Routine Operational Discharges to Sea |
| **Marine Ecology** | Mobilisation | Discharge of Ballast Water from Vessels |
| **Marine Ecology** | Operation | Noise from Helicopters |
| **Marine Ecology** | Mobilisation | Lighting from Drill Unit and Vessels |
| **Marine Ecology** | Operation | Lighting from Drill Unit and Vessels |
| **Marine Ecology** | Decommissioning | Lighting from Drill Unit and Vessels |
| **Marine Ecology** | Operation | Drilling and Placement of Infrastructure on the Seafloor |
| **Marine Ecology** | Rehab and Closure | Drilling and Placement of Infrastructure on the Seafloor |
| **Marine Ecology** | Operation | Disturbance and/or Smothering of soft-sediment benthic communities due to drilling solids discharge |
| **Marine Ecology** | Operation | Disturbance and/or Smothering of hardgrounds / deep-water reef communities due to drilling solids discharge |
| **Marine Ecology** | Operation | Biochemical Impacts of residual WBMs, NADFs and cements additives on marine organisms in unconsolidated sediments |
| **Marine Ecology** | Operation | Biochemical Impacts of residual WBMs, NADFs and cements additives on marine organisms on hard grounds |
| **Marine Ecology** | Operation | Biochemical Impacts of residual WBMs, NADFs and cements additives on marine organisms in the water column |
| **Marine Ecology** | Operation | Increased Water Turbidity and reduced Light Penetration on marine ecology |
| **Marine Ecology** | Operation | Reduced physiological functioning of marine organisms due to indirect biochemical effects in the sediments |
| **Marine Ecology** | Mobilisation | Disturbance, behavioural changes and avoidance of feeding and/or breeding areas in seabirds, seals, turtles and cetaceans due to drilling and vessel noise (continuous noise) |
| **Marine Ecology** | Operation | Disturbance, behavioural changes and avoidance of feeding and/or breeding areas in seabirds, seals, turtles and cetaceans due to drilling and vessel noise (continuous noise) |
| **Marine Ecology** | Decommissioning | Disturbance, behavioural changes and avoidance of feeding and/or breeding areas in seabirds, seals, turtles and cetaceans due to drilling and vessel noise (continuous noise) |
| **Marine Ecology** | Operation | Disturbance and behavioural changes in seabirds, seals, turtles and cetaceans due to Geophysical Surveys and Vertical Seismic Profiling (impulsive noise) |

| Discipline | Phase | Impact |
|---|---|---|
| **Marine Ecology** | Operation | Impacts of infrastructure and residual cement on marine biodiversity - Wellhead removal |
| **Marine Ecology** | Decommissioning | Impacts of infrastructure and residual cement on marine biodiversity - Wellhead removal |
| **Marine Ecology** | Operation | Impacts of infrastructure and residual cement on marine biodiversity - Wellhead Abandonment |
| **Marine Ecology** | Decommissioning | Impacts of infrastructure and residual cement on marine biodiversity - Wellhead Abandonment |
| **Marine Ecology** | Operation | Impacts of flare lighting on marine fauna |
| **Marine Ecology** | Operation | Impact on marine fauna from the discharge of treated produced water |
| **Marine Ecology** | Operation | Impact on marine fauna from hydrocarbon 'drop-out' |
| **Fisheries** | Operation | Impacts on the fishing sector catch rates (tuna pole and large pelagic longline. |
| **Fisheries** | Operation | Exclusion from Fishing Ground Due to Temporary Safety Zone around Vessels - Large Pelagic Longline |
| **Fisheries** | Operation | Discharge of Drill Cuttings |
| **Fisheries** | Mobilisation | Vessel and Drilling Noise |
| **Fisheries** | Operation | Vessel and Drilling Noise |
| **Fisheries** | Decommissioning | Vessel and Drilling Noise |
| **Fisheries** | Operation | Vertical Seismic Profiling Noise |
| **Fisheries** | Operation | Sonar Survey (MBES) Noise |
| **Maritime Heritage** | Operation | Damage to or Loss of Palaeontological Materials |
| **Maritime Heritage** | Operation | Damage to or Loss of Maritime Archaeological Sites or Material |
| **Social** | Operation | Uncertainty/Confusion related to different processes |
| **Social** | Operation | Impact on the cohesion in the community |
| **Economic** | Planning | Stimulation of economic activity (additional business sales) throughout the exploration industry's value chain for the duration of the survey operations |
| **Economic** | Planning | Impact on commercial fishing operators targeting large pelagic longline fish species because of reduced fishing grounds and potential lowered catch potential |
| **Economic** | Planning | Impact on maritime logistics operations because of disrupted shipping routes to major ports along the South African coast. Alternate routes could impact on the economic efficiency of maritime logistics |

| Discipline | Phase | Impact |
|---|---|---|
| **Economic** | Mobilisation | The establishment of the onshore logistics base will create temporary employment opportunities for skilled labour |
| **Economic** | Mobilisation | Employment opportunities created by the logistics base will provide compensation to employees that will contribute toward household livelihoods and their access to services and amenities |
| **Economic** | Mobilisation | The economic activity stimulated by the sourcing of inputs for exploration activities will increase the fiscus of government through fiscal benefits in the form of taxation (personal, business, production, product, imports, etc) |
| **Economic** | Mobilisation | The sourcing of materials, equipment and associated services will generate additional business sales throughout the exploration industry's value chain – businesses providing inputs to the exploration industry will benefit from an increase in sales and economic output |
| **Economic** | Mobilisation | Additional employment opportunities could be created throughout the exploration industry's value chain due to increased demand generated for goods and services |
| **Economic** | Mobilisation | The demand for bulk services contributes to the fiscus of the local authority or providing agent |
| **Economic** | Mobilisation | The increased demand on bulk infrastructure requires additional investment to accommodate additional demand. Additional demand is accompanied by an increased maintenance burden |
| **Economic** | Operation | The operational phase of the exploration activity will generate demand for goods and services necessary to sustain operational activities. This sustained demand over the operational period of exploration could lead to additional business sales throughout the exploration industry's value chain (increased economic output, production and gross value added) |
| **Economic** | Operation | New employment opportunities throughout the exploration industry's value chain could be stimulated as a result of the increased demand generated by the proposed exploration activity |
| **Economic** | Operation | The logistics base of the exploration activity sustains skilled employment opportunities for the duration of exploration activities |
| **Economic** | Operation | The employment opportunities created directly (i.e. through the projects logistics base) or indirectly (i.e. throughout the exploration industry's value chain) by the proposed exploration activity provides compensation to employees which in turn assists with maintaining household livelihoods (i.e. access to services and amenities) |
| **Economic** | Operation | The exploration activity through its expenditure during its operation phase stimulates economic activity throughout its value chain and as a result increases the fiscal value (i.e. taxes) collected by government |
| **Economic** | Operation | The exploration activity further contributes toward a basic sector of the economy and therefore assists with maintaining the economic functionality of the receiving economy by providing a basis from which SMME development could occur |
| **Economic** | Operation | The demand for bulk services contributes to the fiscus of the local authority or providing agent |

| Discipline | Phase | Impact |
|---|---|---|
| **Economic** | Operation | The increased demand on bulk infrastructure requires additional investment to accommodate additional demand. Additional demand is accompanied by an increased maintenance burden |
| **Economic** | Operation | The proposed exploration activity could lead to reduced fishing grounds and catch potential for the large pelagic longline fishing industry, which, in turn, may result in decreased economic productivity for the receiving economy's fishing industry. As a consequence, the demand for inputs to the fishing industry and the outputs from the industry may be impacted (limiting business sales, economic output and gross value added). The impact is viewed as a temporary impact given that exploration activities will not be a long-term sustained operation |
| **Economic** | Operation | Due to the temporary decrease of economic productivity in the receiving economy's large pelagic longline fishing industry, the demand for employment throughout the industry's value chain could be lowered, affecting the availability of employment opportunities |
| **Economic** | Operation | Due to the temporary decreased of economic productivity in the receiving economy's large pelagic longline fishing industry and the subsequent lowering of demand for employment in the industry, the compensation of employees and income of households dependent on the industry could be lowered, impacting on the capability of households to sustain livelihoods |
| **Economic** | Operation | Due to the temporary decreased of economic productivity in the receiving economy's large pelagic longline fishing industry, the fiscal value that government receives (e.g. taxation of productions, production, businesses and employees) as a result of economic activity throughout the industry's value chain could be diminished |
| **Economic** | Operation | The temporary decrease of economic productivity in the receiving economy's large pelagic longline fishing industry could temporarily diminish the demand for new business (SMME) development due to limited scope with which business sales can be stimulated |
| **Economic** | Operation | The proposed exploration activities' area of interest overlaps with established and commonly used shipping routes. This overlap may result in disruptions to shipping operations, as vessels may need to use alternative routes. Such deviations can diminish operational efficiency and subsequently reduce the economic output (limiting business sales, economic output and gross value added) within the receiving economy's transport and storage industry. The impact is viewed as a temporary impact given that exploration activities will not be a long-term sustained operation |
| **Economic** | Operation | Due to the temporary decrease of economic productivity in the receiving economy's transport and storage industry, the demand for employment throughout the industry's value chain could be lowered, affecting the availability of employment opportunities |
| **Economic** | Operation | Due to the temporary decreased of economic productivity in the receiving economy's transport and storage industry and the subsequent lowering of demand for employment in the industry, the compensation of employees and income of households dependent on the industry could be lowered, impacting on the capability of households to sustain livelihoods |

| Discipline | Phase | Impact |
|---|---|---|
| **Economic** | Operation | Due to the temporary decreased of economic productivity in the receiving economy's transport and storage industry, the fiscal value that government receives (e.g. taxation of productions, production, businesses and employees) as a result of economic activity throughout the industry's value chain could be diminished |
| **Economic** | Operation | The temporary decrease of economic productivity in the receiving economy's transport and storage industry could temporarily diminish the demand for new business (SMME) development due to limited scope with which business sales can be stimulated |
| **Air Quality** | Operation | Atmospheric Emissions (routine) |
| **Climate Change** | Operation | Climate Change (routine) |
| **No-Go** | Operation | No-Go Alternative |

Table 6: Potential Impacts identified in EIA Report – Unplanned Events

| Discipline | Phase | Impact |
|---|---|---|
| **Marine Ecology** | Mobilisation | Unplanned Collision of Vessels with Marine Fauna |
| **Marine Ecology** | Operation | Unplanned Collision of Vessels with Marine Fauna |
| **Marine Ecology** | Decommissioning | Unplanned Collision of Vessels with Marine Fauna |
| **Marine Ecology** | Mobilisation | Unplanned Loss of Equipment |
| **Marine Ecology** | Operation | Unplanned Loss of Equipment |
| **Marine Ecology** | Decommissioning | Unplanned Loss of Equipment |
| **Marine Ecology** | Mobilisation | Unplanned Oil release to the sea due to vessel collisions, bunkering accident and line / pipe rupture |
| **Marine Ecology** | Operation | Unplanned Oil release to the sea due to vessel collisions, bunkering accident and line / pipe rupture |
| **Marine Ecology** | Decommissioning | Unplanned Oil release to the sea due to vessel collisions, bunkering accident and line / pipe rupture |
| **Marine Ecology** | Operation | Unplanned Well Blow-out (condensate) |
| **Marine Ecology** | Operation | Unplanned Well Blow-out (crude oil) |
| **Fisheries** | Operation | Impact on fisheries of small scale hydrocarbon spill |
| **Fisheries** | Operation | Impact on fisheries of large-scale hydrocarbon spill (condensate) |
| **Fisheries** | Operation | Impact on fisheries of large-scale hydrocarbon spill (crude oil) |
| **Fisheries** | Operation | Loss of Equipment |
| **Cultural Heritage** | Operation | Cultural heritage impact of drilling - Normal Operations |

| Discipline | Phase | Impact |
|---|---|---|
| **Cultural Heritage** | Operation | Cultural heritage impact of drilling - Unplanned Events |
| **Social** | Operation | Impact of oils spills or unplanned events on the livelihoods of the fishers |
| **Social** | Operation | Impact of well blow out on the fishing industry (worst case scenario) |
| **Economic** | Operation | The oil spill response activity could generate demand for goods and services necessary to sustain operational activities. This sustained demand over the response period of exploration could lead to additional business sales throughout the response industry's value chain (increased economic output, production and gross value added) (condensate) |
| **Economic** | Operation | The oil spill response activity could generate demand for goods and services necessary to sustain operational activities. This sustained demand over the response period of exploration could lead to additional business sales throughout the response industry's value chain (increased economic output, production and gross value added) (crude oil) |
| **Economic** | Operation | New employment opportunities throughout the response industry's value chain could be stimulated as a result of the increased demand generated by the response activity (condensate) |
| **Economic** | Operation | New employment opportunities throughout the response industry's value chain could be stimulated as a result of the increased demand generated by the response activity (crude oil) |
| **Economic** | Operation | The employment opportunities created directly or indirectly by the response activity provides compensation to employees which in turn assists with maintaining household livelihoods (i.e., access to services and amenities) (condensate) |
| **Economic** | Operation | The employment opportunities created directly or indirectly by the response activity provides compensation to employees which in turn assists with maintaining household livelihoods (i.e., access to services and amenities) (crude oil) |
| **Economic** | Operation | A well blow-out event could lead to reduced fishing grounds and catch potential for the large pelagic longline fishing industry, which, in turn, may result in decreased economic productivity for the receiving economy's fishing industry. As a consequence, the demand for inputs to the fishing industry and the outputs from the industry may be impacted (limiting business sales, economic output and gross value added). The impact is viewed as a temporary impact given that the well blow-out event might not be a long-term sustained event (condensate) |
| **Economic** | Operation | A well blow-out event could lead to reduced fishing grounds and catch potential for the large pelagic longline fishing industry, which, in turn, may result in decreased economic productivity for the receiving economy's fishing industry. As a consequence, the demand for inputs to the fishing industry and the outputs from the industry may be impacted (limiting business sales, economic output and gross value added). The impact is viewed as a temporary impact given that the well blow-out event might not be a long-term sustained event (crude oil) |

| Discipline | Phase | Impact |
|---|---|---|
| **Economic** | Operation | The potential area that is affected by a well blow-out event overlaps with established and commonly used shipping routes. This overlap may result in disruptions to shipping operations, as vessels may need to use alternative routes. Such deviations can diminish operational efficiency and subsequently reduce the economic output (limiting business sales, economic output and gross value added) within the receiving economy's transport and storage industry. The impact is viewed as a temporary impact given that exploration activities will not be a long-term sustained operation (condensate) |
| **Economic** | Operation | The potential area that is affected by a well blow-out event overlaps with established and commonly used shipping routes. This overlap may result in disruptions to shipping operations, as vessels may need to use alternative routes. Such deviations can diminish operational efficiency and subsequently reduce the economic output (limiting business sales, economic output and gross value added) within the receiving economy's transport and storage industry. The impact is viewed as a temporary impact given that exploration activities will not be a long-term sustained operation (crude oil) |
| **Economic** | **Operation** | The potential area that is affected by a crude oil well blow-out event overlaps with established and commonly used cruise tourism routes. This overlap may result in disruptions to cruise line operations, as vessels may need to use alternative routes, or temporarily postpone trips along popular routes. Such deviations can diminish operational efficiency and subsequently affect economic activity (limiting business sales, economic output and gross value added) within the receiving economy's tourism and transport and storage industry. The impact is viewed as a temporary impact given that the majority of surface oil has evaporated, biodegraded and dispersed after 60 days thereby reducing the area affected by an oil spill event (crude oil) |
| **Air Quality** | Operation | Atmospheric Emissions (upset) |
| **Climate Change** | Operation | Climate Change (upset) |

# 6 ENVIRONMENTAL MANAGEMENT APPROACH

The compilation of an EMPr for an activity which has the potential to result in significant environmental impacts is typically compiled at the culmination of a thorough investigation into the receiving environment and the identification and assessment of likely environmental impacts (i.e. EIA). This EMPr forms part of an EA application process. This EMPr aims to comply with the requirement of Appendix 4 of the EIA Regulations, 2014. These requirements are systematically addressed in the subsequent sections of this report. The primary objectives of the EMPr are as follows:

- To promote sustainability and describe an action programme to mitigate negative impacts as far as possible;
- To be a practical document that sets out both the goals and actions required in mitigation. Though the term “mitigation” can be broad in definition, it means in this context to “allay, moderate, palliate, temper or intensify.” Mitigation of a negative impact means that its effect is reduced. Mitigation of a positive impact means that its effect is increased or optimised; and
- To indicate responsibilities for the implementation of these action items within the EMPr.

This EMPr shall be deemed to have contractual standing on the basis that its contents and specifically objectives are a detailed expansion of the environmental risks and consequent requirements of the EA (if, and when issued). Where relevant the Applicant is responsible for delegating responsibility for compliance to designated parties (internal or external). Such delegation must be legally binding to the extent relevant.

The objectives and targets in this EMPr are further guided by the NEMA, and specifically by the EIA Regulations, 2014. Thus, the underlying principles of sustainable development are the ultimate objectives and target of this

report. The EMPr has included measures to ensure the development activity complies with the following principles, as instilled in the NEMA, amongst others:

i. That the disturbance of ecosystems and loss of biological diversity are minimised and remedied;

ii. That pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied;

iii. That waste is avoided, minimised and reused or recycled where possible and otherwise disposed of in a responsible manner;

iv. That a risk-averse and cautious approach is applied, which considers the limits of current knowledge about the consequences of decisions and actions; and

v. That negative impacts on the environment and on people's environmental rights be anticipated, prevented and remedied.

## 6.1 ENVIRONMENTAL MANAGEMENT PRINCIPLES

NEMA establishes a general framework for environmental law, in part by prescribing national environmental management principles that must be applied when making decisions that may have a significant impact on the environment. These principles are briefly summarised below:

### 6.1.1 HOLISTIC PRINCIPLE

The Holistic principle, as defined by NEMA (Section 2(4) (b)) requires that environmental management must be integrated, acknowledging that all elements of the environment are linked and inter-related and it must take into account the effect of decisions on all aspects of the environment and all people in the environment by pursuing the selection of the best practicable environmental option (defined below in Section 6.1.2). Holistic evaluation does not mean that a project must be looked at as a whole. It rather means that it must be accepted that there is an all-inclusive whole into which a project is introduced. If the indications are that the project could have major adverse effects, the project must be reconsidered and where appropriate, re-planned or relocated to avoid an adverse impact or to ensure a beneficial impact.

### 6.1.2 BEST PRACTICABLE ENVIRONMENTAL OPTION

When it is necessary to undertake any action with environmental impacts, the different options that could be considered for the purpose must be identified and defined. The Best Practicable Environmental Option (BPEO) is defined in NEMA as "the option that provides the most benefit or causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term." Other guidelines typically used for environmental management in terms of other legislation include: BPM which is the Best Practicable Means and BAT which is the Best Available Technology.

### 6.1.3 SUSTAINABLE DEVELOPMENT

The concept of sustainable development was introduced in the 1980's with the aim to ensure that the use of natural resources is such that our present needs are provided without compromising the ability of future generations to meet their own needs. The constitution of South Africa is built around the fact that everyone has the right to have the environment protected through reasonable legislative and other measures that secure ecologically sustainable development. The National Environmental Principles included in the NEMA require development to be socially, environmentally and economically sustainable.

### 6.1.4 PREVENTATIVE PRINCIPLES

The preventative principle is fundamental to sustainable development and requires that the disturbance to ecosystems and the pollution, degradation of the environment and negative impacts on the environment be avoided, or, where they cannot be altogether avoided, are minimised and remedied.

### 6.1.5 THE PRECAUTIONARY PRINCIPLE

The precautionary principle requires that where there is uncertainty, based on available information, that an impact will be harmful to the environment, it is assumed, as a matter of precaution, that the said impact will be harmful to the environment until such time that it can be proven otherwise. The precautionary principle requires that decisions by the private sector, governments, institutions and individuals need to allow for and recognise conditions of uncertainty, particularly with respect to the possible environmental consequences of those decisions.

In the context of the EIA process in South Africa, the precautionary principle also translates to a requirement to provide sound, scientifically based, information that is sufficient to provide the decision-making authority with reasonable grounds to understand the potential impacts on the environment, the extent thereof and how impacts could be mitigated. If such information is not adequate for this purpose, the relevant authority cannot be satisfied as is required and then the authority should require that further information be collected and provided.

### 6.1.6 DUTY OF CARE AND CRADLE TO GRAVE PRINCIPLE

In terms of the NEMA Section 28, “Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment.”

By way of example, the principle of “duty of care” in terms of waste management emphasises the responsibility to make sure that waste is correctly stored and correctly transported, as it passes through the chain of custody to final point of disposal. This means that waste must always be stored safely and securely. The company removing and disposing of waste also holds the responsibility to hold the relevant licenses, and that waste is transported alongside the necessary paperwork.

“Cradle to Grave” refers to the responsibility a company takes for the entire life cycle of a product, service or programme, from design to disposal or termination. Any person who generates, transports, treats or disposes of waste must ensure that there is no unauthorised transfer or escape of waste from his control. Such a person must retain documentation describing both the waste and any related transactions. In this way, he retains responsibility for the waste generated or handled. This places responsibility for a waste on the Generator and is supported by the "Cradle to Grave" principle, according to which a "manifest" accompanies each load of Hazardous Waste until it is responsibly and legally disposed. This manifest is transferred from one transporter to the next along with the load, should more than one transporter be involved. Once the waste is properly disposed of at a suitable, permitted facility, a copy of the manifest must be returned to the point of origin.” Duty of Care offers one strategy to implement sustainable development.

### 6.1.7 POLLUTER PAYS PRINCIPLE

The "polluter pays principle" holds that the person or organisation causing pollution is liable for any costs involved in cleaning it up or rehabilitating its effects. It is noted that the polluter will not always necessarily be the generator, as it is possible for responsibility for the safe handling, treatment or disposal of waste to pass from one competent contracting party to another. The polluter may therefore not be the generator but could be a disposal site operator or a transporter. Through the 'duty of care' principle, however, the generator will always be one of the parties held accountable for the pollution caused by the waste. Accordingly, the generator must be able to prove that the transferral of management of the waste was a responsible action. The polluter pays principle acceding to NEMA dictates that “the cost of remedying pollution, environmental degradation and consequent adverse effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment.”

## 6.2 DUTY OF CARE RESPONSIBILITIES

Section 28 of the NEMA makes provision for duty of care, and remediation of environmental damage. The binding principles are described below:

1. Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment.

   (1A) Subsection (1) also applies to a significant pollution or degradation that-

   a) occurred before the commencement of this Act;

   b) arises or is likely to arise at a different time from the actual activity that caused the contamination; or

   c) arises through an act or activity of a person that results in a change to pre-existing contamination.

2. Without limiting the generality of the duty in subsection (1), the persons on whom subsection (1) imposes an obligation to take reasonable measures, include an owner of land or premises, a person in control of land or premises or a person who has a right to use the land or premises on which or in which-

   a) any activity or process is or was performed or undertaken; or

   b) any other situation exists, which causes, has caused or is likely to cause significant pollution or degradation of the environment.

3. The measures required in terms of subsection (1) may include measures to-

   a) investigate, assess and evaluate the impact on the environment;

   b) inform and educate employees about the environmental risks of their work and the manner in which their tasks must be performed in order to avoid causing significant pollution or degradation of the environment;

   c) cease, modify or control any act, activity or process causing the pollution or degradation;

   d) contain or prevent the movement of pollutants or the cause of degradation;

   e) eliminate any source of the pollution or degradation; or

   f) remedy the effects of the pollution or degradation.

## 6.3 FAILURE TO COMPLY WITH ENVIRONMENTAL CONSIDERATIONS

Within the provisions of the relevant environmental legislation, there are a number of penalties for non-compliance or offences. Below a few extracts are presented for information purposes, however these must not be read in isolation and the reader is reminded that there are other Acts, or sections of Acts, that may be applicable to the relevant project:

- NEMA Section 49B(1): A person convicted of an offence in terms of section 49A(1)(a), (b), (c), (d), (e), (f) or (g) is liable to a fine not exceeding R10 million or to imprisonment for a period not exceeding 10 years, or to both such fine or such imprisonment- this includes commencing with a listed activity without an EA or the non-compliance with conditions of any EA and associated EMPr;
- NEMA Section 49B(2): A person convicted of an offence in terms of section 49A(1)(i), (j) or (k) is liable to a fine not exceeding R5 million or to imprisonment for a period not exceeding 5 years, and in the case of a second or subsequent conviction to a fine not exceeding R10 million or to imprisonment for a period not exceeding 10 years, and in both instances to both such fine and such imprisonment;
- NEMA Section 49B(3): A person convicted of an offence in terms of section 49A(1)(h), (l), (m), (n), (o) or (p) is liable to a fine or to imprisonment for a period not exceeding one year, or to both a fine and such imprisonment;
- NEM:BA Section 102 (1): A person convicted of an offence in terms of section 101 is liable to a fine not exceeding R10 million, or an imprisonment for a period not exceeding ten years, or to both such a fine and such imprisonment;

- NEM:WA Section 68 (1): A person convicted of an offence referred to in section 67(1)(b), (c), (d), (e), (f), (i), (j), (k) or (l) or section 67(2)(a), (b), (c), (d) or (e) is liable to a fine not exceeding R5 000 000 or to imprisonment for a period not exceeding five years, or to both a fine and such imprisonment, in addition to any other penalty or award that may be imposed or made in terms of the National Environmental Management Act;
- NEM:WA Section 68 (2): A person convicted of an offence referred to in section 67(1)(b), (c), (d), (e), (f), (i), (j), (k) or (l) or section 67(2)(a), (b), (c), (d) or (e) is liable to a fine not exceeding R5 000 000 or to imprisonment for a period not exceeding five years, or to both a fine and such imprisonment, in addition to any other penalty or award that may be imposed or made in terms of the National Environmental Management Act;
- NEM:WA Section 68 (3): Any person convicted of an offence referred to in section 67(1)(m) is liable to a fine or to imprisonment for a period not exceeding six months or to both a fine and such imprisonment;
- NEM:WA Section 68 (4): A person who is convicted of an offence in terms of this Act and who persists after conviction in the act or omission that constituted the offence commits a continuing offence and is liable on conviction to a fine not exceeding R1 000 or to imprisonment for a period not exceeding 20 days, or to both such fine and such imprisonment, in respect of each day that person persists with that act or omission;

It is recommended that a procedure for non-compliances (i.e. incentives or disincentives for conformance and non-conformance with the EMPr requirements) must be employed to ensure that the EMPr is adequately implemented. The system to be used must be determined before the project commences, included in the tender documents and contracts, and made clear to all project workers. The system may include that the independent Environmental Control Officer (ECO) can be authorized to impose spot fines on the Contractor and/or his subcontractors for any of the defined transgressions. Such fines should be issued in addition to any remedial costs incurred as a result of non-compliance with the environmental specifications and or legal obligations.

# 7 ROLES AND RESPONSIBILITIES

The applicant will be responsible for ensuring overall compliance with the provisions of the EMPr. Implementation is the key to the success of the EMPr. In order to ensure that the EMPr and its mitigation measures are implemented, roles and responsibilities need to be clearly defined and documented prior to commencement. This section serves as a guide on which party is normally responsible for certain tasks. Specific roles are designated in the specific environmental management and mitigation requirements in this EMPr.

## 7.1 THE PROJECT APPLICANT/PROPONENT

The Applicant is the principal party (Proponent) of the project. The legal accountability for correct implementation of the relevant requirements of the EA and EMPr falls primarily upon the applicant and must therefore be built into all contractor's contractual agreements. The applicant's role typically includes:

- Provide for all necessary supervision during the execution of the project including appointment of key personnel to act on his/her behalf during the project (e.g. Project Manager). The key personnel will be tasked with ensuring that the various contractors comply with the necessary provisions of the EA and EMPr;
- Ensure that the various contractors and applicable sub-contractors appoint a suitably qualified, competent Environmental Officer (EO) that will be responsible for among others, ensuring daily compliance with the EMPr and EA throughout the execution of the relevant project components;
- Appoint a suitably qualified, competent independent Environmental Control Officer (ECO) who will undertake periodic audits on the various contractors works;
- Appoint an independent and suitably qualified Marine Mammal Observer (MMO) to monitor marine fauna for the duration of the exploration activities;

- Appoint an independent and suitably qualified Passive Acoustic Monitoring (PAM) operator to monitor marine fauna for the duration of the exploration activities;
- Appoint a suitably qualified Fisheries Liaison Officer (FLO) to facilitate communications between the exploration and fishing vessels for the duration of the exploration activities;
- Notify the relevant competent authority of changes in the project resulting in significant environmental impacts;
- Assess the various contractor's environmental performance during exploration, in consultation with the ECO;
- Ensure compliance with regulations;
- To implement the projects as per the approved project plan;
- To ensure that implementation is conducted in an environmentally acceptable manner;
- To inform and educate all employees about the environmental risks associated with the different activities that should be avoided during the exploration process and lessen significant impacts to the environment;
- Ensure MMOs and PAM operators are briefed on the area-specific sensitivities and on the exploration planning (including roles and responsibilities, and lines of communication); and
- Seabird, turtle and marine mammal incidence data and seismic source output data arising from surveys should be made available on request to the Marine Mammal Institute, DFFE, and the Petroleum Agency South Africa for analyses of impacts in local waters. Therefore, ultimately, the Applicant is responsible for the development and implementation of the EMPr and, where relevant, ensuring that the conditions in the EA are satisfied. Where exploration activities are contracted out (e.g. to Contractors and Subcontractors), the liability associated with non-compliance still rests with the Applicant (unless otherwise agreed upon between the authorities, the Applicant and the contracting parties). The Applicant (and not the Contractor) is therefore responsible for liaising directly with the relevant authorities with respect to the preparation and implementation of the EMPr and meeting authorisation conditions.

## 7.2 THE PROJECT MANAGER

During the project, it is envisaged that there may be a number of contractors and sub-contractors undertaking various activities on the project. The Project Manager would oversee all contractors and sub-contractors from a project management point of view. The roles of the Project Manager typically include the following:

- The Project Manager acts on behalf of the Applicant regarding the administration of contracts to sub-contractors, etc.;
- Provides and/or approves scheduling, aspects of co-ordination and estimation;
- Ensures implementation of the project plan within cost, time and quality constraints;
- Ensures that EMPr is executed as planned; and
- Keeps the asset owner informed of progress made during the life cycle of the project.

## 7.3 THE ENVIRONMENTAL CONTROL OFFICER

The ECO is appointed by the Applicant and should be independent from the Applicant and the Contractors. The ECO should have appropriate training and/or experience in the implementation of environmental management specifications. The ECO must preferably have a tertiary qualification in an Environmental Management or appropriate field. The ECO provides feedback to the Project Manager regarding all environmental matters. The ECO's key role is auditing the implementation of the EMPr. For the purposes of implementing the conditions contained herein, the Applicant should appoint the ECO well before the start of exploration activities. The ECO is responsible for the ongoing auditing function as well as the clarification of environmental conditions contained

in this EMPr to anyone working on the project. **For the purposes of this project, the role of ECO and MMO can be fulfilled by the same person.**

The ECO roles include:

- Recommendations for review and update of the EMPr;
- Liaison between the Applicant, Contractors, authorities and other lead stakeholders on high importance environmental concerns;
- Ensures that correct shape files have been uploaded into the vessel navigation systems to support effective implementation of spatial controls
- Review the project induction training to ensure environmental issues receive adequate attention and important site-specific issues are included;
- Conduct environmental audits of the site/contractors including relevant documentation on a monthly basis;
- Validating the regular site inspection reports, which are to be prepared by the relevant contractor EO's;
- Maintain a record of all non-conformances and incidents to ensure that measures are put in place to remedy such;
- Maintain a public complaints register in which all complaints are recorded, as well as action taken; and
- Verification that all environmental monitoring programmes (sampling, measuring, recording etc. when specified) are carried out according to protocols and schedules.

It is important to note that where opportunity for interpretation occurs within the conditions of this EMPr, the interpretation of the ECO will take preference.

## 7.4 MARINE MAMMAL OBSERVER

The applicant should appoint a minimum of two dedicated MMOs[1], with a recognised MMO training course, on board for marine fauna observation (360 degrees around survey and other vessels), distance estimation and reporting. One MMO should also have PAM training. The MMO must ensure compliance with mitigation measures during pre-drilling surveys and seismic geophysical surveying during well logging and testing.

The duties of the MMO would be to:

- Give effective briefings to crew members, and establish clear lines of communication and procedures for onboard operations;
- Record seismic source activities, including sound levels, "soft-start" procedures and pre-start regimes;
- Observe and record responses of marine fauna to seismic source from optimum vantage points, including seabird, turtle, seal and cetacean incidence and behaviour and any mortality or injuries of marine fauna as a result of the exploration activities. Data captured should include species identification, position (latitude/longitude), distance/bearing from the vessel, swimming speed and direction (if applicable) and any obvious changes in behaviour (e.g. startle responses or changes in surfacing/diving frequencies, breathing patterns) as a result of the seismic activities. Both the identification and the behaviour of the animals must be recorded accurately along with current seismic sound levels. Any attraction of predatory seabirds, large pelagic fish or cetaceans (by mass disorientation or stunning of fish as a result of exploration activities) and incidents of feeding behaviour among the hydrophone streamers should also be recorded;
- Record sightings of any injured or dead protected species (marine mammals, large pelagic fish (e.g. sharks), seabirds and sea turtles) should be recorded, regardless of whether the injury or death was caused by the seismic vessel itself. If the injury or death was caused by a collision with the seismic

[1] Non-dedicated MMOs can be implemented for short surveys using low-energy sources. Such personnel are trained MMOs who may undertake other roles on the vessel when not undertaking their mitigation role (JNCC 2017).

vessel, the date and location (latitude/longitude) of the strike, and the species identification or a description of the animal should be recorded and included as part of the daily report;

- Record meteorological conditions at the beginning and end of the observation period, and whenever the weather conditions change significantly;
- Request the delay of start-up or temporary termination of the exploration activities or adjusting of sound source, as appropriate. It is important that MMO decisions on the termination of seismic source is made confidently and expediently and following dialogue between the observers on duty at the time. A log of all termination decisions must be kept (for inclusion in both daily and "close-out" reports);
- Use a recording spreadsheet in order to record all the above observations and decisions; and
- Prepare daily reports of all observations, to be forwarded to the necessary authorities as required, in order to ensure compliance with the mitigation measures.

## 7.5 PASSIVE ACOUSTIC MONITORING OPERATOR

An independent Passive Acoustic Monitoring (PAM) Operator is required on board during pre-drilling surveys and seismic geophysical surveying during well logging and testing. As a minimum at least one must be on watch at all times while acoustic sources are active. The duties of the PAM operator would be to:

- Provide effective regular briefings to crew members, and establish clear lines of communication and procedures for onboard operations;
- Ensure that the hydrophone cable is optimally placed, deployed and tested for acoustic detections of marine mammals;
- Confirm that there is no marine mammal activity within 500 m of the seismic source array prior to commencing with the "soft-start" procedures;
- Record species identification, position (latitude/longitude), distance and bearing from the vessel and acoustic source, where possible;
- Record general environmental conditions;
- Record seismic source activities, including sound levels, "soft-start" procedures and pre-start regimes; and
- Request the delay of start-up and temporary termination of the geophysical survey, as appropriate.

## 7.6 THE CONTRACTOR/ OPERATOR

The contractor is usually a third party appointed by the applicant/project manager to undertake the actual exploration activities. For the purposes of this section, any contractor (regardless of who appointed them) is referred to as the "contractor".

The relevant contractors are answerable to the Project Manager and ECO for all environmental issues associated with the project. Contractor performance will, amongst others, be assessed on health, safety and environmental management criteria. The principal contractor/s, any other contractors and sub-contractors will be required to comply with the provisions contained herein, and accordingly, the EMPr and its provisions must form part of any contractual arrangements between the applicant and contractors, and contractors and their sub-contractors, etc. The contractor must comply with EMPr and ensure that all employees and sub-contractors appointed are familiar with the EMPr. The legal accountability for correct implementation of the relevant requirements of the EA and EMPr must be contractually bound to the appointed contractor.

The Contractors roles include (but not limited to):

- Provide all necessary supervision during the execution of the project;
- Appoint a suitably qualified, competent EO that will be responsible for amongst others, ensuring daily compliance with the EMPr, EA during the acquisition phase;

- Adhere to the instructions of the MMO and PAM operators with regards to acoustic source soft start procedures and possible temporary termination of activities if indicated by marine fauna observations;
- To implement the project as per the approved project plan;
- To ensure that implementation is conducted in an environmentally acceptable manner;
- To fulfil all obligations as per the agreed contract; and
- Ensure that the Contractors staff and employees have received the appropriate environmental awareness training prior to commencing exploration activities.

## 7.7 THE CONTRACTOR/ OPERATOR ENVIRONMENTAL OFFICER

The principal contractor shall appoint an Environmental Officer (EO), who is responsible for implementation of the EMPr. The Contractor must ensure that the Contractor's EO is suitably qualified and competent to perform the necessary tasks and is appointed at a level such that she/he can interact effectively with other Contractors, labourers, the ECO and the public (if necessary). The Contractor's EO ensures that all sub-contractors working under the Contractor and sub-contractors abide by the requirements of the EMPr. The appointment of additional EO's and/or sub-contractors EO's is at the ECO's discretion. The costs related to the implementation of the EMPr will be the responsibility of the relevant Contractor/ sub-contractor.

The Contractor's EO roles will include:

- Preparing activity based Environmental Method Statements where applicable and where required by the ECO;
- Review the contractors safe work procedures/risk assessments/induction training/DSTI's (daily safe task instruction) during exploration and include information relating to the relevant environmental risks and appropriate mitigation measures;
- Support the ECO in monitoring by maintaining a permanent presence on board the exploration vessel;
- Establishing and maintaining an environmental incident register;
- Taking required corrective action within specified time frame in respect of non-conformances and environmental incidents;
- Assist in finding environmentally acceptable solutions to problems;
- Attendance at HSE meetings, toolbox talks and induction programmes (where relevant);
- Complete a daily diary with the purpose of recording environmental issues and corrective measures on a daily basis;
- Report any complaints to the ECO to be captured in the complaints register;
- Liaise with the project teams on issues related to implementation of, and compliance with the EMPr; and
- Ensure adequate and compliant waste management.

## 7.8 THE AUTHORITIES

The authorities that should be involved include the Competent Authorities, i.e. PASA and the DMRE. The authorities may be required to perform the following roles:

- Review Monitoring and Audit reports, if required;
- Review whether there is compliance by the Applicant and Contractor with the terms of the EMPr and permit/license conditions. Whenever necessary, the authorities should assist the Applicant in understanding and meeting the specified requirements; and
- The authorities may perform random controls to check compliance. In case of persistent non-compliance, the Applicant will be required to provide an action plan with corrective measures, and have it approved by the authorities.

# 8 ENVIRONMENTAL MANAGEMENT SYSTEM

The purpose of this EMPr is to ensure that the environment is properly considered during the design, mobilisation, operations, and completion of the exploration activities, and that negative impacts are minimised or prevented, and positive impacts enhanced. At the same time the EMPr should provide a logical extension of the EIA, specialist studies, or any other technical planning and assessment documentation, to ensure that recommendations are implemented, and that the project does not deviate from the environmental profile that formed the basis of the assessment.

## 8.1 DOCUMENT CONTROL

A formal document control system should be established. The document control system must provide for the following requirements;

- Documents are approved for adequacy prior to use;
- Review and update documents as necessary and re-approve documents;
- Ensure that changes and the current version status of documents are identified;
- Ensure that relevant versions of applicable documents are available at points of use;
- Ensure that documents remain legible and readily identifiable;
- Ensure that documents of external origin necessary for the EMPr are identified and their distribution controlled; and
- Prevent unintended use of obsolete documents and apply suitable identification to them if they are retained for any purpose.

The responsibility for establishing a suitable document control system rests with the Project Manager.

## 8.2 RECORD KEEPING

It is essential that an official procedure for control of records be developed to ensure records required to demonstrate conformity to environmental standards are maintained. The Applicant, or the Project Manager (if assigned) is therefore required to develop and maintain a procedure for the identification, storage, protection, retrieval, retention and disposal of records as part of the EMPr. Records must be legible, identifiable and traceable.

## 8.3 AUDITING AND REPORTING PROCEDURES

Reporting procedures must be developed at the start of the project, for conveying information from the compliance monitoring activities and to ensure that management is able to take rapid corrective action should certain thresholds be exceeded. Different reporting procedures may include:

- Inspections;
- Accidents and emergencies;
- Measuring performance indicators and interpreting and acting on the indicators;
- Records of monitoring activities to test the effectiveness of mitigation measures and impact controls, as well as for compliance auditing purposes; and
- Training programmes and evidence of appropriate levels/amount of skills/capacities created.

All monitoring and auditing must be accompanied by applicable records and evidence (e.g. delivery slips, photographic records, etc.). All reports must be retained and made available for inspection by the ECO, the Applicant and /or the Relevant Competent Authorities. All reports shall be signed by the relevant parties to ensure accountability. The Applicant must use the audit report findings to continually ensure that environmental protection measures are working effectively through a system of self-checking. The EMPr should be viewed as a dynamic document aimed at continual environmental performance improvement.

The following auditing and reporting shall be required throughout exploration:

- Daily Environmental Diary: These reports must be prepared by the contractors' EO and must aim to monitor and report on day-to-day activities so as to ensure compliance with the relevant authorisations, licences and permits, the approved EMPr, and environmental method statements;
- Monthly Compliance Reports (EO): These reports must be prepared by the contractors' EO and must aim to provide a concise monthly performance report, including copies of relevant documents (e.g. waste manifests, incident registers, consultation registers, etc);
- Monthly Audit Reports: The ECO must compile monthly compliance reports (audits) which are to be submitted to the Applicant for review and correction of non-compliance issues. It is the responsibility of the ECO to report any non-compliance, which is not correctly rectified. Depending on the outcome of the authorisation processes it may be a requirement to submit these to the relevant authorities.

## 8.4 RESPONDING TO NON-COMPLIANCES

Non-compliance will be identified and managed through the following four key activities including:

- Inspections of the vessel and activities related to exploration;
- Monitoring of selected environmental quality variables (where relevant);
- Audits of the exploration activities and relevant documentation; and
- Reporting on a monthly basis.

An environmental non-conformance and incident register must be prepared and maintained by the ECO throughout the exploration activities in order to track and monitor environmental concerns, incidents, and non-conformances. The register must include details of date, location (coordinates), description of the NC or Incident, applicable environmental commitment/standard, corrective action taken, adequacy of corrective action, date rectified, etc.

Non-compliance with the EMPr or any other environmental legislation, specifications or standards shall be recorded by the ECO in the non-conformance register. This register shall be maintained by the ECO and will be sent to the Applicant and Contractor on a regular basis (monthly), and the Applicant shall ensure that the responsible party takes the necessary corrective actions. Non-conformances may only be closed out in the register by the ECO upon confirmation that adequate corrective action has been taken and/or documented proof provided. The register should be utilised to measure overall environmental performance.

## 8.5 ENVIRONMENTAL INCIDENCES

For the purposes of this project, an environmental incident can be divided into three levels, i.e. major, medium and minor. All Major and Medium environmental incidents shall be recorded in the ECO's non-conformance and incident register. Minor incidents shall be recorded by the contractor, and by the Applicant in their own incident register. Definitions of environmental incidents are provided in Table 7.

Table 7: Description of incidents and non-conformances for the purpose of the project

| | |
|---|---|
| **Non-Conformance** | Any deviation from work standards, practices, procedures, regulations, management system performance etc. that could either directly or indirectly lead to injury or illness, damage to the workplace or oceanic environment, legal transgression or a combination of these. |
| **Major Environmental Incident** | An incident or sequel of incidents, whether immediate or delayed, that results or has the potential to result in widespread, long-term, irreversible significant negative impact on the oceanic environment and/or has a high risk of legal liability.<br><br>A major environmental incident usually results in a significant pollution and may entail risk of public danger. Major environmental incidents usually remain an irreversible impact even with the involvement of long-term external intervention |

| | |
|---|---|
| | i.e. expertise, best available technology, remedial actions, excessive financial cost etc. Major environmental incidents must be reported to the authorities. The ECO shall make the final decision as to whether a particular incident should be classified as a Major incident. |
| **Medium Environmental Incident** | An incident or sequel of incidents, whether immediate or delayed, that results or has the potential to result in widespread or localised, short term, reversible significant negative impact on the oceanic environment and/or has a risk of legal liability.<br><br>A medium environmental incident may be reported to the authorities, can result in significant pollution or may entail risk of public danger. The impact of medium environmental incidents should be reversible within a short to medium term with or without intervention. The ECO shall make the final decision as to whether a particular incident should be classified as a Medium incident. |
| **Minor Environmental Incident** | An incident or sequel of incidents, whether immediate or delayed, where the oceanic environmental impact is negligible immediately after occurrence and/or once-off intervention on the day of occurrence. |

The following incident reporting procedures shall apply to this project:

- All environmental incidents shall be reported to Contractor's EO, and the ECO, and shall be recorded in the contractors' respective incident registers;
- The ECO shall record the incident in the non-conformance and incident register and advise on the appropriate measures and timeframes for corrective action;
- An incident report shall be completed by the relevant party responsible for the incident for all medium and major incidents and the report shall be submitted to the Project Manager and ECO within 5 calendar days of the incident;
- The EO shall investigate all incidents and identify any required actions to prevent a recurrence of such incidents; and
- In the event of an emergency incident (unexpected sudden occurrence), including an unplanned event (e.g. well blow-out), major emission, fire or explosion leading to serious danger to the public or potentially serious pollution of or detriment to the environment, whether immediate or delayed, the Applicant shall notify the relevant authorities in accordance with Section 30(3) of the NEMA. The Applicant shall engage the ECO who shall assess all major incidents and shall advise the Applicant when any such incident must be reported to the authorities as per the above requirement.

## 8.6 APPLICATION OF THE MITIGATION HIERARCHY

A key component of the EIA process is to explore practical ways of avoiding and where not possible to reducing potentially significant impacts of the proposed seismic acquisition activities. The mitigation measures put forward are aimed at preventing, minimising or managing significant negative impacts to as low as reasonably practicable (ALARP). The mitigation measures are established through the consideration of legal requirements, project standards, best practice industry standards and specialist inputs.

The mitigation hierarchy, as specified in International Finance Corporation (IFC) Performance Standard 1, is based on a hierarchy of decisions and measures aimed at ensuring that wherever possible potential impacts are mitigated at source rather than mitigated through restoration after the impact has occurred. Any remaining significant residual impacts are then highlighted, and additional actions are proposed. With few exceptions, however, identified impacts were of low significance with very low or zero potential for further mitigation. In such cases the appropriate project Standards will be used and additional best management practices are proposed.

The operator will ensure that the proposed exploration activity is undertaken in a manner consistent with good international industry practice and Best Available Techniques (BAT), and in compliance with the applicable legislative provisions.

The operator will ensure that the exploration is undertaken in a manner consistent with good international industry practice and in compliance with the applicable requirements in MARPOL 73/78 and industry best practices with regard to waste management.

# 9 REVIEW AND REVISION OF THE EMPR

It is important to note that this EMPr is made legally binding on the Applicant through the EA and the approval of the EMPr by the decision-making authority. It is important to consider that the EMPr is a dynamic document which may require such alteration and /or amendment as the project evolves. Conditions under which the EMPr would require revision include:

- Changes in legislation;
- Occurrence of unanticipated impacts or impacts of greater intensity, extent and significance than predicted;
- Inadequate mitigation measures (i.e. where environmental performance does not meet the required level despite the implementation of the mitigation measure);
- Secondary impacts occur as a result of the mitigation measures; and
- Instances where the implementation of the specified management, as a result of changes in circumstances, may become impractical or unreasonable to implement.

The Applicant in consultation with the ECO should be responsible for ensuring that the registration and updating of all relevant EMPr documentation is carried out. It shall be the responsibility of the Applicant, in consultation with the ECO, to ensure that all personnel are performing according to the requirements of the document control procedure, and to initiate the revision of controlled documents, when required by changes in process or operations.

The ECO must undertake a risk assessment of any proposed changes to the EMPr. This risk assessment must be included in the applicable monthly audit report, and where applicable supported by the necessary proof of public consultation. It is important to note that if alterations and/or amendments are required these may only be affected with written approval from the competent authority and in accordance with the relevant legal processes.

# 10 ENVIRONMENTAL AWARENESS PLAN AND TRAINING

Training and environmental awareness is an integral part of a complete EMPr. The overall aim of the training will be to ensure that all site staff are informed of their relevant requirements and obligations pertaining to the relevant authorisations, licences, permits and the approved EMPr and protection of the environment.

The applicant and contractor must ensure that all relevant employees are trained and capable of carrying out their duties in an environmentally responsible and compliant manner and are capable of complying with the relevant environmental requirements. To obtain buy-in from staff, individual employees need to be involved in:

- Identifying the relevant risk;
- Understanding the nature of risks;
- Devising risk controls; and
- Given incentive to implement the controls in terms of legal obligations.

The Applicant shall ensure that adequate environmental training takes place. All employees shall have been given an induction presentation on environmental awareness. Where possible, the presentation needs to be conducted in the language of the employees. All training must be formally recorded, and attendance registers retained. The environmental training should, as a minimum, include the following:

- General background and definition of the oceanic environment;
- The importance of compliance with all environmental policies;
- The environmental impacts, actual or potential, of their work activities;
- Compliance with mitigation measures proposed for sensitive marine fauna;
- Their roles and responsibilities in achieving compliance with the environmental policy and procedures and with the requirement of the applicant's environmental management systems, including emergency preparedness and response requirements;
- The potential consequences (legal and/or other) of departure from specified operating procedures including fines (where applicable);
- The mitigation measures required to be implemented when carrying out their work activities; and
- All operational risks must be identified, and processes established to mitigate such risk, proactively. Thus, the applicant needs to inform the employees of any environmental risks that may result from their work, and how these risks must be dealt with in order to avoid pollution and/or degradation of the oceanic environment.

The specific requirements for environmental training during exploration include:

- Environmental Induction Training: All workers must receive induction training which shall be presented by the Contractors HSE Manager Representatives. The induction training must include an environmental management component which will be prepared by the Contractor's EO and presented where possible by the Contractor's EO. The training material must include general environmental awareness with an overview of the approved EMPr and applicable authorisations, licences and permits. Health and safety expectations including communication and reporting to key personnel, including incidents and during emergencies, should also be outlined. The Induction Training Material must be reviewed and approved by the ECO;
- Weekly Environmental Toolbox Talks will be prepared by the Contractor's EO to cover a range of environmental topics and must be presented to relevant staff during applicable times during the exploration activities (e.g. at the start of a day or activity). The aim of these toolbox talks will be to inform employees of general environmental requirements pertaining to specific activities, as well as specific EMPr and EA requirements and obligations. The ECO shall review environmental toolbox talks on a periodic basis to ensure the material is relevant and appropriate;
- Informal training of all staff is also required on an on-going basis through informal discussions, on-site supervision and through facilitation of day-to-day activities. Such training must be given or otherwise facilitated by the Contractor's EO; and
- The Contractor's EO must review all safe work procedures/risk assessments/DSTI's (daily safe task instruction) from the safety department and include the relevant environmental risks and appropriate mitigation measures where necessary. Since the above procedures are specific to the applicable activity being undertaken, the inclusion of environmental measures aims to ensure each activity is undertaken in an environmentally responsible manner.

# 11 EMERGENCY RESPONSE PLAN

The Applicant must identify potential emergencies and develop procedures for preventing and responding to them. There are several options for dealing with high priority impacts and risks, as the paradigm has two components, probability and consequence. The design of control measures rests on understanding the cause and effect. Best practise is to intervene with the ultimate factors where feasible, rather than treat the outcomes. Emergency response therefore has the option of reducing probability or reducing the consequence while reducing the probability is the preferred option. Below are some common emergency preparedness approaches:

- Threat consequence if a risk eventuates, when the risk becomes an issue;
- Combine reducing the probability and treating the consequence;

- Offset environmental losses by investing in other assets;
- Not manage some of the risks because there are too many; and
- Make provision to manage residual impacts or issues that arise because of shortcomings in risk identification and rating, avoidance and mitigation or because a rare event has occurred.

Residual impacts are those impacts that despite reducing the probability and consequence might still occur. In these cases, parties will have to be compensated, pollution cleaned up and damage to the environment remediated.

The Applicant shall be required to develop and implement an Emergency Preparedness and Response Plan prior to commencing work. The Applicant must ensure that the Emergency Preparedness and Response Plan makes provision for environmental emergencies, including, but not limited to:

- Fire Prevention;
- Fire Emergency Response;
- Spill prevention;
- Spill Response;
- Accidents to employees; and
- Use of hazardous substances and materials, etc.

The Applicant and Contractor must ensure that lists of all emergency telephone numbers/contact persons (including fire control) are kept up to date and that all numbers and names are posted at relevant locations throughout the exploration phase.

## 11.1 SPILL RESPONSE PROCEDURE

The Applicant together with the relevant contractors must develop a Shipboard Oil Pollution Emergency Plan (SOPEP) as required by the MARPOL Regulations. The Contractor must ensure that all employees, staff and labourers are informed and instructed regarding implementation of spill prevention measures and spill response procedures. In the event of a spill, the following general requirements shall apply, and the detailed spill procedure must cater for these requirements:

- Immediately reporting of spills by all employees and/or visitors to the relevant supervisor and EO (this requirement must be including in induction training);
- Take immediate action to contain or stop the spill where it is safe to do so;
- Contain the spill and prevent its further spread;
- Dispose of any contaminated materials according to appropriate waste disposal procedure. Note: Waste from spills of hazardous materials shall be disposed of as hazardous waste at a suitably licensed onshore waste disposal facility;
- The Contractor's EO shall record details of the spill in their respective incident registers;
- Photographic evidence shall be obtained of the spill clean-up.

In the case of large spills, the services of a specialist spill response agency shall be required, who shall advise on appropriate clean-up procedures and follow-up monitoring (if required). The incident procedures as defined in Section 8.5 shall also apply.

The Applicant must also, (as per Section 30 of the NEMA) notify the Director-General (Department of Forestry, Fisheries and the Environment - DFFE, Competent Authority), South African Police Services, Provincial Environmental Authority, the Local Municipality, and any persons whose health may be affected of the nature of an incident including:

- Any risks posed to public health, safety and property;

- Toxicity of the substance or by products released by the incident; and
- Any step taken to avoid or minimise the effects of the incident on public health and the environment.

## 11.2 MEASURES TO CONTROL OR REMEDY ANY CAUSES OF POLLUTION OR DEGRADATION

The broad measures to control or remedy any causes of pollution or environmental degradation as a result of the proposed activities taking place on the project are provided below:

- Ensure that the environmentally sensitive areas are adequately understood by the ship's Captain throughout exploration;
- Contain potential pollutants and contaminants (where possible) at source;
- Handling of potential pollutants and contaminants (where possible) must be conducted in controlled areas;
- Ensure the timeous clean-up of any spills;
- Implement a waste management system for all waste streams present; and
- Investigate any third-party claims of pollution or contamination as a result of the project activities.

## 11.3 PROJECT CONTROLS FOR UNPLANNED WELL BLOWOUT

The following project control measures have been identified during the EIA process and will be required for implementation during the exploration activities in order to prevent or respond to an unplanned well blowout event.

- Compliance with COLREGS (the Convention dealing with safety at sea, particularly to reduce the risk of collisions at sea) and SOLAS (the Convention ensuring that vessels comply with minimum safety standards).
- A 500 m safety zones will be enforced around the drilling unit within which fishing and other vessels would be excluded.
- Regulation 37 of MARPOL Annex I will be applied, which requires that all ships of 400 gross tonnage and above carry an approved Shipboard Oil Pollution Emergency Plan (SOPEP). The purpose of a SOPEP is to assist personnel in dealing with unexpected discharge of oil, to set in motion the necessary actions to stop or minimise the discharge, and to mitigate its effects on the marine environment.
- As standard practice, an Emergency Response Plan (ERP) and an Oil Spill Contingency Plan (OSCP) will be prepared and available at all times during the drilling operation, which must be approved by SAMSA / DFFE / PASA in accordance to local legislation.
- Project vessels will be equipped with appropriate spill containment and clean-up equipment, e.g. booms, dispersants and absorbent materials. All relevant vessel crews will be trained in spill clean-up equipment use and routine spill clean-up exercises.
- The primary safeguard against a blow-out is the column of drilling fluid in the well, which exerts hydrostatic pressure on the wellbore. Under normal drilling conditions, this pressure should balance or exceed the natural rock formation pressure to help prevent an influx of gas or other formation fluids. As the formation pressures increase, the density of the drilling fluid is increased to help maintain a safe margin and prevent "blow-outs". However, if the density of the fluid becomes too heavy, the formation can break down. If drilling fluid is lost in the resultant fractures, a reduction of hydrostatic pressure occurs. Maintaining the appropriate fluid density for the wellbore pressure regime is therefore critical to safety and wellbore stability. Abnormal formation pressures are detected by primary well control equipment (pit level indicators, return mud-flow indicators and return mud gas detectors) on the drill unit. The drilling fluid is also tested frequently during drilling operations and its composition can be adjusted to account for changing downhole conditions. The likelihood of a blow-out is further

minimised by installation of a BOP on the wellhead at the start of the risered drilling stage. The BOP is a secondary control system, which contain a stack of independently-operated cut-off mechanisms, to ensure redundancy in case of failure. The BOP is designed to close in the well to prevent the uncontrolled flow of hydrocarbons from the reservoir. A blow-out occurs in the highly unlikely event of these pressure control systems failing. It is further required that mudline closure devices be installed in addition to BOP.

- If the BOP does not successfully shut off the flow from the well, the drilling rig would disconnect and move away from the well site while specialised teams mobilise a capping system. The capping system would be lowered into place from its support barge and connected to the top of the BOP to stop the flow of oil or gas.
- Information provided by the Applicant for the Oil Spill Modelling Study has considered both condensate and crude oil as potential fluid types. In addition, the scenarios modelled the possibility of high blow rates representing what is considered well beyond expectations and representative of a 'worst case' scenario. Two release points were also modelled (i.e. a 'worst-case' of the potential five well locations identified); one in the northern and one in the central areas of interest (AOI).
- Oil Spill Response Limited (OSRL), the global oil spill response co-operative funded by more than 160 oil and energy companies, has a base in Saldanha Bay and another base in Aberdeen, which houses well capping equipment designed to shut-in an uncontrolled subsea well. The Saldanha based capping stack is available to oil and gas companies across the industry and provides for swift subsea incident response around the world. The equipment is maintained ready for immediate mobilisation and onward transportation by sea and/or air in the event of an incident. The operator must be a member of OSRL, at the point of commencing the project. This would significantly reduce the spill period. All of the wells must be designed to allow for capping.
- Other project controls include the preparation and implementation of plans that would include aspects related to Shipboard Oil Pollution Emergencies, Oil Spill Contingency and Well Control Contingency.

# 12 MANAGEMENT AND MITIGATION

Table 8 below provides a comprehensive list of all the technical or management options that need to be executed as part of the environmental requirements of the project. The phase, timeframes, responsible party, monitoring party, target and performance indicator for each of the options are provided.

Table 8: Technical or Management Options

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| **12.1 LEGAL COMPLIANCE** | | | | | | | |
| A | • The Applicant shall identify and comply with all relevant national, provincial and local legislation, including associated regulations and bylaws and shall establish and maintain procedures to keep track of, document and ensure compliance with environmental legislative changes. | Planning<br>Operation | Prior to operation and ongoing | Applicant | ECO (Monthly) | Ensure compliance with relevant legislation. | Up to date legal register.<br>(Legal register)<br>(ECO Monthly Audit) |
| B | • Should there be changes in legislation and/or regulations the Applicant shall take the necessary actions to incorporate such changes and to pass these requirements on to the Contractors. | Planning<br>Operation | Prior to operation and ongoing | Applicant<br>ECO | ECO (Monthly) | Ensure compliance with relevant legislation / Confirmation that requirements in terms of updated legislation are passed onto the contractors. | (Contractors contractual agreements)<br>(ECO Monthly Audit) |
| C | • The Applicant is responsible for the maintenance, update and review of the EMPr. The ECO shall include any recommendations for proposed amendments/ alterations of the EMPr to the Applicant who shall engage the competent authority, to the extent required, with regards to such changes. | Planning<br>Operation | As required | Applicant<br>ECO | ECO (Monthly)<br>Applicant (as and when necessary) | Ensure EMPr is reviewed and updated where necessary to ensure adequate mitigation for all impacts | Audit results and recommendations<br>(ECO Monthly Audit) |

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| | | | | | | associated with the project. | |
| 12.2 SCHEDULING | | | | | | | |
| A | • Based on the findings of the Drill Cutting and Oil Spill Modelling, Acoustics, Marine Ecology and Fisheries recommendations, scheduling alternatives were considered in order to avoid/ minimise the impacts associated with exploration activities.<br>○ Although operations can be undertaken year-round, preference should be given to planning sonar surveys to avoid movement of migratory cetaceans (particularly baleen whales) from their southern feeding grounds into low latitude waters (beginning of June to end of November). | Planning<br>Operation | Prior to operation and ongoing | Applicant<br>ECO | ECO (ongoing) | consideration given to sonar surveys windows | Survey logs and ECO Reports. |
| 12.3 APPOINTMENT OF CONTRACTORS | | | | | | | |
| A | • The EMPr must be made binding on the contractor/s and should be included in tender documentation and contracts. The costs related to the implementation of the EMPr during exploration activities must be provided for in the contract. | Planning<br>Operation | Prior to operation | Applicant<br>Contractors | ECO (Once-off at the start of individual contractor's work) | Ensure that the contractor is in possession of the EMPr and that they understand their obligations thereto. | Confirmation that contractor has received EMPr, and that EMPr has been made contractually binding.<br>(Contractual agreements) (ECO Monthly Audit) |
| B | • All contractors and sub-contractors must have a copy of this EMPr on site and should be briefed by the EO with regards to the use and implementation of the EMPr. | Planning<br>Operation | Prior to Operation and Ongoing | Contractor | ECO (Monthly) | Ensure all contractors are aware of EMPr requirements. | Confirmation that contractors have received training relating to EMPr implementation. |

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| | | | | | Applicant (once off per contractor) | | (Training records)<br>(ECO Monthly Audit) |
| C | • The Contractor shall appoint a dedicated Contractor's EO who is suitably qualified to perform the necessary tasks and is appointed at a level such that she/he can interact effectively with other site Contractors, labourers, the ECO and the public. The Contractor's EO shall be appointed prior to the onset of the exploration activities. | Planning | Prior to Operation and Ongoing | Contractor | ECO (Once-off) | Ensure a suitably qualified EO is present on site to oversee day to day activities and ensure successful implementation of EMPr during the exploration activities. | Confirmation that EO has been appointed and is suitably qualified to perform the necessary duties contained in this EMPr.<br>(ECO Monthly Audit) |
| D | • The Contractor shall ensure that all sub-contractors working under them abide by the requirements of the EMPr through the inclusion of the EMPr and applicable environmental requirements in contractual agreements for all sub-contractors. | Operation | Ongoing | Contractor | EO (Weekly)<br>ECO (Monthly) | Ensure that the contractor implements all the mitigation measures as described in the EMPr. | Signed declaration of understanding by contractors<br>(EO weekly checklist) (ECO Monthly Audit Report) |
| 12.4 HEALTH AND SAFETY | | | | | | | |
| A | The Applicant through the Project Manager shall ensure:<br>• That reasonable measures are taken to ensure the safety of all site staff;<br>• Provide appropriate Personal Protective Equipment (PPE) where required;<br>• Compliance with relevant sections of the Mine Health and Safety Act (Act No. 29 of 1996); | Operation | Ongoing | Project Manager<br>Contractor | Safety Department | Ensure compliance with legal provisions of OHSA. | (safety reports)<br>(safety audits) |

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| | • That all accidents and incidents are recorded and reported to the Project Manager and EO/ECO; and<br>• The Applicant and Contractor must ensure that he/she has the contact details of the nearest emergency rooms (hospitals), of both private and public hospitals. | | | | | | |
| 12.5 SOCIAL | | | | | | | |
| A | • The Applicant is to submit all forms of financial insurance and assurances to PASA to manage all damages and compensation requirements in the event of an unplanned pollution event. | Planning | Throughout the exploration phase | Applicant | Once off | Protect applicants and communities from potential losses. | Insurance policy |
| B | • If there are actual losses due to the activities performed by the Applicants, the claimants should be compensated for their losses at market rates. The Applicants must have a claims procedure appropriate to their activities. Compensation should follow the international standards such as the IFC principles, which states that market related prices should be paid, and if anything is restored, it must be to the same or better standards than before. | Operation | Throughout the exploration phase | Applicant | ECO – As required – claims submitted in terms of the claims procedure. | Ensures that project affected stakeholders do not suffer actual losses because of the exploration. | Claims Procedure<br>Claims Register<br>Completed Claim Forms |
| C | • The Applicant must have an oil spill contingency plan in line with international requirements and the requirements specified in Section 11 of the EMPr. | Exploration | Throughout the exploration phase | Applicant | Once off | Ensure any spills can be cleaned up promptly | Oil Spill Contingency Plan |
| D | • The Applicant must develop a stakeholder engagement strategy that explains the process of exploration and associated activities. It must include explanations of the potential outcomes and of the next phases such as production. | Planning | Before exploration phase commence | Applicant | Once off | Educate communities about the process and their rights | Stakeholder Engagement Strategy |

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| E | • The Applicant must establish appropriate community communication protocols and forums with local representation for the duration of the exploration activities. | Planning<br>Operation | Throughout the exploration phase | Applicant | As needed – but at least before drilling commence and at the end of the exploration phase. | Ensure appropriate community communication protocols. | Communication protocol |
| F | • The Applicants must conduct a stakeholder analysis as part of their Stakeholder Engagement Strategy. They must ensure that all stakeholder groupings identified in the stakeholder analysis are included in the strategy. The strategy must be inclusive and transparent. | Planning | Before exploration phase commence | Applicant | Once off | Ensure voices of diverse groups are documented and considered throughout the process. | Stakeholder Engagement Strategy |
| G | • In the case of a severe unplanned oil blow out causing actual losses in national and international waters and shores international conventions and procedures must be considered. South Africa and Namibia have Oil Spill Contingency Plans and are signatories of the International Convention on Civil Liability for Oil Pollution Damage, 1992 (CLC Protocol of 1992) and the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, 1992 (IOPC, Fund Protocol of 1992). The IOPC produced a Claims Manual (2005) that contains specific information on claiming procedures. These claims could include loss or damage to property, fishing nets, loss of livelihood etc, resulting from the discharge of oil from an offshore installation and also damage or loss caused by methods used to clean up polluted areas. Depending on the nature of the claim, the following information may be required: | Unplanned Events | When needed | Applicant<br>DFFE | Once of when needed | Compensate for losses in case of a severe unplanned oil blow out. | Official documentation as required |

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| | ○ Nature of loss, including evidence that the alleged loss resulted from the contamination;<br>○ Monthly breakdown of income for the period of the loss and over the previous three years;<br>○ Where possible, monthly breakdown of units (for example kilograms of fish caught and sold or number of hotel rooms let) for the period of the loss and over the previous three years;<br>○ Saved overheads or other normal variable expenses; and<br>○ Method of calculation of loss. | | | | | | |
| 12.6 ECONOMIC | | | | | | | |
| A | • Ensure that an efficient and effective operational plan is developed for pre-drilling surveys to ensure that the disruption to ocean-based industries is limited. | Pre-Drilling | Pre-Drilling | Applicant | Once-off | Operational Plan in place | Operational Plan |
| B | • Labour to be employed at the onshore logistics facility should so far as possible be sourced from local markets. The sourcing of employment from the local market is dependent on the availability of skills. Should the necessary skills not be available, skilled labour should be sourced from beyond the receiving economy. The sourcing of labour should also consider the role of woman and other previously disadvantaged communities.<br>• Employment sourced for the proposed exploration activity should, as far as possible, be sourced from the receiving economy and its immediate markets. The sourcing of local labour should be cognisant of key issues | Planning<br>Operation | Planning<br>Operation | Applicant | ECO (ongoing) | Local employment and use of local services. | Employment Records<br>Local Content Records |

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| | such as youth unemployment, woman in the workforce and other pertinent national employment targets.<br>• The temporary nature of the employment opportunity would provide labourers at the project to benefit from temporary income generation. Should the operator of the exploration activity be in a position to provide longer term employment opportunities, local labour should be considered. | | | | | | |
| C | • The project should, as far as possible, focus on sourcing inputs from the receiving economy, i.e., businesses located in the immediate economy. Localised sourcing enables local businesses to benefit from economic opportunities in the receiving economy.<br>• The operator of the exploration activity should confirm with provider of space for the logistics base whether sufficient bulk supply to the logistics operation is available. A clear understanding of additional supply requirements should be identified so that effective and efficient planning to support operations can be undertaken.<br>• The exploration operator based on commercial exploration success, should liaise with local educational institutions to assess if there are any long-term skills transfer or training opportunities to support potential future development in the block. | Planning<br>Mobilisation<br>Operation<br>Post-operation | Planning<br>Operation<br>Post-operation | Applicant | ECO (ongoing) | Local employment and use of local services. | Employment Records<br>Local Content Records |
| D | • Coordination should be done between the exploration activity operator and relevant shipping industry associations (such as the South African Association of Ship Operators and Agents and the South African Association of Ship Operators and Agents) to coordinate exploration activities and maritime logistics operations to | Pre-Drilling | Pre-Drilling | Applicant | Once-off | Operational Plan in place | Operational Plan |

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| | minimise and reduce the impact that the proposed exploration activity could have on the industry's operational efficiency and value generation. | | | | | | |
| 12.7 MARITIME HERITAGE/ PALAEONTOLOGICAL FEATURES | | | | | | | |
| A | • It is presumed that the box cores and piston cores will be handed over to consultant marine biologists for analysis for the baseline environmental inventory. This intended analysis for baseline purposes constitutes mitigation.<br>• The modern deep-sea shell fauna is hardly sampled and poorly known. New samples from any deep-water location have the potential to discover unknown species, or at least add to the very small existing museum collections of specimens. In this respect the concerns of palaeontology and marine biology coincide.<br>• It is expected that the molluscs shells and any other fossil material (fish teeth, otoliths etc.) will be sieved out at some stage. Fine sieves must be used as some deep-sea molluscs are tiny. All shells and other material of interest must have the details of context recorded and be kept for identification by an appropriate specialist, and ultimately be deposited in a curatorial institution such as the IZIKO Museum. The best outcome for piston cores is that core splits, or site duplicate cores, are the subject of a detailed study, such as for a B.Sc. Honours or M.Sc. project. | Pre-Drilling Box and Piston Coring | Pre-Drilling Box and Piston Coring | Contractor<br>Marine Biologist | ECO (Ongoing) | Baseline monitoring of the palaeontological material | Baseline monitoring report |
| B | • The sampling of drill cuttings for various standard industry analyses, most notably micro-palaeontological and palaeo-environmental, constitutes prescribed or "built-in" mitigation, the main aspects of which are very | Operation | Well Drilling | Contractor<br>Marine Biologist | ECO (Ongoing) | Baseline monitoring of the palaeontological material | Baseline monitoring report |

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| | likely to be written up by the consulting experts and published in the longer term.<br>• The sizes of typical drill cuttings are in the range of 0.1 mm (100 µm - very fine sand) to 3-4 mm (granules). Macrofossils are destroyed and not delivered to the "shale shaker" screen and only very small fossils will be enclosed in the coarse cuttings, such as larval mollusc shells, micro-molluscs, barnacle fragments and opercula, polychaete worm mouthparts, tiny fish teeth etc. from marine deposits and small aquatic molluscs and plant material from terrestrial deposits. Such will be in the cuttings samples and inform palaeo-environmental interpretations. There is therefore no special requirement for additional observations and a Fossil Finds Procedure at the "shale shaker" on the vessel. | | | | | | |
| **C** | • Should unrecorded ship wreck material be present in the project area, it may be subject to accidental impact, and it is recommended, therefore, that:<br>o The interpretation of any future seabed bathymetric data / review of video footage must include the requirement to flag any shipwreck or related material.<br>o Any such finds must be reported to SAHRA.<br>o Any shipwreck finds must be excluded from areas subject to seabed sampling or well drilling by the implementation of a buffer of at least 50 m around the site or material. | Pre-Drilling<br>Operation | Pre-drilling surveys<br>Operation | Contractor | ECO (ongoing)<br>Independent Researcher | Well(s) specifically sited to avoid potential heritage features. | Pre-drilling Site Survey Results<br>(Pre-drilling Site Survey Reports) |

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| 12.8 CULTURAL HERITAGE | | | | | | | |
| A | • Establish a participatory forum in the area of indirect influence (i.e., between Port Nolloth and Hout Bay) in which consultation with representatives from coastal stakeholders and indigenous groupings and their leadership, can present the form of engagement and ritual events (that recognize the cultural dimension of human relations with the sea) that should be undertaken prior or during the implementation of the project. Such engagement should ensure open, direct and consistent communication with stakeholders that may be affected by operations. | Planning | Before exploration phase commence | Applicant | Once off | Participatory forum | Stakeholder Engagement Strategy |
| B | • Support the implementation of the identified ritual event/s which are to take place as per the timeline appropriate to project operations, led by the aboriginal/First Nations paramount chiefs (and nominated traditional leaders) and indigenous Nguni leadership, or as deemed appropriate by affected stakeholders and determined during the consultation/s in the participatory forum.<br>• Support the implementation of a gender sensitive event/s that recognises gendered health and wellbeing connection with the ocean, led by nationally approved gender awareness entities in the area of indirect influence (i.e., Port Nolloth and Hout Bay), as deemed appropriate by affected stakeholders and determined during the consultation/s, that recognizes gendered coastal cultural heritage to permit all genders to articulate their cultural relation with the sea and coast. | Planning | Before exploration phase commence | Applicant | Once off | Participatory forum<br>Support (where applicable and identified) for ritual and gender sensitive events in recognition of connection with the ocean. | Stakeholder Engagement Strategy |

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| 12.9 AIR QUALITY AND CLIMATE CHANGE | | | | | | | |
| A | • Implement a maintenance plan to ensure all ship engines and boilers receive adequate maintenance to minimise soot and unburnt fuel released to the atmosphere and maximize energy efficiency. | Operation | Ongoing | Contractor | ECO (Weekly) | Ensure that no excessive air quality impacts are perceived | Visual confirmation of compliance with EMPr conditions.<br>(EO weekly checklist)<br>(ECO Monthly Audit) |
| B | • Ensure no incineration (subject to obtaining an atmospheric emissions license) of waste occurs within the port limits. | Operation | Ongoing | Contractor | ECO (Weekly) | Ensure that no excessive air quality impacts are perceived | Visual confirmation of compliance with EMPr conditions.<br>(EO weekly checklist)<br>(ECO Monthly Audit) |
| C | • The control measures for flaring of gas given by the World Bank Group (Appendix E of the Climate Change Assessment Report in Appendix 4 of the EIA Report) should be implemented. | Operation | Ongoing | Contractor | ECO (Weekly) | Flaring of gas in line with World Bank Group requirements. | Flaring of gas in line with World Bank Group requirements.<br>(EO weekly checklist)<br>(ECO Monthly Audit) |
| D | • Project vessels will be operated by contractors in compliance with MARPOL Annex VI Regulation 18 - Fuel Quality requirements. Project vessels will be supplied with marine gas oil (MGO) or heavy fuel oil (HFO) with less than 0.5% sulphur (mass). | | | | | | |

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| 12.10 | NOISE FROM HELICOPTERS | | | | | | |
| A | • Pre-plan flight paths to ensure that no flying occurs over seal colonies and seabird nesting areas.<br>• Avoid extensive low-altitude coastal flights.<br>• Maintain a flight altitude >1 000 m to be maintained at all times, except when taking off and landing or in a medical emergency.<br>• Maintain an altitude of at least 762 m or 2 500 ft above the highest point of a National Park or World Heritage Site.<br>• Comply fully with aviation and authority guidelines and rules.<br>• Brief all pilots on the ecological risks associated with flying at a low level along the coast or above marine mammals. | Planning<br>Operation<br>Demobilisation | Prior to Operation and Ongoing | Applicant<br>Contractor | EO (Weekly)<br>ECO (Monthly) | Ensure that noise levels are controlled within acceptable limits.<br>No complaints relating to noise.<br>Prepared flight paths. | Confirmation that noise levels are within acceptable limits and relevant notifications undertaken.<br>Prepared flight paths.<br>(EO weekly checklist)<br>(ECO Monthly Audit)<br>(Consultation register) |
| B | • The drilling contractor will ensure that the proposed drilling campaign is undertaken in a manner consistent with good international industry practice and Best Available Techniques (BAT).<br>• All whales and dolphins are given protection under the South African Law. The Marine Living Resources Act (Act No. 18 of 1998) states that no whales or dolphins may be harassed, killed or fished. No vessel or aircraft may, without a permit or exemption, approach closer than 300 m to any whale and a vessel should move to a minimum distance of 300 m from any whales if a whale surfaces closer than 300 m from a vessel or aircraft. | Planning<br>Operation | Prior to Operation and Ongoing | Applicant<br>Contractor | MMO (ongoing)<br>ECO (Monthly) | Avoid/ move away from whales | MMO Sightings<br>(MMO) Records<br>(ECO Monthly Audit) |

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| 12.11 | PRE-DRILLING SONAR SURVEYS ACOUSTIC IMPACTS | | | | | | |
| A | • 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 survey vessel), distance estimation and reporting.<br>• One MMO should also have PAM training. The MMO must ensure compliance with mitigation measures during seismic geophysical surveying. | Pre-Drilling | Pre-Drilling | Applicant | Applicant (once off prior to operations) | Appoint MMO to ensure monitoring of successful implementation of the EMPr.<br>One MMO to have PAM training to ensure monitoring of successful implementation of the EMPr. | Confirmation that MMO has been appointed and is suitably qualified to perform the duties contained in this EMPr.<br>(MMO appointment and CV) |
| B | • Ensure survey 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. | Pre-Drilling | Pre-Drilling | Contractor<br>PAM Operator | PAM Operator (ongoing)<br>ECO (Monthly) | Adequate equipment is in place and used as per the requirements and specifications. | Confirmation of PAM Operations (PAM Operator Reports, ECO Reports). |
| C | • Pre-survey scans should be limited to 15 minutes prior to the start of survey equipment. | Pre-Drilling | Pre-Drilling | Contractor | MMO (ongoing)<br>ECO (Monthly) | Pre-survey scans limited to 15 minutes prior to the start of survey equipment. | MMO observations (MMO Reports, ECO Reports). |
| D | • "Soft starts" should be carried out for any equipment of source levels greater than 210 dB re 1 µPa at 1 m over a period of 20 minutes to give adequate time for marine mammals to leave the vicinity. | Pre-Drilling | Pre-Drilling | Contractor | MMO (ongoing)<br>ECO (Monthly) | Utilisation of soft starts at initiation. | Confirmation soft starts at initiation.<br>(MMO Reports)<br>(ECO Monthly Audit) |

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| E | • If several types of sonar equipment are to be started sequentially or interchanged during the operation, only one pre-shoot search is required prior to the start of acoustic output. A pre-shoot search will, however, be required for gaps in data acquisition of greater than 10 minutes. | Pre-Drilling | Pre-Drilling | Contractor | MMO (ongoing)<br>ECO (Monthly) | Pre-shoot search for pauses greater than 10 mins. | Confirmation of pre-shoot search where required.<br>(MMO Reports)<br>(ECO Monthly Audit) |
| F | • Terminate the survey if any marine mammals show affected behaviour within 500 m of the survey vessel or equipment until the mammal has vacated the area. | Pre-Drilling | Pre-Drilling | Contractor | MMO (ongoing)<br>ECO (Monthly) | Termination on marine mammal sighting. | Confirmation of marine mammal sighting<br>(MMO Reports) |
| G | • Although operations can be undertaken year-round, preference should be given to planning sonar surveys to avoid movement of migratory cetaceans (particularly baleen whales) from their southern feeding grounds into low latitude waters (beginning of June to end of November). | Pre-Drilling | Pre-Drilling | Contractor | MMO (ongoing)<br>ECO (Monthly) | Consideration of surveys planned according to the movement of mammals. | Confirmation recording of surveys in line with the movement of mammals.<br>(MMO Reports)<br>(ECO Monthly Audit) |
| H | • Ensure that PAM is incorporated into any surveying taking place between June and November. | Pre-Drilling | Pre-Drilling | Contractor | MMO (ongoing)<br>ECO (Monthly) | Adequate equipment is in place and used as per the requirements and specifications. | Confirmation of PAM Operations (PAM Operator Reports, ECO Reports). |
| I | • No sonar survey-related activities are to take place within declared Marine Protected Areas (MPA). | Pre-Drilling | Pre-Drilling | Contractor | MMO (ongoing)<br>ECO (Monthly) | No sonar surveys in MPAs. | (MMO Reports)<br>(ECO Monthly Audit) |

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| 12.12 | DRILLING OPERATIONS ACOUSTIC IMPACTS | | | | | | |
| A | • Ensure vessel transit speed between the Area of Interest 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). | Mobilisation<br>Operation | During Mobilisation and Operation | Contractor<br>ECO | ECO (ongoing) | Ensure vessel speed limits are adhered to | Confirmation of activities undertaken in accordance with the requirements (ECO Reports, ship logs) |
| B | • Implement a maintenance plan to ensure all diesel motors and generators receive adequate maintenance to minimise noise emissions.<br>• The operations will be managed in compliance with the IFC EHS Guidelines for Offshore Oil and Gas Development, 2015. | Mobilisation<br>Operation | During Mobilisation and Operation | Contractor<br>ECO | ECO (ongoing) | Implementation of vessel maintenance plan. | Confirmation of vessel maintenance plan (ECO Reports, vessel maintenance records) |
| 12.13 | VERTICAL SEISMIC PROFILING ACOUSTIC IMPACTS | | | | | | |
| A | • 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 survey vessel), distance estimation and reporting.<br>• One MMO should also have PAM training. The MMO must ensure compliance with mitigation measures during seismic geophysical surveying. | Operation | Operation | Applicant | Applicant (once off prior to operations) | Appoint MMO to ensure monitoring of successful implementation of the EMPr.<br>One MMO to have PAM training to ensure monitoring of successful implementation of the EMPr. | Confirmation that MMO has been appointed and is suitably qualified to perform the duties contained in this EMPr.<br>(MMO appointment and CV) |
| B | • Ensure survey vessel is fitted with PAM technology (one or more hydrophones), which detects animals through | Operation | Operation | Contractor<br>PAM Operator | PAM Operator (ongoing) | Adequate equipment is in place and used as per the | Confirmation of PAM Operations (PAM Operator Reports, ECO Reports). |

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| | their vocalisations, should it be possible to safely deploy PAM equipment. | | | | ECO (Monthly) | requirements and specifications. | |
| C | • Pre-start Protocols for airgun testing and profiling:<br>o 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 unforeseen technical issue which results in a night-time start, refer to "periods of low visibility" below.<br>o 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.<br>o 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.<br>o 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, | Operation | Operation | Contractor | MMO (ongoing) | Commence during daylight hours<br>1 hr pre-shoot visual and PAM scan.<br>Soft starts<br>Delays soft starts if marine mammals are observed.<br>VSP pulses under 200 pulses. | (MMO Reports)<br>(ECO Monthly Audit) |

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| | delay the "soft-start" until animals move outside the 500 m mitigation zone.<br>o Maintain visual and possibly acoustic observations within the 500 m mitigation zone continuously during VSP operation to identify if there are any cetaceans present.<br>o Keep VSP operations under 200 pulses to remain within the 500 m exclusion zone for LF cetaceans. | | | | | | |
| **D** | • Shut-Downs<br>o Shut down the acoustic source if cetaceans, penguins, shoaling large pelagic fish or turtles are sighted within 500 m mitigation zone until such time 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 move outside the 500 m mitigation zone before the soft-start procedure and production may commence. | Operation | During Operation | Contractor<br>MMO<br>PAM Operator | MMO (ongoing)<br>ECO (Monthly) | Visual scanning and termination of activities. | Confirmation recording of visual scanning. Termination of activities.<br>(MMO Reports)<br>(ECO Monthly Audit) |
| **E** | • Breaks in Airgun Firing less than 20 minutes:<br>o 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 mitigation zone during the breakdown period.<br>o If a cetaceans are 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 | Operation | During Operation | Contractor<br>MMO<br>PAM Operator | MMO (ongoing)<br>ECO (Monthly) | Visual scanning and termination of activities if required. | Confirmation recording of visual scanning. Termination of activities.<br>(MMO Reports)<br>(ECO Monthly Audit) |

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| | penguins, shoaling large pelagic fish or turtles, the animals move outside the 500 m mitigation zone within the 20 minute period. | | | | | | |
| **F** | • Breaks in Airgun Firing longer than 20 minutes:<br>o 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. | Operation | During Operation | Contractor<br>MMO<br>PAM Operator | MMO (ongoing)<br>ECO (Monthly) | Visual scanning and termination of activities if required. | Confirmation recording of visual scanning. Termination of activities.<br>(MMO Reports)<br>(ECO Monthly Audit) |
| **G** | • Period of low visibility<br>o 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 deployed considering the metocean conditions), or:<br>o 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; and<br>o 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. | Operation | During Operation | Contractor<br>MMO<br>PAM Operator | MMO (ongoing)<br>ECO (Monthly) | Visual scanning and termination of activities if required. | Confirmation recording of visual scanning. Termination of activities.<br>(MMO Reports)<br>(ECO Monthly Audit) |

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| 12.14 | WASTE MANAGEMENT | | | | | | |
| A | • The Applicant in consultation with the relevant contractor must develop and implement a Waste Management Plan which establishes the procedures for the storage, collection and disposal of waste, including liquid and solid waste, and hazardous and non-hazardous wastes. | All phases | All Phases | Contractor | ECO (ongoing) | Responsible Waste Management Practice | Audits. |
| B | • The discharge of biodegradable food wastes (excluding cooking oils and grease) from vessels is regulated by MARPOL 73/78 Annex V, which stipulates that:<br>o No disposal to occur within 3 nm (± 5.5 km) of the coast.<br>o Disposal between 3 nm (± 5.5 km) and 12 nm (± 22 km) needs to be comminuted to particle sizes smaller than 25 mm.<br>o Disposal overboard without macerating can occur greater than 12 nm from the coast. As the drilling unit will be stationary, food waste will need to be comminuted prior to discharge at the drilling site. | Operation | During Operation | Contractor<br>ECO | ECO (ongoing) | Proper waste management in line with the required EMPr and regulations. | Recording of waste types and quantities (waste register and records) |
| C | • Discharges of oily water (deck drainage, bilge and mud pit wash residue) to the marine environment are regulated by MARPOL 73/78 Annex I, which stipulates that vessels must have:<br>o A Shipboard Oil Pollution Emergency Plan (SOPEP).<br>o A valid International Oil Pollution Prevention Certificate, as required by vessel class. | Operation | During Operation | Contractor<br>ECO | ECO (ongoing) | Proper waste management in line with the required EMPr and regulations. | Recording of waste types and quantities (waste register and records) |

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| | ○ Equipment for the control of oil discharge from machinery space bilges and oil fuel tanks, e.g. oil separating/filtering equipment and oil content meter. Oil in water concentration must be less than 15 ppm prior to discharge overboard.<br>○ Oil residue holding tanks.<br>○ Oil discharge monitoring and control system. The system will ensure that any discharge of oily mixtures is stopped when the oil content of the effluent exceeds 15 ppm. | | | | | | |
| **D** | • Sewage and grey water discharges from vessels are regulated by MARPOL 73/78 Annex IV, which specifies the following:<br>○ Vessels must have a valid International Sewage Pollution Prevention Certificate (ISPPC).<br>○ Vessels must have an onboard sewage treatment plant providing primary settling, chlorination and dechlorination before discharge of treated effluent.<br>○ The discharge depth is variable, depending upon the draught of the seismic vessel / support vessel at the time, but will be in accordance with MARPOL 73/78 Annex IV.<br>○ Discharge of sewage beyond 12 nm requires no treatment. However, sewage effluent must not produce visible floating solids in, nor cause the discolouration of, the surrounding water.<br>○ Sewage must be comminuted and disinfected for discharges between 3 nm (± 6 km) and 12 nm (± 22 km) from the coast. This will require an onboard | Operation | During Operation | Contractor<br>ECO | ECO (ongoing) | Proper waste management in line with the required EMPr and regulations. | Recording of waste types and quantities (waste register and records) |

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| | sewage treatment plant or a sewage comminuting and disinfecting system.<br>○ Disposal of sewage originating from holding tanks must be discharged at a moderate rate while the ship is proceeding on route at a speed not less than 4 knots. | | | | | | |
| E | • Sewage will be treated using a marine sanitation device to produce an effluent with:<br>○ 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).<br>○ Minimal residual chlorine concentration of 0.5 mg/ℓ.<br>○ No visible floating solids or oil and grease. | Operation | During Operation | Contractor<br>ECO | ECO (ongoing) | Proper waste management in line with the required EMPr and regulations. | Recording of waste types and quantities (waste register and records) |
| F | • The project will also comply with industry best practices with regard to waste management, including the compilation of a wate management plan that includes the following:<br>○ Waste management will follow key principles: Avoidance of Waste Generation, adopting the Waste Management Hierarchy (reduce, reuse, recycle, recover, residue disposal), and use of Best Available Technology (BAT).<br>○ An inventory will be established of all the potential waste generated, clarifying its classification (hazardous, non-hazardous or inert) and quantity, as well as identifying the adequate treatment and disposal methods.<br>○ Waste collection and temporary storage shall be designed to minimise the risk of escape to the | Operation | During Operation | Contractor<br>ECO | ECO (ongoing) | Proper waste management in line with the required EMPr and regulations. | Recording of waste types and quantities (waste register and records) |

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| | environment (for example by particulates, infiltration, runoff or odours).<br>○ On-site waste storage should be limited in time and volume.<br>○ Dedicated, clearly labelled, containers (bins, skips, etc.) will be provided in quantities adapted to anticipated waste streams and removal frequency. | | | | | | |
| **G** | • Cooling water and freshwater surplus would be tested prior to discharge and would comply with relevant South African Water Quality Guidelines for residual chlorine, salinity and temperature relative to the receiving environment. | Operation | During Operation | Contractor | ECO (ongoing) | Comply with relevant South African Water Quality Guidelines | Water quality tests performed (water quality tests results) |
| **H** | • Contractors will be required to develop a Waste and Discharge Management Plan for all wastes generated at the various sites and a Chemical Management Plan detailing the storage and handling of chemicals, as well as measures to minimise potential pollution. These plans will include / address the following:<br>○ Environmental awareness to ensure wastes are reduced and managed as far as possible.<br>○ Avoidance of waste generation, adopting the Waste Management Hierarchy (reduce, reuse, recycle, recover, residue disposal), and use of BAT.<br>○ Treatment of wastes at source (including maceration of food wastes, compaction, incineration, treatment of sewage and oily water separation).<br>○ Development of a waste inventory that classifies (hazardous, non-hazardous or inert) and quantifies | Planning<br>Operation | During Planning and Operation | Contractor | ECO (ongoing) | Waste and chemical management in line with the Waste and Discharge Management Plan and Chemical Management Plan | Waste and Discharge Management Plan<br>(Waste and discharge records)<br>Chemical Management Plan<br>(Chemical Management Records) |

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| | waste, and identifies treatment and disposal methods.<br>o Waste collection and temporary storage, which is designed to minimise the risk of escape to the environment (for example by particulates, infiltration, runoff or odours).<br>o On-site waste storage, which is limited in time and volume.<br>o Provision of dedicated, clearly labelled, containers (bins, skips, etc.) in quantities adequate to handle anticipated waste streams and removal frequency.<br>o Implement a waste management system that addresses all wastes generated.<br>o 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.<br>o Implement leak detection and repair programs for valves, flanges, fittings, seals, etc.<br>o Use a low-toxicity biodegradable detergent for the cleaning of all deck spillages.<br>o Prohibit operational discharges within MPAs during transit to and from the drill site.<br>o Chemicals will be appropriately stored onboard the project vessels (segregation, temperature, ventilation, retention, etc.). | | | | | | |
| I | • Avoid the unnecessary discharge of ballast water.<br>• Use filtration procedures during loading in order to avoid the uptake of potentially harmful aquatic organisms, | Operation | During Operation | Contractor<br>ECO | ECO (ongoing) | Proper waste management in line with the | Recording of waste types and quantities (waste register and records) |

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| | pathogens and sediment that may contain such organisms.<br>• Ensure that routine cleaning of ballast tanks is 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.<br>• Ensure all equipment (e.g. drill string, wellhead, BOP etc.) that has been used in other regions is thoroughly cleaned prior to deployment.<br>• Ballast water discharged will follow the requirements of the International Maritime Organisation's (IMO) 2004 International Convention for the Control and Management of Ships' Ballast Water and Sediments. By establishing standards and procedures for the management and control of ships' ballast water and sediments, the Convention aims to prevent the spread of harmful aquatic organisms from one region to another.<br>• The Convention stipulates that all ships are required to develop and implement a Ballast Water Management Plan, which includes a detailed description of the actions to be taken to implement the Ballast Water Management requirements.<br>• All ships using ballast water exchange should, wherever possible, do so at least 200 nautical miles (± 370 km) from nearest land in waters of at least 200 m deep. Where this is not feasible, the exchange should be as far from the nearest land as possible, and in all cases a minimum of 50 nm (± 93 km) from the nearest land and preferably in water at least 200 m in depth.<br>• Ships will also have a Ballast Water Record Book to record when ballast water is taken on board; circulated or treated for Ballast Water Management purposes; and | | | | | required EMPr and regulations. | Ballast Water Record Book |

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| | discharged into the sea. Project vessels would be required to comply with this requirement. | | | | | | |
| 12.15 | LIGHTING FROM DRILLING UNIT AND VESSELS | | | | | | |
| A | • The lighting on the support vessels, and drill rig, should be reduced to a minimum compatible with safe operations whenever and wherever possible.<br>• Light sources should, if possible and consistent with safe working practices, be positioned in places where emissions to the surrounding environment can be minimised. | Operation | During Operation | Contractor<br>ECO | ECO (ongoing) | Adequate lighting and vessel planning, operation and maintenance in line with the requirements of the EMPr and legislation. | Confirmation of lighting and vessel planning, operation and maintenance undertaken in accordance with the requirements (ECO Reports, maintenance plans, OM Manuals). |
| B | • Designated personnel receive training on the handling of affected seabirds from a suitably qualified facility/ organisation.<br>• Keep disorientated, but otherwise unharmed, seabirds in dark containers (e.g. cardboard boxes) for subsequent release during daylight hours. Capturing and transportation of seabirds must be undertaken according to specific protocols as outlined in the OWCP. Specifical personnel onboard must be trained in this regard.<br>• Report ringed/banded birds to the appropriate ringing/banding scheme (details are provided on the ring). | Operation | During Operation | Contractor<br>ECO | ECO (ongoing) | Safe keeping of animals as per the requirements.<br>Report ringed/ banded birds. | Safe keeping of animals as per the requirements.<br>(EO/ MMO Reports)<br>Report ringed/ banded birds.<br>(EO/ MMO Reports) |

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| 12.16 | DRILLING AND PLACEMENT OF INFRASTRUCTURE ON THE SEAFLOOR | | | | | | |
| A | • Implement procedures for ROVs that stipulate that the ROV does not land or rest on the seabed as part of normal operations.<br>• Ensure there is meticulous design of pre-drilling site surveys and Ecological Baseline Surveys to provide sufficient information on seabed habitats, and to map sensitive and potentially vulnerable habitats thereby preventing potential conflict with the well site.<br>• Design of pre-drilling site surveys to ensure there is sufficient information on seabed habitats, including the mapping of sensitive and potentially vulnerable habitats within 1 000 m of a proposed well site.<br>• The mapping of the sensitive and potentially vulnerable habitats should be done in conjunction with independent researchers, the DFFE and the South African National Biodiversity Institute (SANBI) in order to ensure that the results could be made available to other researchers.<br>• If sensitive and potentially vulnerable habitats are detected, adjust the well position accordingly to beyond 1 000 m or implement appropriate technologies, operational procedures and monitoring surveys to reduce the risks of, and assess the damage to, vulnerable seabed habitats and communities.<br>• Limit the area directly affected by physical contact with infrastructure to the smallest area required.<br>• Based on pre-drilling ROV survey(s), the well(s) will specifically be sited to avoid sensitive hardgrounds, as | Planning<br>Operation | Pre-drilling surveys<br>Operation | Contractor | ECO (ongoing)<br>Independent Researcher<br>DFFE | Well(s) specifically sited to avoid sensitive hardgrounds. | Pre-drilling Site Survey Results<br>(Pre-drilling Site Survey Reports) |

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| | the preference will be to have a level surface area to facilitate spudding and installation of the wellhead.<br>• Avoid anchoring on sensitive seabed structures.<br>• The exploration operations must be carried out in compliance with international best practice. This must include well design, casing, cementation, drilling, plugging, etc.<br>• Relevant blow out prevention and management infrastructure must be installed, and maintained.<br>• Critical safety equipment must be subject to testing and certification as per manufacturers requirements.<br>• It is recommended that the results of the ROV surveys be made available to public research institutions in order to facilitate research and contribute to the knowledge or the sea bottom ecosystems.<br>• Install over-trawlable abandonment caps over the wellheads only if these fall within the footprint of the demersal trawl fishery. | | | | | | |
| 12.17 | DISCHARGE OF CEMENT, CUTTINGS AND DRILLING FLUIDS | | | | | | |
| **A** | • Ensure there is meticulous design of pre-drilling site surveys and Ecological Baseline Surveys to provide sufficient information on seabed habitats, and to map sensitive and potentially vulnerable habitats (particularly in the modelled cuttings footprints) thereby preventing potential conflict with the well site.<br>• Ensure that, based on the pre-drilling site survey and expert (independent marine ecologist) review, drilling locations are not located within a 1 000 m radius of any | Planning<br>Operation | Pre-drilling surveys<br>Operation | Contractor | ECO (ongoing)<br>Independent Researcher<br>DFFE | Well(s) specifically sited to avoid sensitive hardgrounds. | Pre-drilling Site Survey Results<br>(Pre-drilling Site Survey Reports)<br>Ecological Baseline Surveys<br>(Ecological Baseline Surveys Report) |

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| | sensitive and potentially vulnerable habitats (e.g. hard grounds), species (e.g. cold corals, sponges) or sensitive structural features (e.g. rocky outcrops).<br>• The mapping of the sensitive and potentially vulnerable habitats should be done in conjunction with independent researchers and the DFFE in order to ensure that the results could be made available to other researchers.<br>• If sensitive and potentially vulnerable habitats are detected, adjust the well position accordingly or implement appropriate technologies, operational procedures and monitoring surveys to reduce the risks of, and assess the damage to, vulnerable seabed habitats and communities.<br>• Avoid excess cement usage during the riserless stage.<br>• Monitor (using ROV) cement returns and if significant discharges are observed on the seafloor terminate cement pumping.<br>• As information gathered during surveys is of high scientific value, such information should be made available (inter alia to SANBI, SAEON, and the DFFE) to contribute to the knowledge base of deep-water environments. | | | | | | |
| **B** | • The operator will also ensure that the proposed drilling campaign is undertaken in a manner consistent with good international industry practice and BAT. The following controls will be implemented:<br>o Based on pre-drilling survey(s), the well(s) will specifically be sited to avoid sensitive or potentially vulnerable hardground habitats as the preference | Planning<br>Operation | Pre-drilling surveys<br>Operation | Contractor | ECO (ongoing)<br>Independent Researcher<br>DFFE | Well(s) specifically sited to avoid sensitive hardgrounds.<br>Cutting discharges. | Pre-drilling Site Survey Results<br>(Pre-drilling Site Survey Reports)<br>Monitored cement return using ROV |

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| | will be to have a level surface area to facilitate spudding and installation of the wellhead.<br>o Should high-performance WBMs not be able to provide the necessary characteristics for drilling during the risered stage, a low toxicity Group III NADF must be used. In this instance, an "offshore treatment and disposal" strategy will be implemented (i.e. cuttings will be treated offshore to reduce oil content to <6% Oil On Cutting (OOC) and discharged overboard).<br>o Discharge of risered cuttings via a caisson at greater than 10 m below surface to reduce dispersion of the cuttings in surface currents.<br>o Careful selection of drilling fluid additives taking into account their concentration, toxicity, bioavailability and bioaccumulation potential; Ensure only low-toxicity, low bioaccumulation potential and partially biodegradable additives are used.<br>o Maintain a full register of Material Safety Data Sheets (MSDSs) for all chemical used, as well as a precise log file of their use and discharge.<br>o If NADFs are used for drilling the risered sections, ensure regular maintenance of the onboard solids control package and avoid inappropriate discharge of NADF cuttings. | | | | | | (ROV footage)<br>Cutting discharges<br>(Cutting discharge records) |
| **C** | • Monitoring requirements:<br>o Test drilling fluids for toxicity, barite contamination and zero oil content to ensure the specified discharge standards are maintained. | Operation | Operation | Contractor | ECO (ongoing) | Monitoring of drilling fluids undertaken | Drilling fluid tests<br>(Drilling fluid test reports)<br>Monitored cement return using ROV |

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| | ○ Monitor (using ROV) cement returns and if significant discharges are observed on the seafloor terminate cement pumping, as far as possible.<br>○ Monitor (using ROV) hole wash out to reduce discharge of fluids, as far as possible. | | | | | | (ROV footage) |
| 12.18 | WELL TESTING | | | | | | |
| A | • Use high efficiency burners for flaring (in this case non-routine flaring) to optimise combustion of the hydrocarbons in order to minimise emissions and hydrocarbon 'drop-out' during well testing.<br>• Optimise well test programme to reduce flaring as much as possible during the test.<br>• Monitor flare (continuous) for any malfunctioning, etc. (including any drop-out). | Operation | Operation | Contractor | ECO (ongoing) | Use of high efficiency burners.<br>Reduced flaring where possible.<br>Flare monitoring. | Well testing in line with the requirements of the EMPr<br>(Well test reports)<br>(ECO Reports) |
| B | • Commence with well testing during daylight hours, as far as possible.<br>• Designated personnel receive training on the handling of affected seabirds from a suitably qualified facility/ organisation.<br>• Keep disorientated, but otherwise unharmed, seabirds in dark containers (e.g. cardboard box) for subsequent release during daylight hours. Capturing and transportation of seabirds must be undertaken according to specific protocols as outlined in the OWCP. Specifical personnel onboard must be trained in this regard. | Operation | During Operation | Contractor<br>ECO | ECO (ongoing) | Commencement during daylight hours<br>Safe keeping of animals as per the requirements. | Safe keeping of animals as per the requirements.<br>(EO/ MMO Reports)<br>Report ringed/ banded birds.<br>(EO/ MMO Reports) |
| C | • Once the produced water has been separated from the hydrocarbon component, the hydrocarbon component | Operation | During Operation | Contractor | ECO (ongoing) | Proper flaring of hydrocarbons. | Well testing in line with the requirements of the EMPr |

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| | will be burned off via the flare booms, while the water will be temporarily collected in a slop tank. The product water is then either directed to:<br>○ a settling tank prior to transfer to supply vessel for onshore treatment and disposal; or a dedicated treatment unit where, after treatment, it is either: if hydrocarbon content is < 30 mg/l, discharged overboard; or if hydrocarbon content is > 30 mg/l, subject to a 2nd treatment or directed to tank prior to transfer to supply vessel for onshore treatment and disposal. | | | ECO | | Safe collection of produced water. | (Well test reports)<br>(ECO Reports) |
| **D** | • Develop and implement procedures aligned with international best practice for handling radioactive sources used for logging and testing. If radioactive sources are used, these will be contained sources for use for x-ray and other purposes and will be managed according to requisite national and international regulation, as well as the operators procedures. | | | | | | |
| 12.19 | **FISHERIES** | | | | | | |
| **A** | • At least three weeks prior to the commencement of the drilling operations, 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 (500m), and (4) details on the movements of support vessels servicing the project. This Notice to Mariners should be distributed timeously to fishing companies and directly onto vessels where possible. | Planning<br>Operation | Three weeks prior to operation | Contractor<br>FLO | FLO (pre- and post operations)<br>ECO | Notification of stakeholders. | Confirmation of notification of stakeholders. |

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| | • Stakeholders include the relevant fishing industry associations: FishSA, SA Tuna Association; SA Tuna Longline Association, Fresh Tuna Exporters Association, South African Deepsea Trawling Industry Association (SADSTIA) and South African Hake Longline Association (SAHLLA). Other key stakeholders: South African Navy Hydrographer (SANHO), South African Maritime Safety Association (SAMSA), and DFFE Vessel Monitoring, Control and Surveillance (VMS) Unit in Cape Town.<br>• These stakeholders should again be notified at the completion of drilling when the drilling unit and support vessels are off location. | | | | | | |
| B | • Request, in writing, the SANHO to broadcast a navigational warning via Navigational Telex (Navtext) and Cape Town radio (Channel 16 VHF; Call sign: ZSC) for the duration of the well drilling operation. | Planning<br>Operation | During Operation | Contractor<br>FLO | FLO (pre- and post operations)<br>ECO | Navigational Telex (Navtext) and Cape Town radio broadcast. | Navigational Telex (Navtext) and Cape Town radio broadcast. |
| C | • Manage the lighting on the drilling unit and support vessels to ensure that it is sufficiently illuminated to be visible to fishing vessels and compatible with safe operations. | Operation | During Operation | Contractor<br>FLO | FLO (pre- and post operations)<br>ECO | Adequate lighting in place | Adequate lighting in place |
| D | • Notify any fishing vessels at a radar range of 24 nm from the drilling unit via radio regarding the safety requirements around the drilling unit. | Operation | During Operation | Contractor<br>FLO | FLO (pre- and post operations)<br>ECO | Notification of fishing vessels. | Notification of fishing vessels. |
| E | • Implement a grievance mechanism that allows stakeholders to register specific grievances related to operations, by ensuring they are informed about the process and that resources are mobilised to manage the | Operation | During Operation | Contractor<br>FLO | FLO (pre- and post operations) | Grievance mechanism | Grievance mechanism. (Complaints register) |

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| | resolution of all grievances, in accordance with the Grievance Management procedure. | | | | ECO | | |
| 12.20 | UNPLANNED EVENS – VESSEL STRIKES | | | | | | |
| A | • Keep a constant watch from all vessels (Vessel Captain and crew) for cetaceans and turtles in the path of the vessel. Alter course and avoid animals when necessary. | Pre-Drilling<br>Mobilisation<br>Operation<br>Decommissioning | Pre-Drilling<br>Mobilisation<br>Operation<br>Decommissioning | Contractor<br>ECO | ECO (ongoing) | Ensure vessel speed limits are adhered to | Confirmation of activities undertaken in accordance with the requirements (ECO Reports, ship logs) |
| B | • Ensure vessel transit speed between the Area of Interest 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) as well as when sensitive marine fauna are present in the vicinity. | Pre-Drilling<br>Mobilisation<br>Operation<br>Decommissioning | Pre-Drilling<br>Mobilisation<br>Operation<br>Decommissioning | Contractor<br>ECO | ECO (ongoing) | Ensure vessel speed limits are adhered to | Confirmation of activities undertaken in accordance with the requirements (ECO Reports, ship logs) |
| 12.21 | UNPLANNED EVENTS - ACCIDENTAL LOSS OF EQUIPMENT | | | | | | |
| A | • 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.<br>• Minimise the lifting path between vessels. | Pre-Drilling<br>Mobilisation<br>Operation<br>Decommissioning | Pre-Drilling<br>Mobilisation<br>Operation<br>Decommissioning | Contractor | ECO (ongoing) | Sealed containers.<br>Correct lifting equipment and procedures. | Confirmation of activities undertaken in accordance with the requirements (ECO Reports) |
| B | • Maintain an inventory of all equipment and undertake frequent checks to ensure these items are stored and secured safely on board each vessel. | Pre-Drilling<br>Mobilisation | Pre-Drilling<br>Mobilisation | Contractor | ECO (ongoing) | Equipment inventory. | Confirmation of activities undertaken in accordance |

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| | | Operation<br>Decommissioning | Operation<br>Decommissioning | | | | with the requirements (ECO Reports)<br>(Equipment Inventory) |
| C | • Undertake a post drilling ROV survey to scan seafloor for any dropped equipment and other removable features 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. | Decommissioning | Decommissioning | Contractor | ECO (ongoing) | ROV Survey | ROV Survey<br>(ROV Survey Footage) |
| D | • Notify SAN Hydrographer of any hazards left on the seabed or floating in the water column, with the dates of abandonment/loss and locations and request that they send out a Notice to Mariners with this information. | Pre-Drilling<br>Mobilisation<br>Operation<br>Decommissioning | Pre-Drilling<br>Mobilisation<br>Operation<br>Decommissioning | Contractor | ECO (ongoing) | Notifications to SAN Hydrographer. | (Notifications to SAN Hydrographer) |
| E | • Establish 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 location, and where applicable, the dates of retrieval. | Pre-Drilling<br>Mobilisation<br>Operation<br>Decommissioning | Pre-Drilling<br>Mobilisation<br>Operation<br>Decommissioning | Contractor | ECO (ongoing) | Hazards database. | (Hazards database) |
| F | • Establish a functional grievance mechanism that allows stakeholders to register specific grievances related to operations, by ensuring they are informed about the process and that resources are mobilised to manage the resolution of all grievances, in accordance with the Grievance Management procedure. | Operation | Operation | Applicant | ECO (ongoing) | Grievance Mechanism | Grievance Mechanism |

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| 12.22 UNPLANNED EVENTS – ACCIDENTAL OIL RELEASE TO THE SEA DUE TO VESSEL COLLISIONS, BUNKERING ACCIDENT AND LINE / PIPE RUPTURE | | | | | | | |
| A | • Ensure personnel are adequately trained in both accident prevention and immediate response, and resources are available on each vessel. | Pre-Drilling<br>Mobilisation<br>Operation<br>Decommissioning | Pre-Drilling<br>Mobilisation<br>Operation<br>Decommissioning | Contractor | ECO (ongoing) | Training of personnel. | (Training Records) |
| B | • Obtain permission from DFFE to use low toxicity dispersants should these be required; Use cautiously. | Pre-Drilling<br>Mobilisation<br>Operation<br>Decommissioning | Pre-Drilling<br>Mobilisation<br>Operation<br>Decommissioning | Contractor | ECO (ongoing) | Permission for low toxicity dispersants. | (Permission for low toxicity dispersants) |
| C | • 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. | Pre-Drilling<br>Mobilisation<br>Operation<br>Decommissioning | Pre-Drilling<br>Mobilisation<br>Operation<br>Decommissioning | Contractor | ECO (ongoing) | Spills contained. | (Incident Reports)<br>(ECO Reports) |
| D | • Ensure adequate resources are provided to collect and transport oiled birds to a cleaning station. | Pre-Drilling<br>Mobilisation<br>Operation<br>Decommissioning | Pre-Drilling<br>Mobilisation<br>Operation<br>Decommissioning | Contractor | ECO (ongoing) | Resources for collection and transportation of birds. | (Incident Reports)<br>(ECO Reports) |

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| **E** | • Ensure offshore bunkering is not undertake in the following circumstances:<br>o Wind force and sea state conditions of ≥6 on the Beaufort Wind Scale;<br>o During any workboat or mobilisation boat operations;<br>o During helicopter operations;<br>o During the transfer of in-sea equipment; and<br>o At night or times of low visibility. | Pre-Drilling<br>Mobilisation<br>Operation<br>Decommissioning | Pre-Drilling<br>Mobilisation<br>Operation<br>Decommissioning | Contractor | ECO (ongoing) | Proper offshore bunkering. | (Incident Reports)<br>(ECO Reports) |
| **F** | • A 500 m safety zones will be enforced around the drilling unit within which fishing and other vessels would be excluded. | Mobilisation<br>Operation<br>Decommissioning | Pre-Drilling<br>Mobilisation<br>Operation<br>Decommissioning | Contractor | ECO (ongoing) | Safety zone around drilling vessel | (FLO Reports)<br>(ECO Reports) |
| **G** | • Regulation 37 of MARPOL Annex I will be applied, which requires that all ships of 400 gross tonnage and above carry an approved Shipboard Oil Pollution Emergency Plan (SOPEP). The purpose of a SOPEP is to assist personnel in dealing with unexpected discharge of oil, to set in motion the necessary actions to stop or minimise the discharge, and to mitigate its effects on the marine environment. | Pre-Drilling<br>Mobilisation<br>Operation<br>Decommissioning | Pre-Drilling<br>Mobilisation<br>Operation<br>Decommissioning | Contractor | ECO (ongoing) | SOPEP | (SOPEP) |
| **H** | • As standard practice, an Emergency Response Plan (ERP) and an Oil Spill Contingency Plan (OSCP) will be prepared and available at all times during the drilling operation. | Pre-Drilling<br>Mobilisation<br>Operation | Pre-Drilling<br>Mobilisation<br>Operation | Contractor | ECO (ongoing) | ERP<br>OSCP | (ERP)<br>(OSCP) |

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| | | Decommissioning | Decommissioning | | | | |
| I | • Project vessels will be equipped with appropriate spill containment and clean-up equipment, e.g. booms, dispersants and absorbent materials. All relevant vessel crews will be trained in spill clean-up equipment use and routine spill clean-up exercises. | Pre-Drilling<br>Mobilisation<br>Operation<br>Decommissioning | Pre-Drilling<br>Mobilisation<br>Operation<br>Decommissioning | Contractor | ECO (ongoing) | Containment of spills | Spill containment and clean-up equipment<br>(Visual Inspection)<br>(Training Records) |
| 12.23 | UNPLANNED EVENTS – WELL BLOWOUT | | | | | | |
| A | • The safe operating metocean conditions need to be defined based on the drill rig/ ship. Operations should not occur outside of these pre-defined metocean conditions. | Operation | Operation | Contractor | ECO (ongoing) | No operations outside of pre-defined safe metocean conditions | (metocean data/ observations) |
| B | • Develop a response strategy and plan (OSCP), aligned with the National OSCP 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:<br>○ Develop an Oiled Wildlife Contingency Plan (OWCP) in collaboration with specialist wildlife response organisations with experience in oiled wildlife response. The OWCP should be integrated into the site-specific OSPC and include detailed protocols on | Operation | Operation | Contractor | ECO (ongoing) | OSCP<br>OWCP | (OSCP)<br>(OWCP) |

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| | the collection, handling and transport of oiled marine fauna.<br>○ 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.<br>○ 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.<br>○ Well-specific oil spill modelling for planning purposes taking into consideration site- and temporal-specific information, the planned response strategy, and associated resources.<br>○ Develop intervention plans for the most sensitive areas to minimise risks and impacts and integrate these into the well-specific response strategy and associated plans.<br>○ If modelling and intervention planning indicates that the well-specific response strategy and plans cannot reduce the response times to less than the time it would take oil to disperse, additional proactive measures must be committed to. For example: Implement measures to reduce surface response times (e.g. pre-mobilise a portion of the dispersant stock on the support vessels, contract additional response vessels and aircrafts, improve dispersant spray capability, etc.).<br>○ The OSCP must include an oiled wildlife contingency plan or any wildlife response strategy developed in | | | | | | |

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| | consultation with specialist wildlife response organisations, e.g. SANCCOB. Such plan must consider and align with international best practice, including the IPIECA Wildlife Response Preparedness Guidelines. | | | | | | |
| **C** | • Schedule joint oil spill exercises including the operator and local departments / organisations to test the Tier 1, 2 & 3 responses. | Operation | Operation | Contractor | ECO (ongoing) | Schedule joint oil spill exercises | (Schedule joint oil spill exercises) |
| **D** | • Ensure contract arrangements and service agreements are in place to implement the OSCP, e.g. capping stack in Saldanha Bay and other international locations, surface response equipment (e.g. booms, dispersant spraying system, skimmers, etc.), dispersants, response vessels, etc. | Operation | Operation | Contractor | ECO (ongoing) | Contract arrangements and service agreements are in place to implement the OSCP. | (Contractual Agreements) |
| **E** | • 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 DFFE. | Operation | Operation | Contractor | ECO (ongoing) | Permission for low toxicity dispersants. | (Permission for low toxicity dispersants) |
| **F** | • Ensure a standby vessel is within 30 minutes of the drilling unit, equipped for dispersant spraying and can be used for mechanical dispersion (using the propellers of the ship and/or firefighting equipment). It should have at least 5 $m^3$ of dispersant onboard for initial response. | Operation | Operation | Contractor | ECO (ongoing) | Standby vessel with dispersant. | Standby vessel with dispersant. |
| **G** | • Implement all project controls related to unplanned well blowout in Section 11.3 of the EMPr | Operation | Operation | Contractor | ECO (ongoing) | Implementation of all project controls. | Confirmation of implementation of all project controls. |

| Item No. | Technical or Management Option | Phase | Timeframes | Responsible Party | Monitoring Party (Frequency) | Target | Performance Indicators (Monitoring Tool) |
|---|---|---|---|---|---|---|---|
| **H** | • In the event of a 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 resources | Operation | Operation | Contractor | ECO (ongoing) | SAR pollution monitoring | SAR pollution monitoring |
| **I** | • The Operator is to submit all forms of financial insurance and assurances to PASA to manage all damages and compensation requirements in the event of an unplanned pollution event. | Planning | Planning | Applicant | ECO (Once-Off) | Financial insurance and assurances in place. | Financial insurance and assurances policies or guarantees |
| **J** | • Establish a functional grievance mechanism that allows stakeholders to register specific grievances related to operations, by ensuring they are informed about the process and that resources are mobilised to manage the resolution of all grievances, in accordance with the Grievance Management procedure. | Operation | Operation | Applicant | ECO (ongoing) | Grievance Mechanism | Grievance Mechanism |

# 13 APPENDICES

Appendix 1: EAP Curriculum Vitae