



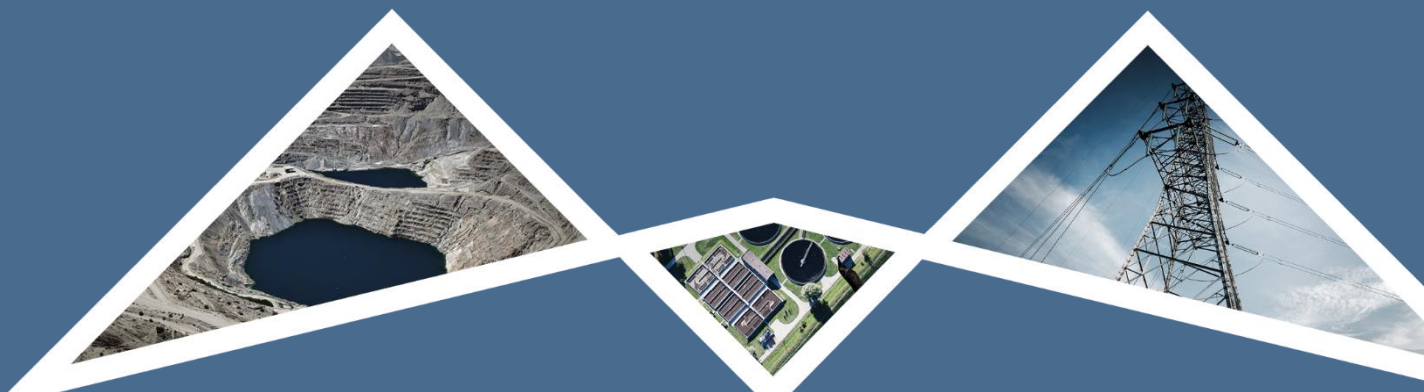
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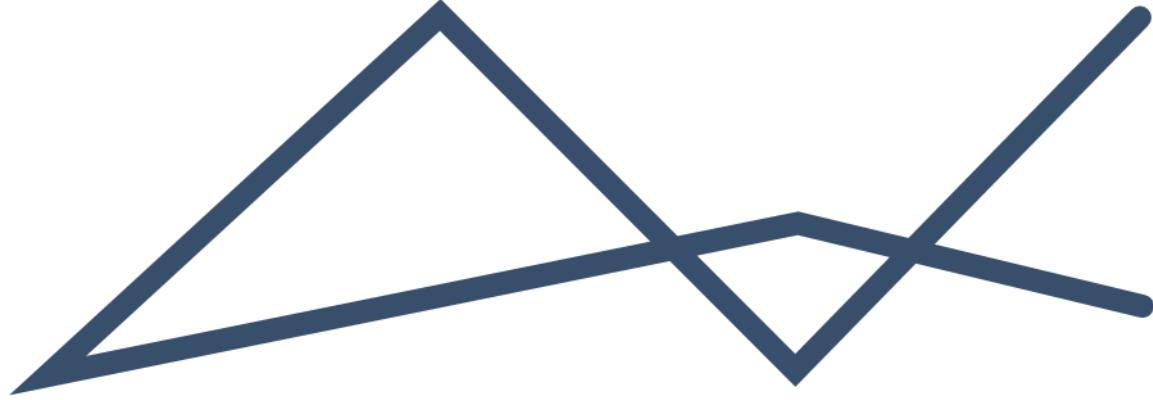
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## ENVIRONMENTAL MANAGEMENT PROGRAMME:

PROPOSED TGS ORANGE BASIN RECONNAISSANCE PERMIT

PASA REFERENCE: 12/1/040








### DOCUMENT DETAILS

**EIMS REFERENCE:** 1520

**DOCUMENT TITLE:** Environmental Management Programme: TGS Orange Basin  
Reconnaissance Permit

### DOCUMENT CONTROL

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### REVISION AND AMENDMENTS

REVISION DATE:	REV #	DESCRIPTION
2022/10/06	ORIGINAL DOCUMENT	Environmental Management Programme for public review
2022/12/05	REVISION 1	Environmental Management Programme for adjudication



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## Abbreviations

BPEO	:	Best Practicable Environmental Option
DFFE	:	Department of Forestry, Fisheries and Environment
DWS	:	Department of Water and Sanitation
EA	:	Environmental Authorisation
CBA	:	Critical Biodiversity Area
EAP	:	Environmental Assessment Practitioner
ECO	:	Environmental Control Officer
EO	:	Environmental Officer
EIA	:	Environmental Impact Assessment
EIMS	:	Environmental Impact Management Services (Pty) Ltd
EMF	:	Environmental Management Framework
EMPr	:	Environmental Management Programme Report
EPRP	:	Emergency Preparedness and Response Plan
ESA	:	Ecological Support Area
HSE	:	Health, Safety and Environment
I&AP	:	Interested and Affected Party
ISO	:	International Standards Organisation
MPRDA	:	Minerals and Petroleum Resources Development Act (Act No. 28 of 2002)
NFA	:	National Forests Act (Act 84 of 1998)
NEMA	:	National Environmental Management Act (Act No. 107 of 1998)
NEMAQA	:	National Environmental Management: Air Quality Act (Act No. 39 of 2004)
NEMBA	:	National Environmental Management: Biodiversity Act (Act No. 10 of 2004)
NEMWA	:	National Environmental Management: Waste Act (Act No. 59 of 2008)
NWA	:	National Water Act (Act No. 36 of 1998)
OHSA	:	Occupational Health and Safety Act (Act No. 85 of 1993)
SABS	:	South African Bureau of Standards
SANAS	:	South African National Accreditation System
SWMP	:	Storm Water Management Plan



## **1 INTRODUCTION**

TGS Geophysical Company (UK) (hereafter TGS) has applied for Environmental Authorization for a 3D seismic survey off the West Coast of South Africa. Environmental Impact Management Services (Pty) Ltd (EIMS) has been appointed by TGS to prepare and submit an application for Environmental Authorisation (EA) as per the requirements of the Environmental Impact Assessment (EIA) Regulations, 2014, as amended, promulgated under the National Environmental Management Act (Act No. 107 of 1998- NEMA) and the requirements of the Minerals and Petroleum Resources Development Act (Act No. 28 of 2002 – MPRDA).

The proposed project area is located between approximately 120 km offshore of St Helena Bay, extending north along the western coastline to approximately 230 km offshore of Hondeklip Bay over a number of petroleum licence blocks.

The area of interest for the proposed 3D seismic survey is approximately 57 400 km<sup>2</sup> in extent. It is proposed that a single survey vessel equipped with seismic sources and streamers be used. The proposed 3D survey would be supported by up to two escort vessels. The 3D survey will take in the order of 70 days including downtime.

The Environmental Management Programme (EMPr) has been compiled to meet the requirements for an 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 – <ul style="list-style-type: none"> <li>(i) The EAP who prepared the EMPR; and</li> <li>(ii) The expertise of that EAP to prepare an EMPR, including a curriculum vitae;</li> </ul>	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 6
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 through the environmental impact assessment process for all phases of the development including – <ul style="list-style-type: none"> <li>(i) Planning and design;</li> <li>(ii) Pre-construction activities;</li> <li>(iii) Construction activities;</li> <li>(iv) rehabilitation of the environment after construction and in the case of a closure activity, closure; and</li> <li>(v) Where relevant, operation activities;</li> </ul>	Section 13
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 – <ul style="list-style-type: none"> <li>(i) Avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;</li> <li>(ii) Comply with any prescribed environmental management standards or practices; and</li> <li>(iii) Comply with any applicable provisions of the act regarding closure, where applicable.</li> </ul>	Section 13





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 13
Appendix 4(1)(1)(h)	The frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);	Section 13
Appendix 4(1)(1)(i)	An indication of the persons who will be responsible for the implementation of the impact management actions;	Section 13
Appendix 4(1)(1)(j)	The time periods within which the impact management actions contemplated in paragraph (f) must be implemented;	Section 13
Appendix 4(1)(1)(k)	The mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);	Section 13
Appendix 4(1)(1)(l)	A program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;	Section 13
Appendix 4(1)(1)(m)	An environmental awareness plan describing the manner in which – <ul style="list-style-type: none"><li>(i) The applicant intends to inform his or her employees of any environmental risk which may result from their work; and</li><li>(ii) Risks must be dealt with in order to avoid pollution or the degradation of the environment; and</li></ul>	Section 11
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 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 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 (Report Compiler) & Mr Liam Whitlow (Reviewer)
Tel No.:	+27 11 789 7170
E-mail:	<a href="mailto:tgs@eims.co.za">tgs@eims.co.za</a>

### 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 29 years' experience in conducting EIA's. Please refer to the EIMS website ([www.eims.co.za](http://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.

Liam holds a B. Sc. Hons degree in Environmental Management and has completed an additional B. Sc. honours course in applied limnology. In addition, he has completed a higher certificate in Project Management with Damelin Business School and a course on ISO14001 Auditing Principles and Environmental Management Systems Auditor Training. Liam is a registered professional natural scientist with the South African Council for Natural Scientific Professions. Liam's professional experience, gained over more than 21 years, lies mainly with environmental impact assessments including project managing significantly large EIAs in the mining and infrastructure sectors. Liam's other experience includes ISO14001, Site Assessments, Water-use licensing, Environmental monitoring, and



Environmental Management Plans. Liam's experience lies mainly within South Africa, but he has been involved in projects in both Lesotho and Botswana.

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 proposed activity

Seismic survey programmes comprise of data acquisition in either two-dimensional (2D) and/or three-dimensional (3D) scales, depending on information requirements. 2D surveys are typically applied to obtain regional data from widely spaced survey grids and provide a vertical profile through the subsurface, highlighting geophysical, geological information and features along the seismic line. Infill surveys on closer grids subsequently provide more detail over specific areas of interest. In contrast, 3D seismic surveys are conducted on a very tight survey grid spacing in specific target areas, often identified during 2D applications, providing a cube image of the subsurface geology within the survey volume. The current proposed seismic survey as discussed in this report is a 3D seismic survey and does not include any provision for exploration drilling.

During seismic surveys high-level, low frequency sound pulses are generated by an acoustic instrument towed behind a survey vessel, just below the sea surface. The sounds are directed towards the seabed and the seismic signal is reflected by the geological interfaces below the seafloor. The reflected signals are received by an array of receivers or sets of hydrophones towed behind the vessel in a single streamer (2D) or in multiple streamers (3D) and are fed back to the recording instruments on board. The spacing between the hydrophone groups is commonly 25 m or shorter, depending on the purpose of the seismic survey. Each group contains many hydrophones, spaced less than 1 m apart. The hydrophone streamers must be towed at constant depth (6 – 10 m), with flotation usually achieved by filling the cables with kerosene, gel or flexible polymer foam, so that they are neutrally buoyant. To compensate for minor adjustments, Automatic Cable Levellers, or "birds" are used. The ends of the hydrophone streamers are marked with tail buoys, to warn shipping about the presence of the cable in the water. The tail buoys also act as a platform for surface positioning systems so that the cable locations can be accurately monitored. Refer to Figure 1, Figure 2 and Figure 3 for illustrative examples of typical survey vessel, equipment and activities.

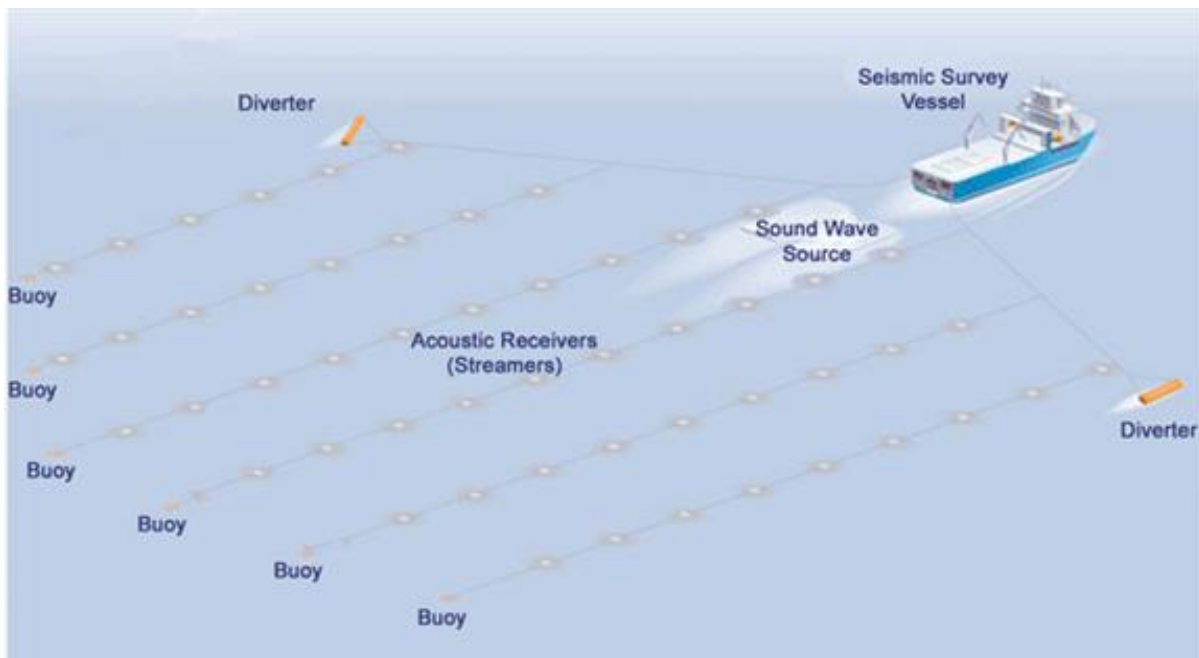


Figure 1: Example of seismic survey vessel and associated equipment (FishSAFE, 2021).

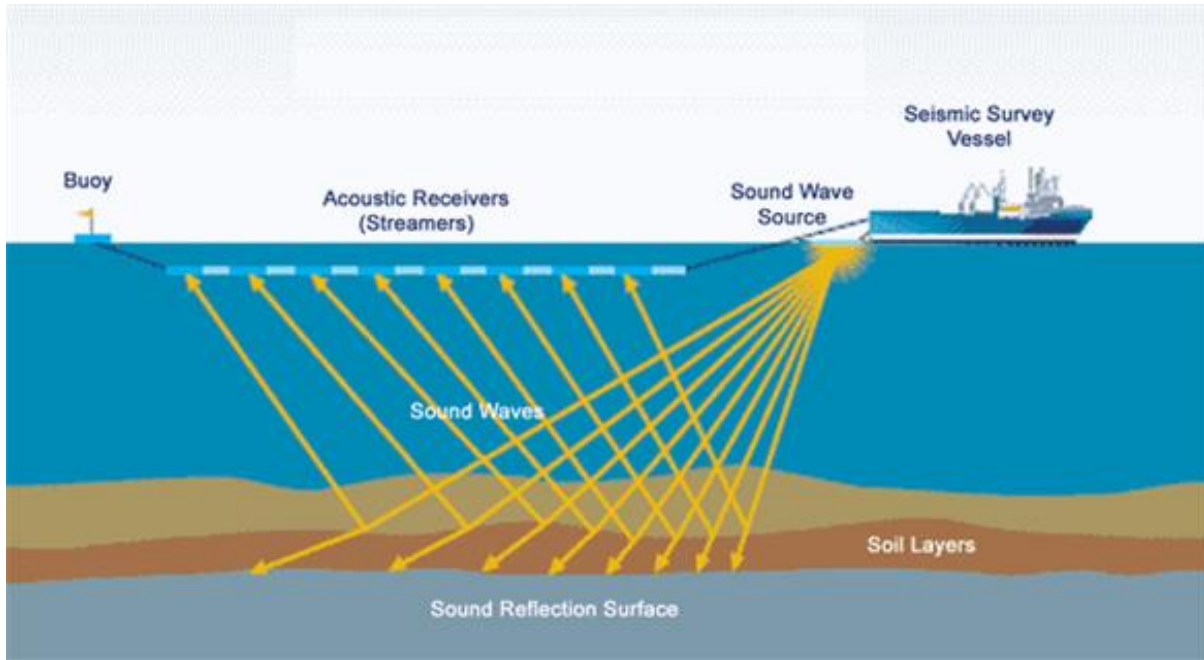


Figure 2: Example demonstration of seismic survey activities (Fish SAFE, 2021).

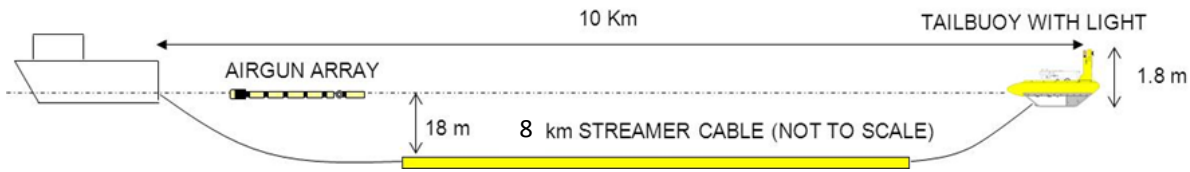


Figure 3: Schematic diagram showing side-view of the seismic source array and hydrophone cable ("streamer")

While acquiring the seismic data, the survey vessel would travel along transects of a prescribed grid within the survey area that have been chosen to cross any known or suspected geological structure in the area. The vessel typically travels at a speed of between four and six knots (i.e. 2 to 3 meters per second / 7.2 to 10.8 kilometres per hour) while surveying. The survey vessel length is approximately 100 m.

The proposed survey would involve a seismic sound source and multiple hydrophone streamers, which would be approximately 8 000 m long and 2 000 m wide. The streamers would be towed at a depth of 8 m below the surface and would not be visible, except for the tail-buoy at the terminal end of the cable. The array has an operating pressure of 2 000 pounds per square inch. The sound source would be towed behind the vessel at a depth of between 5 – 25 m below the surface. As the survey vessel would be restricted in manoeuvrability, other vessels should remain clear of it and therefore a support vessel usually assists in the operation of keeping other vessels at a safe distance.

Each triggering of a sound source is termed a seismic pulse, and these are discharged at intervals of 6 – 20 seconds (depending on water depth and other environmental characteristics). Each seismic pulse is usually only between 5 and 30 milliseconds in duration, and despite peak levels within each pulse being high, the total energy delivered into the water is low. Seismic sources have most of their energy in the 5-300 Hz frequency range, with the optimal frequency required for deep penetration seismic work being 50-80 Hz.

Sound levels from individual sound sources used today in the seismic industry range from 200 to 255 dB re 1  $\mu$ Pa at 1 m, for small to large individual seismic sources, respectively. For sound source arrays, sound levels range from 235 dB re 1  $\mu$ Pa at 1 m for a small array (500 cubic inches) to 260 dB re 1  $\mu$ Pa at 1 m for large arrays (7 900 cubic inches). The majority of the produced energy is below 250 Hz, with 90% of the energy between 70 to 140 Hz, although pulses do contain some higher frequencies up to 16 kHz. It must be noted, however, that the sound level specifications for sound source arrays refer to sound levels in the vertical direction directly beneath the sound source array, generally near its centre, with nominal sound levels in the horizontal direction being ~10-20 dB lower.



## **6 SITE DESCRIPTION AND SENSITIVE AREAS**

There are six offshore Marine Protected Areas (MPAs) in the general project area, but none fall within the Survey area. The proposed 3D survey area lies well offshore of these MPAs. Although there is no overlap of the 3D survey area with Ecologically and Biologically Significant Areas (EBSAs), critical biodiversity areas (CBAs) within the Reconnaissance Permit and 3D survey areas include both CBA1: natural and CBA2: natural areas (Figure 4). No no-go areas were identified.



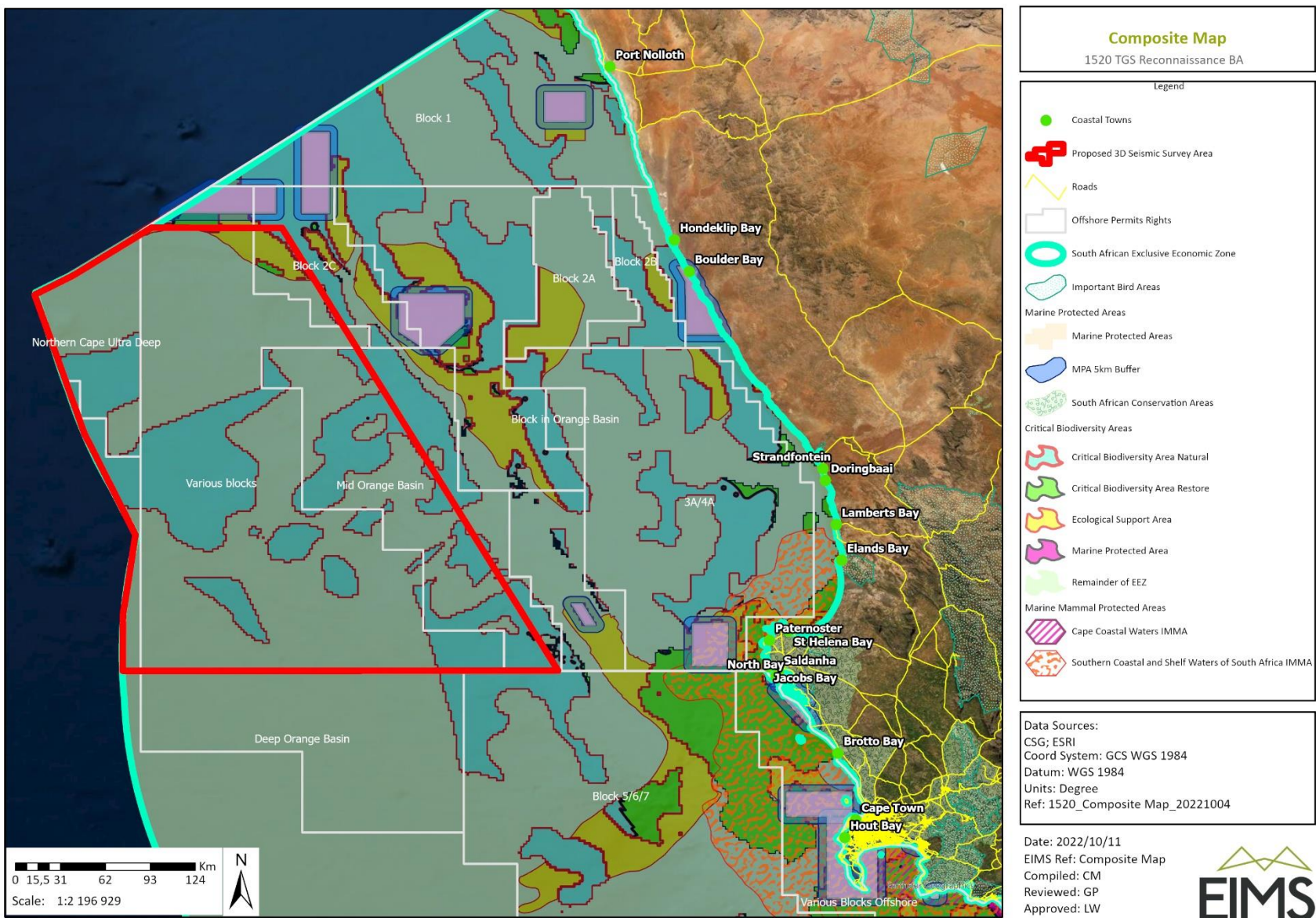


Figure 4: Locality/ sensitivity map showing the preferred site for the 3D Survey.



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 3: Potential Impacts identified in BA report

#	Impact	Phase
1	Impacts of seismic noise on mysticetes and odontocetes	Operation
2	Impacts of seismic noise on seals	Operation
3	Impacts of seismic noise on turtles	Operation
4	Impacts of seismic noise on diving seabirds	Operation
5	Impacts of seismic noise to pelagic fish	Operation
6	Impacts of seismic noise to marine invertebrates	Operation
7	Impacts of seismic noise to plankton and ichthyoplankton	Operation
8	Disturbance and behavioural changes in seabirds, seals, turtles and cetaceans due to vessel noise	Operation
9	Disturbance and behavioural changes in seabirds, seals, turtles and cetaceans due to noise of support aircraft	Operation
10	Disturbance and behavioural changes in pelagic fauna due to vessel lighting	Operation
11	Impacts of marine biodiversity through the introduction of non-native species in ballast water and on ship hulls	Operation
12	Impacts of normal vessel discharges on marine fauna	Operation
13	Impacts on turtles and cetaceans due to ship strikes, collision and entanglement with towed equipment	Operation
14	Impacts on benthic and pelagic fauna due to accidental loss of equipment to the seabed or the water column	Operation
15	Impacts of an operational spill or collision on marine fauna	Operation
16	Impacts of exclusion from fishing ground on the large pelagic longline sector due to the safety zone around the survey vessel	Operation
17	Impact of Exclusion of the Tuna Pole-Line Sector from access to Fishing Ground	Operation
18	Impact of Underwater Sound on the Large Pelagic Longline Sector	Operation
19	Impact of Underwater Sound on the Tuna Pole-Line Sector	Operation
20	Impacts of an operational spill on the large pelagic longline sector	Operation
21	Impacts of the unplanned loss of equipment to sea from the survey vessel	Operation



#	Impact	Phase
22	Impacts on Cultural Heritage	Operation
23	Impacts of an operational spill or collision on marine fauna	Operation
24	Impacts on Cultural Heritage	Operation
25	Uncertainty	Planning
26	Concerns about cumulative impacts	Planning
27	Further marginalisation of vulnerable groups	Planning
28	Stakeholder fatigue and disillusionment	Planning
29	Perceived impact on livelihoods	Operation
30	Impacts on sense and spirit of place	Operation
31	Impacts on social licence to operate	Operation
32	Community expectations	Operation
33	Social unrest	Operation

## 7 ENVIRONMENTAL MANAGEMENT APPROACH

The compilation of an EMPr for an activity which is likely 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.

## **7.1 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:

### **7.1.1 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 7.1.2). 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.

### **7.1.2 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.

### **7.1.3 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.

### **7.1.4 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.

### **7.1.5 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 South Africa, the DWS (then DWAF) adopted a BPEO guideline in 1991 for water quality management and in 1994 in the Minimum Requirements document for waste management.

In terms of DWAF Minimum Requirements for the Handling and Disposal of Hazardous Waste, 1994, the precautionary principle is defined as, "Where a risk is unknown; the assumption of the worst-case situation and the making of provision for such a situation." Here the precautionary principle assumes that a waste or an identified contaminant of a waste is "both highly hazardous and toxic until proven otherwise."

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.

### **7.1.6 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 program, from design to disposal or termination. In terms of the DWAF Minimum Requirements for the Handling and Disposal of Hazardous Waste, 1994, "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.

### **7.1.7 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."

## **7.2 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.

### **7.3 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;
- NWA Section 151 (1c): No person may fail to comply with any condition attached to a permitted water use under this Act;



- NWA Section 151 (2): Any person who contravenes any provision of subsection (1) is guilty of an offence and liable, on the first conviction, to a fine or imprisonment for a period not exceeding five years, or to both a fine and such imprisonment and, in the case of a second or subsequent conviction, to a fine or imprisonment for a period not exceeding ten years 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.

## **8 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.

### **8.1 The Project Applicant/Proponent**

The applicant is the principal party (Proponent) of the project. For the purposes of this project, it is understood that the Applicant role is fulfilled by the TGS. 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/developers 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 MMO to monitor marine fauna for the duration of the survey;
- Appoint an independent and suitably qualified PAM operator to monitor marine fauna for the duration of the survey;
- Appoint a suitably qualified FLO to facilitate communications between the seismic and fishing vessels for the duration of the survey;
- Notify the relevant competent authority of changes in the development resulting in significant environmental impacts;
- Assess the various contractor's environmental performance during the survey, 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 survey process and lessen significant impacts to the environment;
- Ensure MMOs and PAM operators are briefed on the area-specific sensitivities and on the seismic survey 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 survey 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 survey 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.

## 8.2 The Project Manager

During the development, 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 estimating;
- Ensures implementation of the project plan within cost, time and quality constraints;
- Ensures that implementation of EMPr is executed as planned; and
- Keeps the asset owner informed of progress made during the life cycle of the project.



### 8.3 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 survey activities. The ECO is responsible for the auditing function as well as the clarification of environmental conditions contained in this EMPr to anyone working on the site. **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 site 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 consultation 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.

### 8.4 Marine Mammal Observer

Independent Marine Mammal Observer (MMO) is required on board at all times; as a minimum sufficient MMOs must be on watch to cover all hours for the pre-acquisition observations and while the acoustic source is active. 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 seismic survey. 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 seismic survey 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 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 seismic survey or adjusting of seismic 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.

## **8.5 Passive Acoustic Monitoring Operator**

An independent Passive Acoustic Monitoring (PAM) Operator is required on board at all times, as a minimum at least one must be on watch at all times while the acoustic source is 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;
- Request the delay of start-up and temporary termination of the seismic survey, as appropriate;

## **8.6 Fisheries Liaison Officer**

An Independent Fisheries Liaison Officer (FLO) must be appointed to undertake the following:

- Facilitate communication with maritime vessels;
- Report daily on vessel activity;
- Respond and advise on action to be taken in the event of encountering fishing gear; and
- Report daily on the survey vessel’s potential impacts on marine fauna.

## **8.7 The Contractor/ Operator**

The contractor is usually a third party appointed by the applicant/project manager to undertake the actual survey acquisition. 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 EMP 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 his employees and sub-contractors appointed by him/her 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 seismic 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 survey activities.

### **8.8 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 the survey 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 survey 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 Consultation register;
- Liaise with the project teams on issues related to implementation of, and compliance with the EMPr; and
- Ensure adequate and compliant waste management.





## 8.9 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.

## 9 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 survey 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.

### 9.1 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.

### 9.2 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.

### 9.3 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 the survey:

- 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.

#### **9.4 Responding to Non-Compliances**

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

- Inspections of the survey vessel and activities related to the survey;
- Monitoring of selected environmental quality variables (where relevant);
- Audits of the survey 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 3D seismic survey 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.

#### **9.5 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 4.



Table 4: Description of incidents and non-conformances for the purpose of the project

<b>Non-Conformance</b>	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.
<b>Major Environmental Incident</b>	<p>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.</p> <p>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.</p>
<b>Medium Environmental Incident</b>	<p>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.</p> <p>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.</p>
<b>Minor Environmental Incident</b>	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 a 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.



## 9.6 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 seismic survey is undertaken in a manner consistent with good international industry practice and Best Available Techniques (BAT), and in compliance with the applicable requirements in the MPRDA regulations.

The operator will ensure that the proposed seismic survey 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

Detailed mitigation measures for seismic surveys in other parts of the world are provided by Weir et al. (2006), Compton et al. (2007) and US Department of Interior (2007). Many of the international guidelines presented in these documents are extremely conservative as they are designed for areas experiencing repeated, high intensity surveys and harbouring particularly sensitive species, or species with high conservation status. A number of countries have more recently updated their guidelines, most of which are based on the JNCC (2010, 2017) recommendations but adapted for specific areas of operation. A review and comparison of these is provided in MaMa CoCo SEA (2015). The guidelines currently applied to seismic surveying in South African waters are those proposed in the Generic EMPr (CCA & CMS 2001). These have been updated as necessary to include salient points from recognised international guidelines, particularly the JNCC (2010, 2017) Guidelines and the 2013 New Zealand Code of Conduct for seismic operations.

## 10 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.

## **11 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 the survey 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 seismic survey process (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 seismic survey 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.

## 12 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 seismic survey phase.



## 12.1 Spill Response Procedure

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 9.5 shall also apply.

The Applicant must also, (as per Section 30 of the NEMA) notify the Director-General (DWS, Competent Authority, DEFF), 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.

## 12.2 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 the survey;
- 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.



## 13 MANAGEMENT AND MITIGATION

Table 5: Technical or Management Options

Item No.	Technical or Management Option	Phase	Timeframes	Responsible Party	Monitoring Party (Frequency)	Target	Performance Indicators (Monitoring Tool)
<b>13.1 Legal Compliance</b>							
<b>A</b>	<ul style="list-style-type: none"> <li>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.</li> </ul>	Planning Operation	Prior to operation and ongoing	Applicant	ECO (Monthly)	Ensure compliance with relevant legislation.	Up to date legal register. (Legal register) (ECO Monthly Audit)
<b>B</b>	<ul style="list-style-type: none"> <li>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.</li> </ul>	Planning Operation	Prior to operation and ongoing	Applicant ECO	ECO (Monthly)	Ensure compliance with relevant legislation / Confirmation that requirements in terms of updated legislation are passed onto the contractors.	(Contractors contractual agreements) (ECO Monthly Audit)
<b>C</b>	<ul style="list-style-type: none"> <li>Should surveys run simultaneously, it would be required to amend the EMP, which would be subject to further assessment and consultation.</li> </ul>						
<b>13.2 Scheduling</b>							
<b>A</b>	<p>Based on the findings of the Acoustics, Marine Ecology and Fisheries recommendations, it is recommended that the survey window of January – May be utilised in order to:</p> <ul style="list-style-type: none"> <li>Avoid sensitive areas and periods for some marine fauna: Movement of migratory cetaceans (particularly baleen whales) from their southern feeding grounds into low latitude waters (June/July and late October/November), and their aggregation on the summer feeding grounds between St Helena Bay and Dassen Island from late October to late December and ensure that migration paths are not blocked by seismic operations;</li> <li>Avoid periods of peak fishing activity during June and July in order to reduce the probability of disruption to the large pelagic longline fishing sector and tuna pole line fishing sector.</li> </ul>	Planning Operation	Prior to operation and ongoing	Applicant ECO	ECO (ongoing)	Limit survey to January – May.	Survey logs and ECO Reports.





Item No.	Technical or Management Option	Phase	Timeframes	Responsible Party	Monitoring Party (Frequency)	Target	Performance Indicators (Monitoring Tool)
<b>13.3 Appointment of ECO/MMO/PAM/FLO</b>							
<b>A</b>	<ul style="list-style-type: none"> <li>The Applicant shall appoint a suitably qualified ECO who shall be independent from the Applicant and the Contractor. The ECO must preferably have a tertiary qualification in Environmental Management or appropriate environmental science field. The ECO should have appropriate qualification and experience in the implementation of environmental management specifications. For the purposes of implementing the conditions contained in this EMPr. The Applicant shall provide the ECO with the necessary support to ensure that the environmental aspects relating to the development is adhered to. The appointment of the ECO shall remain in force until all obligations of this EMPr have been met (e.g. including any relevant rehabilitation phase).</li> </ul>	Planning Operation	Prior to operation	Applicant	Applicant (once off prior to operations)	Appoint ECO to ensure monitoring of successful implementation of the EMPr.	Confirmation that ECO has been appointed and is suitably qualified to perform the duties contained in this EMPr. (ECO appointment and CV)
<b>B</b>	<ul style="list-style-type: none"> <li>Qualified, independent MMOs are required on board at all times; as a minimum sufficient MMOs must be on watch to cover all hours while the acoustic source is active.</li> </ul>	Planning Operation	Prior to operation	Applicant	Applicant (once off prior to operations)	Appoint MMO 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. (MMO appointment and CV)
<b>C</b>	<ul style="list-style-type: none"> <li>Qualified, independent PAM Operators are required on board at all times, as a minimum one must be on watch while the acoustic source is active.</li> </ul>	Planning Operation	Prior to operation	Applicant	Applicant (once off prior to operations)	Appoint PAM to ensure monitoring of successful implementation of the EMPr.	Confirmation that PAM has been appointed and is suitably qualified to perform the duties contained in this EMPr. (PAM appointment and CV)
<b>D</b>	<ul style="list-style-type: none"> <li>The Applicant shall appoint an independent FLO who must have experience in the liaising with the fishing operations and communities.</li> </ul>	Planning Operation	Prior to operation	Applicant	Applicant (once off prior to operations)	Appoint FLO to ensure monitoring of successful implementation of the EMPr.	Confirmation that FLO has been appointed and is suitably qualified to perform the duties contained in this EMPr. (FLO appointment and CV)
<b>E</b>	<ul style="list-style-type: none"> <li>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.</li> </ul>	Planning Operation	As required	Applicant ECO	ECO (Monthly) Applicant (as and when necessary)	Ensure EMPr is reviewed and updated where necessary to ensure adequate mitigation for all impacts associated with the project.	Audit results and recommendations (ECO Monthly Audit)



Item No.	Technical or Management Option	Phase	Timeframes	Responsible Party	Monitoring Party (Frequency)	Target	Performance Indicators (Monitoring Tool)
<b>13.4 Appointment of Contractors</b>							
<b>A</b>	<ul style="list-style-type: none"> <li>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 survey activities must be provided for in the contract.</li> </ul>	Planning Operation	Prior to operation	Applicant 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. (Contractual agreements) (ECO Monthly Audit)
<b>B</b>	<ul style="list-style-type: none"> <li>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.</li> </ul>	Planning Operation	Prior to Operation and Ongoing	Contractor	ECO (Monthly) Applicant (once off per contractor)	Ensure all contractors are aware of EMPr requirements.	Confirmation that contractors have received training relating to EMPr implementation. (Training records) (ECO Monthly Audit)
<b>C</b>	<ul style="list-style-type: none"> <li>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 seismic survey.</li> </ul>	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 seismic survey.	Confirmation that EO has been appointed and is suitably qualified to perform the necessary duties contained in this EMPr. (ECO Monthly Audit)
<b>D</b>	<ul style="list-style-type: none"> <li>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.</li> </ul>	Operation	Ongoing	Contractor	EO (Weekly) ECO (Monthly)	Ensure that the contractor implements all the mitigation measures as described in the EMPr.	Signed declaration of understanding by contractors (EO weekly checklist) (ECO Monthly Audit Report)
<b>13.5 Health and Safety</b>							
<b>A</b>	<p>The Applicant through the Project Manager shall ensure:</p> <ul style="list-style-type: none"> <li>That reasonable measures are taken to ensure the safety of all site staff;</li> <li>Provide appropriate Personal Protective Equipment (PPE) where required;</li> <li>Compliance with the Occupational Health and Safety Act (Act No. 85 of 1993) and associated regulations;</li> <li>That all accidents and incidents are recorded and reported to the Project Manager and EO/ECO; and</li> <li>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.</li> </ul>	Operation	Ongoing	Project Manager Contractor	Safety Department	Ensure compliance with legal provisions of OHSA.	(safety reports) (safety audits)



Item No.	Technical or Management Option	Phase	Timeframes	Responsible Party	Monitoring Party (Frequency)	Target	Performance Indicators (Monitoring Tool)
<b>13.6 Emergency Response / Disaster Management Planning</b>							
<b>A</b>	<ul style="list-style-type: none"> <li>Develop and implement an Emergency Preparedness and Response Plan (EPRP) for implementation during the seismic survey. This should be revised periodically as the various phases of the seismic survey work takes place.</li> </ul>	Planning Operation	Prior to Operation and Ongoing	Contractor	ECO (Once-off)	Ensure emergency preparedness and response systems in place.	Verification that EPRP is in place. (ECO Audit) (EPRP) (Incident Reports)
<b>13.7 Socio-Economic Considerations</b>							
<b>A</b>	<ul style="list-style-type: none"> <li>TGS should develop a community engagement protocol that is based on the San Code of Research Ethics. This should be done in consultation with the affected communities. This should include a communication strategy and grievance mechanism.</li> </ul>	Planning Operation	Prior to Operation and Ongoing	Applicant/ Project manager	ECO (Monthly)	Ensure that socio-economic considerations are considered and implemented where necessary	Preparation and maintenance of a community engagement protocol.  (ECO Monthly Audit) (Consultation register)
	<ul style="list-style-type: none"> <li>TGS should contribute to assisting with collaboration on independent research on how fish species on the West Coast such as snoek respond to seismic surveying. TGS will further contact relevant scientific research institutions to offer the potential of collaborating in independent on-water research during the survey. It is recommended that the Department of Agriculture, Forestry and Fisheries, Oceans &amp; Coasts, Research component be contacted for possible collaboration on further research on the impact so seismic surveys on the marine ecosystem.</li> </ul>	Planning Operation	Prior to Operation and Ongoing	Applicant/ Project manager	ECO (Monthly)	Ensure that socio-economic considerations are considered and implemented where necessary	Proof of consultation and attempts at collaboration
<b>C</b>	<ul style="list-style-type: none"> <li>Consult with communities on potential ways in which to make a positive contribution to the communities.</li> <li>TGS should investigate opportunities for the employment of people from local communities and skills development.</li> </ul>	Planning Operation	Prior to Operation and Ongoing	Applicant/ Project manager	ECO (Monthly)	Ensure that socio-economic considerations are considered and implemented where necessary	Consultation Register  (ECO Monthly Audit)
<b>D</b>	<ul style="list-style-type: none"> <li>A representative from TGS should consult with the traditional leadership of the affected communities to establish what their understanding of meaningful consultation is and how communities should be consulted in future. This will assist with adjusting the relationship between TGS and the traditional communities. Given the socio-political environment, opposition to the project and associated non-technical risks, further meaningful</li> </ul>	Planning Operation	Prior to Operation and Ongoing	Applicant/ Project manager	ECO (Monthly)	Ensure that socio-economic considerations are considered and implemented where necessary	Consultation Register and workshops  (ECO Monthly Audit)



Item No.	Technical or Management Option	Phase	Timeframes	Responsible Party	Monitoring Party (Frequency)	Target	Performance Indicators (Monitoring Tool)
	<p>engagement with the leadership and communities are critical from a social perspective.</p> <ul style="list-style-type: none"> <li>TGS should also initiate discussions in their industry. The seismic survey industry should reassess their position and social licence to operate as an industry in a South African context and conduct a strategic environmental assessment of the impact of the industry and embark on an awareness raising and education campaign. Having meetings will not be sufficient. Participatory processes and workshops where communities can engage in experiential learning should be considered. If the seismic survey industry fails to address the community's need for education and cooperation it will result in significant delays and increase the risk for social unrest.</li> </ul>						
E	<ul style="list-style-type: none"> <li>TGS should approach the authorities and enter into conversation regarding a strategic impact assessment for the area that should be contributed to by all the production/ exploration companies involved.</li> </ul>	Planning Operation	Prior to Operation and Ongoing	Applicant/ Project manager	ECO (Monthly)	Ensure that socio-economic considerations are considered and implemented where necessary	Proof of consultation with authorities
<b>13.8 Heritage/ Palaeontological Features</b>							
A	<ul style="list-style-type: none"> <li>Re-assess post-project the potential effects on the identified communities and their intangible cultural heritage. This will require consideration of the socio-economic baseline developed during this environmental impact process against quantified economic damage and losses and human development impacts in a follow-up socio-economic assessment. It will enable the heritage specialist to evaluate the link between the socio-economic changes induced by the proposed project as it relates to changes in the intangible cultural heritage practices of the communities.</li> <li>Based on the outcomes, provide resources and support for communities to develop and undertake safeguarding measures or plans to enhance the mitigation capacity of their intangible cultural heritage by fostering dialogue, mutual understanding and reconciliation between and within communities.</li> <li>3D seismic surveys have the potential to locate wrecks on the surface, and sometimes below sediments on the ocean</li> </ul>	Planning Closure	During Operation	Applicant/ Project manager in consultation with specialist	EO – once off	<p>Re-assess post project, the effects on the identified communities and their intangible cultural heritage</p> <p>Enhance mitigation capacity of intangible cultural heritage</p>	Safeguarding measures or plans in place post survey.



Item No.	Technical or Management Option	Phase	Timeframes	Responsible Party	Monitoring Party (Frequency)	Target	Performance Indicators (Monitoring Tool)
	floor. Any shipwrecks or pieces thereof noted during the survey must be shared with the SAHRA MUCH Unit for inclusion into the national database. These could then be identified and be incorporated into the EMPr.						
<b>13.9 Air Quality</b>							
<b>A</b>	<ul style="list-style-type: none"> <li>Maintain all diesel motors and generators in good working order. Properly tune and maintain all engines, motors, generators and all auxiliary power to contain the minimum of soot and unburned diesel.</li> </ul>	Operation	Ongoing	Applicant & Contractor	ECO (Weekly)	Ensure that no excessive air quality impacts are perceived	Visual confirmation of compliance with EMPr conditions. (EO weekly checklist) (ECO Monthly Audit)
<b>13.10 Noise Nuisance</b>							
<b>A</b>	<p>In the unlikely event that aircraft are utilised for crew changes or medivac:</p> <ul style="list-style-type: none"> <li>Plan support aircraft flight path to avoid sensitive and protected areas and ensure no flying occurs over coastal seal colonies and seabird nesting areas</li> <li>Avoid extensive low-altitude coastal flights by ensuring that the flight path is perpendicular to the coast, as far as possible.</li> <li>Brief all pilots on the ecological risks associated with flying at a low level along the coast or above marine mammals.</li> </ul>	Planning Operation	Prior to Operation and Ongoing	Applicant Contractor	EO (Weekly) ECO (Monthly)	<p>Ensure that noise levels are controlled within acceptable limits.</p> <p>No complaints relating to noise.</p>	Confirmation that noise levels are within acceptable limits and relevant notifications undertaken. (EO weekly checklist) (ECO Monthly Audit) (Consultation register)
<b>13.11 Acoustic Impacts of Seismic Surveys on Marine Fauna</b>							
<b>A</b>	<ul style="list-style-type: none"> <li>All initiation of seismic source acquisition be carried out as "soft-starts" of at least 20 minutes duration.</li> </ul>	Operation	During Operation	Contractor	EO (Weekly) ECO (Monthly)	Utilisation of soft starts at initiation.	Confirmation soft starts at initiation. (EO weekly checklist) (ECO Monthly Audit)
<b>B</b>	<ul style="list-style-type: none"> <li>Implement a dedicated MMO and PAM pre-acquisition watch of at least 60 minutes (to accommodate deep-diving species in water depths greater than 200 m).</li> </ul>	Operation	During Operation	Contractor	EO (Weekly) ECO (Monthly)	Utilisation of soft starts at initiation.	Confirmation soft starts at initiation. (EO weekly checklist) (ECO Monthly Audit)
<b>C</b>	<ul style="list-style-type: none"> <li>Implement a "soft-start" procedure of a minimum of 20 minutes' duration on initiation of the seismic source if: <ul style="list-style-type: none"> <li>During all hours it is confirmed visually by the MMO during the pre-acquisition watch (60 minutes) that there are no penguins or feeding aggregations of diving seabirds, shoaling large pelagic fish, turtles, seals or cetaceans within 500 m of the seismic</li> </ul> </li> </ul>	Operation	During Operation	Contractor	EO (Weekly) ECO (Monthly)	Utilisation of soft starts at initiation.	Confirmation soft starts at initiation. (EO weekly checklist) (ECO Monthly Audit)



Item No.	Technical or Management Option	Phase	Timeframes	Responsible Party	Monitoring Party (Frequency)	Target	Performance Indicators (Monitoring Tool)
	<p>source, and by PAM technology that there are no vocalising cetaceans detected in the 500 m mitigation zone.</p> <ul style="list-style-type: none"> <li>During times of poor visibility or darkness it is confirmed by PAM technology that no vocalising cetaceans are present in the 500 m mitigation zone during the pre-acquisition watch (60 minutes).</li> </ul>						
<b>D</b>	<ul style="list-style-type: none"> <li>Delay “soft-starts” if penguins or feeding aggregations of diving seabirds, shoaling large pelagic fish, turtles, seals or cetaceans are observed within the mitigation zone. <ul style="list-style-type: none"> <li>A “soft-start” should not begin until 30 minutes after cetaceans depart the 500 m mitigation zone or 30 minutes after they are last seen or acoustically detected by PAM in the mitigation zone.</li> <li>In the case of penguins, diving seabirds, shoaling large pelagic fish and turtles, delay the “soft-start” until animals are outside the 500 m mitigation zone.</li> <li>In the case of fur seals, which may occur commonly around the vessel, delay “soft-starts” for at least 10 minutes until it has been confirmed that the mitigation zone is clear of all seal activity. However, if after a period of 10 mins seals are still observed within 500 m of the seismic source, the normal “soft-start” procedure should be allowed to commence for at least a 20-minute duration. Seal activity should be carefully monitored during “soft-starts” to determine if they display any obvious negative responses to the seismic source and gear or if there are any signs of injury or mortality as a direct result of the seismic activities.</li> <li>In the case of shoaling large pelagic fish being observed within the mitigation zone, delay the “soft-start’ until animals are outside the 500 m mitigation zone.</li> </ul> </li> </ul>	Operation	During Operation	Contractor MMO	MMO (ongoing) ECO (Monthly)	Visual scanning of seabirds.	Confirmation recording of diving seabirds, turtles, seals and cetaceans visual scanning. (MMO Reports) (ECO Monthly Audit)
<b>E</b>	<ul style="list-style-type: none"> <li>When arriving at the survey area for the first time, survey activities 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, the initial acoustic source activation (including seismic source tests) may only be undertaken if</li> </ul>	Operation	During Operation	Contractor	EO (Weekly) ECO (Monthly)	Utilisation of soft starts at initiation.	Confirmation soft starts at initiation. (EO weekly checklist) (ECO Monthly Audit)



Item No.	Technical or Management Option	Phase	Timeframes	Responsible Party	Monitoring Party (Frequency)	Target	Performance Indicators (Monitoring Tool)
	the normal 60-minute PAM pre-watch and "soft-start" procedures have been followed. .						
F	<ul style="list-style-type: none"> <li>Schedule "soft-starts" so as to minimise, as far as possible, the interval between reaching full power operation and commencing a survey line. The period between the end of the soft start and commencing with a survey line must not exceed 20 minutes. If it does exceed 20 minutes, refer to breaks in acquisition below.</li> </ul>	Operation	During Operation	Contractor	EO (Weekly) ECO (Monthly)	Utilisation of soft starts after breaks.	Confirmation soft starts after breaks. (EO weekly checklist) (ECO Monthly Audit)
G	<ul style="list-style-type: none"> <li>An area of radius of 500 m from the centre of the seismic source array be scanned (visually during the day) by an independent observer for the presence of seals prior to the commencement of "soft starts" and that these be delayed until such time as this area is clear of seals for a period of 10 minutes. If after a period of 10 minutes seals are still within 500 m of the seismic sources, the normal "soft start" procedure should be allowed to commence for at least a 20-minutes duration. Their activity should be carefully monitored during "soft-starts" to determine if they display any obvious negative responses to the seismic sources and gear or if there are any signs of injury or mortality as a direct result of the seismic activities.</li> </ul>	Operation	During Operation	Contractor MMO	MMO (ongoing) ECO (Monthly)	Visual scanning of seabirds.	Confirmation recording of seabird visual scanning. (MMO Reports) (ECO Monthly Audit)
H	<ul style="list-style-type: none"> <li>Terminate seismic source on observation of any obvious mortality or injuries to seals when estimated by the MMO to be as a direct result of the survey.</li> </ul>	Operation	During Operation	Contractor MMO	MMO (ongoing) ECO (Monthly)	Recording of mass mortality as a result of survey activities. Ceasing of survey activities.	Confirmation recording of mortality as a result of survey activities. (MMO Reports) (ECO Monthly Audit)
I	<ul style="list-style-type: none"> <li>Plan seismic surveys to avoid sensitive areas and periods for some marine fauna: Within 100 m of critical turtle foraging habitats (e.g. seamounts or convergence zones). Movement of migratory cetaceans (particularly baleen whales) from their southern feeding grounds into low latitude waters (June/July and late October/November), and their aggregation on the summer feeding grounds between St Helena Bay and Dassen Island from late October to late December and ensure that migration paths are not blocked by seismic operations. If possible the survey should be undertaken from North to South to avoid these feeding aggregations.</li> </ul>	Planning Mobilisation	Pre-Survey Planning	Contractor	MMO (ongoing) ECO (Monthly)	Surveys planned according to the movement of mammals.	Confirmation recording of surveys in line with the movement of mammals. (MMO Reports) (ECO Monthly Audit)
J	<ul style="list-style-type: none"> <li>Plan survey, as far as possible, so that the first commencement of seismic source sounding in a new area (including seismic source tests) are undertaken during daylight hours.</li> </ul>	Planning Mobilisation	Pre-Survey Planning	Contractor	MMO (ongoing) ECO (Monthly)	Surveys commence during daylight hours.	Confirmation recording of surveys commencement during daylight hours. (MMO Reports)



Item No.	Technical or Management Option	Phase	Timeframes	Responsible Party	Monitoring Party (Frequency)	Target	Performance Indicators (Monitoring Tool)
							(ECO Monthly Audit)
<b>K</b>	<ul style="list-style-type: none"> <li>Prohibit seismic source use (including seismic source tests) outside of the Reconnaissance Permit Area. Although a seismic vessel and its gear may pass through a declared Marine Protected Area, acoustic sources (seismic sources) must not be operational during this transit.</li> </ul>	Planning Mobilisation	Pre-Survey Planning	Contractor	MMO (ongoing) ECO (Monthly)	No seismic source operational during transit	Confirmation no survey equipment in use during transit. Survey logs. (MMO Reports) (ECO Monthly Audit)
<b>L</b>	<ul style="list-style-type: none"> <li>A buffer of at least 5 km is recommended around MPAs.</li> </ul>	Planning Mobilisation	Pre-Survey Planning	Contractor	MMO (ongoing) ECO (Monthly)	No surveys undertaken in MPAs or within 5 km from MPAs.	Confirmation no survey equipment in use within MPAs. Survey logs. (MMO Reports) (ECO Monthly Audit)
<b>M</b>	<ul style="list-style-type: none"> <li>When arriving at the survey area for the first time, survey activities 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, the initial acoustic source activation (including seismic source tests) may only be undertaken if the normal 60-minute PAM pre-watch and “soft-start” procedures have been followed.</li> </ul>	Operation: Pre-Start Observations	During Operation	Contractor MMO PAM Operator	MMO (ongoing) PAM Operator (ongoing) ECO (Monthly)	New location arrival procedure followed.	Confirmation of following of new location arrival procedure. Survey logs. (MMO Reports) (PAM Reports) (ECO Monthly Audit)
<b>N</b>	<ul style="list-style-type: none"> <li>In the unlikely event that multiple surveys would take place at the same time within the same survey area then during seismic source pulses, each survey vessel must be at least 40 kilometres from any other survey vessel until sufficient objective evidence is obtained that a reduced buffer distance is acceptable.</li> </ul>	Operation	During Operation	Contractor	EO (Weekly) ECO (Monthly)	Negligible cumulative noise impacts	Confirmation: 40 km distance maintained between any other survey vessels while seismic source is active.
<b>O</b>	<ul style="list-style-type: none"> <li>Baseline noise measurements can provide useful information (prior to operations) when interpreting underwater noise predictions for the introduction of a new noise source. As such, it is recommended that underwater noise measurements be implemented that would include the deployment of underwater sound monitoring equipment to establish an actual baseline prior to the commencement of the survey and then operational levels of noise during the survey.</li> </ul>	Planning Mobilisation	Pre-Survey Planning	Applicant/ Contractor	ECO (Once-off) MMO (ongoing)	Baseline (pre-commencement) and operational underwater noise measurements	Baseline and Operational Monitoring (Noise Monitoring Programme, Noise Monitoring Reports for Baseline and Operations)
<b>P</b>	<ul style="list-style-type: none"> <li>Consideration is to be given to the practicality (considering the weather conditions and costs) of aerial surveys to locate feeding aggregations. The use of drones could be considered (considering the weather conditions and costs) to supplement the observations of the MMO prior to soft starts.</li> </ul>	Planning Mobilisation	Pre-Survey Planning	Applicant/ Contractor	ECO (Once-off) MMO (ongoing)	Consideration given to use of aerial surveys or drones for feeding aggregations.	Consideration given to use of aerial surveys or drones for feeding aggregations.





Item No.	Technical or Management Option	Phase	Timeframes	Responsible Party	Monitoring Party (Frequency)	Target	Performance Indicators (Monitoring Tool)
<b>13.12 Line Turns and Breaks in Acquisition</b>							
<b>A</b>	<ul style="list-style-type: none"> <li>If line changes are expected to take less than 40 minutes, seismic acquisition can continue during the line change if:               <ul style="list-style-type: none"> <li>The power is reduced to 180 cubic inches (or as close as is practically feasible) at standard pressure. Seismic source volumes of less than 180 cubic inches can continue to discharge at their operational volume and pressure;</li> <li>The Seismic Pulse Interval (SPI) is increased to provide a longer duration between pulses, with the SPI not to exceed 5 minutes; and</li> <li>The power is increased, and the SPI is decreased in uniform stages during the final 10 minutes of the line change (or geophone repositioning), prior to data collection re-commencing (i.e. a form of mini soft start).</li> <li>Normal MMO and PAM observations continue during this period when reduced power seismic source is active.</li> </ul> </li> </ul>	Operation	During Operation	Contractor	EO (Weekly) ECO (Monthly)	Utilisation of soft starts.	Confirmation soft starts (EO weekly checklist) (ECO Monthly Audit)
<b>B</b>	<ul style="list-style-type: none"> <li>If after breaks in seismic acquisition, the seismic source can be restarted within 5 minutes, no soft-start is required, and acquisition can recommence at the same power level provided no marine mammals have been observed or detected in the mitigation zone during the break-down period.</li> <li>For all breaks in seismic source of longer than 5 minutes, but less than 20 minutes, implement a “soft-start” of similar duration, assuming there is continuous observation by the MMO and PAM operator during the break.</li> <li>For all breaks in seismic source of 20 minutes or longer, implement a 60-minute pre-acquisition watch and 20-minute “soft-start” procedure prior to the survey operation continuing.</li> <li>For planned breaks, ensure that there is good communication between the seismic contractor and MMO and PAM operators in order for all parties to be aware of these breaks and that early commencement of pre-watch periods can be implemented to limit delays.</li> </ul>	Operation	During Operation	Contractor	EO (Weekly) ECO (Monthly)	Utilisation of soft starts.	Confirmation soft starts (EO weekly checklist) (ECO Monthly Audit)
<b>C</b>	<ul style="list-style-type: none"> <li>If line changes are expected to take longer than 40 minutes:</li> </ul>	Operation	During Operation	Contractor	EO (Weekly)	Utilisation of soft starts.	Confirmation soft starts (EO weekly checklist)



Item No.	Technical or Management Option	Phase	Timeframes	Responsible Party	Monitoring Party (Frequency)	Target	Performance Indicators (Monitoring Tool)
	<ul style="list-style-type: none"> <li>Terminate seismic source at the end of the survey line and implement a pre-acquisition search (60 minutes) and “soft-start” procedure (20 minutes) when approaching the next survey line.</li> <li>If line turn is shorter than 80 minutes (i.e. shorter than a 60-minute pre-acquisition watch and 20-minute “soft-start” combined), the pre-acquisition watch can commence before the end of the previous survey line.</li> </ul>				ECO (Monthly)		(ECO Monthly Audit)
<b>13.13 Shut-downs</b>							
<b>A</b>	<ul style="list-style-type: none"> <li>Seismic source should be terminated on observation of penguins or feeding aggregations of diving seabirds, turtles, slow swimming large pelagic fish (including whale sharks, basking sharks, and manta rays), seals and cetaceans within the 500 m mitigation zone. If PAM detects the presence of very high frequency cetaceans (Heaviside’s dolphins, pygmy sperm whale and dwarf sperm whale) within 1 000 m of the sound source, seismic source should be terminated.</li> <li>Terminate source for cetaceans until such time as there has been a 30-minute delay from the time the animal was last sighted within the mitigation zone before the commencement of the normal soft start procedure. For specific species of turtles, penguins diving seabirds and slow swimming large pelagic fish, diving seabirds, terminate source until such time as the animals are outside of the 500 m mitigation zone (seismic “pause”, no soft-start required)</li> </ul>	Operation	During Operation	Contractor MMO PAM Operator	MMO (ongoing) ECO (Monthly)	Visual scanning and termination of activities.	Confirmation recording of visual scanning. Termination of activities. (MMO Reports) (ECO Monthly Audit)
<b>B</b>	<ul style="list-style-type: none"> <li>Seismic source should be terminated on observation of any obvious mortality or injuries to cetaceans, turtles, seals or mass mortalities of invertebrate and fish species (specifically large shoals of tuna or surface shoaling small pelagic species such as sardine, anchovy and mackerel) as a direct result of the survey. Such mortalities would be of particular concern where a) commercially important species are involved, or b) mortality events attract higher order predator and scavenger species into the seismic area during the survey, thus subjecting them to acoustic impulses.</li> </ul>	Operation	During Operation	Contractor MMO PAM Operator	MMO (ongoing) ECO (Monthly)	Visual scanning and termination of activities.	Confirmation recording of visual scanning. Termination of activities. (MMO Reports) (ECO Monthly Audit)



Item No.	Technical or Management Option	Phase	Timeframes	Responsible Party	Monitoring Party (Frequency)	Target	Performance Indicators (Monitoring Tool)
C	<ul style="list-style-type: none"> <li>Seismic source should also be terminated when obvious changes to turtle, seal or cetacean behaviours are observed from the survey vessel, or turtles and cetaceans (not seals) are observed within 500 m of operating seismic sources or appear to be approaching active seismic sources (particularly if the MMO has lost sight of the approaching animal prior to it entering the mitigation zone). The rationale for this is that animals at close distances (i.e. where physiological injury may occur) may be suffering from reduced hearing as a result of seismic sounds, that frequencies of seismic sound energy lies below best hearing frequencies (certain toothed cetaceans and seals), or that animals have become trapped within the area filled with sound through diving behaviour.</li> </ul>	Operation	During Operation	Contractor MMO PAM Operator	MMO (ongoing) ECO (Monthly)	Visual scanning and termination of activities.	Confirmation recording of visual scanning. Termination of activities. (MMO Reports) (ECO Monthly Audit)
D	<ul style="list-style-type: none"> <li>Although a seismic vessel and its gear may pass through a declared Marine Protected Area, acoustic sources (seismic sources) must not be operational during this transit.</li> </ul>	Planning Mobilisation	Pre-Survey Planning	Contractor	MMO (ongoing) ECO (Monthly)	No surveys seismic source operational during transit	Confirmation no survey equipment in use during transit. Survey logs. (MMO Reports) (ECO Monthly Audit)
<b>13.14 Key Equipment</b>							
A	<p>Key Equipment to be used:</p> <ul style="list-style-type: none"> <li>All seismic vessels must be fitted with Passive Acoustic Monitoring (PAM) technology, which detects animals through their vocalisations.</li> <li>The use of PAM 24-h a day must be implemented to detect deep diving species.</li> <li>Ensure the PAM streamer is fitted with at least four hydrophones, of which two are HF and two LF, to allow directional detection of cetaceans.</li> <li>Ensure the PAM hydrophone streamer is towed in such a way that the interference of vessel noise is minimised.</li> <li>Ensure spare PAM hydrophone streamers are readily available in the event that PAM breaks down, in order to ensure timeous redeployment</li> <li>Define and enforce the use of the lowest practicable seismic source volume for production. Design arrays to maximise downward propagation, minimise horizontal propagation and minimise high frequencies in seismic source pulses;</li> </ul>	Planning Mobilisation Operation	Mobilisation and Operation	Contractor PAM Operator	PAM Operator (ongoing) ECO (Monthly)	Adequate equipment is in place and used as per the requirements and specifications.	Confirmation Of PAM Operations (PAM Operator Reports, ECO Reports). Use of lowest volume seismic sources, turtle friendly buoys, operation within approved area, use of solid streamers.



Item No.	Technical or Management Option	Phase	Timeframes	Responsible Party	Monitoring Party (Frequency)	Target	Performance Indicators (Monitoring Tool)
	<ul style="list-style-type: none"> <li>• Ensure the ramp-up noise volumes do not exceed the production volume.</li> <li>• Prohibit seismic source use (including seismic source tests) outside of the area of operation (which includes line turns undertaken outside the licence area).</li> <li>• The operator must provide a display screen for the acoustic source operations. All information relating to the activation of the acoustic source and the power output levels must be readily available to support the observers in real time via the display screen and to ensure that operational capacity is not exceeded.</li> <li>• MMOs are to be equipped with infra-red cameras in order to observe mammals at night.</li> <li>• Ensure that 'turtle-friendly' tail buoys are used by the survey contractor or that existing tail buoys are fitted with either exclusion or deflector 'turtle guards'.</li> <li>• Ensure that solid streamers rather than fluid-filled streamers are used to avoid leaks.</li> <li>• Ensure that 'turtle-friendly' tail buoys are used by the survey contractor or that existing tail buoys are fitted with either exclusion or deflector 'turtle guards'.</li> <li>• Ensuring that loads are lifted using the correct lifting procedure and within the maximum lifting capacity of crane system.</li> <li>• Minimise the lifting path between vessels</li> <li>• Undertake frequent checks to ensure items and equipment are stored and secured safely on board each vessel.</li> <li>• In the event that equipment is lost during the operational stage, assess safety and metocean conditions before performing any retrieval operations. Establishing a hazards database listing the type of gear left on the seabed and/or in the Reconnaissance Permit Area with the dates of abandonment/loss and locations, and where applicable, the dates of retrieval. Notify SAN Hydrographer of any hazards left on the seabed or floating in the water column, and request that they send out a Notice to Mariners with this information.</li> <li>• Use low toxicity dispersants cautiously and only with the permission of DFFE.</li> <li>• Ensure adequate resources are provided to collect and transport oiled birds to a cleaning station.</li> </ul>						



Item No.	Technical or Management Option	Phase	Timeframes	Responsible Party	Monitoring Party (Frequency)	Target	Performance Indicators (Monitoring Tool)
<b>13.15 PAM Malfunctions</b>							
<b>A</b>	<ul style="list-style-type: none"> <li>• If the PAM system malfunctions or becomes damaged <b>during night-time operations or periods of low visibility</b>, continue operations for 30 minutes without PAM if no marine mammals were detected by PAM in the mitigation zones in the previous 2 hours, while the PAM operator diagnoses the issue. If after 30 minutes the diagnosis indicates that the PAM gear must be repaired to solve the problem, reduce power to 180 cubic inches. The reduced seismic source may continue for 30 minutes while PAM is being repaired, the last 10-minute of which is a 10-minute ramp up to full power (mini “soft-start”). If the PAM repair will take longer than 60 minutes, stop surveying until such time as a functional PAM system can be redeployed and tested..</li> <li>• If the PAM system breaks down <b>during daylight hours</b> operations may continue for 20 minutes without PAM while the PAM operator diagnoses the issue. If the diagnosis indicates that the PAM gear must be repaired to solve the problem, operations may continue for an additional 2 hours without PAM monitoring as long as:               <ul style="list-style-type: none"> <li>○ No marine mammals were detected solely by PAM in the mitigation zones in the previous 2 hours;</li> <li>○ Two MMOs maintain watch at all times during operations when PAM is not operational;</li> <li>○ The time and location in which operations began without an active PAM system is recorded.</li> </ul> </li> </ul>	Operation	Operation	Contractor PAM Operator MMO	PAM Operator (ongoing) ECO (Monthly)	Ceasing activities during PAM Malfunctions. PAM equipment investigation and repair.	Ceasing activities during PAM Malfunctions. PAM equipment investigation and repair. (PAM Operator Reports, ECO Reports).
<b>13.16 Seismic source Testing</b>							
<b>A</b>	<p>For seismic source testing the following should apply:</p> <ul style="list-style-type: none"> <li>• Maintain a pre-acquisition watch of 60-minutes before any instances of seismic source testing. If only a single lowest power seismic source is tested, the pre-acquisition watch period can be reduced to 30 minutes.</li> </ul>	Operation	Operation	Contractor	PAM Operator (ongoing) ECO (Monthly)	Adequate testing is in place and conducted as per the requirements and specifications.	Testing in line with the requirements (PAM Operator Reports, ECO Reports).
<b>B</b>	<ul style="list-style-type: none"> <li>• Implement a “soft-start” procedure if testing multiple seismic sources.               <ul style="list-style-type: none"> <li>○ The “soft-start” should be carried out over a time period proportional to the number of seismic</li> </ul> </li> </ul>	Operation	Operation	Contractor	PAM Operator (ongoing) ECO	Adequate testing is in place and conducted as per the requirements and specifications.	Testing in line with the requirements (PAM Operator Reports, ECO Reports).



Item No.	Technical or Management Option	Phase	Timeframes	Responsible Party	Monitoring Party (Frequency)	Target	Performance Indicators (Monitoring Tool)
	<p>sources being tested and not exceed 20 minutes; seismic sources should be tested in order of increasing volume;</p> <ul style="list-style-type: none"> <li>○ If testing all seismic sources at the same time, a 20 minute “soft-start” is required;</li> <li>○ If testing a single lowest power seismic source a “soft-start” is not required.</li> </ul>				(Monthly)		
<b>13.17 Waste Management</b>							
<b>A</b>	<ul style="list-style-type: none"> <li>• The discharge of biodegradable wastes from vessels is regulated by MARPOL 73/78 Annex V, which stipulates that:               <ul style="list-style-type: none"> <li>○ No disposal to occur within 3 nautical miles (<math>\pm</math> 5.5 km) of the coast.</li> <li>○ Disposal between 3 nautical miles (<math>\pm</math> 5.5 km) and 12 nautical miles (<math>\pm</math> 22 km) needs to be comminuted to particle sizes smaller than 25 mm.</li> <li>○ Disposal overboard without macerating can occur greater than 12 nautical miles from the coast when the vessel is sailing.</li> </ul> </li> </ul>	Operation	During Operation	Contractor ECO	ECO (ongoing)	Proper waste management in line with the required EMPr and regulations.	Recording of waste types and quantities (waste register and records)
<b>B</b>	<ul style="list-style-type: none"> <li>• 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:               <ul style="list-style-type: none"> <li>○ A Shipboard Oil Pollution Emergency Plan (SOPEP).</li> <li>○ A valid International Oil Pollution Prevention Certificate, as required by vessel class.</li> <li>○ 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.</li> <li>○ Oil residue holding tanks.</li> <li>○ Oil discharge monitoring and control system.</li> </ul> </li> </ul>	Operation	During Operation	Contractor ECO	ECO (ongoing)	Proper waste management in line with the required EMPr and regulations.	Recording of waste types and quantities (waste register and records)
<b>C</b>	<ul style="list-style-type: none"> <li>• Sewage and grey water discharges from vessels are regulated by MARPOL 73/78 Annex IV, which specifies the following:               <ul style="list-style-type: none"> <li>○ Vessels must have a valid International Sewage Pollution Prevention Certificate.</li> </ul> </li> </ul>	Operation	During Operation	Contractor 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)
	<ul style="list-style-type: none"> <li>○ Vessels must have an onboard sewage treatment plant providing primary settling, chlorination and dechlorination before discharge of treated effluent.</li> <li>○ 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.</li> <li>○ 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.</li> <li>○ Sewage must be comminuted and disinfected for discharges between 3 nautical miles (<math>\pm 6</math> km) and 12 nautical miles (<math>\pm 22</math> km) from the coast. This will require an onboard sewage treatment plant or a sewage comminuting and disinfecting system.</li> <li>○ 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.</li> </ul>						
D	<ul style="list-style-type: none"> <li>• Sewage will be treated using a marine sanitation device to produce an effluent with:               <ul style="list-style-type: none"> <li>○ A biological oxygen demand (BOD) of <math>&lt;25</math> mg/l (if the treatment plant was installed after 1/1/2010) or <math>&lt;50</math> mg/l (if installed before this date).</li> <li>○ Minimal residual chlorine concentration of 1.0 mg/l.</li> <li>○ No visible floating solids or oil and grease.</li> </ul> </li> </ul>	Operation	During Operation	Contractor ECO	ECO (ongoing)	Proper waste management in line with the required EMPr and regulations.	Recording of waste types and quantities (waste register and records)
E	<ul style="list-style-type: none"> <li>• The project will also comply with industry best practices with regard to waste management, including the compilation of a waste management plan that includes the following:               <ul style="list-style-type: none"> <li>○ 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).</li> <li>○ 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.</li> </ul> </li> </ul>	Operation	During Operation	Contractor 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)
	<ul style="list-style-type: none"> <li>Waste collection and temporary storage shall be designed to minimise the risk of escape to the environment (for example by particulates, infiltration, runoff or odours).</li> <li>On-site waste storage should be limited in time and volume.</li> <li>Dedicated, clearly labelled, containers (bins, skips, etc.) will be provided in quantities adapted to anticipated waste streams and removal frequency.</li> </ul>						
<b>F</b>	<ul style="list-style-type: none"> <li>Avoid the unnecessary discharge of ballast water.</li> <li>Use filtration procedures during loading in order to avoid the uptake of potentially harmful aquatic organisms, pathogens and sediment that may contain such organisms.</li> <li>Ensure that routine cleaning of ballast tanks to remove sediments 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.</li> <li>Ensure all infrastructure (e.g. arrays, streamers, tail buoys etc) that has been used in other regions is thoroughly cleaned prior to deployment.</li> </ul>	Operation	During Operation	Contractor ECO	ECO (ongoing)	Proper waste management in line with the required EMPr and regulations.	Recording of waste types and quantities (waste register and records)
<b>13.18 Vessel and Aircraft Operations</b>							
	<ul style="list-style-type: none"> <li>Ensure vessel transit speed between the survey area and port is a maximum of 12 knots (22 km/hr), except in the MPAs where it is reduced further to 10 knots (18 km/hr) as well as when they are present in the vicinity.</li> </ul>	Operation	During Operation	Contractor ECO	ECO (ongoing)	Ensure vessel speed limits are adhered to	Confirmation of flights undertaken in accordance with the requirements (ECO Reports, ship logs)
<b>A</b>	<p>In the unlikely event that aircraft are utilised for crew changes or medivac:</p> <ul style="list-style-type: none"> <li>Pre-plan flight paths to ensure that no flying occurs over seabird and seal colonies and offshore islands by at least 1 852 m (i.e. 1 nm);</li> <li>Avoid extensive low-altitude coastal flights by ensuring that the flight path is perpendicular to the coast, as far as possible</li> <li>The flight path between the onshore logistics base and seismic vessel should be perpendicular to the coast;</li> <li>Brief all pilots on the ecological risks associated with flying at a low level along the coast or above marine mammals.</li> </ul>	Operation	During Operation	Contractor ECO	ECO (ongoing)	Adequate flight planning in line with the requirements of the EMPr and legislation.	Confirmation of flights undertaken in accordance with the requirements (ECO Reports, Flight plans).
<b>B</b>	<ul style="list-style-type: none"> <li>The lighting on the seismic vessel and support vessels should be reduced to a minimum compatible with safe</li> </ul>	Operation	During Operation	Contractor ECO	ECO (ongoing)	Adequate lighting and vessel planning,	Confirmation of lighting and vessel planning, operation and





Item No.	Technical or Management Option	Phase	Timeframes	Responsible Party	Monitoring Party (Frequency)	Target	Performance Indicators (Monitoring Tool)
	<p>operations whenever and wherever possible. Light sources should, if possible and consistent with safe working practices, be positioned in places where emissions to the surrounding environment can be minimised.</p> <ul style="list-style-type: none"> <li>• Keep disorientated, but otherwise unharmed, seabirds in dark containers for subsequent release during daylight hours. Ringed/banded birds should be reported to the appropriate ringing/banding scheme (details are provided on the ring.</li> <li>• Avoid the unnecessary discharge of ballast water.</li> <li>• Use filtration procedures during loading in order to avoid the uptake of potentially harmful aquatic organisms, pathogens and sediment that may contain such organisms.</li> <li>• Ensure all infrastructure (e.g. arrays, streamers, tail buoys etc.) that has been used in other regions is thoroughly cleaned prior to deployment.</li> <li>• Implement a waste management system that addresses all wastes generated at the various sites, shore-based and marine. This should include:               <ul style="list-style-type: none"> <li>○ Separation of wastes at source;</li> <li>○ Recycling and re-use of wastes where possible;</li> </ul> </li> <li>• Treatment of wastes at source (maceration of food wastes, compaction, incineration, treatment of sewage and oily water separation).</li> <li>• Implement leak detection and repair programmes for valves, flanges, fittings, seals, etc.</li> <li>• Use a low-toxicity biodegradable detergent for the cleaning of all deck spillages.</li> <li>• The vessel operators should keep a constant watch for marine mammals and turtles in the path of the vessel. Keep watch for marine mammals behind the vessel when tension is lost on the towed equipment and either retrieve or regain tension on towed gear as rapidly as possible.</li> <li>• In the event that equipment is lost during the operational stage, assess safety and metocean conditions before performing any retrieval operations.</li> <li>• Ensure that routine cleaning of ballast tanks to remove sediments 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.</li> </ul>					operation and maintenance in line with the requirements of the EMPr and legislation.	maintenance undertaken in accordance with the requirements (ECO Reports, maintenance plans, OM Manuals).



Item No.	Technical or Management Option	Phase	Timeframes	Responsible Party	Monitoring Party (Frequency)	Target	Performance Indicators (Monitoring Tool)
	<ul style="list-style-type: none"> <li>• Prepare and implement a Shipboard Oil Pollution Emergency Plan and an Oil Spill Contingency Plan. In doing so take cognisance of the South African Marine Pollution Contingency Plan, which sets out national policies, principles and arrangements for the management of emergencies including oil pollution in the marine environment.</li> <li>• 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.</li> <li>• Ensure offshore bunkering is not undertake in the following circumstances:               <ul style="list-style-type: none"> <li>○ Wind force and sea state conditions of <math>\geq 6</math> on the Beaufort Wind Scale;</li> <li>○ During any workboat or mobilisation boat operations;</li> <li>○ During helicopter operations;</li> <li>○ During the transfer of in-sea equipment; and</li> <li>○ At night or times of low visibility.</li> </ul> </li> </ul>						
<b>13.19 Fisheries</b>							
<b>A</b>	<ul style="list-style-type: none"> <li>• At least three weeks prior to the commencement of survey activities the following key stakeholders should be consulted and informed of the proposed survey programme (including navigational co-ordinates of location, timing and duration of proposed activities) and the likely implications thereof (specifically the exclusion and safety zone around the survey vessels):               <ul style="list-style-type: none"> <li>○ Fishing industry associations: SA Tuna Association; SA Tuna Longline Association, Fresh Tuna Exporters Association, South African Deepsea Trawling Industry Association (SADSTIA), South African Hake Longline Association (SAHLLA), SA Commercial Linefish Association and West Coast Rock Lobster Association.</li> <li>○ Other key stakeholders: SANHO, South African Maritime Safety Association, Ports Authority and the Department of Agriculture, Forestry and Fisheries Vessel Monitoring, Control and Surveillance Unit in Cape Town.</li> </ul> </li> </ul>	Planning Operation	Three weeks prior to operation	Contractor FLO	FLO (pre- and post operations) 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)
	<ul style="list-style-type: none"> <li>These stakeholders should again be notified at the completion of the project when the survey and support vessels are off location.</li> </ul>						
<b>B</b>	<ul style="list-style-type: none"> <li>Request, in writing, the SANHO to broadcast a navigational warning via Navigational Telex (Navtext) and Cape Town radio for the duration of the activity.</li> <li>For the duration of the survey, circulate a daily survey schedule (look-ahead), via email, to key fishing associations.</li> </ul>	Planning Operation	During Operation	Contractor FLO	FLO (pre- and post operations) ECO	Navigational Telex (Navtext) and Cape Town radio broadcast.	Navigational Telex (Navtext) and Cape Town radio broadcast.
<b>C</b>	<ul style="list-style-type: none"> <li>Timing: Timing of the seismic survey to avoid periods of peak fishing activity during May, June and July is recommended in order to reduce the probability of disruption to the large pelagic longline fishing sector.</li> </ul>	Planning Operation	March-July	Contractor	ECO (monthly)	Time the survey to avoid peak fishing activity.	Confirmation that survey timed to avoid peak fishing activity.
<b>D</b>	<ul style="list-style-type: none"> <li>Ensure project vessels fly standard flags and lights to indicate that they are engaged in towing surveys and are restricted in manoeuvrability.</li> </ul>	Operation	During operation	Contractor	ECO (monthly)	Vessel's indication in place.	Adequate indication in place.
<b>E</b>	<ul style="list-style-type: none"> <li>The lighting on the survey and support vessels should be managed to ensure that they are sufficiently illuminated to be visible to fishing vessels, as well as ensure that it is reduced to a minimum compatible with safe operations whenever and wherever possible.</li> </ul>	Operation	During Operation	Contractor FLO	FLO (pre- and post operations) ECO	Adequate lighting in place	Adequate lighting in place
<b>GF</b>	<ul style="list-style-type: none"> <li>Notify any fishing vessels at a radar range of 12 nm from the vessel via radio regarding the safety requirements around the survey vessel.</li> </ul>	Operation	During Operation	Contractor FLO	FLO (pre- and post operations) ECO	Notification of fishing vessels.	Notification of fishing vessels.
<b>G</b>	<ul style="list-style-type: none"> <li>Implement a grievance mechanism in case of disruption to fishing or navigation. The grievance mechanism should allow stakeholders to register specific grievances related to operations, by ensuring they are informed about the process and that resources are mobilized to manage the resolution of all grievances, in accordance with the Grievance Management procedure</li> </ul>	Operation	During Operation	Contractor FLO	FLO (pre- and post operations) ECO	Grievance mechanism	Grievance mechanism. (Complaints register)



## 14 APPENDICES

Appendix 1: EAP Curriculum Vitae

## CURRICULUM VITAE

<b>Name:</b>	<b>Liam Michael Whitlow</b>
<b>Nationality:</b>	South African
<b>Date of Birth:</b>	22 August 1978
<b>Profession:</b>	Environmental Scientist
<b>Professional Qualification/ Training:</b>	BSc Honours Environmental Management; Rand Afrikaans University (now University of Johannesburg), 2000
	Higher Certificate in Project Management; Damelin Business School, 2001.
	ISO 14001 Auditor Training; BVQI, 2003.
	Environmental Monitoring- Fallout Dust Training; Dustwatch, 2014.
	Aquifer Hydraulics and Groundwater Monitoring Certificate Course; North West University, 2014.
	Carbon Footprint Analyst Course; Terra Firma Academy, 2017.
<b>Professional Membership/ Registrations:</b>	Registered Environmental Assessment Practitioner: Number 2019/222 Registered Professional Natural Scientist (SACNASP- #400148/08). Member of Land Rehabilitation Society of Southern Africa (LaRSSA).
<b>Current Employer:</b>	Environmental Impact Management Services (Pty) Ltd.

## KEY EXPERIENCE

Liam holds a B. Sc. Hons degree in Environmental Management and has completed an additional B. Sc. honours course in applied limnology. In addition he has completed a higher certificate in Project Management with Damelin Business School and a course on ISO14001 Auditing Principles and Environmental Management Systems Auditor Training. Liam is a registered professional natural scientist with the South African Council for Natural Scientific Professions. Liam's professional experience, gained over more than 17 years, lies mainly with environmental impact assessments including project managing significantly large EIA's in the mining and infrastructure sectors. Liam's other experience includes ISO14001, Site Assessments, Water-use licensing, Environmental monitoring, and Environmental Management Plans. Liam's experience lies mainly within South Africa but he has been involved in projects in both Lesotho and Botswana.

## CAREER SUMMARY

<b>Period: January 2011- Current</b>	<b>Organisation: EIMS</b>	<b>Position: Director, Senior Environmental Assessment Practitioner</b>
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<b>Key Projects/Assignments</b>	<p><u>Technical Director:</u> Responsible for the technical management of EIMS including the following aspects:</p> <ul style="list-style-type: none"><li>• Technical review and direction for complex projects;</li><li>• Quality control and assurance;</li><li>• Staff management and performance review;</li><li>• Client management; and</li><li>• Marketing and business development.</li></ul> <p><u>Project Experience:</u></p> <ul style="list-style-type: none"><li>• Transnet Multi-products Pipeline (~650km total length) in Gauteng, Mpumalanga and between Durban and Johannesburg, RSA. Project manager and Environmental Advisor to the New Multiproduct Pipeline (NMPP) Alliance for the monitoring of construction phase. 2009-2017.</li><li>• Olifants River Water Resources Development Project, Steelpoort, Mpumalanga, RSA. EIMS was appointed to undertake the required environmental monitoring (noise, air quality, and water quality) for the construction of the Phase 1C of the bulk water pipeline. Project manager, 2012-2017.</li><li>• GSW Dilokong Chrome Mine Due Diligence, Limpopo, RSA. Environmental lead to undertake an environmental due. 2017.</li><li>• Tshipi é Ntle Manganese Mine Environmental Due Diligence, Kathu, Northern Cape, RSA. Project manager and senior consultant (in association with GSW) for an environmental review to inform a due diligence being undertaken. 2017.</li><li>• Libra Due Diligence, Mpumalanga and Free State Province, RSA. Project manager and senior consultant to conduct a high level environmental review and due diligence study for the Anglo Libra project (incl various Anglo Coal assets) for Mindset Mining Consultants, 2016.</li><li>• Sedgman Environmental Training, Pretoria, RSA. Compiled and presented a training workshop to Sedgman Engineers, focusing on the application and interpretation of the South African Environmental Laws, in relation to their operations and client profile. 2017.</li><li>• EIA and EMP for the Transnet Richards Bay Coal Line: Overvaal Tunnel, Mpumalanga Province. Project manager, responsible for successful completion of the EIA. 2015-2016.</li><li>• Tetra 4 Virginia Natural Gas Production, Water Monitoring, Free State, RSA. Project manager appointed to undertake surface and groundwater sampling to establish an environmental baseline and to monitor the actual impacts associated with the proposed natural gas production activities. 2015-2017.</li><li>• Drafted the 2014-2019, 3rd Edition Environmental Management, Plan (compiled in terms of Section 11(2) of the National Environmental</li></ul>
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Management Act 1998 (act 107 of 1998), for the National Department of Energy. Project manager and report writer. 2014-2015.

- Environmental Advisory to the Government Technical Advisory Centre, Public Private Partnership Unit. Environmental lead in a team of consultants providing consulting services to report to the GTAC on the lessons learn from past PPP's and to suggest means of improving the process for future PPP's. 2015.
- Eskom Lambda 400-765kV Sub-station and Associated Transmission Lines, Mpumalanga, RSA. Project manager and Environmental Assessment Practitioner for EIA. 2010-2012.

Mine Closure and Financial Provisioning:

- Determined Financial Provisions in accordance with the 'Guideline Document for the Evaluation of the Quantum of Closure-Related Financial Provision' provided by a Mine (DMR Guideline): Mooiplaats Colliery 2018; Exxaro Paardeplaats Coal Mine- Update 2018.
- Final Rehabilitation, Decommissioning and Closure Plan (FRDCP) prepared in accordance with the requirements of the NEMA Financial Provisioning Regulations (2015) (NEMA GNR 1147): Tetra 4 Virginia Natural Gas Project, 2017; Motuoane Gas Hennenman Exploration Right-2017; Motuoane Gas Ladysmith Exploration Right- 2017; Sungu Sungu Dannhauser Exploration Right- 2016; Kangala Colliery- Eloff Phase 3 Pit-2020; Anker Coal Elandsfontein Colliery-2021.
- Review of closure plans and financial provisions for closure as a component of Due Diligence and/or Competent Persons Reports: Environmental Review for 5 large Coal mining operations held by Exxaro- 2018; Environmental Review for Dilokong Chrome Mine- 2017; Environmental Review for Tshipi Mine- 2017; Environmental Review on numerous large coal mines held by Anglo Coal-2016.

Environmental Monitoring:

- Project manager and senior environmental scientist for the construction phase environmental monitoring on the Olifants River Water Resources Project Phase 2C (bulk water pipeline). The project included monitoring of water (point and diffuse), air quality (PM10 and fallout dust), and noise to ensure and guide compliance with the environmental specifications of the construction phase EMPR.
- Project manager and senior environmental scientist for the water resource monitoring of the Tetra4 Virginia Natural Gas Production Project. This includes specialist low-flow sampling of dissolved gases in the groundwater as well as general water quality parameters in both regional ground and surface water resources.
- Project Director for the routine water resource (surface and groundwater) monitoring being undertaken for the United Manganese of the Kalahari



	(UMK), manganese mine in Northern Cape. Responsible for technical and quality review and oversight.	
<b>Period: January 2002-December 2010</b>	<b>Organisation: EIMS</b>	<b>Position: Senior Environmental Assessment Practitioner</b>
<b>Key Projects/Assignments</b>	<p>Project Manager and Environmental Assessment Practitioner for the following:</p> <ul style="list-style-type: none"> <li>• Environmental applications, including EIAs, and mining permit applications, for various (7 Packages including N1, N3, N12, R21, and R24) Gauteng road upgrades as part of the Gauteng Freeway Improvement Project. EIMS was also appointed to undertake the role of Independent ECO's for certain GFIP Packages</li> <li>• EIA for OCGT Peaking Power Station within the Coega IDZ.</li> <li>• EIA for spent nuclear fuel storage facility at Pelindaba.</li> <li>• EIA for nuclear waste smelter at Pelindaba.</li> <li>• EIA and water-use licensing for an underground ash disposal facility in Mpumalanga Province.</li> <li>• EIA for the proposed upgrade of the effluent collection and treatment facilities at the South African Nuclear Energy Corporation, Pelindaba.</li> <li>• EIA for proposed Garona to Aries 400KV Transmission line.</li> <li>• EIA for numerous Golf Estates.</li> <li>• EIA for Market Street Underpass as part of the Provincial government Precinct and City Square (Johannesburg) CBD.</li> <li>• EIA's for numerous residential developments.</li> <li>• Scoping report for the Eskom Janus substation in Limpopo Province.</li> <li>• EIA's for low-cost housing developments in the East Rand, Ekurhuleni Metropolitan Council as part of the Regional Professional Team.</li> <li>• Environmental exemption process for a World Summit on Sustainable Development project, Moroka Dam, Gauteng Province.</li> <li>• Numerous environmental exemption applications for housing developments.</li> <li>• Environmental Scoping studies for Sentech telecommunication masts in Eastern Cape Province.</li> <li>• Environmental Studies for telecommunication facilities for Vodacom.</li> <li>• Environmental Studies for 150+ telecommunication facilities for Cell C and Siemens in five provinces.</li> <li>• Environmental Studies for Eskom Telecommunications.</li> </ul>	





	<p>Environmental Site Assessment and Remediation:</p> <ul style="list-style-type: none"> <li>Participation in several Environmental Site Assessments in Gaborone (Botswana) and Mpumalanga.</li> </ul> <p>Strategic Environmental Assessment:</p> <ul style="list-style-type: none"> <li>Participation in the compilation of the Strategic Environmental Assessment for the Hartbeespoort Dam area.</li> </ul> <p>ISO 14001 Environmental Management Systems and Auditing</p> <ul style="list-style-type: none"> <li>Participation in the compilation of the ISO 14001 system (legal register) for Coega Development Corporation, Eastern Cape Province.</li> <li>Participation in the compilation of the ISO 14001 system (legal register) for Matimba Power Station in Limpopo Province.</li> </ul> <p>Mining Related Permits and Rights</p> <ul style="list-style-type: none"> <li>Environmental Management Programme and EIA for the Cranemere Gas Exploration Project in the Eastern Cape Province.</li> <li>EIA and EMPR for the proposed Loopspruit Coal Mine, Mpumalanga Province.</li> <li>Project Manager for in excess of 40 mining permit applications for the Transnet New Multi-products Pipeline, Inland and Trunkline (between Johannesburg and Durban). Applications submitted in 4 different provinces.</li> <li>Project Manager for 5 Mining Permit Applications for the South African National Roads Agencies Gauteng Freeway Improvement Project.</li> </ul> <p>Numerous NEMA Section 24(G) Rectification applications for a broad spectrum of developments</p>
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## LANGUAGE CAPABILITY

Language	Speak	Read	Write
English	Excellent	Excellent	Excellent
Afrikaans	Excellent	Excellent	Good

## DECLARATION

I confirm that the above information contained in the CV is an accurate description of my experience and qualifications and that, at the time of signature.



 Recoverable Signature

X 

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Liam Whitlow

Director

Signed by: 6f6103b0-585d-4fda-855e-bdf53a161a41

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Signature of Staff Member

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Date

## CURRICULUM VITAE

<b>Name:</b>	<b>Gideon Petrus Kriel</b>
<b>Nationality:</b>	South African
<b>Date of Birth:</b>	1 September 1983
<b>Profession:</b>	Environmental Scientist
<b>Professional Qualification/ Training:</b>	M.Env.Sci Water Sciences; North West University (Potchefstroom Campus), 2008
	Implementation of Environmental Management Systems (ISO 14001); Centre for Environmental Management, North-West University (Potchefstroom Campus), 2007.
	Bringing Data Into GIS (ArcGIS); GIMS (now ESRI SA), 2008.
	Tools for Wetland Assessment; Rhodes University, 2013
<b>Professional Membership/ Registrations:</b>	Registered Professional Natural Scientist (SACNSP- #400202/09) – Environmental Sciences
	Registered Environmental Assessment Practitioner (EAPASA- #2019/1451)
	Water Institute of Southern Africa (WISA) Member (21161)
<b>Current Employer:</b>	Environmental Impact Management Services (Pty) Ltd.

## KEY 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 and Integrated Waste and Water Management Plans (IWWMP).

## CAREER SUMMARY

<b>Period: July 2007- Current</b>	<b>Organisation: EIMS</b>	<b>Position: Senior Environmental Assessment Practitioner</b>
<b>Key Projects/Assignments</b>	<u>Senior Consultant:</u> Responsible for the following aspects: <ul style="list-style-type: none"> <li>• Technical review and direction;</li> </ul>	



- Quality control and assurance;
- Client management; and
- Marketing and business development.

Project Experience:

- Environmental Impact Assessment for the proposed Zonk'izizwe Mixed Use Development in Midrand, Gauteng.
- Basic Assessments for the road upgrades for the Johannesburg Roads Agency (JRA).
- Environmental Impact Assessment for the proposed Thabeng Eco Reserve and Golf Estate, near Ohrigstad, Limpopo.
- Basic Assessment for the proposed TATA Steel KZN Clean Energy Project, Richards Bay, KwaZulu-Natal.
- Basic Assessment for the proposed IFM Clean Energy Project, Mooi Nooi, North-West Province.
- Compilation of ISO 14001 Aspect/Impact registers for Clover (Pty) Ltd.
- Basic Assessment for the proposed N17 Phase 2 project: Addition of Auxiliary Lanes Between the Rondebult Road Interchange and the Proposed Trichardt Road Interchange.
- Basic Assessment for the Proposed Early Warning System for the South African Nuclear Energy Corporation of South Africa (NECSA).
- Environmental Impact Assessment for the Proposed Water and Effluent Collection and Treatment Infrastructure Upgrade for the Nuclear Energy Corporation of South Africa (NECSA).
- Basic Assessment for the proposed Residential Development on Portions 16 & 17 of the Farm Wilgespruit 190 IQ, Wilgeheuwel, Roodepoort.
- Independent Environmental Control Officer for the Eye of Africa Golf Estate, Gauteng.
- Independent Environmental Control Officer for the Department of International Relations Head Office Construction, Pretoria.
- Water Use License Application for the Upgrade of the Low Level Bridge on Hyperion Drive, North Riding, Johannesburg.
- Diatom Water Quality Assessments for the Upgrade of the Low Level Bridge on Hyperion Drive, North Riding, Johannesburg.
- Basic Assessment for the Proposed Rand Water 1400mm diameter L17 Bulk Water Pipeline, Brakpan, Gauteng.
- Wetland Delineation for Anglo Platinum Potgietersrus Platinum Limited near Mokopane, Limpopo.



- Independent Environmental Control Officer for the Knock-down and Rebuild of the Shell Range River Service Station, Gillview, Johannesburg.
- Independent Designated Environmental Officer for the Refurbishment of the South African National Roads Agency Limited (SANRAL) Dalpark Operations Centre, Brakpan.
- Waste Licence Application for the Proposed Water and Effluent Collection and Treatment Infrastructure Upgrade for the Nuclear Energy Corporation of South Africa (NECSA).
- Prospecting Rights Applications on behalf of the African Exploration Mining and Finance Corporation (Pty) Ltd for a variety of projects in Limpopo, Free State and North-West Provinces.
- Environmental Impact Assessment and Waste Management Licence Application for the Lusikisiki Sewer and Sewer Treatment Plant, Lusikisiki, Eastern Cape.
- Diatom Monitoring for the Lusikisiki Sewer and Sewer Treatment Plant, Lusikisiki, Eastern Cape.
- Appointed as a Blue Water Services Inspector for the 2012 Blue Water Services Audits by the Department of Water Affairs.
- Basic Assessment for the formalisation of Masibambane, Masibulele, Ilinge, Dacawa Gwentshe, Velwano, Mathemba Vuso in Mdantsane for the Buffalo City Metropolitan Municipality.
- Environmental Impact Assessment for the Proposed Sunny South Housing Development for the Buffalo City Metropolitan Municipality.
- Basic Assessment and Water Use Licence for the Mqonjwana Access Road for the Mbizana Local Municipality.
- Independent Environmental Control Officer for the East London Industrial Development Zone (ELIDZ): Infrastructure Services for the Zone 1B West Residential Development.
- Heritage Impact Assessment and Public Participation for the Proposed Reconstruction of Fleet Street, East London for the Buffalo City Metropolitan Municipality.
- Environmental Monitoring (Water Quality) for Phase 2 CD of the Olifants River Water Resources Development Project for Basil Read.
- Basic Assessment and Water Use Licence Application for the Proposed Sidwadani River Access Road near Mthatha, Eastern Cape on behalf of the South African National Roads Agency (SOC) Limited.
- Basic Assessment and Water Use Licence Application for the Proposed Mngazi River Access Road near Port St Johns, Eastern Cape on behalf of the South African National Roads Agency (SOC) Limited.



- Independent Environmental Control Officer for the East London Industrial Development Zone (ELIDZ): Proposed MMOEM Facilities.
- Amalinda Fairlands Feasibility Study for the Buffalo City Metropolitan Municipality (CS Consulting).
- Independent Environmental Control Officer for the Lusikisiki Sewer and Sewer Treatment Plant, Lusikisiki, Eastern Cape.
- Independent Environmental Control Officer for the Noblesfontein Wind Energy Facility near Victoria West, Northern Cape Province.
- Independent Environmental Control Officer for the Reconstruction of Fleet Street, East London, Buffalo City Metropolitan Municipality, Eastern Cape Province.
- Transnet Freight Rail NEMA Section 24G Rectification Application – Coega Station to Tankatara Level Crossing, Coega, Eastern Cape.
- Independent Environmental Control Officer for the Sunny South Housing Development for the Buffalo City Metropolitan Municipality.
- Vincent-Berea Local Spatial Development Framework, CS Consulting (Buffalo City Metropolitan Municipality), East London, Eastern Cape.
- Participatory Based Planning Support to Informal Settlements Upgrading Projects In Buffalo City Metropolitan Municipality, CS Consulting, Eastern Cape.
- Molopo Free State Wetland Delineations, Virginia, Free State.
- Puma Energy Fuel Depot Wetland Delineation, Nelspuit, Mpumalanga.
- Mdantsane Roads Cluster 2 Environmental Control Officer, Buffalo City Metropolitan Municipality.
- Giuricich Chemical Removal at Vodacom Site, East London.
- Internal Environmental Management System Audits (ISO 14001) for the East London Distribution Centre and Ladismith Plant for Parmalat South Africa.
- Environmental Control Officer for the Eskom Albany-Mimosa 66KV Distribution Line near Alicedale, Eastern Cape.
- Environmental Impact Assessment for the Proposed Algoa Basin Oil & Gas Production Project for Aberdeen Offshore Engineering.
- Basic Assessment for the Proposed Ablution Facilities Along the Coast for Nyandeni Local Municipality.
- Environmental Control Officer for the Eskom Wittekleibosch-Dieprivier 132kV Power Line and Switching Station, Tsitsikamma, Eastern Cape.
- Specialist Walkdown and Site Specific EMPR for the Eskom Ankerlig-Omega Power line, Western Cape.



- Wetland Assessment for the Lichtenburg Hospital Basic Assessment Process for PH Bagale (on behalf of the Department of Health).
- Update of the Integrated Waste and Water Management Plan Eskom Lethabo Power Station, Free State.
- Basic Assessment for the Upgrade of the Loop 16 (Gariep) Road for ACWA Power, Groblershoop, Northern Cape.
- Prospecting Rights Application and Basic Assessment for Black Mountain Mining, Aggeneys, Northern Cape.
- Basic Assessment for the Eskom Riverbank IPP Projects, Eastern Cape.
- Environmental Control Officer for the SANRAL N2 Section 15 from Buffalo River (km 2,94) to Breidbach Intersection (km 9,8) and the R63 from Alexandra Road (km 0) to Bhisho, Eastern Cape.
- Environmental Control Officer for the Greenfields section of the SANRAL N2 Wild Coast Toll Highway (Southern Section), Eastern Cape.
- Basic Assessment for the Upgrading to a Surface Standard Portion of Road DR08606 +1-12KM, Eastern Cape Department of Roads and Public Works, Eastern Cape.
- Transnet TM2 Aquatic Monitoring Programme.
- Prospecting Right Applications and Basic Assessment Processes for Black Mountain Mining near Aggeneys, Northern Cape.
- Eskom Amathole Stormwater Environmental Control Officer, Eastern Cape.
- Update of the ACWA Bokpoort Concentrated Solar Plant Integrated Waste and Water Management Plan, Northern Cape.
- Update of the Rirhanzdu Rehabilitation Strategy and Implementation Plan, Mpumalanga.
- Basic Assessment and Water Use Licence Application for the Proposed Megamor Park Extension, Meisieshalt, East London for Umbra Trading 11.
- Creation of the Ekurhuleni Metropolitan Municipality Parks GIS Layer.
- Enviro-legal review for Bax Kaplan Russel for a Waste Processing Facility in Wilsonia, East London.
- Enviro-Legal Review: Demonstration of On-Site Faecal Sludge Treatment In East London, Impilo Yabantu Services (Pty) Ltd.
- Umgeni Raw Water Management Audit for SizweNtsalubaGobodo, Pietermaritzburg.
- Umgeni Waste Water Management Audit for SizweNtsalubaGobodo, Pietermaritzburg.



- Competent Persons Report (Environmental) for the Ntshovelo Mining Resources (Pty) Ltd Welgemeend Colliery.
- Umgeni Potable Water Management Audit for SizweNtsalubaGobodo, Pietermaritzburg.
- Cambridge Pedestrian Bridge Enviro-legal Interpretation for CBM Consulting Engineers.
- Komati Power Station Legal Audit for Eskom.
- Beaconhurst Drive Enviro-legal Interpretation for CBM Consulting Engineers.
- Port of Ngqura Tank Farm Infrastructure Specialists Services for Transnet Group Capital.
- Prospecting Rights Application and Basic Assessment for Black Mountain Mining, Northern Cape.
- Independent Environmental Control Officer for the East London Industrial Development Zone (ELIDZ): GW1 Facilities in Zone 1A.
- Basic Assessment and Water Use Licence Application for the Proposed Summerpride Erf 107 Residential Development, East London.
- Harmony Target 1 & 2 Performance Assessment Audits, Welkom
- Harmony President Steyn North (Steyn 3\_ 7 & 9) Performance Assessment Audits, Welkom.
- City of Ekurhuleni Tsakane Sewer Pump Station Basic Assessment, Ekurhuleni.
- Eskom Duvha Power Station Legal Compliance Audit.
- Buffalo City Metropolitan Municipality Eastern Beach Sewer Upgrade Environmental Officer, East London.
- Transnet Group Capital Coega Kop Quarry Water Use Licence Application.
- SCAW Dimbaza Foundry Groundwater Monitoring, Dimbaza.
- Mulilo Struisbult PV2 Grid Connection Basic Assessment, Copperton.
- Mulilo Struisbult PV2 EMPr Amendment, Copperton.
- Tosaco Offshore Exploration Environmental Impact Assessment.
- Azinam Offshore Block 2B Stakeholder Engagement.
- TGS Orange Basin Offshore Reconnaissance Basic Assessment.
- GIS work for a large amount of projects from 2007 - Present including the following: the identification and mapping of sensitivities and interested and affected parties, the delineation of site boundaries, the identification of alternative development sites, geo-referencing of old maps and technical drawings, production of informative maps for Basic Assessments,





	Environmental Impact Assessments and Environmental Compliance Monitoring.
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## LANGUAGE CAPABILITY

Language	Speak	Read	Write
English	Excellent	Excellent	Excellent
Afrikaans	Excellent	Excellent	Excellent

## DECLARATION

I confirm that the above information contained in the CV is an accurate description of my experience and qualifications at the time of signature.

\_\_\_\_\_  
Signature of Staff Member

17 October 2022

\_\_\_\_\_  
Date