Samara Mining (Pty) Ltd Proposed Diamond Prospecting Right in Offshore Concession Areas 4C and 5C off the West Coast, South Africa

Heritage Specialist Study

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10 March 2023

Executive Summary

ACO Associates was appointed to produce a baseline, desk-based assessment of the maritime archaeological potential of Concession Areas 4C and 5C, to determine the potential impacts on maritime heritage receptors arising from proposed diamond prospecting in these concession areas.

Prospecting activities will include bulk seabed sampling undertaken by a crawler vehicle deployed from a specialised vessel. The crawler will use water jets to loosen seabed sediment, which is then pumped to surface for shipboard processing. It is estimated that approximately 20 seabed sampling trenches[1], each 240 m long, 20 m wide with a depth of between 1 m and 4 m, will be excavated in the concession areas as part of the prospecting programme.

This assessment identified palaeontological resources, submerged prehistoric archaeological sites and material, and maritime heritage, principally historical shipwrecks, as the heritage receptor classes likely to be impacted by the proposed prospecting.

Four main classes of palaeontological material may be present in the concession areas. Cretaceous fossil wood is likely to occur given the presence in Area 4C of the Namaqua Fossil Forest where fossilized yellowwood trees litter the seabed. This occurrence is a Marine Protected Area which, with a buffer of 5 km will be excluded from all prospecting activities.

Cenozoic shelly macrofauna comprises black phosphatic shell casts and more rarely partly intact shells of various ages, mainly of Eocene and early Miocene ages which have been eroded out of extensive Neogene and Quaternary cemented crusts or “hardgrounds” and released for incorporation into the Last Transgression Sequence gravels.

The bones and teeth of sharks, fish, extinct whale species and the occasional remains of land-living animals that roamed the ice-age exposed shelf are also phosphatized and reworked into the latest, loose Last Transgression Sequence sediments on the seabed.

And lastly, shells from the Last Transgression Sequence are “subfossil” shells that occur abundantly in the sediments accumulated on the shelf during the last 20,000 years as it was submerged to increasing depths. The marine shell fossils, which occur in the Last Transgression Sequence are predominantly the species expected on the West Coast Shelf, but unexpected species and “extralimitals” (species beyond their normal home range) are quite common and can provide important information about ocean warming and cooling during the last 20,000 years.

With regard to submerged prehistoric archaeology, the maximum sea level low stand during the Quaternary, when hominins would have been present in and on the South African landscape, was -120 m. Any areas of South Africa’s current seabed shallower than -120 m, thus have the potential to have been used by our ancestors and to preserve the archaeological evidence of that use. Most of Concession Areas 4C and 5C lie below the -120 m contour and the seabed here will not contain submerged prehistoric archaeological remains. It is only within a relatively narrow band of a couple of kilometres just seaward of the eastern (landward) boundary of the concession areas, where the water is shallower than -120 m, that there is some potential for the presence of these remains.

[1] Exploration and geotechnical results will determine the requirement.

According to South African Heritage Resources Agency (SAHRA)'s Maritime and Underwater Cultural Heritage database, there are at least 68 wrecks recorded between the Oliphants and Orange Rivers. Sixteen of these shipwrecks are known to be on or close to the shore between Port Nolloth and Swartkop, landward of the concession areas, and these wrecks will thus not interfere with or be impacted by the proposed prospecting.

There are no recorded wrecks within Concession Areas 4C and 5C, although a 2017 heritage impact assessment produced for portions of the concession areas suggests that five wrecks have the potential to be present within the concession area boundaries. This assessment believes, however, that with the exception of the *Eros* which on balance is more likely to be located near Lamberts Bay than in the vicinity of the concession areas, it is possible, but unlikely, that the remains of the *Haab*, *Jessie Smith*, *Ocean King* and *La Porte* lie within the concession areas.

Lastly, although unlikely, the possibility does exist for the remains of currently unknown and unrecorded wrecks to be present in the concession areas.

Findings: It is likely that fossils of various types will be present within the Concession Areas 4C and 5C, although their distribution and density is generally understood to be patchy and low. The Namaqua Fossil Forest Marine Protected Area (MPA) will be buffered by an additional 5km and excluded from prospecting activities.

In respect of other fossils it is recommended that:

- The Environmental Management Programme (EMPr) for the prospecting rights must include provisions for the collection of representative examples of the fossils that occur;
- "Run of mine" material on the oversize screen should be monitored for fossils as part of normal sampling and mining process;
- Potential fossil material should be collected for later identification and evaluation. The company must apply to SAHRA for a general permit to destroy, damage, excavate, disturb, and collect fossils identified during sampling, as per the National Heritage Resources Act (Act No. 25 of 1999) (NHRA) and any recovered material is to be temporarily stored by the company. When a collection of fossil material has been accumulated, the appointed palaeontologist should undertake the identification and evaluation of the fossil material and compile the report for submission to SAHRA. The Environmental Manager/Officer is to liaise with the appointed palaeontologist on the progress of the fossil collection and the scheduling of the evaluation; and
- For overall monitoring purposes it is suggested that a few small bulk samples of shells (~5 litres) are collected on occasion. The idea is to sample the typical assemblage at a few points in the sampling/mining area. It is possible that an uncommon assemblage may be encountered, such as a shallow-water fauna or a lagoonal fauna, in which case it should also be sampled.

Most of Concession Areas 4C and 5C lie below the -120 m bathymetric contour and the seabed here will not contain submerged prehistoric archaeological sites or materials. However, within a relatively narrow band of a couple of kilometres seaward of the eastern boundary of the concession areas, where the water is shallower than -120 m, there is some potential for the presence of these remains. In Concession Area 4C this landward portion of the concession area is excluded from prospecting activities by the presence of the Namaqua Fossil Forest MPA and its buffer, so it is just within Concession Area 5C that there is the potential for impacts to submerged prehistoric archaeology.

These sites and materials in or on the seabed cannot be directly identified from geophysical data, but seabed features such as palaeo-channels, gravel river terraces and horizons of organic rich sediments visible in the seismic data, or large rocky outcrops shown in the swathe bathymetry can indicate an increased likelihood of such materials being present in an area.

Subject to agreement related to the commercial sensitivity of these data it is, therefore, recommended that the seismic Chirp and seabed bathymetry data from the inshore portion of Concession Area 5C is made available for archaeological research purposes.

It is also recommended that if the stone and gravel fraction of the sampled sediments is retained as part of the prospecting process, this material from the inshore portion of Concession Area 5C is made available for archaeological review and analysis.

In respect of maritime archaeological sites and materials, the available evidence suggests that it is unlikely that there are any historical wrecks located within either concession area and this heritage receptor was scoped out of the impact assessment.

The absence of historical wrecks in the concession areas can be confirmed by the geophysical contractor during the processing and analysis of the swathe bathymetry and magnetometer data to be acquired for the proposed prospecting. It is, therefore, recommended that any wreck or any potentially anthropogenic seabed anomaly (either magnetic or sonar) identified during the processing of the geophysical data during Phase 2 of the prospecting programme is flagged and that these sites and/or anomalies are excluded from the areas to be subject to bulk seabed sampling. The implementation of a buffer of at least 50 m around each such site and/or anomaly will serve to ensure that they are not impacted by the bulk sampling. Any such sites or flagged anomalies must be reported to SAHRA.

If an undetected wreck is encountered during seabed sampling, it is recommended that the following mitigation measures must be implemented:

- Seabed sampling activities in the area must be stopped immediately;
- The responsible Environmental Manager/Officer must be informed immediately;
- The Environmental Manager/officer must inform SAHRA immediately;
- A suitably qualified maritime archaeologist must be contacted to assess the find;
- If any artefacts have been recovered from the site, these must be kept wet and retained for assessment by the maritime archaeologist;
- The location of the find and any associated data used to identify the wreck must be provided to SAHRA to be added to the national shipwreck database; and
- Following consultation with SAHRA and the maritime archaeologist, an exclusion zone around the site is likely to be required within which seabed sampling activities may not take place.

In terms of cumulative impacts, the presence of palaeontological resources within the seabed of the area is a given, although they are generally scarce and their distribution is patchy.

Although there is very little concrete evidence for the distribution of submerged prehistoric sites and materials in, and on the seabed around the South African coast, it is clear these sites and material will and do exist. Using the terrestrial archaeology of the West Coast as a proxy for the spatial distribution of sites on the now inundated continental shelf, it is also clear that significant archaeological sites and material will be highly localised and most of the seabed will not contain such material.

Thus, while other current and future seabed activities, such as prospecting or mining, which disturb and affect the seabed have the potential to impact palaeontological resources and submerged prehistoric sites and materials, it is likely that such impacts will be infrequent and of low cumulative significance.

With respect to potential cumulative impacts on historical shipwrecks, the discussion above indicates that this area of South Africa's West Coast has relatively few wrecks, when compared to places like Table Bay, which alone contains more than 400 wrecks. The majority of West Coast wrecks are also located close to the coast,

and cumulative impacts arising from offshore mining and prospecting are thus potentially more of a risk in Concession Area 5C .

Generally, however, historical wrecks and related maritime archaeological debris are avoidable (through the collection and analysis of geophysical data) and actively avoided (because of potential damage they can cause to mining plant and machinery) by seabed activities such as mining or prospecting.

Impacts on historical shipwrecks arising from seabed activities are likely to be accidental where they do occur, and once a site has been encountered on the seabed it is likely to be excluded from the area of activities as an operational obstruction or risk.

There is thus a very low potential for cumulative impacts on maritime archaeological resources, principally historical shipwrecks, arising out of current and future seabed activities in the area surrounding Concession Areas 4C and 5C.

Conclusion: It is our reasoned opinion that the proposed prospecting activities in Concession Areas 4C and 5C are likely to have a very low impact on palaeontological and submerged prehistoric archaeological resources, and no impact on maritime archaeological sites and materials.

Provided the recommendations to mitigate and offset potential impacts are implemented, the proposed prospecting can be considered to be paleontologically and archaeologically acceptable.

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Acronyms and Abbreviations

BA	Basic Assessment Process
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EMPr	environmental Management Programme
ESA	Early Stone Age
GNR	Government Notice Regulation
HIA	Heritage Impact Assessment
LN	Listed notice
LSA	Late Stone Age
MIS	Marine Isotope Stage
MPA	Marine Protected Area
MPRDA	Minerals and Petroleum Resources Development Act (Act No. 28 of 2002)
MSA	Middle Stone Age
NEMA	National Environmental Management (Act No. 107 of 1998)
NHRA	National Heritage Resources Act (Act No. 25 of 1999)
SAHRA	South African Heritage Resources Agency
SAHRAIS	South African Heritage Resources Agency Information Syste
SRK	SRK Consulting (South Africa) (Pty) Ltd
UNCLOS	United Nations Convention on the Law of the Sea

Glossary

Archaeology	Remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures.
Baseline	Information gathered at the beginning of a study which describes the environment prior to development of a project and against which predicted changes (impacts) are measured.
Cumulative Impacts	Direct and indirect impacts that act together with current or future potential impacts of other activities or proposed activities in the area/region that affect the same resources and/or receptors.
Early Stone Age	The archaeology of the Stone Age between 700 000 and 2 500 000 years ago**.**
Environment	The external circumstances, conditions and objects that affect the existence of an individual, organism or group. These circumstances include biophysical, social, economic, historical, and cultural aspects.
Environmental Authorisation	Permission granted by the competent authority for the applicant to undertake listed activities in terms of the NEMA EIA Regulations, 2014 (GNR 982, as amended by GNR 326)
Environmental Impact Assessment	A process of evaluating the environmental and socio-economic consequences of a proposed course of action or project.
Environmental Impact Assessment Report	The report produced to relay the information gathered and assessments undertaken during the Environmental Impact Assessment.
Environmental Management Programme	A description of the means (the environmental specification) to achieve environmental objectives and targets during all stages of a specific proposed activity.
Heritage	That which is inherited and forms part of the National Estate (Historical places, objects, fossils as defined by the National Heritage Resources Act 25 of 1999.
Holocene	The most recent geological time period which commenced 10 000 years ago.
Hominin	A member of the tribe Hominini which comprises those species regarded as human, directly ancestral to humans, or very closely related to humans.
Impact	A change to the existing environment, either adverse or beneficial, that is directly or indirectly due to the development of the project and its associated activities.
Late Stone Age	The archaeology of the last 20 000 years associated with fully modern people.
Marine Isotope Stage	Alternating warm and cool periods in the Earth's paleoclimate, deduced from oxygen isotope data reflecting changes in temperature derived from data from deep sea core samples.
Middle Stone Age	The archaeology of the Stone Age between 20 000-300 000 years ago associated with early modern humans.
Mitigation measures	Design or management measures that are intended to minimise or enhance an impact, depending on the desired effect. These measures are ideally incorporated into a design at an early stage.
Pleistocene	A geological time period (of 3 million – 10 000 years ago).
Quaternary	The current and most recent of the three periods of the Cenozoic Era spanning the period from ± 2.5 million years ago to the present.

Scoping	A procedure to consult with stakeholders to determine issues and concerns and for determining the extent of and approach to an EIA and EMPr (one of the phases in an EIA and EMPr). This process results in the development of a scope of work for the EIA, EMPr and specialist studies.
Specialist study	A study into a particular aspect of the environment, undertaken by an expert in that discipline.
Stakeholders	All parties affected by and/or able to influence a project, often those in a position of authority and/or representing others.

1 Introduction

1.1 Background

Samara Mining (Pty) Ltd (Samara) intends to undertake an exploration programme in Inshore Blocks 4C and 5C (the Block) located approximately 10 km to 195 km offshore of the West Coast of South Africa (Figure 1-1). The application is for a Prospecting Right for bulk sampling for diamonds, which will be undertaken in a number of phases.

To prospect for diamonds, Samara Mining intends to use both non-invasive and invasive methods. The non-invasive work will consist of desktop studies, geophysical surveys, 3D geological modelling and resource estimation. The invasive method will comprise of bulk sampling of the seabed.

The desktop studies will use available historic data to get a clear understanding of the proposed diamond deposit character.

Geophysical surveys will be conducted to identify geological features and sediments where exploration sampling will be undertaken. The equipment for the geophysical survey will be deployed from a vessel appropriate for the depth and survey methods to be used.

Where geological features of interest (showing potential for diamond prospecting) are identified, follow up surveys and bulk seabed sampling will be undertaken. Bulk sampling will entail the extraction of diamonds from the seabed using fit-for purpose vessels, equipped with a crawler that will dredge materials from the seabed. The diamonds will be sorted from the dredged material in a mechanical treatment plant on board the vessel.

ACO Associates was appointed to undertake a maritime heritage specialist study of the project to inform the Environmental Impact Assessment (EIA) process.

1.2 Terms of Reference

ACO Associates was appointed to produce a baseline, desk-based assessment of the maritime archaeological potential of Concession Areas 4C and 5C, to determine the potential impacts on maritime heritage receptors arising from proposed diamond prospecting in these concession areas.

This report includes:

- A consideration of the palaeontological potential of the concession areas and the likelihood of impacts on palaeontological resources arising from the prospecting;
- A review of recorded maritime casualties within the concession areas and their vicinity; and
- A consideration of the potential for the presence of submerged pre-colonial archaeological material in or on the seabed in the concession areas.

The Heritage Impact Assessment (HIA) will assess the potential impacts of prospecting on these underwater and maritime heritage resources and make recommendations for measures to mitigate impacts.

This meets the requirement of the South African Heritage Resources Agency (SAHRA) set out in their interim comment on the draft Scoping Report issued on 23 September 2021, “that the project should include an Underwater HIA”.

The HIA will meet the requirements of SAHRA’s minimum standards for HIAs and Appendix 6 of the EIA Regulations (2014 as amended).

This HIA must be submitted to SAHRA for their comment.

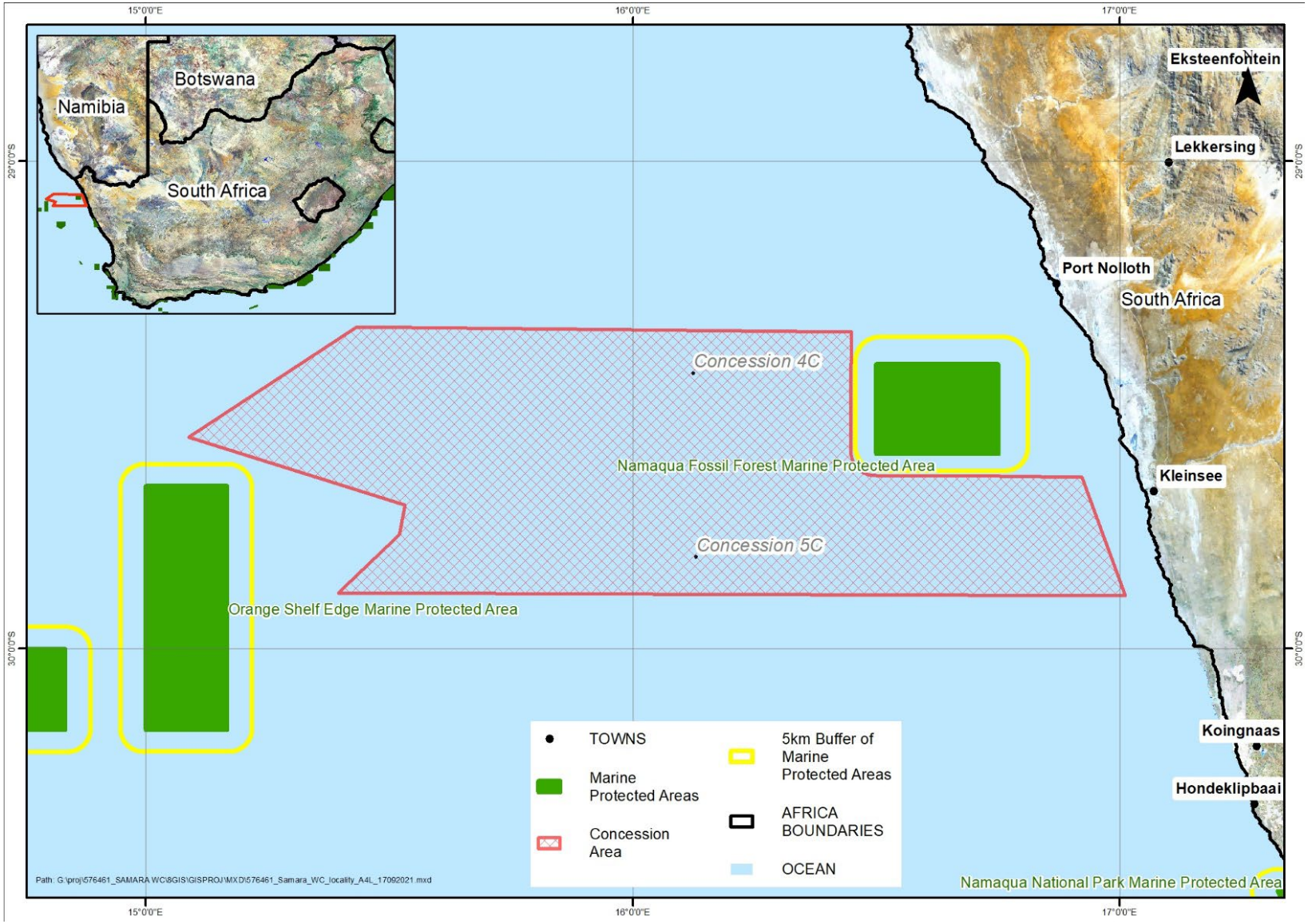

Figure 1-1: Extent and location of Concession Areas 4C and 5C. Note the Marine Protected Areas and buffer zones in the vicinity of the Block.

2 Details of the Specialist

This study has been undertaken by John Gribble BA Hons, MA (ASAPA) of ACO Associates CC, archaeologists and heritage consultants.

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3 Content of Report

The EIA Regulations, 2014 (Government Notice Regulation (GNR) 982 of 2014, amended by GNR 326 of 2017) Appendix 6 prescribe the required content in a specialist report. These requirements and the sections of this specialist report in which they are addressed, are summarised in Table 3-1.

Table 3-1: Content of specialist report as per EIA Regulations, 2014

GNR 982, Appendix 6 Ref.:	Item	Report Section:
(1) (a) (i)	Details of the specialist who prepared the report;	2
(1) (a) (ii)	Expertise of that specialist to compile a specialist report including a curriculum vitae;	App D
(1) (b)	A declaration that the specialist is independent in a form as may be specified by the competent authority;	App C
(1) (c)	An indication of the scope of, and the purpose for which, the report was prepared;	1.2
(1) (cA)	An indication of the quality and age of base data used for the specialist report;	3
(1) (cB)	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	8.3
(1) (d)	The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	N/A
(1) (e)	A description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	4.2
(1) (f)	Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	8
(1) (g)	An identification of any areas to be avoided, including buffers;	7, 8
(1) (h)	A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Figure 2 1, Figure 5 5
(1) (i)	A description of any assumptions made and any uncertainties or gaps in knowledge;	3.1
(1) (j)	A description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	7, 8
(1) (k)	Any mitigation measures for inclusion in the EMPr;	9
(1) (l)	Any conditions for inclusion in the environmental authorisation;	N/A
(1) (m)	Any monitoring requirements for inclusion in the EMPr or environmental authorisation;	N/A
(1) (n) (i)	A reasoned opinion whether the proposed activity, activities or portions thereof should be authorised;	9.1
(1) (n) (iA)	A reasoned opinion regarding the acceptability of the proposed activity or activities;	9.1
(1) (n) (ii)	If the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	9

GNR 982, Appendix 6 Ref.:	Item	Report Section:
(1) (o)	A description of any consultation process that was undertaken during the course of preparing the specialist report;	N/A
(1) (p)	A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	See EIA Report
(1) (q)	Any other information requested by the competent authority.	N/A
(2)	Where the government notice *gazetted* by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	N/A

3.1 Assumptions and Limitations

The study is based on several assumptions and is subject to certain limitations, which should be borne in mind when considering information presented in this report. The validity of the findings of the study is not expected to be affected by these assumptions and limitations:

- South Africa's record of maritime and underwater cultural heritage resources is based on a mix of information derived in the main from historical documents and other secondary sources. Information primary sources such as geophysical data and other field-based observations and site recordings is very limited and comprises only a small fraction of the available data;
- Similarly, direct evidence for submerged pre-colonial archaeological sites and materials on the South African continental shelf is very limited, but sites found in similar offshore contexts elsewhere in the world and the known terrestrial archaeology of the West Coast illustrate the potential for such sites on the continental shelf; and
- While every effort has been made to ensure the accuracy of the information presented in this report, the reliance on secondary data sources means that there are gaps and inaccuracies in this record and the locations of most of the wrecks referred to in the following sections are approximate. The potential also exists for currently unknown and/or unrecorded maritime heritage sites to be encountered within the concession areas in the course of prospecting activities.

Any other assumptions made in the report are explicitly stated in the relevant sections.

4 Approach

4.1 Guidelines

The *Minimum Standards for Heritage Specialist Studies in terms of Section 38 of the National Heritage Resources Act (Act No. 25 of 1999) (NHRA)* published by SAHRA are the relevant guidelines which govern the form and content of this HIA (see https://www.sahra.org.za/Wordpress/wp-content/uploads/2020/01/Minimum_Standards_for_Heritage_reports_For_Public_Review.pdf).

If the scope of a development triggers the National Environmental Management Act (Act No. 107 of 1998) (NEMA) or the Minerals and Petroleum Resources Development Act (MPRDA) (Act No. 28 of 2002) then a HIA will form part of the specialist reports in an Environmental Authorisation (EA) Application process required in terms of the NEMA and the NEMA EIA Regulations, (2014 and 2017 as amended).

In terms of the NEMA regulations, every EA application should be accompanied by a HIA, which has been produced by (an) appropriate independent heritage specialist(s) and "must identify, assess and record current conditions and locations of all heritage resources in the area proposed for development and impact zone, the impact of the development on the identified heritage resources or landscapes and make recommendations for protection or mitigation to reduce the impact on the resources".

Part II of the SAHRA *Minimum Standards* sets out the minimum standards for and stipulates the information required by SAHRA to be included in a HIA. This includes:

- A declaration of independence and the CV(s) of the heritage specialist(s);
- An introduction and terms of reference for the assessment;
- A description of the proposed project;
- A description of the legislative framework governing the project and heritage resources;
- A statement of the assessment methodology used, including information about any assumptions, gaps, restrictions and limitations;
- A description of the heritage resources within the project area;
- An assessment of potential impacts and risks to heritage resources arising from the project; and
- Conclusions and recommendation with regard to measures to mitigate any impacts.

This report includes all of the above and thus meets the requirements set out in the SAHRA *Minimum Standards*.

4.2 Methodology

This HIA is an entirely desk-based assessment of the maritime and underwater cultural heritage potential of Concession Areas 4C and 5C, within the study area defined in Section 4.2.1.

The baseline heritage resource assessment comprises a short description of the extent of South Africa's maritime and underwater cultural heritage and the maritime history of West Coast, and a discussion of potential maritime heritage resources of the concession areas within that wider context. This includes potential pre-colonial archaeological sites and materials in offshore, submerged contexts. A review of information about the possible palaeontological resources in the concession areas is also included.

The HIA draws information from readily available documentary sources and databases, including SAHRA's Maritime and Underwater Cultural Heritage database, a database of underwater heritage resources maintained by ACO Associates, and from relevant primary and secondary sources and aims to identify as accurately as possible the maritime heritage resources within the concession areas. The report also references the findings of a previous HIA produced in 2017 for the inshore portions of Concession Areas 4C, 5C and 6C (Maitland, 2017). Palaeontological information is sourced from impact assessments from several nearby concession areas.

An assessment of the potential impacts of the proposed prospecting on maritime and underwater cultural heritage resources is provided and this is supported by recommendations for measures to mitigate possible impacts arising from prospecting operations in the concession areas.

4.2.1 Study Area

The study area for this HIA is defined by the extents of the two concession areas, excluding the Namaqua Fossil Forest Marine Protected Area (MPA) and a buffer of 5 km that has been placed around it (Figure 4-1).

4.3 Impact Assessment

Potential impacts of the proposed project were identified based on the baseline data, project description, review of other studies for similar projects and professional experience.

The significance of the impacts was assessed using the prescribed SRK impact rating methodology (see Section 8.1).

Practical mitigation and optimisation measures that can be implemented effectively to reduce or enhance the significance of impacts were identified. The impact significance was re-rated assuming the effective implementation of mitigation measures.

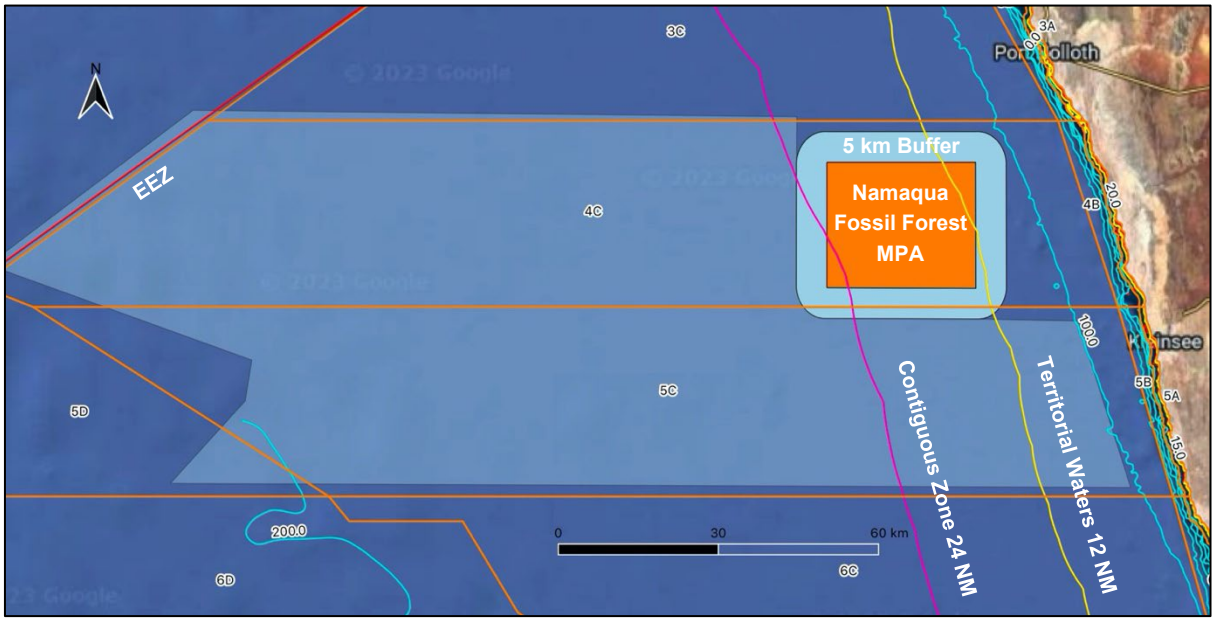

Figure 4-1: The extents of Concession Areas 4C and 5C which formed the study area for this assessment (blue polygon). The excluded Namaqua Fossil Forest MPA and the 5 km buffer in place around it are also shown. The position of the concession areas in relation to boundaries of South Africa's EEZ, Contiguous Zone and Territorial Waters are indicated (Source: Google Earth).

5 Project Description

The project is located in Offshore Concession Areas 4C and 5C, which are located beyond approximately 10 km seaward of both Port Nolloth and Kleinsee. The western boundary of the prospecting right areas is located between approximately 140 and 195 km offshore and is defined by the outer edge of South Africa's Exclusive Economic Zone (EEZ) (Figure 1-1 and Figure 4-1). The total prospecting right area is approximately 781 362 hectares in extent.

The prospecting right area excludes the Namaqua Fossil Forest MPA, located within Concession Area 4C (Figure 4-1).

Human utilization of the offshore concession areas is limited. Demersal fisheries are active in the extreme offshore portions of the concession areas whilst traditional line-fishing has not been reported. Shipping traffic is primarily located on the outer edge of the continental shelf. Traffic inshore of the continental shelf largely consists of fishing vessels. Although there is no current development or production from the South African West Coast, exploration for oil and gas is being undertaken in the area. Both marine diamond prospecting and mining occurs near Concession Areas 4C and 5C.

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

The prospecting process will be undertaken in phases as follows:

- **Phase 1 (Desktop Studies):** This phase will use non-invasive methods that will consist of desktop-literature studies, geophysical surveys within the Concession Areas, geophysical data processing and interpretation, compilation of a GIS database, geological modelling and delineation of potential diamond trap-sites which will form the knowledge base to plan and design the exploration sample programme. This phase will comprise of non-invasive methods which will be executed in eight stages;
- **Phase 2 (Exploitation Sampling)**: This phase will be the invasive method of the exploration sample programme. This programme will consist of reconnaissance exploration sample drilling within the Concession Areas. The results of the reconnaissance drilling programme will firstly identify which of the potential trap-sites carry a positive grade and secondly which of the positive trap-sites have an overall grade and footprint size to justify either further infill geophysical survey lines and/or infill detail drilling to increase confidence towards an estimate diamond resource. The planning and design of the in-fill geophysical survey and in-fill drill exploration programmes will lead to Phase three. This phase will be executed in four stages; and
- **Phase 3 (Geophysical Surveys)**: This phase will consist of non-invasive detail infill geophysical surveys and invasive detail infill drilling within priority trap-site features. Results of the first detail infill exploration work will determine the level of confidence reached to either justify resource estimation and preliminary mine plan design or do a second programme of detail infill drilling to then reach a confidence level for resource estimation and preliminary mine plan design. Preliminary mine plan will be followed by a trench bulk sampling programme to simulate mining, finalise the mine plan and gather geotechnical and production data for the feasibility study. This phase will determine the feasibility and decision on proceeding with the mining project in concession 4C and 5C and will be executed in eleven stages.

6 Applicable Legislation and Policy

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

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

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

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

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

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

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

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

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

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

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

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

South Africa's Maritime Zones Act of 1994 is the national legislative embodiment of the international maritime zones set out in the United Nations Convention on the Law of the Sea (UNCLOS). The Act defines the extent of the territorial waters, contiguous zone (also known as the maritime cultural zone), EEZ and continental shelf (which together comprises of some 4.34 million square kilometres of seabed) and sets out South Africa's rights and responsibilities in respect of these various maritime zones.

Under the terms of Sections 4(2) and 6(2) of the Maritime Zones Act respectively, "any law in force in the Republic, including the common law, shall also apply in its territorial waters" and "subject to any other law the Republic shall have, in respect of objects of an archaeological or historical nature found in the maritime cultural zone, the same rights and powers as it has in respect of its territorial waters". The NHRA applies, therefore, within South Africa's territorial waters (12 nautical miles seaward of the baseline) and to the outer limit of the maritime cultural zone / contiguous zone (24 nautical miles seaward of the baseline) (see Figure 4-1).

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

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

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

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

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

The NEMA provides a framework for the integration of environmental issues into the planning, design, decision-making and implementation of plans and development proposals that are likely to have a negative effect on the environment.

Regulations governing the environmental authorisation process have been promulgated in terms of NEMA and include the EIA Regulations (GNR 982 of 2014) and Listing Notices (LN) 1-3 (GNR 983, GNR 984 and GNR 985)[2] that list activities requiring an EA.

The proposed prospecting in Concession Areas 4C and 5C triggers activities listed in terms of LN 1 and LN 2 of the EIA Regulations, 2014, requiring and EIA.

[2] As amended by GNR 324, GNR 325, GNR 326 and GNR 327 of 2017, and GNR 517 of 2021.

The EIA process aims to identify and assess all potential environmental impacts (negative and positive) and the EIA/Environmental Management Programme (EMPr) report should recommend how potential negative impacts can be effectively mitigated and how benefits can be enhanced.

7 Heritage Baseline

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

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

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

7.1 Palaeontology

A review of recent palaeontological assessments in the vicinity of Concession Areas 4C and 5C (Pether, Palaeontological assessment (desktop study): Diamond prospecting right application Sea Concession 6B, Morgenson Mining Pty) Ltd, Inner continental shelf off Namaqualand, 2023) indicates that the following palaeontological resources could be present in Concession Area 6B:

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

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

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

In Concession 5B, inshore of 5C, (Bianucci, G, Lambert, & Post, 2007) fossil wood is found on the Precambrian inner shelf as well as onshore in the Quaternary raised beaches, hinting that a source such as a remnant of a Cretaceous channel may be nearby (Pether, Palaeontological assessment (desktop study): Diamond prospecting right application Sea Concession 6B, Morgenson Mining Pty) Ltd, Inner continental shelf off Namaqualand, 2023).

Specimens of fossil wood from this area obtained via diamond exploration are providing valuable insights into the palaeo climates of the Cretaceous West Coast, when wide, well-watered coastal plains were covered by forests of primitive yellow wood (podocarp) trees (Bamford and Corbett 1994,

Bamford and Stevenson 2002, Stevenson and Bamford 2003). Rounded cobbles and pebbles of petrified wood are sometimes noticed in gravels on the Precambrian inner-shelf bedrock to where they have been transported during rising sea levels but are quite rare and far from the source formation (Bamford & Stevenson, A submerged Late Cretaceous Podocarpus Forest, West Coast, South Africa, 2002).

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

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

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

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

7.2 Submerged Prehistory

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

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

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

As with the MIS 2 low sea level stand, those which corresponded with MIS 4 (~70,000 years ago), MIS 6 (~190,000 years ago), MIS 8 (~301,000 years ago) and MIS 12 (~478,000 years ago) would have “added a large coastal plain to the South African land mass” (Van Andel, 1989) where parts of the continental shelf were exposed as dry land (Cawthra, 2016) (Figure 7-1).

The exposure of the continental shelf would have been most pronounced on the wide Agulhas Bank off the southern Cape coast, and it is estimated that a new area of land, as much as 80,000 km^2 in extent, was exposed during the successive glacial maxima (Fisher, 2010) (see Figure 7-2). The exposed continental shelf was quickly populated by terrestrial flora and fauna, and also by our human ancestors who were dependant on these resources (Compton, 2011).

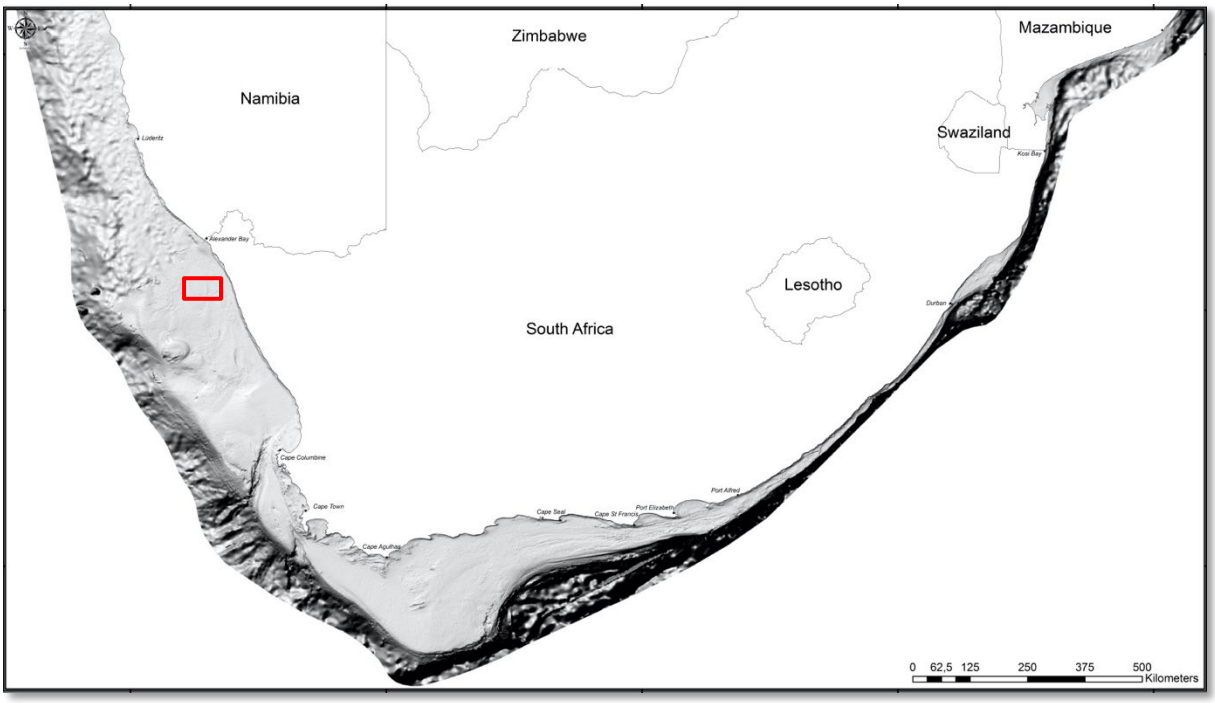

Figure 7-1: Shaded relief map showing the entire extent of the South African continental shelf. The approximate location of Concession Areas 4C and 5C are marked by the red box (De Wet, 2012).

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

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

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

Closer to home, there is archaeological evidence for a prehistoric human presence in what is now Table Bay. In 1995 and 1996 during the excavation of two Dutch East India Company shipwrecks, the *Oosterland* and *Waddinxveen*, divers recovered three Early Stone Age (ESA) handaxes from the seabed under the wrecks. The stone tools, which are between 300,000 and 1.4 million years old, were found at a depth of 7-8 m below mean sea level and were associated with Pleistocene sediments from an ancient submerged and infilled river channel (Figure 7-3). Their unrolled and unworn condition indicate that they had not been carried to their current position by the ancient river and suggests that they were found more or less where they were dropped ESA hominins more than 300,000 years ago (possibly during MIS 8 (~301,000 years ago) or MIS 12 (~478,000 years ago)), when the sea level was at least 10 m lower than it is today (Werz B. a., 2001) (Werz B. C., 2014).

Figure 7-2: Possible extent of the South African continental shelf c.137,000 years ago. The approximate location of Concession Areas 4C and 5C are marked by the red box (Franklin, 2015).

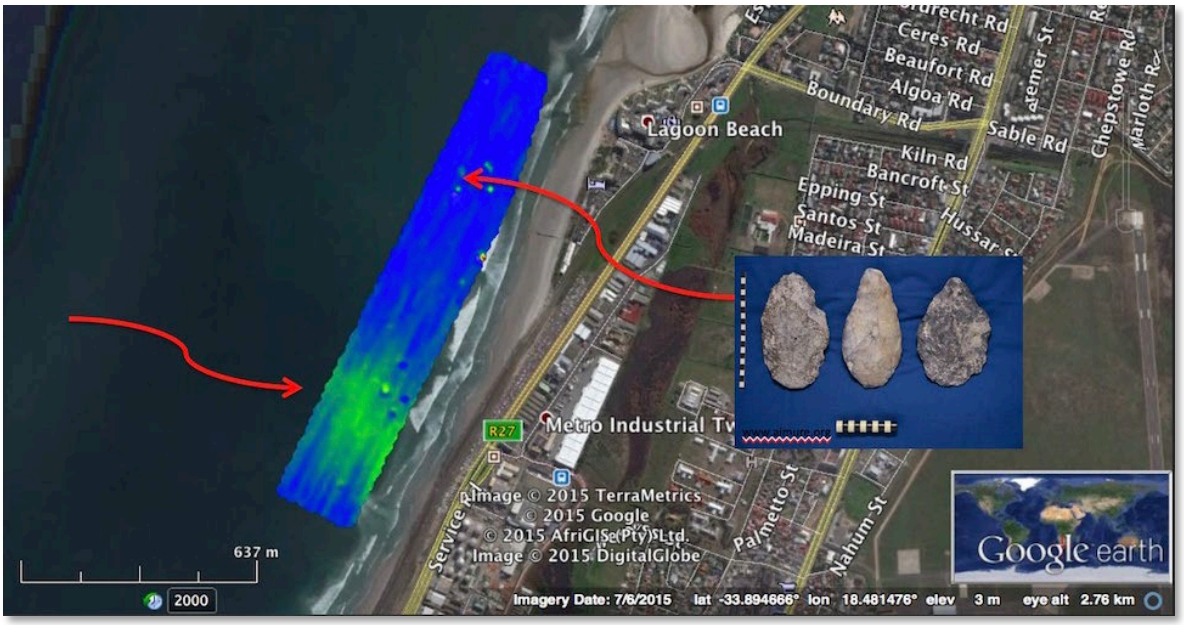

Figure 7-3: Location of the find of Table Bay ESA handaxes (inset) off Milnerton (top arrow) overlain on magnetometer data which shows the submerged palaeo-channel (green) of the Salt River (bottom arrow).

7.2.1 Submerged Prehistory Potential of Concession Areas 4C and 5C

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

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

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

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

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

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

Although no geophysical data were available for Concession Areas 4C and 5C for this assessment, seabed sediment mapping by (O'Shea, 1971) at Kleinzee indicates that a channel cut by the palaeo-Buffels River extends offshore to the west of Kleinzee. O'Shea's seabed seismic data is limited and only extends to the 80-foot (approximately 25m) depth contour, beyond which a gas-rich layer of sediment reflected and effectively blanked the sonar signal. While it is thus not clear whether the Buffels River channel extends into the concession areas, there is nevertheless a channel cut by the palaeo-Buffels River extends offshore to the west of Kleinzee (see Figure 7-4).

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

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

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

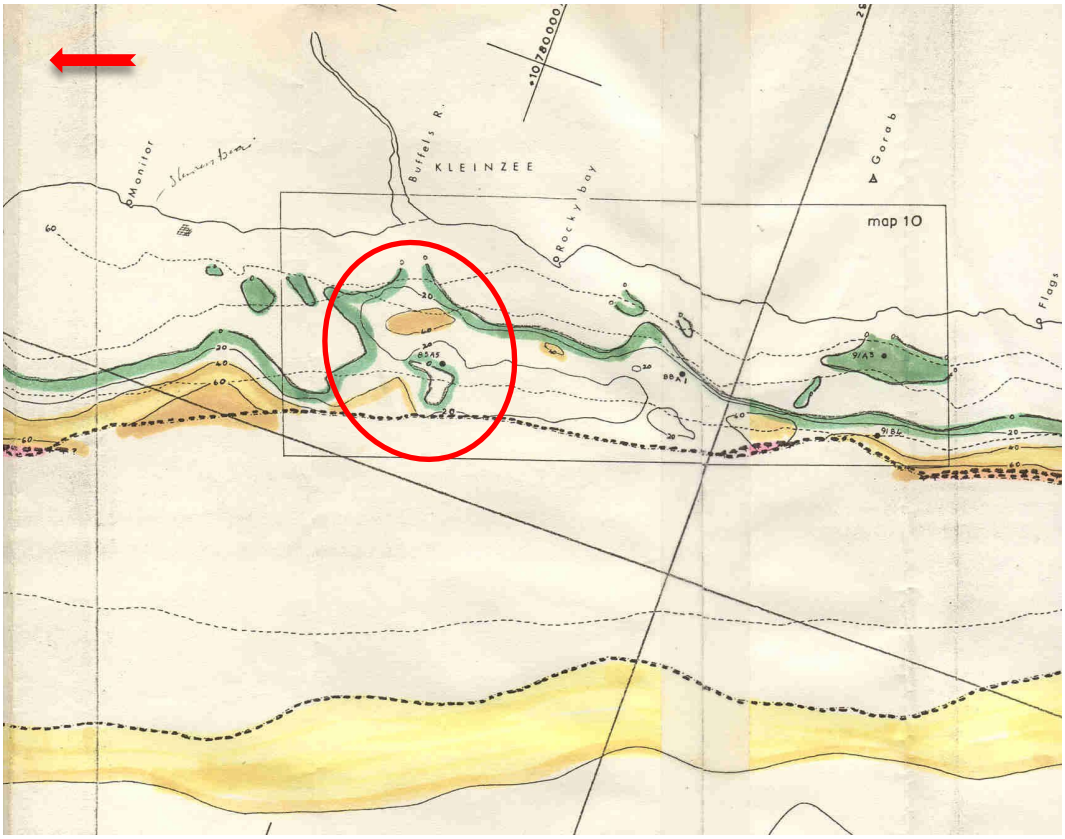

Figure 7-4: A sediment map of the seabed off of Kleinzee. The area circled in red shows the nearshore expression of the Buffels River palaeo-channel. The area between the dark hatched lines in the lower half of the image which truncates the palaeo-channel is the extent of the gas rich sediment which reflected the seismic signal and for which no sub-bottom data is thus available (O'Shea, 1971).

7.3 Maritime History of the South African Coast

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

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

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

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

research in local and foreign archives, together with physical surveys to locate the remains of historical shipwrecks will produce a final tally of more than 3,000.

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

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

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

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

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

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

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

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

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

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

Sixteen (16) of these shipwrecks are known to be on or close to the shore along the approximately 83 km stretch of coastline landward of the concession areas (i.e. the area between Port Nolloth in the north and Swartkop in the south) (Figure 7-5 and Appendix A) and these wrecks will thus not interfere with or be impacted by the proposed prospecting.

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

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

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

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

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

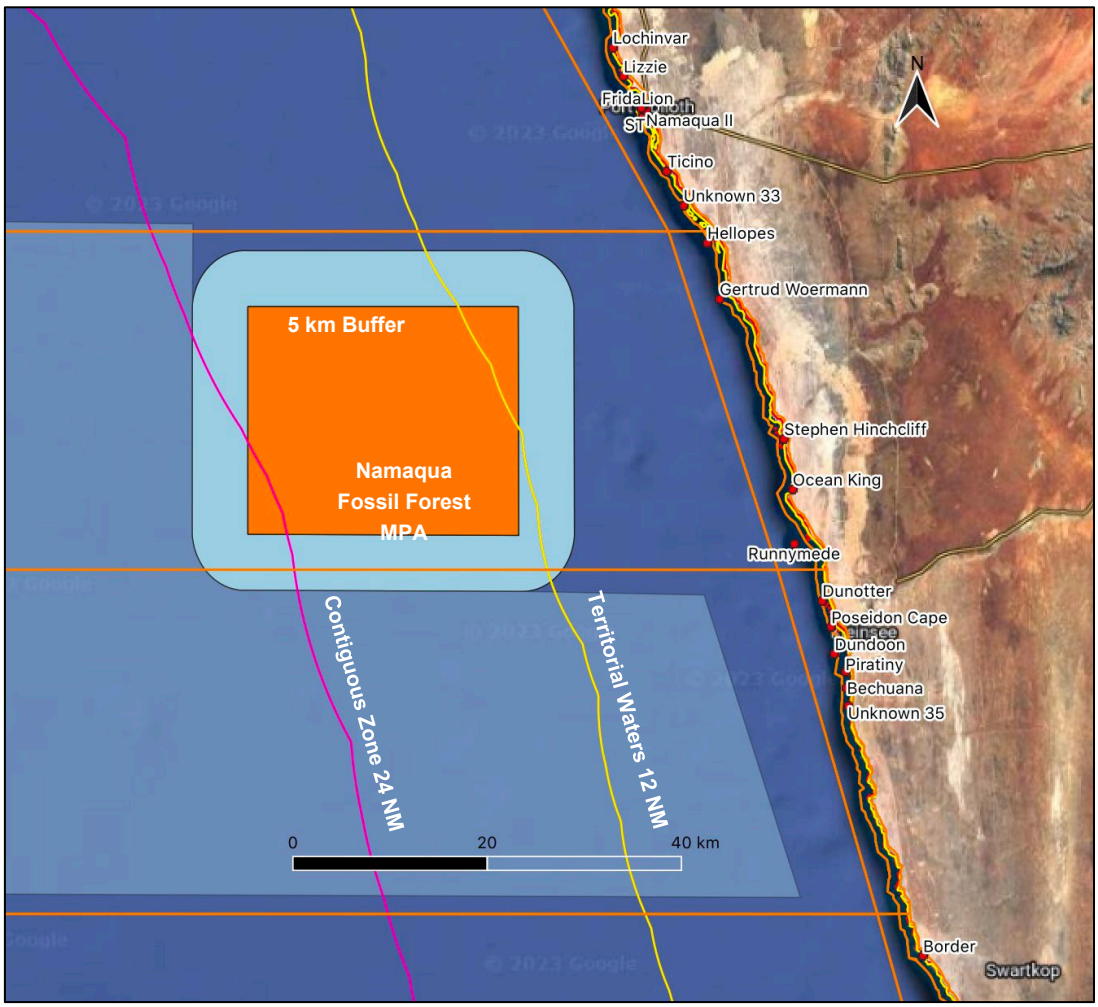

Figure 7-5: Known shipwrecks recorded on the coast in the area adjacent to Concession Areas 4C and 5C, between Port Nolloth and Swartkop (Source: Google Earth).

8 Impact Assessment

8.1 Impact Assessment Methodology

Impacts are rated according to SRK's prescribed impact assessment methodology presented below.

The **significance** of an impact is defined as a combination of the **consequence** of the impact occurring, including possible irreversibility of impacts and/or loss of irreplaceable resources, and the **probability** that the impact will occur.

The criteria used to determine impact consequence are presented in Table 8-1.

Table 8-1: **Criteria used to determine the consequence of the impact**

Rating	Definition of Rating	Score
A. *Extent* *– the area (distance) over which the impact will be experienced*		
Local	Confined to project or study area or part thereof (e.g., the development site and immediate surrounds)	1
Regional	The region (e.g., Municipality or Quaternary catchment)	2
(Inter) national	Nationally or beyond	3
B. ***Intensity*** *– the magnitude of the impact in relation to the sensitivity of the receiving environment, taking into account the degree to which the impact may cause irreplaceable loss of resources*		
Low	Site-specific and wider natural and/or social functions and processes are negligibly altered	1
Medium	Site-specific and wider natural and/or social functions and processes continue albeit in a modified way	2
High	Site-specific and wider natural and/or social functions or processes are severely altered and/or irreplaceable resources[3] are lost	3
C. Duration– *the timeframe over which the impact will be experienced and its reversibility*		
Short-term	Up to 2 years (i.e., reversible impact)	1
Medium-term	2 to 15 years (i.e., reversible impact)	2
Long-term	More than 15 years (state whether impact is irreversible)	3

The combined score of these three criteria corresponds to a Consequence Rating, as summarised in Table 8-2.

Table 8-2: Method used to determine the consequence score

***Combined Score* (A+B+C)**	3 – 4	5	6	7	8 – 9
Consequence Rating	Very low	Low	Medium	High	Very high

Once the consequence was derived, the probability of the impact occurring was considered, using the probability classifications presented in Table 8-3.

[3] Defined as important cultural or biological resource which occur nowhere else, and for which there are no substitutes.

Table 8-3: Probability classification

Probability *– the likelihood of the impact occurring*	
Improbable	< 40% chance of occurring
Possible	40% - 70% chance of occurring
Probable	> 70% - 90% chance of occurring
Definite	> 90% chance of occurring

The overall **significance** of impacts was determined by considering consequence and probability using the rating system prescribed in Table 8-4.

Table 8-4: Impact significance ratings

		Probability			
		Improbable	Possible	Probable	Definite
Consequence	Very Low	**INSIGNIFICANT**	**INSIGNIFICANT**	**VERY LOW**	**VERY LOW**
	Low	**VERY LOW**	**VERY LOW**	**LOW**	**LOW**
	Medium	**LOW**	**LOW**	**MEDIUM**	**MEDIUM**
	High	**MEDIUM**	**MEDIUM**	**HIGH**	**HIGH**
	Very High	**HIGH**	**HIGH**	**VERY HIGH**	**VERY HIGH**

Finally, the impacts were also considered in terms of their status (positive or negative impact) and the confidence in the ascribed impact significance rating. The prescribed system for considering impacts status and confidence (in assessment) is laid out in Table 8-5.

Table 8-5: **Impact status and confidence classification**

Status of impact	
Indication whether the impact is adverse (negative) or beneficial (positive).	+ ve (positive – a 'benefit')
	– ve (negative – a 'cost')
Confidence of assessment	
The degree of confidence in predictions based on available information, SRK's judgment and/or specialist knowledge.	Low
	Medium
	High

The impact significance rating should be considered by authorities in their decision-making process based on the implications of ratings ascribed below:

- **INSIGNIFICANT**: the potential impact is negligible and **will not** have an influence on the decision regarding the proposed activity/development.
- **VERY LOW**: the potential impact is very small and **should not** have any meaningful influence on the decision regarding the proposed activity/development.
- **LOW**: the potential impact **may not** have any meaningful influence on the decision regarding the proposed activity/development.
- **MEDIUM**: the potential impact **should** influence the decision regarding the proposed activity/development.
- **HIGH**: the potential impact **will** affect the decision regarding the proposed activity/development.
- **VERY HIGH**: The proposed activity should only be approved under special circumstances.

Practicable mitigation and optimisation measures are recommended, and impacts are rated in the prescribed way both without and with the assumed effective implementation of mitigation and optimisation measures. Mitigation and optimisation measures are either:

- **Essential**: measures that must be implemented and are non-negotiable; and
- **Best Practice:** recommended to comply with best practice, with adoption dependent on the proponent's risk profile and commitment to adhere to best practice, and which must be shown to have been considered and sound reasons provided by the applicant if not implemented.

8.2 Potential Impacts: Prospecting Activities

Of all the activities to be undertaken as part of the prospecting in Concession Areas 4C and 5C only the bulk seabed sampling has the potential impacts on cultural heritage resources.

Seabed sampling will be undertaken by a crawler vehicle deployed from a specialised sampling vessel. The crawler uses water jets to loosen seabed sediment which is then pumped to surface for shipboard processing. It is estimated that approximately 20 seabed sampling trenches[4], each 240 m long, 20 m wide with a depth of between 1 m and 4 m, will be excavated in the concession areas as part of the prospecting programme.

The potential impacts of seabed sampling on palaeontological resources, submerged prehistoric and maritime archaeological resources are assessed in the following sections.

8.2.1 Potential Impact: Damage to or Loss of Palaeontological Materials

Fossils are rare objects, often preserved due to unusual circumstances. This is particularly applicable to vertebrate fossils (bones), which tend to be sporadically preserved and have high value with respect to palaeoecological and biostratigraphic (dating) information. Such fossils are non-renewable resources. Provided that no subsurface disturbance occurs, the fossils remain sequestered.

The seabed sampling involves a considerable volume of the inner shelf deposits and for the most part the excavated material is the Last Transgression Sequence deposits with expected "subfossil" extant shell species and a 'sprinkling" of scientifically important extralimital species and rare reworked old fossil shells, bones, and teeth in the gravels.

The palaeontological impact of seabed sampling in Concession Areas 4C and 5C will be **localised** but where impacts do occur and because of the non-renewable nature of these resources the effects will be **permanent**.

Although the Namaqua Fossil Forest in Concession Area 4C is subject to a MPA and together with a buffer of 5 km will be excluded from all prospecting activities, reworked, petrified Cretaceous fossil wood is fairly common in the adjacent Concession 5B and nearby onshore deposits and may thus also be more prevalent in other areas of 4C and 5C. Although impacts will be localised, where they do occur their intensity will be **high**, the effects will be **permanent,** and the consequence rating is thus **medium**.

It is possible that seabed sampling will intersect and impact such material. The impact rating for Cretaceous fossil wood in the concession areas is thus assessed to be **low negative**. The lack of concrete information about both the potential presence or distribution of these fossils in the concession areas means that the level of confidence in this assessment of impacts is **low**.

[4] Exploration and geotechnical results will determine the requirement.

Cenozoic shelly macrofauna are expected to be sparse and where present mostly in the form of worn shell casts. Impacts of sampling on the *ex-situ* Cenozoic shelly macrofauna will be **localised**, the intensity **low**, and the effects **permanent**. The consequence rating is thus **low**.

It is unlikely that seabed sampling will intersect and impact such material and the impact rating is thus assessed to be **very low negative**. The lack of concrete information about both the potential presence or distribution of these fossils in the concession areas means that the level of confidence in this assessment of impacts is **low**.

Fossil bones and teeth are phosphatized (petrified) to various degrees and probably also worn by transport and/or pitted by boring organisms. This material is scarce, but the large volumes involved increase the probability that some will be encountered, and these could be of high scientific value. The intensity of impacts will thus be **high**, although **localised**, and the consequence rating to such material is thus assessed to be **high**.

It is possible that seabed sampling will intersect and impact such material. The impact rating is thus assessed to be **medium negative**. The lack of concrete information about both the potential presence or distribution of these fossils in the concession areas means that the level of confidence in this assessment of impacts is **low**.

Quaternary fossil shell assemblages from the Last Transgression Sequence consist mainly of well-known, usual taxa and it is the unexpected, out of range or unknown shell species which are important. The concern here are shell species which are not typical of the normal faunal assemblages of the Namaqua shelf and are generally sparse, although several may occur in the same area. Seabed sampling in Concession Areas 4C and 5C have a strong potential to yield fossil shells of extralimital Algoa species. The intensity of impacts will be medium, duration permanent, but localised. The consequence rating to such material is thus assessed to be **medium**.

It is probable that seabed sampling will intersect and impact such material. The impact rating is thus assessed to be **medium negative**. The lack of concrete information about both the potential presence or distribution of these fossils in the concession areas means that the level of confidence in this assessment of impacts is **low**.

Table 8-6 Significance of loss of Cretaceous Fossil Wood.

	Extent	Intensity	Duration	Consequence	Probability	Significance	Status	Confidence
Without mitigation	Local 1	High 3	Long-term (Irreversible) 3	**Medium** **7**	Possible	**MEDIUM**	– ve	Low
Possible mitigation measures: • Any fossils found during the processing of drill samples must have the details of context recorded, must be kept for identification by an appropriate specialist and, if significant, be deposited in an appropriate institution								
With mitigation	Local 1	Medium 2	Long-term (Irreversible) 3	**Low** **6**	Possible	**LOW**	+ ve	High

Table 8-7: Significance of loss of Cenozoic Shelly Macrofauna.

	Extent	Intensity	Duration	Consequence	Probability	Significance	Status	Confidence
Without mitigation	Local 1	Low 1	Long-term (Irreversible) 3	**Low** **5**	Improbable	**VERY LOW**	– ve	Low
Possible mitigation measures: • Any fossils found during the processing of drill samples must have the details of context recorded, must be kept for identification by an appropriate specialist and, if significant, be deposited in an appropriate institution								
With mitigation	Local 1	Low 1	Long-term (Irreversible) 3	**Low** **5**	Improbable	**VERY LOW**	– ve	Low

Table 8-8: Significance of loss of Fossil Bones and Teeth.

	Extent	Intensity	Duration	Consequence	Probability	Significance	Status	Confidence
Without mitigation	Local 1	High 3	Long-term (Irreversible) 3	**High** **7**	Possible	**MEDIUM**	– ve	Low
Possible mitigation measures: • Any fossils found during the processing of drill samples must have the details of context recorded, must be kept for identification by an appropriate specialist and, if significant, be deposited in an appropriate institution								
With mitigation	Local 1	Low 1	Long-term (Irreversible) 3	**Low** **5**	Possible	**VERY LOW**	– ve	Low

Table 8-9: Significance of loss of Shells from the Last Transgression Sequence.

	Extent	Intensity	Duration	Consequence	Probability	Significance	Status	Confidence
Without mitigation	Local 1	Medium 2	Long-term (Irreversible) 3	**Medium** **6**	Probable	**MEDIUM**	– ve	Low
Possible mitigation measures: • Any fossils found during the processing of drill samples must have the details of context recorded, must be kept for identification by an appropriate specialist and, if significant, be deposited in an appropriate institution								
With mitigation	Local 1	Low 1	Long-term (Irreversible) 3	**Low** **5**	Probable	**LOW**	– ve	Low

With respect to mitigation measure to be implemented during seabed sampling, it is recommended that as part of the normal sampling and mining process the material crossing the oversize screen must be monitored for the occurrence of the various fossil types. Potential fossil material should be collected for later identification and evaluation.

For overall monitoring purposes it is suggested that a few small bulk samples of shells (~5 litres) be collected on occasion. The idea is to sample the typical assemblage at a few points in the sampling/mining area. It is possible that an uncommon assemblage may be encountered, such as a shallow-water fauna or a lagoonal fauna, in which case it should also be sampled.

Data to be recorded during fossil collection includes:

- Date;
- Company name;
- Sample no.;

- Collector's name;
- Position (co-ordinates);
- Water depth;
- Sample subsurface depth;
- Vessel;
- Brief description and photographs;
- A copy of the graphic log of the sample drill hole or mining face showing the vertical sequence of units and the estimated location of the fossil in the sequence; and
- A map of the fossil finds in the particular sampling/mining area, such as a contoured multibeam bathymetric image showing the context of samples in relation to the bedrock topography and sediment bodies.

During all operations, personnel can send queries and images by email to an appointed palaeontologist for evaluation and prompt feedback.

Collected samples are to be temporarily stored by the company but when a collection of fossil material has been accumulated, the appointed palaeontologist should undertake the identification and evaluation of the fossil material and compile the report for submission to SAHRA. A selection of material could be removed for further study. The Environmental Manager/Officer is to liaise with the appointed palaeontologist on the progress of the fossil collection and the scheduling of the evaluation.

With mitigation, impact significance is assessed to be of **low** or **very low** for palaeontological resources.

8.2.2 Potential Impact: Damage to or Loss of Submerged Prehistoric Archaeological Sites or Materials

The past use by our hominin ancestors of the exposed continental shelf is beyond doubt and the evidence of this presence is possible where archaeological material and palaeoenvironmental evidence has survived post-glacial marine transgressions.

Although no geophysical data for the concession areas are presently available, there is the potential for this material to be found on, or associated with surviving palaeo-landsurfaces or in association with any now submerged palaeo-channels in the extreme eastern portion of Concession Area 5C where the water depth is less than 120 m. The equivalent area of Concession Area 4C forms part of the excluded Namaqua Fossil Forest MPA and buffer and will thus not be subject to impacts from seabed sampling.

Sampling activities will have a direct impact on seabed sediments and should there be archaeological material in the affected sediments this will be disturbed and its archaeological context destroyed. The extent of any impacts to submerged prehistoric archaeological sites and material will be **localised** and limited to the sampling trenches. However, the non-renewable nature of such resources means that where impacts do occur their intensity will be **high**, the effects will be **permanent** and the consequence rating is thus **high**.

It is extremely difficult to predict whether prehistoric archaeological remains will be present in or on the seabed within the concession areas or, if they are, where they may be located. The growing evidence-base for submerged prehistoric archaeological remains on the continental shelf globally and in South African waters suggests that wherever seabed disturbance occurs in particularly the landward portion of Concession Area 5C, it is possible that prospecting activities will intersect and impact such material.

The impact rating for submerged prehistoric archaeological remains in the concession areas is thus assessed to be **medium negative**.

The lack of concrete information about both the potential presence or distribution of submerged prehistoric resources in the concession areas means that the level of confidence in this assessment of impacts is **low**.

In respect of mitigation measures, if the prospecting process includes the recovery and retention of the stone and gravel fraction of the recovered sediments in addition to the gem fraction, and samples of the former material can be archaeologically assessed for the presence of stone age lithics and other archaeological material (e.g., bone) this would be beneficial and would make a positive contribution to archaeological knowledge.

Similarly, and bearing in mind the obvious commercial sensitivity of such data, if any evidence in the geophysical data (particularly the Chirp seismic data) for submerged palaeo-river channels, associated gravel terraces and the presence in those portions of the concession areas in water depths of less than 120 m of organic remains or sediment horizons can be made available to researchers, this would also make a positive contribution to the furtherance of archaeological knowledge.

The impact is assessed to be of **medium** significance and with the implementation of mitigation is reduced to **low** (Table 8-10).

Table 8-10: Significance of loss of submerged prehistoric archaeological sites and materials.

	Extent	Intensity	Duration	Consequence	Probability	Significance	Status	Confidence
Without mitigation	Local 1	High 3	Long-term (Irreversible) 3	**High** **7**	Possible	**MEDIUM**	– ve	Low
Possible mitigation measures: • If the stone and gravel fraction of the sampled sediments is retained, archaeological review of this material is strongly recommended; and • The making available to archaeological research of information about the presence of certain seabed features from particularly the seismic Chirp data is strongly recommended.								
With mitigation	Local 1	Medium 2	Long-term (Irreversible) 3	**Medium** **6**	Possible	**LOW**	+ ve	High

8.2.3 Potential Impact: Damage to or Loss of Maritime Archaeological Sites or Materials

The discussion above of the maritime heritage resources in and around Concession Areas 4C and 5C indicates that there are no recorded historical shipwrecks within the concession areas and although a previous HIA for portions of the concession areas (Maitland, 2017) proposes that up to five wrecks could be present in the areas, the available historical information suggests that while this is possible, it is also unlikely.

Furthermore, the possibility that currently unknown historical wrecks or maritime debris are present on the seabed in the concession areas is so low that it can probably be discounted.

There is thus unlikely to be any impact arising from prospecting activities on maritime heritage resources and they are scoped out of this impact assessment.

8.3 Cumulative Impacts

For the purposes of this report, cumulative impacts are defined as ‘direct and indirect impacts that act together with existing or future potential impacts of other activities or proposed activities in the area / region that affect the same resources and / or receptors’.

For the most part, cumulative effects or aspects thereof are too uncertain to be quantifiable, due mainly to a lack of data availability and accuracy. This is particularly true of cumulative effects arising from potential or future projects, the design, or details of which may not be finalised or available and the direct and indirect impacts of which have not yet been assessed.

For practical reasons, the identification and management of cumulative impacts are limited to those effects generally recognised as important on the basis of scientific concerns and/or concerns of affected communities.

8.3.1 Activities Considered

Activities that potentially have cumulative impacts with the proposed Concession Area 4C and 5C prospecting and which are considered in the cumulative impact assessment are listed in Table 8-11. **Note that past and present projects, activities, and stressors should have been largely considered in the baseline and thus the impact assessment in Sections 8.2.**

Table 8-11: Projects, activities and/or stressors with potential cumulative impacts

Project, activity and/or natural stressor	Potentially cumulatively impacted environmental resource										
	Soil / Land	Air quality	Noise	Groundwater	Freshwater	Marine/Coast	Flora / Fauna	Socio-econ	Heritage	Visual	Traffic
Possible present natural stressors											
N/A											
Past and present projects and activities[5]											
Current offshore mineral prospecting or mining in the surrounding concession areas									X		
Possible future natural stressors											
N/A											
Potential future projects											
Offshore prospecting or mining in the surrounding concession areas									X		
Application for offshore oil and gas prospecting in Block 1, which overlaps with Areas 4C and 5C									X		

8.3.2 Cumulative Impact Analysis

Given the nature of palaeontological, submerged prehistoric and maritime archaeological heritage resources and the extent of our knowledge about their occurrence and distribution, an assessment of the cumulative impact of current and future seabed activities on these resources in the area surrounding Concession Areas 4C and 5C, can only be qualitative and descriptive.

The presence of palaeontological resources within the seabed of the area is a given, although they are generally scarce and their distribution is patchy. Thus, while current and future seabed activities

in the area which will disturb the seabed, including mineral, and oil and gas prospecting or mining, have the potential to impact palaeontological resources, it is likely that such impacts will be **infrequent** and of **low** cumulative significance.

Although there is very little concrete evidence for the distribution of submerged prehistoric sites and materials in and on the seabed around the South African coast, it is clear these sites and material will exist. Using the terrestrial archaeology of the West Coast as a proxy for the spatial distribution of sites on the now inundated continental shelf, it is also clear that significant archaeological sites and material will be highly localised and most of the seabed will not contain such material.

Thus, while current and future seabed activities in the area which will disturb the seabed, including mineral, and oil and gas prospecting or mining, have the potential to impact submerged prehistoric sites and materials, it is likely that such impacts will be **infrequent** and of **low** cumulative significance.

With respect to potential cumulative impacts on historical shipwrecks, the discussion above indicates that this area of South Africa's West Coast has relatively few wrecks, when compared to places like Table Bay which alone contains more than 400 wrecks. The majority of West Coast wrecks are also located close to the coast, and cumulative impacts arising from offshore mining and prospecting are thus potentially more of a risk in the A concession areas.

Generally, however, historical wrecks and related maritime archaeological debris are avoidable (through the prior collection and analysis of geophysical data) and actively avoided (because of potential damage they can cause to mining plant and machinery) by seabed activities such as mining or prospecting.

Impacts on historical shipwrecks arising from seabed activities are likely to be accidental where they do occur, and once a site has been encountered on the seabed it is likely to be excluded from the area of activities as an operational obstruction or risk.

There is thus a **very low** potential for cumulative impacts on maritime archaeological resources, principally historical shipwrecks, arising out of current and future seabed activities in the area surrounding Concession Areas 4C and 5C.

9 Findings and Conclusions

The following findings are pertinent:

- It is likely that fossils of various types will be present within the Concession Areas 4C and 5C although their distribution and density is generally understood to be patchy and low. The protected Namaqua Fossil Forest MPA will be buffered by an additional 5km and excluded from prospecting activities.

In respect of other fossils it is recommended that:

- The EMPr for the prospecting rights must include provisions for the collection of representative examples of the fossils that occur;
- "Run of mine" material on the oversize screen should be monitored for fossils as part of normal sampling and mining process;
- Potential fossil material should be collected for later identification and evaluation. The company must apply to SAHRA for a general permit to destroy, damage, excavate, disturb and collect fossils identified during sampling, as per the NHRA and any recovered material is to be temporarily stored by the company. When a collection of fossil material has been accumulated, the appointed palaeontologist should undertake the identification and evaluation of the fossil material and compile the report for submission to SAHRA. The Environmental Manager/Officer) is to liaise with the appointed palaeontologist on the progress of the fossil collection and the scheduling of the evaluation; and
- For overall monitoring purposes it is suggested that a few small bulk samples of shells (~5 litres) are collected on occasion. The idea is to sample the typical assemblage at a few points in the sampling/mining area. It is possible that an uncommon assemblage may be encountered, such as a shallow-water fauna or a lagoonal fauna, in which case it should also be sampled.

Most of Concession Areas 4C and 5C lie below the -120 m bathymetric contour and the seabed here will not contain submerged prehistoric archaeological sites or materials. However, within a relatively narrow band of a couple of kilometres seaward of the eastern boundary of the concession areas, where the water is shallower than -120 m, there is some potential for the presence of these remains. In Concession Area 4C this landward portion of the concession area is excluded from prospecting activities by the presence of the Namaqua Fossil Forest MPA and its buffer, so it is just within Concession Area 5C that there is the potential for impacts to submerged prehistoric archaeology.

These sites and materials in or on the seabed cannot be directly identified from geophysical data, but seabed features such as palaeo-channels, gravel river terraces and horizons of organic rich sediments visible in the seismic data, or large rocky outcrops shown in the swathe bathymetry can indicate an increased likelihood of such materials being present in an area.

Subject to agreement related to the commercial sensitivity of these data it is, therefore, recommended that the seismic Chirp and seabed bathymetry data from the inshore portion of Concession Area 5C is made available for archaeological research purposes.

It is also recommended that if the stone and gravel fraction of the sampled sediments is retained as part of the prospecting process, this material from the inshore portion of Concession Area 5C is made available for archaeological review and analysis.

In respect of maritime archaeological sites and materials, the available evidence suggests that it is unlikely that there are any historical wrecks located within either concession area and this heritage receptor was scoped out of the impact assessment above.

The absence of historical wrecks in the concession areas can be confirmed by the geophysical contractor during the processing and analysis of the swathe bathymetry and magnetometer data to be acquired for the proposed prospecting. It is, therefore, recommended that any wreck or any potentially anthropogenic seabed anomaly (either magnetic or sonar) identified during the processing of the geophysical data during Phase 2 of the prospecting programme is flagged and that these sites and/or anomalies are excluded from the areas to be subject to bulk seabed sampling. The implementation of a buffer of at least 50 m around each such site and/or anomaly will serve to ensure that they are not impacted by the bulk sampling. Any such sites or flagged anomalies must be reported to SAHRA.

If an undetected wreck is encountered during seabed sampling, it is recommended that the following mitigation measures must be implemented:

- Seabed sampling activities in the area must be stopped immediately;
- The responsible Environmental Manager/Coordinator must be informed immediately;
- The Environmental Manager/Coordinator must inform SAHRA immediately;
- A suitably qualified maritime archaeologist must be contacted to assess the find;
- If any artefacts have been recovered from the site these must be kept wet and retained for assessment by the maritime archaeologist;
- The location of the find and any associated data used to identify the wreck must be provided to SAHRA be added to the national shipwreck database; and
- Following consultation with SAHRA and the maritime archaeologist, an exclusion zone around the site is likely to be required within which seabed sampling activities may not take place.

A summary of impacts and mitigation / optimisation measures is provided in Table 9-1.

Table 9-1: Summary of impacts and mitigation / optimisation measures

Impact	Significance rating		Key mitigation / optimisation measures
	Before mitigation/ optimisation	After mitigation/ optimisation	
PROSPECTING ACTIVITYIMPACTS			
Damage to or loss of Cretaceous Fossil Wood	Low (-ve)	Low (+ve)	• The Namaqua Fossil Forrest MPA is excluded from prospecting activities through the implementation of a 5 km exclusion zone around the MPA boundary; • The EMPr must include provisions for the collection of representative examples of the fossils that occur; • "Run of mine" material on the oversize screen should be monitored for fossils as part of normal sampling and mining process; • Potential fossil material should be collected for later identification and evaluation. The company must apply to SAHRA for a general permit to destroy, damage, excavate, disturb and collect fossils identified during sampling, as per the NHRA and any recovered material is to be temporarily stored by the company. When a collection of fossil material has been accumulated, the appointed palaeontologist should undertake the identification and evaluation of the fossil material and compile the report for submission to SAHRA. The Environmental Manager/Officer) is to liaise with the
Damage to or loss of Cenozoic Shelly Macrofauna	Very Low (-ve)	Very Low (+ve)	
Damage to or loss of Fossil Bones and Teeth	Medium (-ve)	Low (+ve)	
Damage to or loss of Shells from the Last Transgression Sequence	Medium (-ve)	Very Low (+ve)	

Impact	Significance rating		Key mitigation / optimisation measures
	Before mitigation/ optimisation	After mitigation/ optimisation	
			appointed palaeontologist on the progress of the fossil collection and the scheduling of the evaluation; and • For overall monitoring purposes it is suggested that a few small bulk samples of shells (~5 litres) are collected on occasion. The idea is to sample the typical assemblage at a few points in the sampling/mining area. It is possible that an uncommon assemblage may be encountered, such as a shallow-water fauna or a lagoonal fauna, in which case it should also be sampled.
Damage to or Loss of Submerged prehistoric archaeological sites or materials	Medium (-ve)	Low (+ve)	• If the stone and gravel fraction of the sampled sediments is retained, archaeological review of this material is strongly recommended; and • The making available to archaeological research of information about the presence of certain seabed features from particularly the seismic Chirp data is strongly recommended.
Damage to or loss of maritime archaeological sites or materials	Unlikely to occur so scoped out of this impact assessment		• The absence of historical wrecks in the concession areas can be confirmed from the geophysical data to be acquired for the proposed prospecting; • Any wreck or possibly anthropogenic seabed anomaly identified in the geophysical data during Phase 2 of the prospecting programme must be is flagged; • These sites and/or anomalies must be excluded from the areas to be subject to bulk seabed sampling. The implementation of a buffer of at least 50 m around each such site and/or anomaly will serve to ensure that they are not impacted by the bulk sampling; • Any such sites or flagged anomalies must be reported to SAHRA. • If an undetected wreck is encountered during seabed sampling, it is recommended that the following mitigation measures must be implemented: o Seabed sampling activities in the area must be stopped immediately; o The responsible Environmental Manager/Officer must be informed immediately; o The Environmental Manager/Officer must inform SAHRA immediately; o A suitably qualified maritime archaeologist must be contacted to assess the find; o If any artefacts have been recovered from the site these must be kept wet and retained for assessment by the maritime archaeologist; o The location of the find and any associated data used to identify the wreck must be provided to SAHRA be added to the national shipwreck database; and o Following consultation with SAHRA and the maritime archaeologist, an exclusion zone around the site is likely to be required within which seabed sampling activities may not take place.

9.1 Conclusion and Authorisation Opinion

It is our reasoned opinion that the proposed prospecting activities in Concession Areas 4C and 5C are likely to have a very low impact on palaeontological and submerged prehistoric archaeological resources, and no impact on maritime archaeological sites and materials.

Provided the recommendations to mitigate and offset potential impacts are implemented, the proposed prospecting can be considered to be archaeologically acceptable.

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Appendix A: Known wrecks on or close to the shore between Port Nolloth and Swartkop

Ship Name	Place	Latitude/Longitude (estimated)* (WGS84)	Event Type	Vessel Category	Type	Date Wreck
Bechuana	Natgooier, 48.3km south of Port Nolloth	-29.7238S / 17.0540E	Wrecked	Motor freighter	Coaster	1950/12/11
Border	Naganas Point / Elands Klip	-29.9387S / 17.1245E	Wrecked	Motor vessel	Coaster	1947/04/01
Dundoon	South of Kleinsee	-29.6963S / 17.0428E	Wrecked	Wooden motor vessel	Trawler	1949/01/01
Dunotter	5km north west of Kleinzee	-29.6534S / 17.0314E	Wrecked	Wooden motor vessel	Crayfish boat	1950
Gertrud Woermann	12 miles south of Port Nolloth	-29.4104S / 16.9363E	Wrecked	Steel screw steamship	Coaster	1903/08/22
Hellopes	7 miles south of Port Nolloth	-29.3651S / 16.9249E	Grounded and refloated	Steel Steamship	-	1911/04/16
Lion	Port Nolloth	-29.2565S / 16.8640E	Wrecked	Sailing Vessel	Cutter	1878/10/20
Namaqua II	Port Nolloth – south of jetty	-29.2586S / 16.8682E	Beached	Steamship	Coaster	1889/05/31

Piratiny	South of Kleinzee / Schulp Point	-29.7105S / 17.0527E	Wrecked	Steamship	-	1943
Poseidon Coast	Kleinzee	-29.6747S / 17.0396E	Wrecked	Twin Screw Motor Vessel	Diamond boat	1985/07/27
Runnymede	45 km south of Port Nolloth	-29.6079S / 17.0053E	Wrecked	Twin Screw Steamship	Coaster	1923/01/24
ST	South of channel to Jetty Port Nolloth	-29.2623S / 16.8655E	Wrecked	Iron Sailing Vessel	Schooner (Three-Masted)	1889/07/06
Stephen Hinchcliff	Thorn Bay / Doring Bay?	-29.5232S / 16.9959E	Foundered	Motor Vessel	Coaster	1954/01/01
Ticino	8 km south of Port Nolloth near Goap	-29.3074S / 16.8877E	Wrecked	Iron Sailing Vessel	Ship (Collier)	1908/08/30
Unknown 33 (*Lochinvar*?)	Cliff Point	-29.3350S / 16.9029E	Wrecked	Motor Vessel ?	Fishing vessel	Unknown
Unknown 35	Rooiklippies, south of Kleinzee	-29.7381S / 17.0549E	Wrecked	Unknown	Unknown	Unknown

*** PLEASE NOTE**: The shipwreck positions provided above are estimated positions based on descriptions of loss in the historical record. Confidence in the accuracy of these positions is thus very low and it is unlikely that the vessels concerned will be found at the given co-ordinates.

Appendix B: Potential wrecks within Concession Areas 4C and 5C (After Maitland 2017)

Ship Name	Place	Latitude/Longitude (estimated)* (WGS84)	Event Type	Vessel Category	Type	Date Wreck
Eros	Near Lamberts Bay	-32.0913S / 18.2226E	Foundered	Steamship	Two masted coaster	1918/05/26
Haab	Between Cape Town and Port Nolloth (grounded on Dassen Island)	Unknown	Abandoned	Wooden sailing vessel	Barque	1897
Jessie Smith	Off Alexander Bay	-28.6411S / 16.4610E	Abandoned	Wooden Sailing Vessel	Brig / Schooner ?	1853/08/23
Ocean King	Penguin Rock – 32 km south of Port Nolloth	-29.5639S / 17.0038E	Foundered	Sailing Vessel	Barque	1881/01/22
Laporte	80 km north of Port Nollloth & 100 m offshore	-28.6351S / 16.4451E	Wrecked	Steel Screw Steamship	-	1904/06/09

*** PLEASE NOTE**: The shipwreck positions provided above are estimated positions based on descriptions of loss in the historical record. Confidence in the accuracy of these positions is thus very low and it is unlikely that the vessels concerned will be found at the given co-ordinates.

Appendix C: Specialist CV – John Gribble

Name: John Gribble

Profession: Archaeologist

Date of Birth: 15 November 1965

Parent Firm: ACO Associates cc

Position in Firm: Senior Archaeologist

Years with Firm: 5+

Years of experience: 27

Nationality: South African

HDI Status: n/a

Education:

1979-1983	Wynberg Boys' High School (1979-1983)
1986	BA (Archaeology), University of Cape Town
1987	BA (Hons) (Archaeology), University of Cape Town
1990	Master of Arts, (Archaeology) University of Cape Town

Employment:

- ACO Associates, Senior Archaeologist and Consultant, September 2017 – present
- South African Heritage Resources Agency, Manager: Maritime and Underwater Cultural Heritage Unit, 2014 – 2017 / Acting Manager: Archaeology, Palaeontology and Meteorites Unit, 2016-2017
- Sea Change Heritage Consultants Limited, Director, 2012 – present
- TUV SUD PMSS (Romsey, United Kingdom), Principal Consultant: Maritime Archaeology, 2011-2012
- EMU Limited (Southampton, United Kingdom), Principal Consultant: Maritime Archaeology, 2009-2011
- Wessex Archaeology (Salisbury, United Kingdom), Project Manager: Coastal and Marine , 2005-2009
- National Monuments Council / South African Heritage Resources Agency, Maritime Archaeologist, 1996-2005
- National Monuments Council, Professional Officer: Boland and West Coast, Western Cape Office, 1994-1996

Professional Qualifications and Accreditation:

- Member: Association of Southern African Professional Archaeologists (No. 043)
- Principal Investigator: Maritime and Colonial Archaeology, ASAPA CRM Section
- Field Director: Stone Age Archaeology, ASAPA CRM Section
- Member: Chartered Institute for Archaeologists (CIfA), United Kingdom
- Class III Diver (Surface Supply), Department of Labour (South Africa) / UK (HSE III)

Experience:

I have nearly 30 years of combined archaeological and heritage management experience. After completing my postgraduate studies, which were focussed on the vernacular architecture of the West Coast, and a period of freelance archaeological work in South Africa and aboard, I joined the National Monuments Council (NMC) (now the South African Heritage Resources Agency (SAHRA)) in 1994. As the Heritage Officer: the Boland I was involved in day to day historical building control and heritage resources management across the region. In 1996 I become the NMC's first full-time maritime archaeologist in which role was responsible for the management and protection of underwater cultural heritage in South Africa under the National Monuments Act, and subsequently under the National Heritage Resources Act.

In 2005 I moved to the UK to join Wessex Archaeology, one of the UK's biggest archaeological consultancies, as a project manager in its Coastal and Marine Section. In 2009 I joined Fugro EMU Limited, a marine geosurvey company based in Southampton to set up their maritime archaeological section. I then spent a year at TUV SUD PMSS, an international renewable energy consultancy based in Romsey, where I again provided maritime archaeological consultancy services to principally the offshore renewable and marine aggregate industries.

In August 2012 I set up Sea Change Heritage Consultants Limited, a maritime archaeological consultancy. Sea Change provides archaeological services to a range of UK maritime sectors, including marine aggregates and offshore renewable energy. It also actively pursues opportunities to raise public awareness and understanding of underwater cultural heritage through educational and research projects and programmes, including some projects being developed in South Africa.

Projects include specialist archaeological consultancy for more than 15 offshore renewable energy projects and more than a dozen offshore aggregate extraction licence areas.

In addition to managing numerous UK development-driven archaeological projects, I have also been involved in important strategic work which developed guidance and best practice for the offshore industry with respect to the marine historic environment. This has included the principal authorship of two historic environment guidance documents for COWRIE and the UK renewable energy sector, and the development of the archaeological elements of the first Regional Environmental Assessments for the UK marine aggregates industry. In 2013-14 I was lead author and project co-ordinator on the Impact Review for the United Kingdom of the 2001 UNESCO Convention on the Protection of the Underwater Cultural Heritage. In 2016 I was co-author of a Historic England / Crown Estate / British Marine Aggregate Producers Association funded review of marine historic environment best practice guidance for the UK offshore aggregate industry.

I returned to South African in mid-2014 where I was re-appointed to my earlier post at SAHRA: Manager of the Maritime and Underwater Cultural Heritage Unit. In July 2016 I was also appointed Acting Manager of SAHRA's Archaeology, Palaeontology and Meteorites Unit.

I left SAHRA in September 2017 to join ACO Associates as Senior Archaeologist and Consultant.

I have been a member of the ICOMOS International Committee for Underwater Cultural Heritage since 2000 and have served as a member of its Bureau since 2009.

I have been a member of the Association of Southern African Professional Archaeologists for more than twenty years and am accredited by ASAPA's CRM section. Since 2010 I have been a member of the UK's Joint Nautical Archaeology Policy Committee.

I am a member of the Advisory Board of the George Washington University / Iziko Museums of South Africa / South African Heritage Resources Agency / Smithsonian Institution 'Southern African Slave

Wrecks Project' and serve on the Heritage Western Cape Archaeology, Palaeontology and Meteorites Committee.

Books and Publications:

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Appendix D: Declaration of Independence

I, John Gribble, declare that:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- There are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24(F) of the Act.

Signature of the specialist

ACO Associates cc

Name of company (if applicable):

9 March 2023

Date