GROMIS-NAMA-AGGENEIS 400KV IPP INTEGRATION: HERITAGE SCREENING

Prepared by CTS Heritage

CTS HERITAGE

For

EnviroWorks

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CTS HERITAGE

EXECUTIVE SUMMARY

Eskom proposes to develop a new power line from Gromis substation via Nama substation towards Aggeneis substation in the Northern Cape Province.

In order to ensure that the Namaqualand network is compliant and that there is sufficient line capacity to accommodate potential Independent Power Producers (IPPs) within the Namaqualand area, the construction of the new Gromis-Nama-Aggeneis 400 kV line and establishment of a 400/132 kV yard at Nama substation is proposed. The Screening Assessment aims to assess possible route alternatives for the proposed new power line.

Based on the available information, the area proposed for the powerline alignments therefore constitutes a very sensitive landscape in terms of impacts to historical, archaeological and palaeontological heritage resources. The proposed development of the 400kV powerline may result in the destruction of significant archaeological, palaeontological and built environment heritage resources through the insensitive placement of pylon footings as well as the loss of a sense of place through the development of large scale and intrusive infrastructure within a sensitive cultural landscape. Each proposed alignment therefore has the potential to impact on:

- Historic townscapes and sense of place of historic cores of Springbok, Nababeep, O'Kiep, Carolusberg and Concordia
- Corbelled houses and other historic structures and farm werfs
- Archaeological heritage resources specifically heritage associated with
    - Copper Mining
    - South African War
    - ESA, MSA and LSA (including OES, grinding grooves and ceramics) sites (tend to be associated with granite outcrops and pans)
    - Engraved rock art
    - Marked and unmarked burial grounds
- Heritage associated with Korana wars and the massacre of Khoe and San peoples
- Palaeontological heritage consisting of trace fossils, mammal bone fossils, sharks teeth, mollusc fossils

The archaeological field assessment identified a number of sites of heritage significance, including cemeteries, sites associated with the living heritage of the Korana people as well as sites associated with the Namaqualand Copper Mining Cultural Landscape. Unusually, very few artefacts or sites associated with the stone age were identified in the field assessment, however such resources are likely present on the landscape. Impacts to the

majority of these resources can be avoided through the sensitive placement of individual specific pylons within any of the proposed corridors. Impacts to the broader cultural landscape are more challenging to mitigate.

Based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the development footprint. The geological structures suggest that the rocks are either much too old to contain fossils. The Tertiary calcretes and Quaternary windblown sands do not preserve fossils except in special circumstances. Since there is an extremely small chance that fossils from the nearby Vryheid Formation may be disturbed a Fossil
Chance find protocol has been added to this report. The potential impact to fossil heritage resources is extremely low. Based on the experience of the palaeontologist and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the loose sands of the Quaternary.

There is an existing 200kV power line that runs along the proposed alignment for Alternative 1. Potential impacts to the cultural landscape can be mitigated by concentrating such electricity infrastructure along one alignment where the landscape is not pristine. Furthermore, a number of no-go areas have been identified (Map 7) based on the location of the known heritage resources, and incorporating the known sensitivity of rocky outcrops, mountains and waterways for heritage resources.

Of the original five proposed alternatives, Alternatives 2 and 3 have been screened out as a result of other environmental and practical reasons. Based on the outcomes of this assessment, a number of heritage resources of heritage significance were identified within the proposed alignment of Alternative 4 (Grade II, IIIA and IIIB). A number of no-go areas have been recommended within the proposed alignment of Alternative 4. While a number of heritage resources were also identified within the proposed alignment for Alternative 1, these are not as sensitive or as significant (mostly Grade IIIB and IIIC) as the resources within Alternative 4. No heritage resources that aren't also located within the proposed alignment for Alternative 1 were identified within the proposed alignment for Alternative 5. It must be noted that Alternative 5 was added as an additional alternative once fieldwork was already underway and as such, Alternative 5 was not fully assessed. However, the assessment conducted has provided sufficient insight into the kinds of heritage resources that may be impacted by the proposed development along this alignment as only a small section of Alternative 5 deviates from Alternative 1, effectively avoiding the Goegaap Nature Reserve, which was fully assessed. Should this alignment be preferred, a more detailed assessment of the corridor can take place to inform the micro-siting of the proposed pylons to

ensure that no significant heritage resources are impacted. ***Based on the information assessed in this HIA, it is recommended that Alternative 1 or Alternative 5 are the preferred alignments.***

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1. INTRODUCTION

1.1 Background Information on Project

Eskom proposes to develop a new power line from Gromis substation via Nama substation towards Aggeneis substation in the Northern Cape Province.

In order to ensure that the Namaqualand network is compliant and that there is sufficient line capacity to accommodate potential Independent Power Producers (IPPs) within the Namaqualand area, the construction of the new Gromis-Nama-Aggeneis 400 kV line and establishment of a 400/132 kV yard at Nama substation is proposed. The Screening Assessment aims to assess possible route alternatives for the proposed new power line.

1.2 Strategic Environmental Assessment for Strategic Electrical Grid Infrastructure Corridors

In 2016 a Strategic Environmental Assessment (SEA) was undertaken by CSIR. The purpose of the SEA was to identify strategic Electricity Grid Infrastructure (EGI) Corridors to support electricity transmission up to 2040. The vision for the Strategic EGI was to expand in an environmentally responsible and efficient manner that effectively meets the country's economic and social development needs.

The final EGI Power Corridors assessed as part of the 2016 EGI Strategic SEA were gazetted for implementation on 16 February 2018 in Government Gazette 41445, Government Notice R.113. One of these corridors, was the Northern Corridor – Please see Figure 1 for the Gazetted Corridors. The proposed new power line will be constructed within the Northern Corridor.

1.3 Alternative Environmental Authorisation procedure to be followed

The above mentioned Gazette provided an alternative procedure to be followed when applying for Environmental Authorisation for the development of large scale electricity transmission and distribution infrastructure (identified in terms of section 24(2)(a) of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA)) when these activities fall within the identified Strategic Transmission Corridors, such as the Northern Corridor.

The development of large scale electricity transmission infrastructure triggers Listed Activity 9 of Listing Notice 2 of the 2014 Environmental Impact Assessment (EIA) Regulations (as amended), which usually would require a full Scoping and Environmental Impact Assessment. However, when such a development is to take place within a Strategic Transmission Corridor, a Basic Assessment (BA) Process in terms of the 2014 EIA Regulations (as

amended) is to be followed. This speeds up the Environmental Authorisation process for EGI developments within any of the five Strategic Transmission Corridors. A prerequisite for the BA process to be followed is however the obtaining of a servitude prior to application for environmental authorisation.

One of the objectives of this SEA process was also to provide developers with the flexibility to consider a range of route alternatives within the strategic corridors to avoid land negotiation issues and to submit a pre-negotiated route to the Competent Authority.

As noted above, this has been achieved for the development of EGI within any of the five Strategic Transmission Corridors gazetted in February 2018 (GN 113 in Government Gazette 41445), for which:

(a) a pre-negotiated route must be submitted to the Department of Environmental Affairs (DEA); and,

(b) a BA procedure needs to be followed in compliance with the 2014 EIA Regulations (as amended) instead of a full Scoping and EIA process previously triggered by such activities.

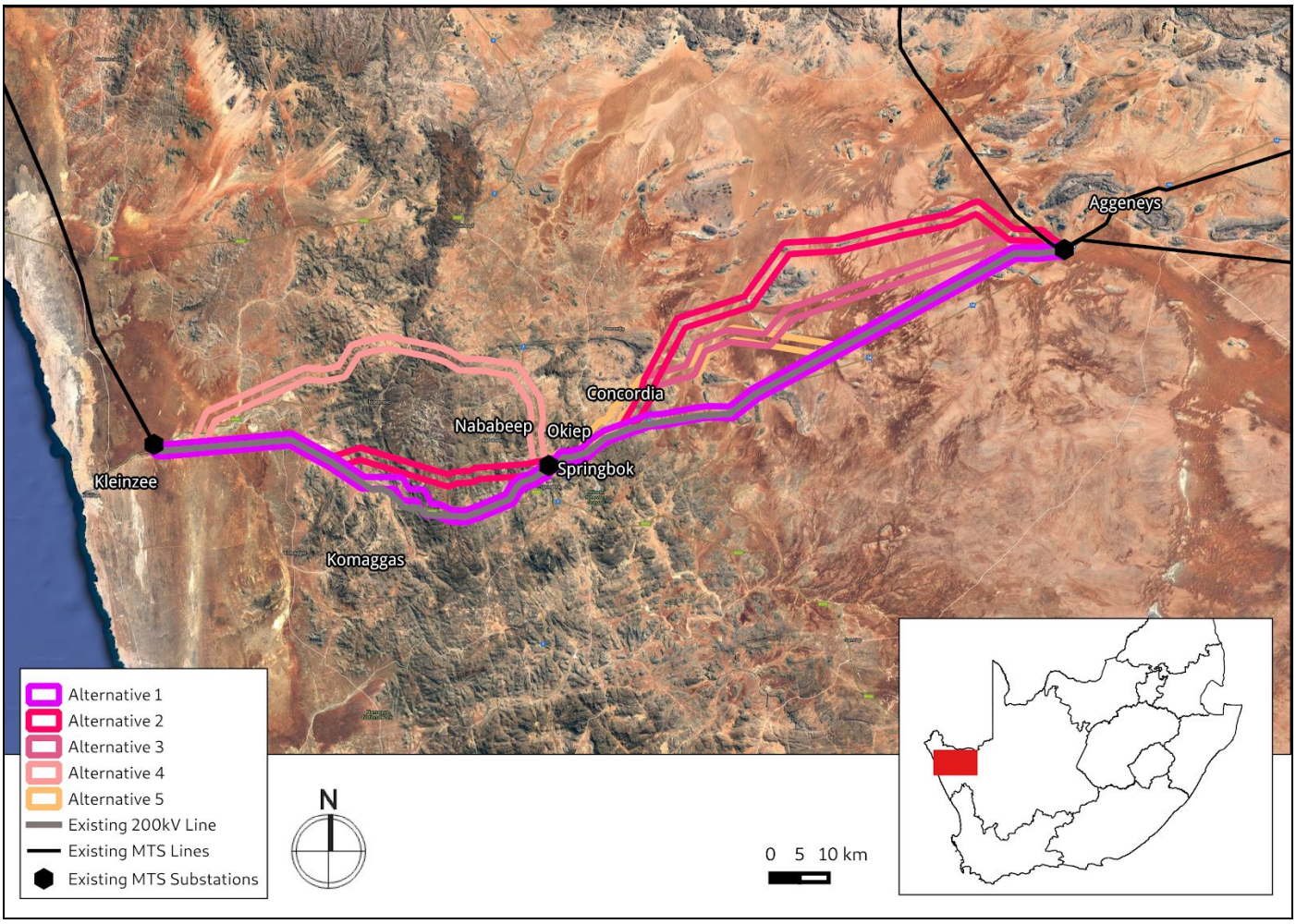
1.4 Description of Property and Affected Environment

The various alternatives proposed for the new powerline are dominated by Namakwa- Karoo type vegetation. The area is flat and sandy to the east towards Aggeneis, as well as from Kleinzee to the area the Spektakel Mountain. It is mountainous in the Springbok region as well as to the west and north towards Gromis. In general, the terrain is rather flat and sandy with some rocky outcrops at several places. The terrain varies in vegetation cover, from grasslands and shrubs towards the west and more bush and shrub field to the east and north in mountainous areas. The terrain is diverse: from flat and sandy Kalahari type landscape to mountainous and coastal environments to the west.

There are several quartz and quartzite outcrops, as well as limestone and calcrete outcrops throughout the footprints for the alternatives. Dolomite outcrops were also noted, but were not as numerous. Spekularite and Shale were also observed. The Buffels River flows from east to west through the region, but mostly outside the footprints for the proposed alternatives. There are several dry waterways in the area, but none of the waterways is perennial due to a five-year drought currently experienced in this area.

Various types of vegetation were observed throughout the footprints for the proposed alternatives including Camel Thorn trees (*Acacia erioloba*), Black Thorn trees (*Acacia mellifera*), Three Thorn/Driedoring (*Rhigozum trichotomum*), Skaapbossie (*Aizoon schellenbergii*), Shepherd tree (*Boscia albitrunca*), Suurgras (*Enneapogon desvauxii*), Pencil Milkbush (*Euphorbia lignose*), Helichrysum tomentosulum, Wild Basil (*Ocimum americanum*),

Honey Locust (*Prosopis glandilosa*), Tall Bushman grass (*Stipagrostis hirtigluma*), Silky Bushman grass (*Stipagrostis uniplumis*), Kortbeen Boesmangras (*Stipagrostis obtuse*), Vygies, Eucalyptus trees at specific areas, Aloes and Quiver trees.



Map 1: Various alternatives screened for Heritage Impacts as part of this assessment

2. METHODOLOGY

2.1 Objective of HIA

The purpose of this Heritage Screening Assessment (HIA) is to evaluate the alternative routes according to potential sensitive heritage issues. The findings of all the specialists will be integrated to make an informed decision on the best route alternative for the proposed power line.

The recommendations from the Screening Report will then be used by Eskom to negotiate a servitude with landowners. These negotiations will take place after the Screening Assessment and will not form part of the current study. After negotiations with landowners Eskom will proceed with the next stage which is to conduct a Basic Assessment in order to obtain an Environmental Authorisation from the competent authority for the pre-negotiated route. Stakeholder consultation will be done again during this phase. Ample time will be provided for the public to comment. All information gathered during the screening process will be used in the BA process and application for authorisation.

2.2 Summary of steps followed

- A Desktop Study was conducted of relevant reports previously written (please see the reference list for the age and nature of the reports used)
- An archaeologist and palaeontologist were contracted to conduct an assessment of archaeological and palaeontological resources likely to be disturbed by the proposed development. The archaeologist conducted his site visit from 14 to 18 October 2019 (Appendix 1).
- The palaeontologist conducted a desktop assessment (Appendix 2).
- The identified resources were assessed to evaluate their heritage significance
- Alternatives and mitigation options were discussed with the Environmental Assessment Practitioner

2.3 Assumptions and uncertainties

- The *significance* of the sites and artefacts is determined by means of their historical, social, aesthetic, technological and scientific value in relation to their uniqueness, condition of preservation and research potential. It must be kept in mind that the various aspects are not mutually exclusive, and that the evaluation of any site is done with reference to any number of these.
- It should be noted that archaeological and palaeontological deposits often occur below ground level. Should artefacts or skeletal material be revealed within the grid connection corridor during construction, such activities should be halted, and it would be required that heritage consultants are notified for an investigation and evaluation of the find(s) to take place.

However, despite this, sufficient time and expertise was allocated to provide an accurate assessment of the general heritage sensitivity of the area.

2.4 Constraints & Limitations

The time limitations for the surveying of all the alternatives for this project were very tight and as such, detailed foot survey assessment of each alternative alignment was not possible. In addition, not all areas were accessible in terms of landowner permissions. It is recommended that accessibility should be well planned and arranged ahead of surveys. Farmers' unions and other stakeholders should be briefed well before fieldwork takes place.

Other than the above, no constraints were experienced. The knowledge of the heritage practitioner, and observations made during the field assessment therefore allow us to predict with some accuracy the archaeological sensitivity of the receiving environment of each of the proposed alternatives.

2.5 EnviroWorks Impact Assessment Methodology

For each potential impact, the DURATION (time scale), EXTENT (spatial scale), IRREPLACEABLE loss of resources, REVERSIBILITY of the potential impacts, MAGNITUDE of negative or positive impacts, and the PROBABILITY of occurrence of potential impacts must be assessed. The assessment of the above criteria will be used to determine the significance of each impact, with and without the implementation of the proposed mitigation measures. The scales to be used to assess these variables and to define the rating categories are tabulated in Table 1 and Table 2 below.

Table 1: Evaluation components, rankings, scales and descriptions (Criteria)

Evaluation Component	Ranking, scale and description (Criteria)
DURATION (D)	**5 - Permanent** **4 - Long term:** Impact ceases after operational phase/life of the activity (> 20 years). **3 - Medium term**: Impact might occur during the operational phase/life of the activity (5 to 20 years) **2 - Short term**: Impact might occur during the construction phase (< 5 years). **1 - Immediate**
EXTENT (or spatial scale/influence of impact) **(E)**	**5 - International:** Beyond National boundaries. **4 - National**: Beyond Provincial boundaries and within National boundaries. **3 - Regional**: Beyond 5 km of the proposed development and within Provincial boundaries **2 - Local:** Within 5kms of the proposed development **1 - Site specific:** On site or within 100 m of the site boundary. **0 - None**
IRREPLACEABLE loss of resources **(I)**	**5 – Definite** loss of irreplaceable resources. **4 – High** potential for loss of irreplaceable resources **3 – Moderate** potential for loss of irreplaceable resources **2 – Low** potential for loss of irreplaceable resources **1 – Very low** potential for loss of irreplaceable resources.

	0 - None
REVERSIBILITY of impact **(R)**	***5 –*** *Impact* ***cannot*** *be reversed.* ***4 – Low*** *potential that impact might be reversed.* ***3 – Moderate*** *potential that impact might be reversed.* ***2 – High*** *potential that impact might be reversed.* ***1 –*** *Impact* ***will be*** *reversible.* ***0 –*** *No impact.*
MAGNITUDE of <u>negative</u> impact (at the indicated spatial scale) **(-M)**	**10 - Very high**: Bio-physical and/or social functions and/or processes might be severely altered **8 - High**: Bio-physical and/or social functions and/or processes might be considerably altered. **6 - Medium**: Bio-physical and/or social functions and/or processes might be notably altered **4 - Low** : Bio-physical and/or social functions and/or processes might be slightly altered. **2 - Very Low**: Bio-physical and/or social functions and/or processes might be negligibly altered. **0 - Zero**: Bio-physical and/or social functions and/or processes will remain unaltered.
MAGNITUDE of <u>POSITIVE</u> IMPACT (at the indicated spatial scale) **(+M)**	**10 - Very high**: Bio-physical and/or social functions and/or processes might be substantially enhanced **8 - High**: Bio-physical and/or social functions and/or processes might be considerably enhanced. **6 - Medium**: Bio-physical and/or social functions and/or processes might be notably enhanced **4 - Low** : Bio-physical and/or social functions and/or processes might be slightly enhanced. **2 - Very Low**: Bio-physical and/or social functions and/or processes might be negligibly enhanced. **0 - Zero**: Bio-physical and/or social functions and/or processes will remain unaltered.
PROBABILITY (of occurrence) **(P)**	**5 - Definite**: >95% chance of the potential impact occurring. **4 - High probability**: 75% - 95% chance of the potential impact occurring. **3 - Medium probability**: 25% - 75% chance of the potential impact occurring **2 - Low probability**: 5% - 25% chance of the potential impact occurring **1 - Improbable**: <5% chance of the potential impact occurring
CUMULATIVE impacts **(C)**	**High**: The activity is one of several similar past, present or future activities in the same geographical area, and might contribute to a very significant combined impact on the natural, cultural, and/or socio-economic resources of local, regional or national concern. **Medium**: The activity is one of a few similar past, present or future activities in the same geographical area, and might have a combined impact of moderate significance on the natural, cultural, and/or socio-economic resources of local, regional or national concern. **Low**: The activity is localised and might have a negligible cumulative impact. **None**: No cumulative impact on the environment.

Once the evaluation components have been ranked for each potential impact, the significance of each potential impact will be assessed (or calculated) using the following formula:

SP (significance points) = (duration + extent + irreplaceable + reversibility + magnitude) x probability

The maximum value is 150 SP (significance points). The unmitigated and mitigated scenarios for each potential environmental impact should be rated as per Table 2 below. Impacts that may result from the planning, design and Construction Phase (briefly describe and compare the potential impacts (as appropriate), significance rating of impacts, proposed mitigation and significance rating of impacts after mitigation that are likely to occur as a result of the planning, design and Construction Phase.

Table 2: Significance Points Ratings

Significance Points	Environmental Significance	Description
100-150	**HIGH (H)**	An impact of high significance which could influence a decision about whether or not to proceed with the proposed project, regardless of available mitigation options.
40-99	**MODERATE (M)**	If left unmanaged, an impact of moderate significance could influence a decision about whether or not to proceed with a proposed project.
<40	**LOW (L)**	An impact of low is likely to contribute to positive decisions about whether or not to proceed with the project. It will have little real effect and is unlikely to have an influence on project design or alternative motivation.
+	**POSITIVE IMPACT (+)**	A positive impact is likely to result in a positive consequence/effect, and is likely to contribute to positive decisions about whether or not to proceed with the project.

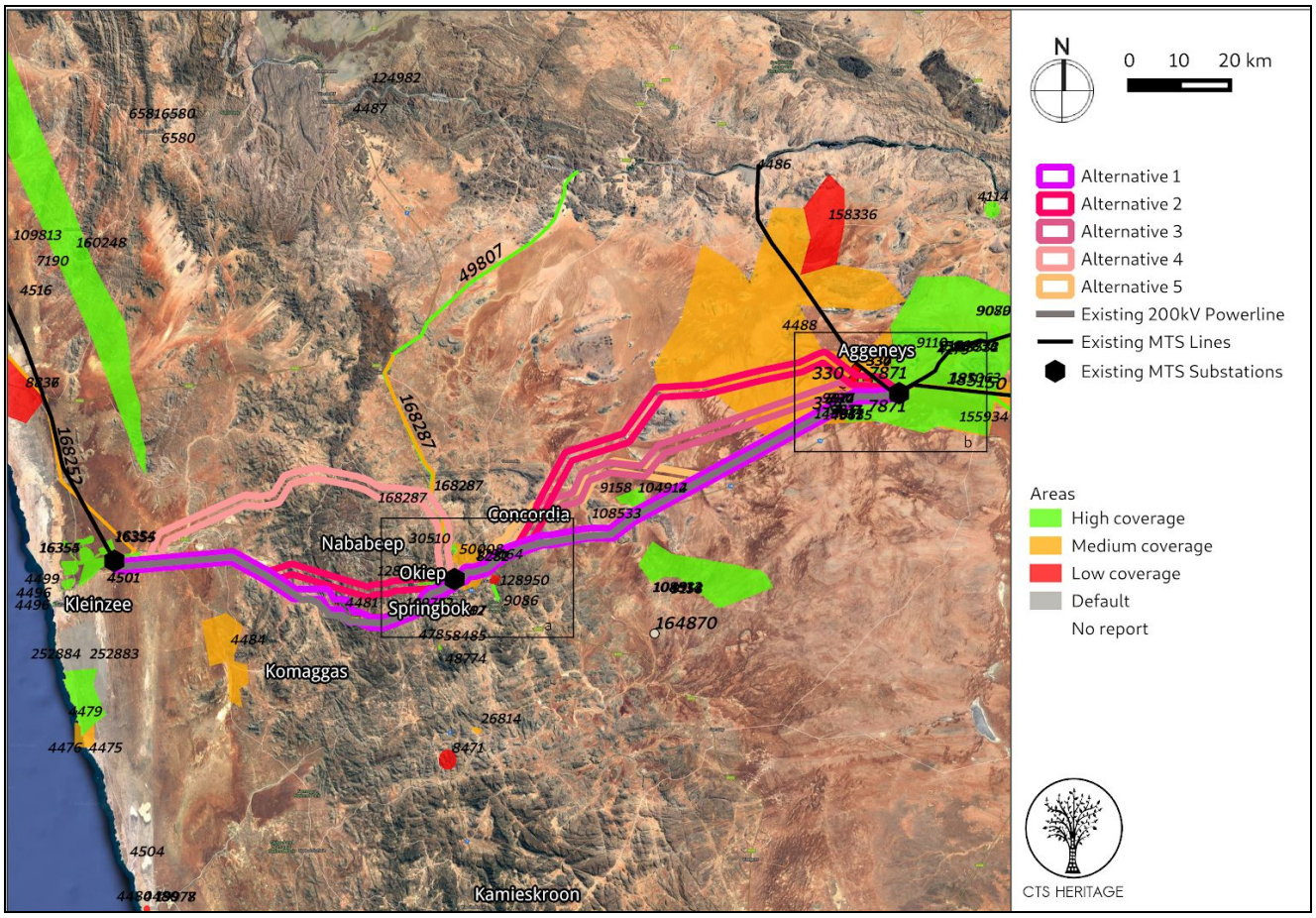
3. HISTORY AND EVOLUTION OF THE SITE AND CONTEXT

3.1 Previous Heritage Assessments

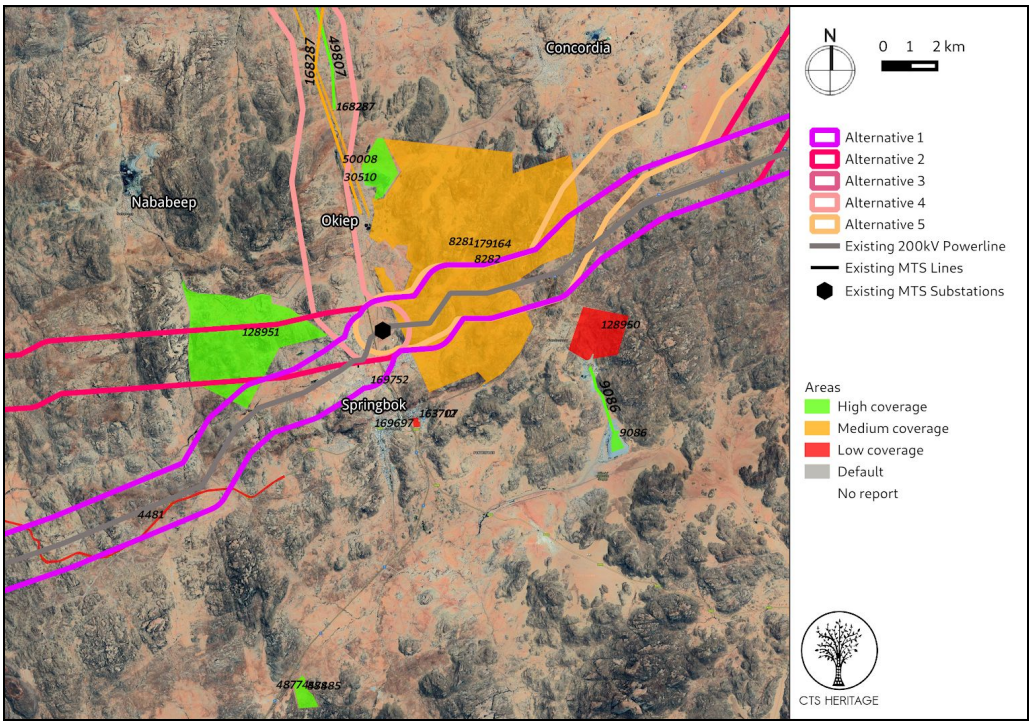
Cultural Landscape, Archaeology and the Built Environment

Prior to 1652, the indigenous peoples (the Khoisan or Nama) of the area extracted raw or "native copper" from the gneiss and granite hills that make up the surrounding Namaqualand Copper belt. This copper was beaten into decorative items, worn as bangles and neck adornments. Early settlers in the Cape Colony heard rumours of mountains in the north-west that were rich in copper. Governor Simon van der Stel was inclined to believe these tales when, in 1681, a group of Namas visited the Castle in Cape Town and brought along some pure copper. Van der Stel himself led a major expedition in 1685 and reached the fabled mountains on 21 October. Three shafts were sunk and revealed a rich lode of copper ore - the shafts exist to this day. For almost 200 years nothing was done

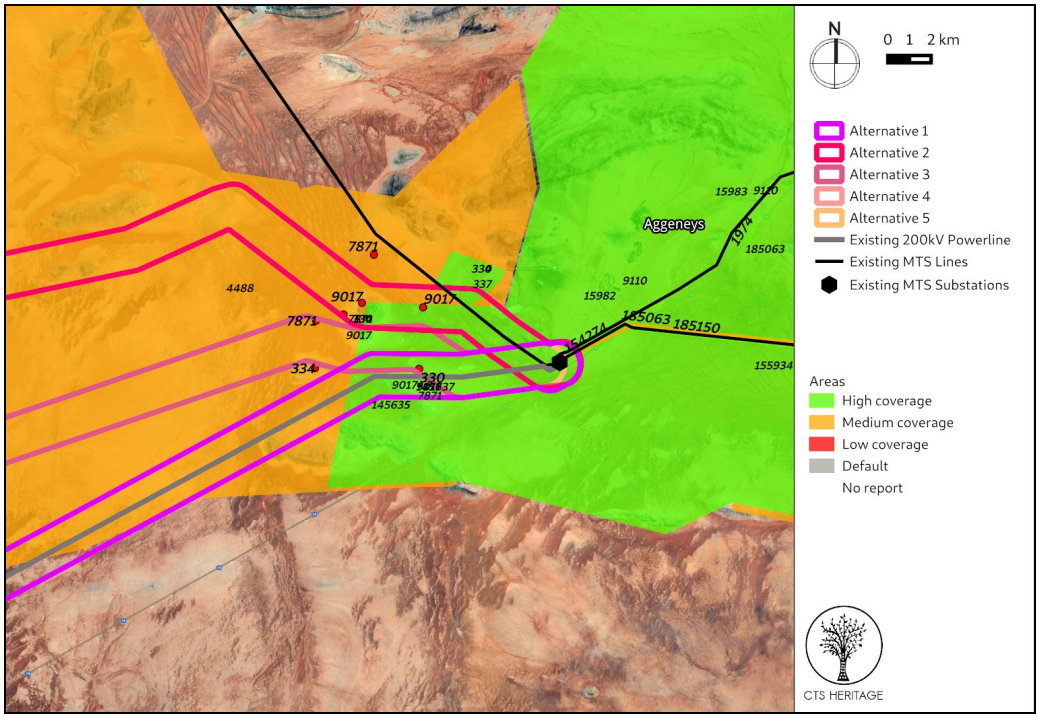
about the discovery, largely because of its remote location. The explorer James Alexander was the first to follow up on van der Stel's discovery. In 1852 he examined the old shafts, discovered some other copper outcrops and started mining operations. Prospectors, miners and speculators rushed to the area, but many companies collapsed when the logistical difficulties became apparent. The first miners were Cornish, and brought with them the expertise of centuries of tin-mining in Cornwall. The ruins of the buildings they constructed as well as the stonework of the bridges and culverts of the railway built to transport the ore to Port Nolloth, can still be seen. The Namaqualand Railway started operating in 1876 and lasted for 68 years, carrying ore to Port Nolloth and returning with equipment and provisions. The carriages were initially pulled by mules and horses, which were later replaced by steam locomotives - the last of these, the *Clara*, stands at Nababeep. Nowadays road transport is used to convey the ore to the railhead at Bitterfontein. The other principal mines of the area are at Carolusberg and Nababeep.



Map 2: Previous Heritage Impact Assessments conducted along the proposed Alternatives



Map 2a: Previous Heritage Impact Assessments conducted along the proposed Alternatives



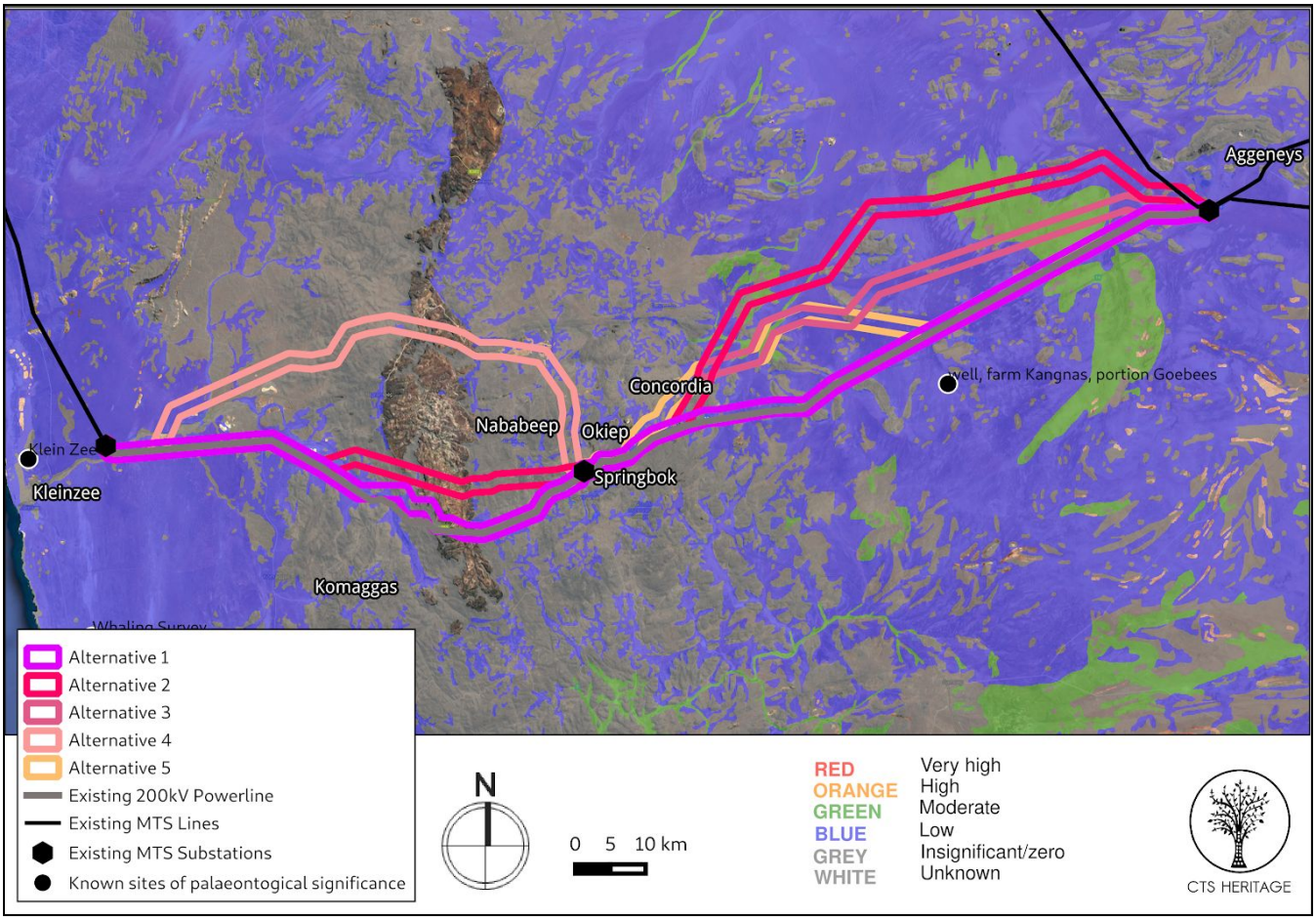
Map 2b: Previous Heritage Impact Assessments conducted along the proposed Alternatives

Springbok (was Springbokfontein until 1911) is located in a valley that lies between the high granite domes of the *Klein Koperberge* (Small Copper Mountains). Copper was first discovered in the area by Simon van der Stel in 1685 at "Blue Mine" - this event is said to mark the beginnings of the mining industry in South Africa. In 1852, the farm on which the town is located was purchased with the intention of establishing a copper mine. The town layout dates to 1862. During the Second Boer War, the mountains around Springbok were used by the Boer forces. The "klipkoppie" was used for a fort under General Manie Maritz as it provided an excellent vantage point across the valley. Remains of stone walls inside the koppie remain from this time. Monument Koppie, a small hill situated in the centre of town, remains a historical site and landmark. While most of this area was destroyed by dynamite planted by a commando led by General Jan Smuts, some of the remains still stand today. Okiep's mine saw action on 4 April 1902 during the Anglo-Boer war when some 700 officers and men of the 3rd Battalion Queen's Royal Regiment, 5th Royal Warwickshire Regiment, Namaqualand Border Scouts, the Town Guard and the Cape Garrison Artillery, withstood a 30-day siege by Jan Smuts' forces. The village of Concordia with a garrison of 100 men, surrendered a day after the siege started. On 4 May 1902 a British relief column arrived from Port Nolloth and ended the siege. A ruined blockhouse is still visible on a hill north-east of the town.

The proposed development covers an extensive area (approximately 165km x 33km). Many Heritage Assessments have been conducted within this general area (approximately 60) which have identified a number of significant heritage resources (271), the majority of which are of archaeological significance. According to Van Ryneveld (2017), "The extremely arid landscape, characterized by flat drainage plains, or peneplains of red Hutton sands, aeolian sands dating back to the Quaternary, are intersected by granite inselbergs protruding above the peneplains and including amongst others the Aggeneys, Black and Gamsberg Mountains. This landscape is reasonably inferred to represent a basic Holocene landscape (Beaumont et. al. 1995), with much wetter conditions having had prevailed throughout the Plio- and Pleistocene, or during Earlier (ESA) and Middle Stone Age (MSA) times." The general area proposed for development has been occupied since the Early Stone Age as evidenced by Early Stone Age artefacts found throughout the Karoo, fairly consistently until modern times. Beaumont et al. (1995) has described the widespread but low density stone artefact scatter of Early and Middle Stone Age material across areas of Bushmanland. In addition, the Heritage Impact Assessments conducted in the area have identified a number of Middle Stone Age sites. Further, according to Morris (2011a) Later Stone Age (LSA) sites are the predominant archaeological trace noted in surveys in the Aggeneys-Pofadder region. The Later Stone Age traces include ceramics, ostrich egg shell as well as "boat-shaped grinding grooves in the outcropping bedrock". According to Webley and Halkett (2012), "These sites probably represent transient settlement by transhumant hunter-gatherers or herders, moving through the area." Further, Webley and Halkett (2012) note that "LSA sites

(consisting mainly of quartz flakes) were concentrated at the base of small koppies. This information is supported by Morris (2011a, b & c) and Pelser (2011)." Additional heritage resources that are likely to be found within the development area include marked and unmarked burial grounds and graves, as well as rock art in the form of rock engravings on the outcrops.

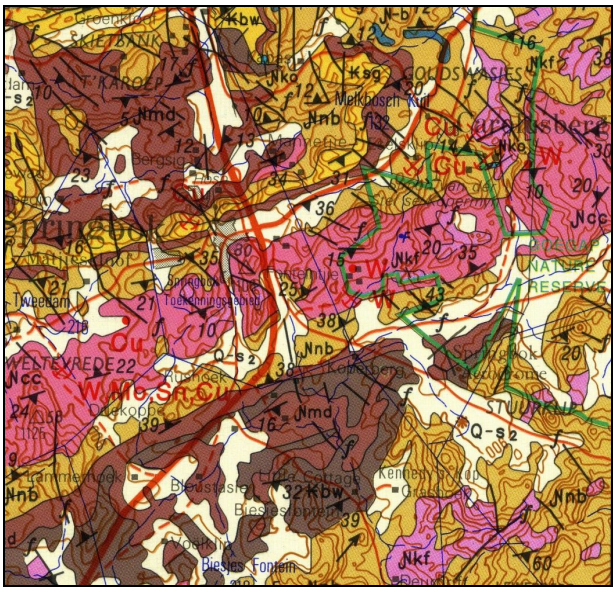
Webley and Halkett (2012) note that appreciation has started emerging regarding the "genocide against the Bushmen in this area, with certain mountainous areas (like Gamsberg near Aggeneys) being likely massacre sites". This has resulted in moves to include the Gamsberg in a potential /Xam and Khomani Heartland World Heritage Site.

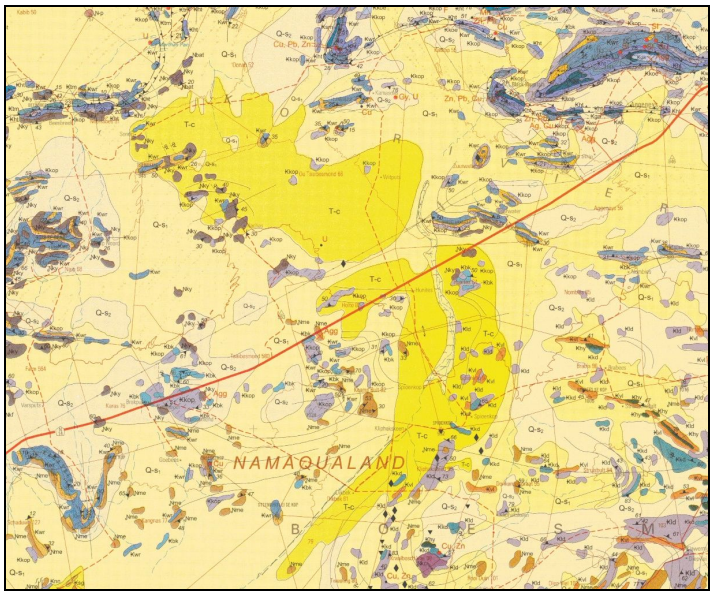


Map 3: Palaeosensitivity of the area underlying the proposed Alternatives (SAHRIS)

Palaeontology

The area proposed for development is underlain by sediments of zero (granites), low and moderate palaeontological sensitivity according to the SAHRIS Palaeosensitivity Map (Map 3). The sediments of low palaeontological sensitivity consist of aeolian dune sands while the sediments of moderate palaeontological sensitivity consist of Gneiss and calcrete. Importantly, the aeolian sands marked as having low palaeontological sensitivity in Map 3 are continuous with the Koekenaap and Graauw Duinen Formations further south which are part of the West Coast Group and are determined to have *very high* palaeontological sensitivity. In the marine deposits that are part of the West Coast Group, fossil molluscan seashells, brachiopods, crustaceans (barnacles, crabs, prawns, ostracods), echinoids, polychaete worm tubes, corals, bryozoans and foraminifera have been found. Shark teeth are common, and other fish teeth occur as well. Bones of whales, dolphins, seals and seabirds have also been found. Trace fossils made by prawns, worms, echinoids, anemones, bivalves, fish *etc*, are pervasive. The bones of land mammals appear in estuarine and lagoonal deposits. Remnants of land snails, tortoises, moles, ostrich bones and egg shells and insect traces occur on the aeolianites. Larger animal bones are sparsely scattered on palaeosurfaces (such as from bovids, zebra, rhino, elephant, pigs *etc*). The deposits associated with vleis, pans and springs are very rich, especially for the fossils of birds and micromammals. It is in these aeolianites (of low palaeontological sensitivity) that the type site for an Early Cretaceous dinosaur called *Kangnasaurus* was located in 1915 (Map 3).





Map 4 and 5: Geological map of the area around Springbok and of the area about 80-90 km to the east, northeast of Springbok and southwest of Agenneys.

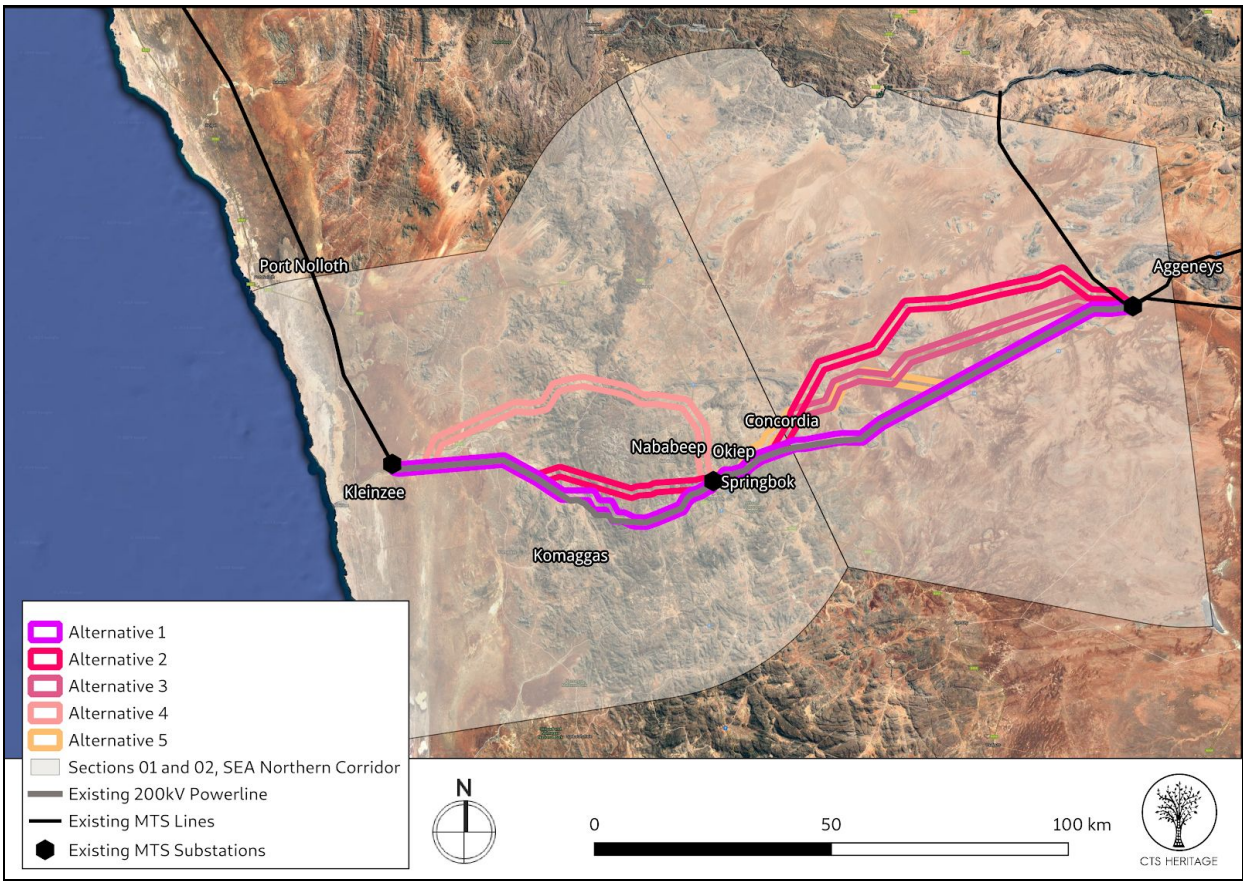
Table 3: Explanation of symbols for the geological map and approximate ages (Erikssen et al., 2006. Johnson et al., 2006; McCarthy et al., 2006; Robb et al., 2006; van der Westhuizen et al., 2006). SG = Supergroup; Fm = Formation; Ma = million years; grey shading = formations impacted by the project.

Symbol	Group/Formation	Lithology	Approximate Age
Q-S 1	Kalahari Group Sands	Red wind-blown sand and dunes	Quaternary, ca 2.5 Ma to present
Q-S 2	Kalahari Group Sands	Sand, scree, rubble, sandy sol	Quaternary, ca 2.5 Ma to present
T-C	Tertiary (undifferentiated)	Calcrete	Tertiary, last 25 Ma to present
JN kf	Keekfontein Granite, Korridor Suite	Epigranular leucogranite	
JN cc	Concordia Granite, Spektakel Suite	Leucogranite	
JN ky	Konkyp Gneiss, Little Namaqualand Suite	Gneiss	
JN md	Modderfontein Gneiss, Little Namaqualand Suite	Leucocratic augen gneiss	
JN b	Nababeep Gneiss, Little Namaqualand Suite	Metanorite	
Kbw	Brandewyn Bank Gneiss, Gladkop Suite,	Biotite gneiss	
Kbk	Brulkop Formation	Biotite gneiss, marble	
Kwr	Wortel Formation, Aggenys Subgroup	Amphibolite/calc-silcrete gneiss	
Kkop	Koeipoort Gneiss	Leucogneiss	

3.2 Results of the SEA for Heritage Impacts for the Northern Corridor Sections 01 and 02

In 2016 a Strategic Environmental Assessment (SEA) was undertaken by CSIR. The purpose of the SEA was to identify strategic Electricity Grid Infrastructure (EGI) Corridors to support electricity transmission up to 2040. For the SEA, five large corridors were identified (International, Northern, Central, Eastern and Western Corridors) for broad heritage assessments. The area proposed for this new infrastructure falls within sections 01 and 02 of the SEA for the Northern Corridor (Map 4). The results of these broad-scale heritage assessments are included below in Table 3. The SEA for Heritage Impacts identified the following sensitivities in this area:

- **Very High Sensitivity**: Copper Mining Landscape, PHS of Orbicule Koppie, Concordia, Van der Stel's Coppermine, Carolusberg, Copper smelting chimney at Springbok, Old smoke stack at Okiep, Cornish pump building at Okiep, Coastal belt (extremely high density pre-colonial occupation) and Cemeteries
- **High Sensitivity**: Grootmis historical settlement, Namaqua National Park, Goegap Provincial Nature Reserve and various Memorials



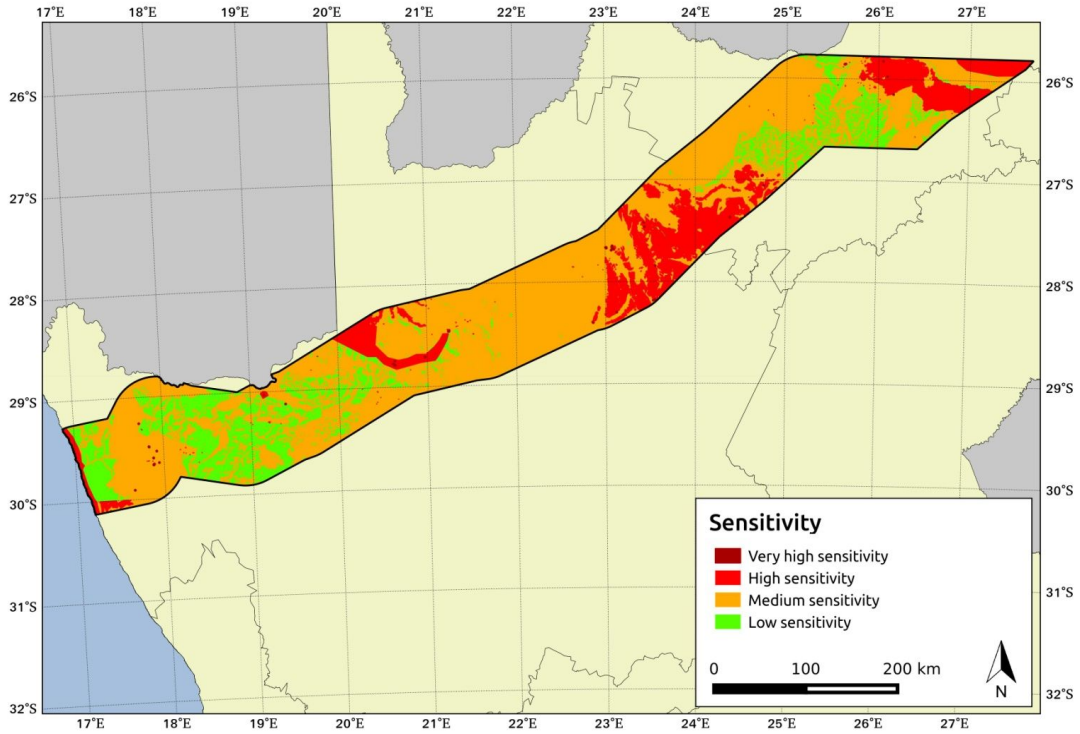
Map 6: Areas covered by the SEA Northern Corridor Assessment Sections 1 and 2

Table 4: Results of the SEA for Heritage Impacts

NC 01	**Heritage Character**
	Surveys in this segment are mainly related to mining and renewable energy projects around Springbok and along the Namaqualand coastline. The bulk of the central area is mountainous due to the granite formations. The high aridity of the area has led to the concentration of archaeological and historical material around rivers and along the coast. The Provincial Heritage Sites (PHSs) are mainly buildings related to the copper mining industry. A large archive of research related sites by Dr Genevieve Dewar and Dr Jayson Orton have been documented but not yet extracted into SAHRIS. A few geometric rock paintings have been found in the granite outcrops of Namaqualand but very few systematic surveys for rock art have yet been conducted in this segment. This segment has several Stone Age shell middens and artefact sites. The Orbicule Koppie, a geological site, is a Provincial Heritage Site in Concordia. There are also significant burial grounds and graves, structures and transport infrastructure with heritage significance which should be avoided. This segment is mostly underlain by igneous and metamorphic rocks, as well as unconsolidated Quaternary deposits which have insignificant to low palaeosensitivity. There are isolated areas of very high palaeosensitivity in the southern part of the segment (e.g. Koekenaap Formation).

	Heritage Recommendations	Palaeontological Recommendations
	- Given the low survey coverage and/or availability of data in this area, it is recommended that full Heritage Impact Assessments be undertaken for proposed electrical infrastructure exceeding 66kV. - For power lines equal to or lower than 66kV an HIA is not recommended since the routes of these power lines can easily be adjusted to avoid impact on sites of high (IIIa) or very high (I and II) significance. - In areas of medium sensitivity (orange on Coverage map 2 - heritage minus palaeontology) further heritage studies are recommended. These may include monitoring during vegetation clearing or a further archaeological reconnaissance of the area or further assessment of the built environment. The details of this study must be discussed with the heritage practitioner. - It is expected that a high number of Stone Age sites is located in this segment. Specifically, rock engraving sites may be located on outcrops and boulders, artefact scatters near pans and riverbeds, and shell middens along the coastline. These will require assessment and possibly avoidance. - It is expected that farmsteads and other structures older than 60 years may be located in rural areas. These will also require assessment and possibly avoidance.	- Any excavation in areas of very high palaeosensitivity (e.g. Koekenaap Formation) will require a Palaeontological Impact Assessment (PIA). - A desktop study will be required in areas of moderate sensitivity and where no palaeosensitivity information exists (shaded green and white respectively on the SAHRIS palaeosensitivity map and orange on Coverage map 2 - palaeontology). - A chance find procedure must be implemented for areas of low palaeosensitivity (e.g. Vredefontein and Lekkersing Formations) indicated in blue on the SAHRIS palaeosensitivity map and also in orange on Coverage map 2 - palaeontology. - No palaeontological studies are required in areas shaded in grey on the SAHRIS palaeosensitivity map and green on Coverage map 2 - palaeontology.
NC 02	**Heritage Character**	
	This segment has one thorough impact assessment east of Concordia where a number of sites were recorded. Apart from this survey only a handful of other impact assessments have been done, mainly limited to the scoping and desktop level. There are no Provincial or National Heritage Sites yet proclaimed in this segment. It is expected that large numbers of archaeological sites will be documented in most areas of the segment due to the high visibility of archaeological material in this environment. There are also significant mining heritage sites that deserve more attention and assessment. The segment, for the most part, manages to avoid the Orange River to the north which is a known focal point for thousands of archaeological sites in the area. There are a high number of Stone Age artefact sites in this segment. Palaeontologically, this segment is underlain mostly by igneous and metamorphic rocks, as well as superficial deposits, which range from having insignificant to low palaeosensitivity levels. Rocks of moderate palaeosensitivity (Witzand Formation) are found mainly in the central part of the segment. A small number of Palaeontological Impact Assessments have been conducted. The areas denoted in white on the palaeosensitivity map have not yet been fully graded by palaeontologists.	
	Heritage Recommendations	**Palaeontological Recommendations**
	- Given the low survey coverage and/or availability of data in this area, it is recommended that full Heritage Impact Assessments be undertaken for proposed electrical infrastructure exceeding 66kV in unsurveyed areas. - In areas where concentration of sites occur with medium (IIIb) to very high (I and II) significance,	- Any excavation in areas of high palaeosensitivity will require a Palaeontological Impact Assessment (PIA) desktop study and possibly field assessment. - A desktop study will be required in areas of moderate sensitivity and where no palaeosensitivity information exists (shaded white on the SAHRIS palaeosensitivity map and orange on Coverage map 2 - palaeontology.).

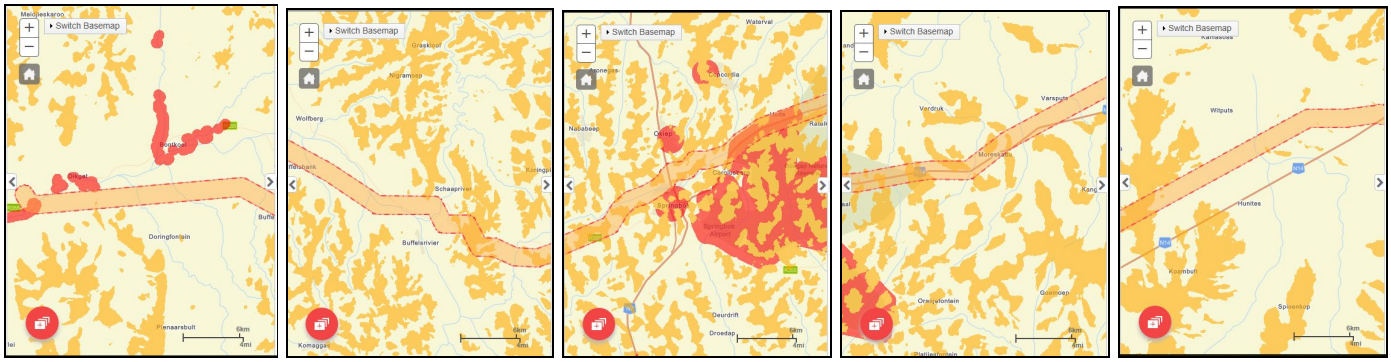
	realignment or specific heritage studies such as Phase 1 and/or 2 Archaeological Impact Assessments would be required. - For power lines equal to or lower than 66kV an HIA is not recommended as the routes of these power lines can easily be adjusted to avoid impact on sites of high (IIIa) or very high (I and II) significance. - In areas of medium sensitivity (orange on Coverage map 2 - heritage minus palaeontology) further heritage studies are recommended. These may include monitoring during vegetation clearing or a further archaeological reconnaissance of the area or further assessment of the built environment. The details of this study must be discussed with the heritage practitioner. - It is expected that there is a high number of Stone Age sites in this segment. Specifically, rock engraving sites may be located on outcrops and boulders, while artefact scatters may be located near pans and riverbeds. These will require assessment and possibly avoidance. - It is expected that farmsteads and other structures older than 60 years may be located in rural areas. These will also require assessment and possibly avoidance.	- A chance find procedure must be implemented for areas of low palaeosensitivity (e.g. Mbizane Formation) shaded also in orange on Coverage map 2 - palaeontology. - No palaeontological studies are required in areas shaded in grey on the SAHRIS palaeosensitivity map and green on Coverage map 2 - palaeontology.



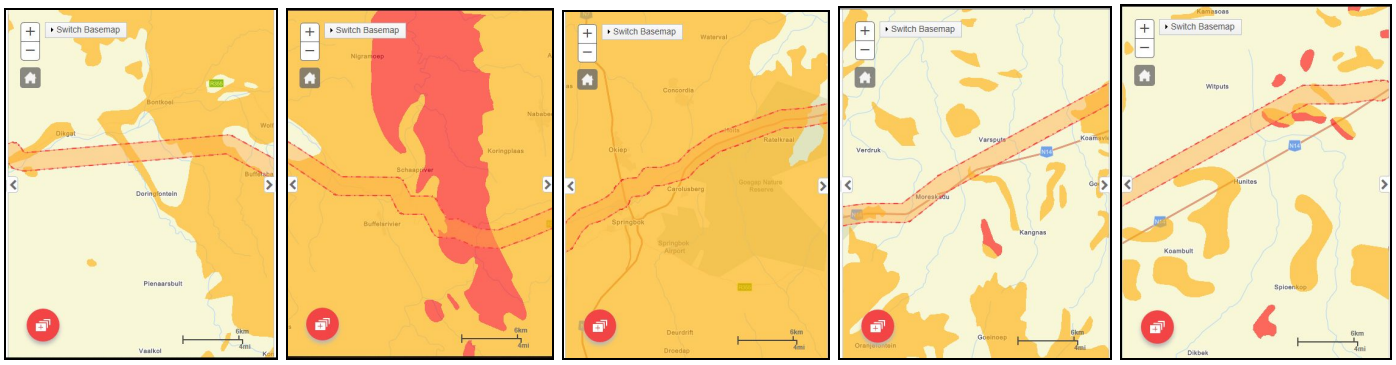
Map 7: Combined sensitivity map for the Northern Corridor from the SEA

3.3 Results of DEA Screening Assessment

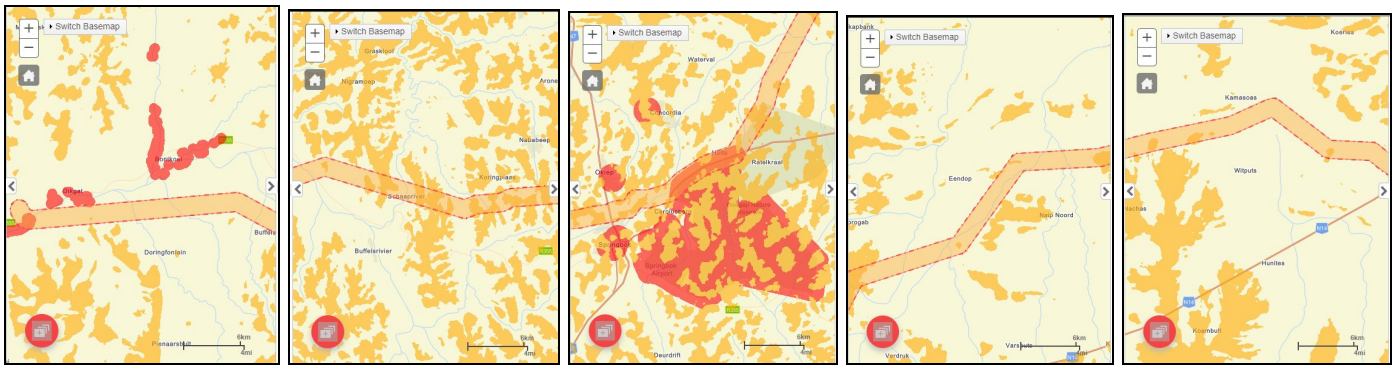
The Environmental Screening Tool is a geographically based web-enabled application which allows a proponent intending to submit an application for environmental authorization in terms of the Environmental Impact Assessment Regulations (2014), to pre-screen their proposed site for any environmental sensitivity - including archaeology and palaeontology. The DEA, in conjunction with private and public organisations, has sourced over 100 environmental data sets including South African Protected Areas Database (SAPAD), South African Conservation Areas Database (SACAD), Renewable Energy, Landcover Data and REDZs and Associated Transmission Corridors Data. However, it is unclear on which criteria sensitivity in terms of archaeology and palaeontology are determined, as the results of the DEA Screening Assessment do not seem to align with the information available from SAHRIS or from other academic sources. The area proposed for this line has been screened as being **highly sensitive** to impacts to archaeological and palaeontological heritage. Please see the resulting maps below.



Map 8.1: Results of DEA Screening Tool for Alternative 1 Impacts to Archaeology

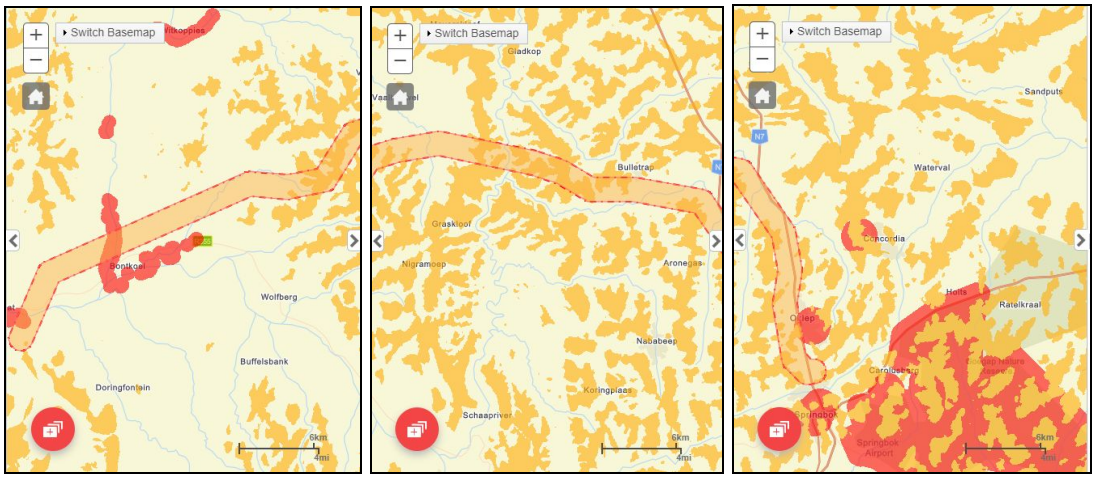


Map 8.2: Results of DEA Screening Tool for Alternative 1 Impacts to Palaeontology

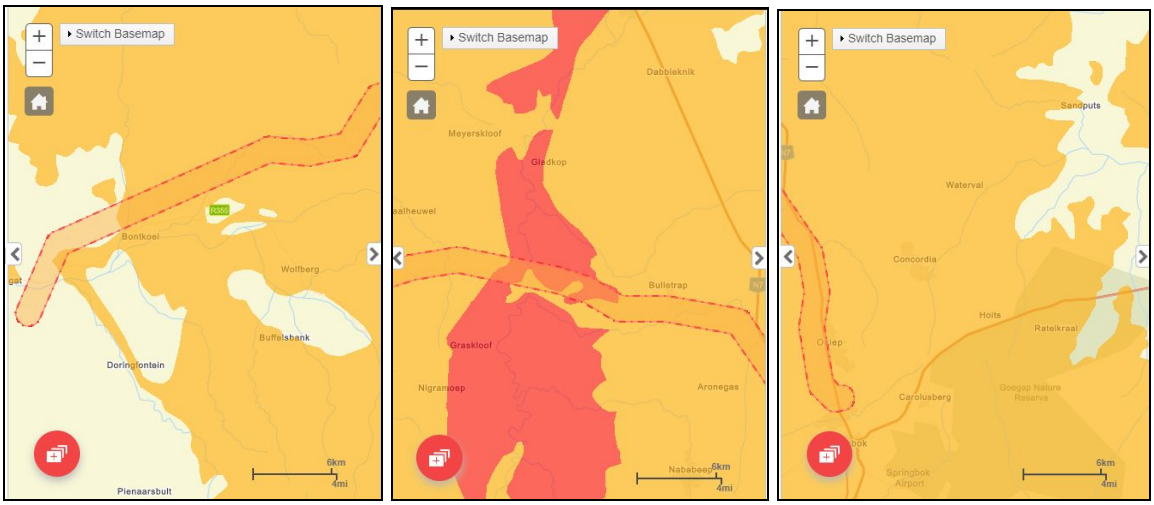


Map 8.3: Results of DEA Screening Tool for Alternative 2 Impacts to Archaeology

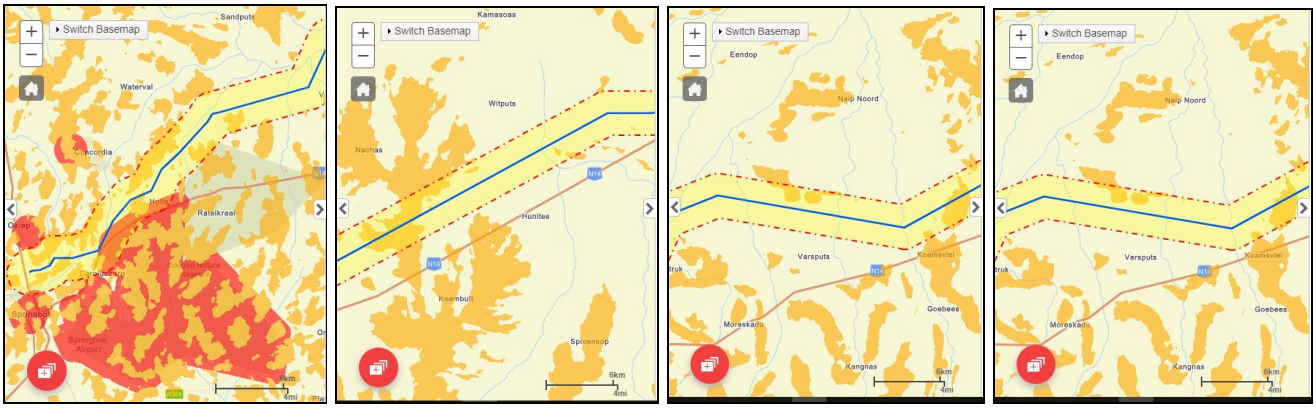
Map 8.4: Results of DEA Screening Tool for Alternative 2 Impacts to Palaeontology



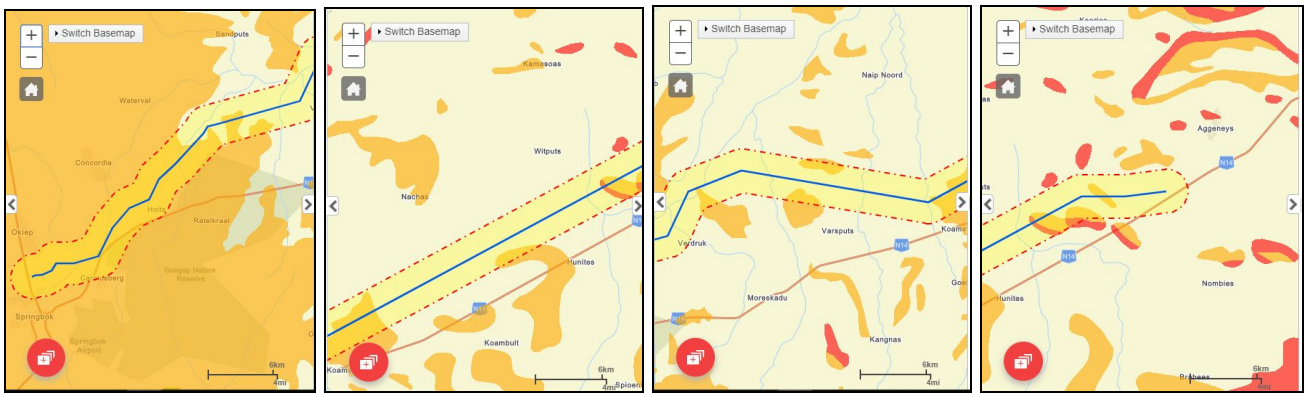
Map 8.5: Results of DEA Screening Tool for Alternative 4 Impacts to Archaeology



Map 8.6: Results of DEA Screening Tool for Alternative 4 Impacts to Palaeontology



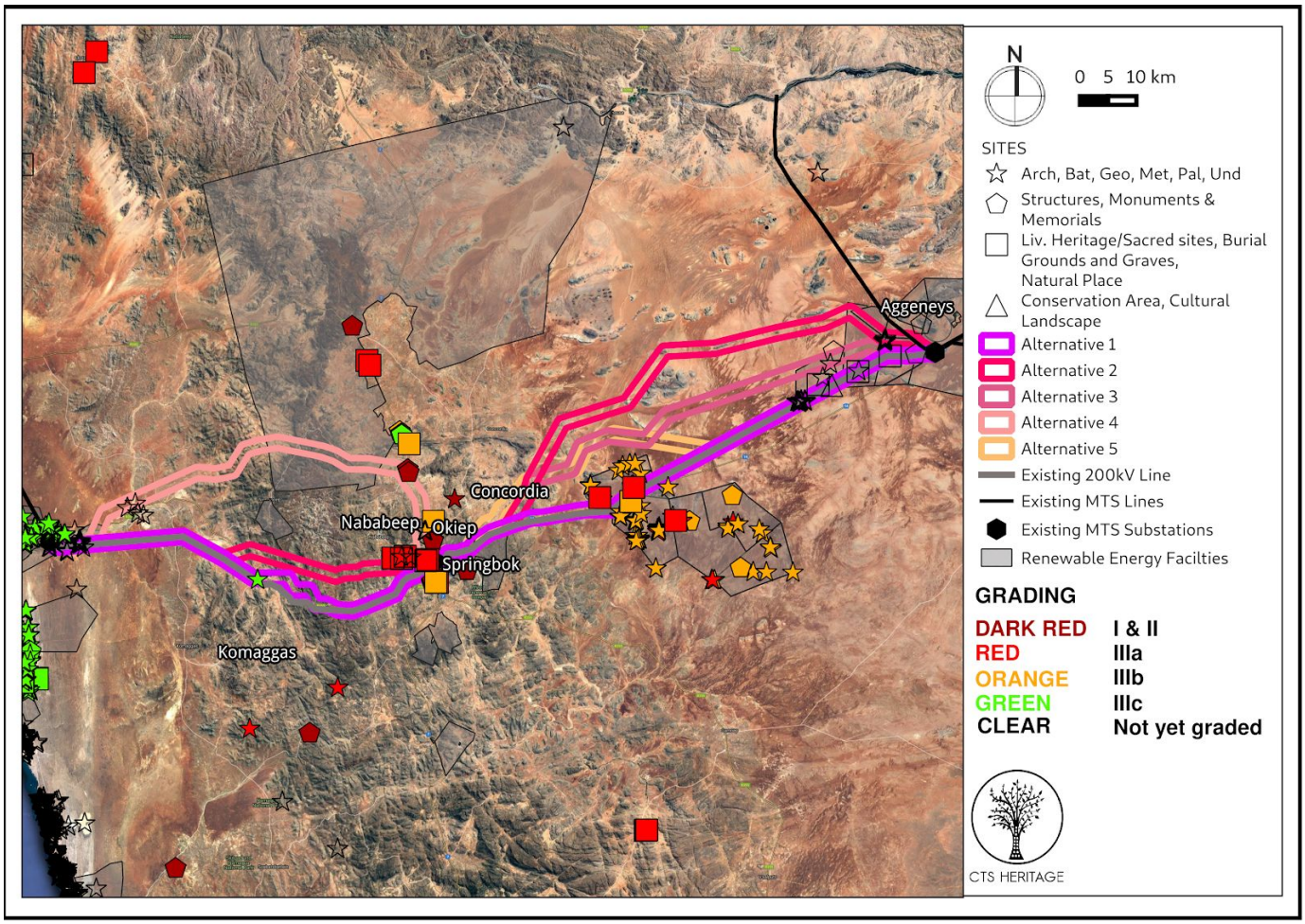
Map 8.7: Results of DEA Screening Tool for Alternative 5 Impacts to Archaeology



Map 8.8: Results of DEA Screening Tool for Alternative 5 Impacts to Palaeontology

3.4 Known Heritage Resources within the proposed Alternative Corridors

The various heritage studies that have been conducted within the area under investigation (Map 2) have identified a number of heritage resources within the proposed alternative corridors (Map 6). These sites and resources are recorded on SAHRIS, the South African Heritage Resources Information System. Please see Table 4 below for all of the known heritage resources that fall within the proposed alternative alignments, overlying the proposed renewable energy developments in this area. From this map, it is clear that the broader landscape is significance in terms of heritage, as everywhere an assessment has been done, significant resources have been identified. The known resources from this area are dominated by archaeological artefact scatters of low heritage significance, burial grounds and graves as well as historical structures.



Map 9: Known heritage resources that fall within the alternative alignments (see attached screening assessment for site IDs) overlying the known renewable energy facilities proposed for this area

Table 5: Known heritage resources that fall within the alternative alignments

Alignment	Site ID	Site no	Full Site Name	Site Type	Grading
Alignment 1	129025	2918BC/SI3PF/2016/007	Sol Invictus 3 Pv Facility- Site 007	Artefacts	Ungraded
Alignment 1	129036	2918BC/SI3PF/2016/008	Sol Invictus 3 Pv Facility- Site 008	Structures	Ungraded
Alignment 1	129037	2918BC/SI3PF/2016/009	Sol Invictus 3 Pv Facility- Site 009	Burial Grounds & Graves	Ungraded
Alignment 1	129038	2918BC/SI3PF/2016/010	Sol Invictus 3 Pv Facility- Site 010	Burial Grounds & Graves	Ungraded
Alignment 1	129039	2918BC/SI3PF/2016/011	Sol Invictus 3 Pv Facility- Site 011	Cultural Landscape	Ungraded

Alignment 1	129043	2918BC/SI3PF/2016/015	Sol Invictus 3 Pv Facility- Site 015	Artefacts	Ungraded
Alignment 1	129044	2918BC/SI3PF/2016/016	Sol Invictus 3 Pv Facility- Site 016	Artefacts	Ungraded
Alignment 1	129045	2918BC/SI3PF/2016/017	Sol Invictus 3 Pv Facility- Site 017	Artefacts	Ungraded
Alignment 1	129060	2918BC/SI3PF/2016/018	Sol Invictus 3 Pv Facility- Site 018	Artefacts	Ungraded
Alignment 1	129061	2918BC/SI3PF/2016/019	Sol Invictus 3 Pv Facility- Site 019	Artefacts	Ungraded
Alignment 1	129062	2918BC/SI3PF/2016/020	Sol Invictus 3 Pv Facility- Site 020	Artefacts	Ungraded
Alignment 1	129063	2918BC/SI3PF/2016/021	Sol Invictus 3 Pv Facility- Site 0121	Artefacts	Ungraded
Alignment 1	129064	2918BC/SI3PF/2016/022	Sol Invictus 3 Pv Facility- Site 0122	Artefacts	Ungraded
Alignment 1	129065	2918BC/SI3PF/2016/023	Sol Invictus 3 Pv Facility- Site 023	Artefacts	Ungraded
Alignment 1	129066	2918BC/SI3PF/2016/024	Sol Invictus 3 Pv Facility- Site 024	Artefacts	Ungraded
Alignment 1	129067	2918BC/SI3PF/2016/025	Sol Invictus 3 Pv Facility- Site 025	Artefacts	Ungraded
Alignment 1	129068	2918BC/SI3PF/2016/026	Sol Invictus 3 Pv Facility- Site 026	Artefacts	Ungraded
Alignment 1	129069	2918BC/SI3PF/2016/027	Sol Invictus 3 Pv Facility- Site 027	Artefacts	Ungraded
Alignment 1	129070	2918BC/SI3PF/2016/028	Sol Invictus 3 Pv Facility- Site 028	Artefacts	Ungraded
Alignment 1	129071	2918BC/SI3PF/2016/029	Sol Invictus 3 Pv Facility- Site 029	Artefacts	Ungraded
Alignment 1	129072	2918BC/SI3PF/2016/030	Sol Invictus 3 Pv Facility- Site 030	Artefacts	Ungraded
Alignment 1	129073	2918BC/SI3PF/2016/031	Sol Invictus 3 Pv Facility- Site 031	Artefacts	Ungraded
Alignment 1	129074	2918BC/SI3PF/2016/032	Sol Invictus 3 Pv Facility- Site 032	Artefacts	Ungraded
Alignment 1	129075	2918BC/SI3PF/2016/033	Sol Invictus 3 Pv Facility- Site 033	Artefacts	Ungraded
Alignment 1	129076	2918BC/SI3PF/2016/034	Sol Invictus 3 Pv Facility- Site 034	Artefacts	Ungraded
Alignment 1	44828	DR2955/SPRING-KOM 01	Road DR2955 between Springbok &; Komaggas 01	Artefacts	Grade IIIc
Alignment 1	103211	DKG2004/001	Dikgat	Archaeological	
Alignment 1	103212	DKG2004/001b	Dikgat	Archaeological	
Alignment 1	103213	DKG2004/001f	Dikgat	Archaeological	
Alignment 1	103214	DKG2004/002	Dikgat	Archaeological	
Alignment 1	103215	DKG2004/003	Dikgat	Archaeological	

Alignment 1	103222	MV2004/001a	Mannel's Vley	Archaeological	
Alignment 1	103224	MV2004/001c	Mannel's Vley	Archaeological	
Alignment 1	103225	MV2004/001d	Mannel's Vley	Archaeological	
Alignment 1	103226	MV2007/001	Mannel's Vley	Archaeological	
Alignment 1	103227	MV2007/002	Mannel's Vley	Archaeological	
Alignment 1	103228	MV2007/003	Mannel's Vley	Archaeological	
Alignment 1	103229	MV2007/004	Mannel's Vley	Archaeological	
Alignment 1	103230	MV2007/005	Mannel's Vley	Archaeological	
Alignment 1	103231	MV2007/006	Mannel's Vley	Archaeological	
Alignment 1	103232	MV2007/007	Mannel's Vley	Archaeological	
Alignment 1	103233	MV2007/008	Mannel's Vley	Archaeological	
Alignment 1	103234	MV2007/009west	Mannel's Vley	Archaeological	
Alignment 1	103235	MV2007/009east	Mannel's Vley	Archaeological	
Alignment 1	103236	MV2007/010	Mannel's Vley	Archaeological	
Alignment 1	103237	MV2007/011	Mannel's Vley	Archaeological	
Alignment 1	103238	MV2007/012	Mannel's Vley	Archaeological	
Alignment 1	103239	MV2007/013	Mannel's Vley	Archaeological	
Alignment 1	103240	MV2007/014	Mannel's Vley	Archaeological	
Alignment 1	34978	KANG018	Kangnas 018	Stone walling	
Alignment 1	87813	KLP001	Klipdam 001	Artefacts	Grade IIIc
Alignment 1	44590	KDM01	Klipdam 01	Stone walling	Grade IIIc
Alignment 1	34973	KANG013	Kangnas 013	Stone walling	Grade IIIa
Alignment 1	35026	KANG073	Kangnas 073	Burial Grounds & Graves	Grade IIIb
Alignment 1	44591	KDM02	Klipdam 02	Burial Grounds & Graves	Grade IIIa
Alignment 1	34974	KANG014	Kangnas 014	Burial Grounds & Graves	Grade IIIa

Alignment 2	128571	2918BC/FZ62/2012/122	Farm Zuurwater 62	Artefacts	Ungraded
Alignment 2	128572	2918BC/FZ62/2012/123	Farm Zuurwater 62- site 123	Artefacts	Ungraded
Alignment 2	128573	2918BC/FZ62/2012/124	Farm Zuurwater 62- site 124	Artefacts	Ungraded
Alignment 2	128574	2918BC/FZ62/2012/125	Farm Zuurwater 62- site 125	Artefacts	Ungraded
Alignment 2	128575	2918BC/FZ62/2012/126	Farm Zuurwater 62- site 126	Artefacts	Ungraded
Alignment 2	128576	2918BC/FZ62/2012/131	Farm Zuurwater 62- site 131	Artefacts	Ungraded
Alignment 2	128577	2918BC/FZ62/2012/130	Farm Zuurwater 62- site 130	Artefacts	Ungraded
Alignment 2	128582	2917DB/SPVKF134/12/2013/057	Solar PV Klipdam Farm 134/17-site 057	Burial Grounds & Graves	Ungraded
Alignment 2	103211	DKG2004/001	Dikgat	Archaeological	
Alignment 2	103212	DKG2004/001b	Dikgat	Archaeological	
Alignment 2	103213	DKG2004/001f	Dikgat	Archaeological	
Alignment 2	103214	DKG2004/002	Dikgat	Archaeological	
Alignment 2	103215	DKG2004/003	Dikgat	Archaeological	
Alignment 2	103222	MV2004/001a	Mannel's Vley	Archaeological	
Alignment 2	103224	MV2004/001c	Mannel's Vley	Archaeological	
Alignment 2	103225	MV2004/001d	Mannel's Vley	Archaeological	
Alignment 2	103226	MV2007/001	Mannel's Vley	Archaeological	
Alignment 2	103227	MV2007/002	Mannel's Vley	Archaeological	
Alignment 2	103228	MV2007/003	Mannel's Vley	Archaeological	
Alignment 2	103229	MV2007/004	Mannel's Vley	Archaeological	
Alignment 2	103230	MV2007/005	Mannel's Vley	Archaeological	
Alignment 2	103231	MV2007/006	Mannel's Vley	Archaeological	
Alignment 2	103232	MV2007/007	Mannel's Vley	Archaeological	
Alignment 2	103233	MV2007/008	Mannel's Vley	Archaeological	
Alignment 2	103234	MV2007/009west	Mannel's Vley	Archaeological	
Alignment 2	103235	MV2007/009east	Mannel's Vley	Archaeological	

Alignment 2	103236	MV2007/010	Mannel's Vley	Archaeological	
Alignment 2	103237	MV2007/011	Mannel's Vley	Archaeological	
Alignment 2	103238	MV2007/012	Mannel's Vley	Archaeological	
Alignment 2	103239	MV2007/013	Mannel's Vley	Archaeological	
Alignment 2	103240	MV2007/014	Mannel's Vley	Archaeological	
Alignment 2	87813	KLP001	Klipdam 001	Artefacts	Grade IIIc
Alignment 2	87815	KLP003	Klipdam 003	Artefacts	Grade IIIc
Alignment 2	44590	KDM01	Klipdam 01	Stone walling	Grade IIIc
Alignment 2	44591	KDM02	Klipdam 02	Burial Grounds & Graves	Grade IIIa
Alignment 3	129021	2918BC/SI3PF/2016/006	Sol Invictus 3 Pv Facility- Site 006	Artefacts	Ungraded
Alignment 3	129036	2918BC/SI3PF/2016/008	Sol Invictus 3 Pv Facility- Site 008	Structures	Ungraded
Alignment 4	128579	2917DB/SPVKF134/12/2013/054	Solar PV Klipdam Farm 134/17-site 054	Artefacts	Ungraded
Alignment 4	128580	2917DB/SPVKF134/12/2013/055	Solar PV Klipdam Farm 134/17-site 055	Stone walling	Ungraded
Alignment 4	128581	2917DB/SPVKF134/12/2013/056	Solar PV Klipdam Farm 134/17-site 056	Artefacts	Ungraded
Alignment 4	128582	2917DB/SPVKF134/12/2013/057	Solar PV Klipdam Farm 134/17-site 057	Burial Grounds & Graves	Ungraded
Alignment 4	103218	STR2004/001	Stryd Rivier	Archaeological	
Alignment 4	103219	STR2004/002	Stryd Rivier	Archaeological	
Alignment 4	87813	KLP001	Klipdam 001	Artefacts	Grade IIIc
Alignment 4	87815	KLP003	Klipdam 003	Artefacts	Grade IIIc
Alignment 4	44590	KDM01	Klipdam 01	Stone walling	Grade IIIc
Alignment 4	**40233**	**OKIEP012**	**Okiep 012**	**Structures**	**Grade II**
Alignment 4	44591	KDM02	Klipdam 02	Burial Grounds & Graves	Grade IIIa
Alignment 5	129025	2918BC/SI3PF/2016/007	Sol Invictus 3 Pv Facility- Site 007	Artefacts	Ungraded
Alignment 5	129036	2918BC/SI3PF/2016/008	Sol Invictus 3 Pv Facility- Site 008	Structures	Ungraded

Alignment 5	129037	2918BC/SI3PF/2016/009	Sol Invictus 3 Pv Facility- Site 009	Burial Grounds & Graves	Ungraded
Alignment 5	129038	2918BC/SI3PF/2016/010	Sol Invictus 3 Pv Facility- Site 010	Burial Grounds & Graves	Ungraded
Alignment 5	129039	2918BC/SI3PF/2016/011	Sol Invictus 3 Pv Facility- Site 011	Cultural Landscape	Ungraded
Alignment 5	129043	2918BC/SI3PF/2016/015	Sol Invictus 3 Pv Facility- Site 015	Artefacts	Ungraded
Alignment 5	129044	2918BC/SI3PF/2016/016	Sol Invictus 3 Pv Facility- Site 016	Artefacts	Ungraded
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Alignment 5	129060	2918BC/SI3PF/2016/018	Sol Invictus 3 Pv Facility- Site 018	Artefacts	Ungraded
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Alignment 5	129063	2918BC/SI3PF/2016/021	Sol Invictus 3 Pv Facility- Site 0121	Artefacts	Ungraded
Alignment 5	129064	2918BC/SI3PF/2016/022	Sol Invictus 3 Pv Facility- Site 0122	Artefacts	Ungraded
Alignment 5	129065	2918BC/SI3PF/2016/023	Sol Invictus 3 Pv Facility- Site 023	Artefacts	Ungraded
Alignment 5	129066	2918BC/SI3PF/2016/024	Sol Invictus 3 Pv Facility- Site 024	Artefacts	Ungraded
Alignment 5	129067	2918BC/SI3PF/2016/025	Sol Invictus 3 Pv Facility- Site 025	Artefacts	Ungraded
Alignment 5	129068	2918BC/SI3PF/2016/026	Sol Invictus 3 Pv Facility- Site 026	Artefacts	Ungraded
Alignment 5	129069	2918BC/SI3PF/2016/027	Sol Invictus 3 Pv Facility- Site 027	Artefacts	Ungraded
Alignment 5	129070	2918BC/SI3PF/2016/028	Sol Invictus 3 Pv Facility- Site 028	Artefacts	Ungraded
Alignment 5	129071	2918BC/SI3PF/2016/029	Sol Invictus 3 Pv Facility- Site 029	Artefacts	Ungraded
Alignment 5	129072	2918BC/SI3PF/2016/030	Sol Invictus 3 Pv Facility- Site 030	Artefacts	Ungraded
Alignment 5	129073	2918BC/SI3PF/2016/031	Sol Invictus 3 Pv Facility- Site 031	Artefacts	Ungraded
Alignment 5	129074	2918BC/SI3PF/2016/032	Sol Invictus 3 Pv Facility- Site 032	Artefacts	Ungraded
Alignment 5	129075	2918BC/SI3PF/2016/033	Sol Invictus 3 Pv Facility- Site 033	Artefacts	Ungraded
Alignment 5	129076	2918BC/SI3PF/2016/034	Sol Invictus 3 Pv Facility- Site 034	Artefacts	Ungraded

4. IDENTIFICATION OF HERITAGE RESOURCES

4.1 Summary of findings of Specialist Reports

Archaeology

A number of heritage resources were identified within all of the proposed alternative corridors. The area assessed is by no means pristine as existing overhead power lines run through the area. In addition, this area is known for its mining and renewable energy developments. It is likely that the proposed development will have a negative impact on the heritage resources situated within the five different alternative corridors proposed for this project.

The majority of the resources identified include sites associated with the historic farmscape, cemeteries and living heritage areas. The historic Namaqualand Copper Mining Landscape has high heritage significance, and sites associated with this cultural landscape must not be impacted. Even though no lithic material was documented during this survey, the presence of stone age background scatter, and the likelihood of subsurface archaeological material remains high.

Palaeontology

The predominant rocks along all the routes are the ancient volcanic and metamorphic rocks of the Bushmanland Terrane, Namaqua-Natal Province (Cornell et al., 2006). These rocks range in age from 2050 to 1030 million years old. Because of their origin they do not contain any fossils and will not be discussed further. Overlying these volcanic and metamorphic rocks (Figures 2, 3) are widespread wind-blown sands of the Kalahari Group that are Quaternary in age, and in the area near Aggeneys are calcretes that have not been dated but generally considered to be Tertiary in age. Some Quaternary pans have fossil fauna and artefacts preserved within them, such as Kath Pan and Townlands near Kuruman (Beaumont, 2004; Walker et al., 2014) but no pans are visible on Google Earth and none have been reported from here.

From the SAHRIS map (Map 3) above the areas are indicated as moderately sensitive (green) so a desktop study has been done. Both areas have exposures of Kalahari sands that are young enough to preserve fossils, but the sands a wind-blown. Transported sands do not preserve any fossils in their primary context and so even if present, would be of very little scientific value. Only fragments of robust fossils, such as bone or silicified woods, could survive any Transportation. In the eastern area near Aggeneys there are also Tertiary calcretes. There are recorded cases of fossils being entrapped in pan calcrete, however, pans have been noted on the geological maps (indicated as small dots or stippling) but none occurs in the project footprint.

4.2 Heritage Resources identified

Archaeology

No stone age artefacts were identified along any of the corridors assessed. Due to the prolonged drought in the region, there is minimal vegetation cover in most of the proposed alignments and windy conditions may have covered some artefacts with sand. Subsurface material may yet be present. Only one Khoi - related stone structure site was recorded along a mountain slope (see MBK006 below).

Historical heritage sites were dominant in the region. The region has a rich history of colonial settlement which coincided with the rise of mining activities in the area since the 1860s, and later the Anglo Boer War, the 1914 Rebellion as well as the First and Second World Wars. Many stone walls, ruins and historical foundations cover the landscape, and those near the development footprints were recorded. Historical artefacts were also identified and recorded.

In terms of living heritage, the Buffelsrivier settlement has diverse living heritage, and it developed due to the labour used at various mines such as Spektakel mine. Some of the mines have closed down, and the settlement continued to exist despite this. It is located on the shore of the Buffels River flowing from east to west towards Kleinzee. Two cemeteries in proximity to the development footprints were recorded. These cemeteries are well fenced, and actively managed.

Table 6: Observations identified during the field assessment

POINT ID	Site No	Site Name	Description	Co-ordinates		Grading	Mitigation
2	MBK001	**Alternative 1**	Informal cemetery. Fenced with at least 50 graves.	-29.638186999	17.905931999	Grade IIIA	50m no go buffer around the site
3	MBK002	**Alternative 1**	Stone combined with cement foundation built with vertical packed stones similar to Sotho-Tswana huts. An outer stone circle has a diameter of 4 m with a well-demarcated entrance. Possibly historical/colonial period.	-29.629054	17.919496999	Grade IIIC	The site should be Recorded before destruction
4	MBK003	**Alternative 1**	Stone and cement square house foundation approximately 5 m x 2 m. Possibly historical. With prominent midden 50 m east of house foundation. Historical.	-29.62850800	17.91940299	Grade IIIC	The site should be Recorded before destruction
5	MBK004	**Alternative 1**	Stone and daub house ruin with foundation. Possibly historical.	-29.620235999	17.929387999	Grade IIIC	The site should be Recorded before destruction

6	MBK005	**Alternative 1**	Stone constructed small stock byre/kraal with prominent entrance ramp to the west of the kraal. Close to Waypoint 005. Historical.	-29.61981600	17.9294660	Grade IIIC	The site should be Recorded before destruction
7	MBK006	**Alternative 1**	Round stone-walled shelters on the mountain slope. Most probably Khoi provenance.	-29.584326999	17.985036000	Grade IIIB	50m no go buffer around the site
8a	MBK007	**Alternative 1**	Cemetery near Springbok informal settlement (Bergsig). Formal cemetery (municipal).	-29.647975999	17.85300200	Grade IIIA	50m no go buffer around the site
8b	MBK008	**Alternative 1**	Livestock byre/kraal most probably for small stock or cattle. Historical.	-29.61794000	17.931978999	Grade IIIC	The site should be Mitigated before Destruction (high/ Medium significance)
11	SCHR001	**Alternative 1**	Square stone-walled house ruin with a round foundation constructed with vertical stones to the south of the house. Possibly a hearth or additional round hut connected to the house. Historical.	-29.689267999	17.61215400	Grade IIIB	50m no go buffer around the site
12	SCHR002	**Alternative 1**	Square stone-walled house ruin with historical significance.	-29.68978800	17.611284999	Grade IIIB	50m no go buffer around the site
8b	MBK008	**Alternative 2**	Livestock byre/kraal most probably for small stock or cattle. Historical.	-29.61794000	17.931978999	Grade IIIC	The site should be Mitigated before Destruction (high/ Medium significance)
17a	WLB001	**Alternative 3**	Mud-brick square house ruin with historical significance. The contextual artefacts date from the 1870s. This house ruin is near to a closed mine and was probably occupied by some of the first mine workers in the region.	-29.5351819999	17.3887779999	Grade IIIA	No go area
17b	TBM001	**Alternative 3**	Existing Nama farmers living and farming on private farmland in the development footprint within Alt 3. High social significance	-29.375029999	18.402636999	Grade IIIA	No go area
18a	STKF001	**Alternative 3**	Stone-walled livestock byre/kraal. Possibly historical.	-29.465340999	17.70639299	Grade IIIC	The site should be Recorded before destruction
18b	OTBM001	**Alternative 3**	Abandoned farm and settlement within the development footprint.	-29.334061999	18.491184000	Grade IIIA	No go area
8a	MBK007	**Alternative 4**	Cemetery near Springbok informal settlement (Bergsig). Formal cemetery (municipal).	-29.647975999	17.85300200	Grade IIIA	50m no go buffer around the site
15	STRR001	**Alternative 4**	Mud-brick square ruin with historical significance. The contextual artefacts	-29.555161999	17.33969700	Grade IIIB	50m no go buffer around the site

			date from the 1870s.				
16	STRR002	**Alternative 4**	Mud-brick square ruin with historical significance. The contextual artefacts date from the 1870s.	-29.55401300	17.34207200	Grade IIIB	50m no go buffer around the site
17a	WLB001	**Alternative 4**	Mud-brick square house ruin with historical significance. The contextual artefacts date from the 1870s. This house ruin is near to a closed mine and was probably occupied by some of the first mine workers in the region.	-29.5351819999	17.3887779999	Grade IIIA	No go area
17b	TBM001	**Alternative 4**	Existing Nama farmers living and farming on private farmland in the development footprint within Alt 3. High social significance	-29.375029999	18.402636999	Grade IIIA	No go area
19	STKF002	**Alternative 4**	House foundation younger than 60 years. Combination of foundation and dung patches where livestock kraals were presented.	-29.463654999	17.707301000	NCW	Phase 1 is seen as Sufficient recording, and it may be Demolished
20	STKF003	**Alternative 4**	Historical stone walls and foundation ruins with artefacts in context. Site is approximately 1 ha in size and proximate to an abandoned mine and Alt 4. The contextual objects are historical ca. 1889-1910.	-29.481041999	17.616134999	Grade IIIA	No go area
21	NGM001	**Alternative 4**	Nigramoep settlement ca. 1904. Site is outside the development footprint but is very sensitive in terms of Historical heritage, living heritage and architecture.	-29.5325300	17.58535600	Grade IIIA	No go area
22	NGM002	**Alternative 4**	Nigramoep closed/abandoned copper mine. Outside development footprint, but a heritage site.	-29.56461300	17.583234999	Grade IIIA	No go area
23	**NBB001**	**Alternative 4**	**Nababeep closed copper mine. Outside development footprint, but still a heritage site. Images of mine and Nababeep museum.**	**-29.58879999**	**17.79025400**	**Grade II**	**No go area**
2	MBK001	**Alternative 5**	Informal cemetery. Fenced with at least 50 graves.	-29.638186999	17.905931999	Grade IIIA	50m no go buffer around the site
3	MBK002	**Alternative 5**	Stone combined with cement foundation built with vertical packed stones similar to Sotho-Tswana huts. An outer stone circle has a diameter of 4 m with a well-demarcated entrance. Possibly historical/colonial period.	-29.629054	17.919496999	Grade IIIC	The site should be Recorded before destruction
4	MBK003	**Alternative 5**	Stone and cement square house foundation approximately 5 m x 2 m. Possibly historical. With prominent midden	-29.62850800	17.91940299	Grade IIIC	The site should be Recorded before destruction

			50 m east of house foundation. Historical.				
5	MBK004	**Alternative 5**	Stone and daub house ruin with foundation. Possibly historical.	-29.620235999	17.929387999	Grade IIIC	The site should be Recorded before destruction
6	MBK005	**Alternative 5**	Stone constructed small stock byre/kraal with prominent entrance ramp to the west of the kraal. Close to Waypoint 005. Historical.	-29.61981600	17.9294660	Grade IIIC	The site should be Recorded before destruction
7	MBK006	**Alternative 5**	Round stone-walled shelters on the mountain slope. Most probably Khoi provenance.	-29.584326999	17.985036000	Grade IIIB	50m no go buffer around the site
8b	MBK008	**Alternative 5**	Livestock byre/kraal most probably for small stock or cattle. Historical.	-29.61794000	17.931978999	Grade IIIC	The site should be Mitigated before Destruction (high/ Medium significance)

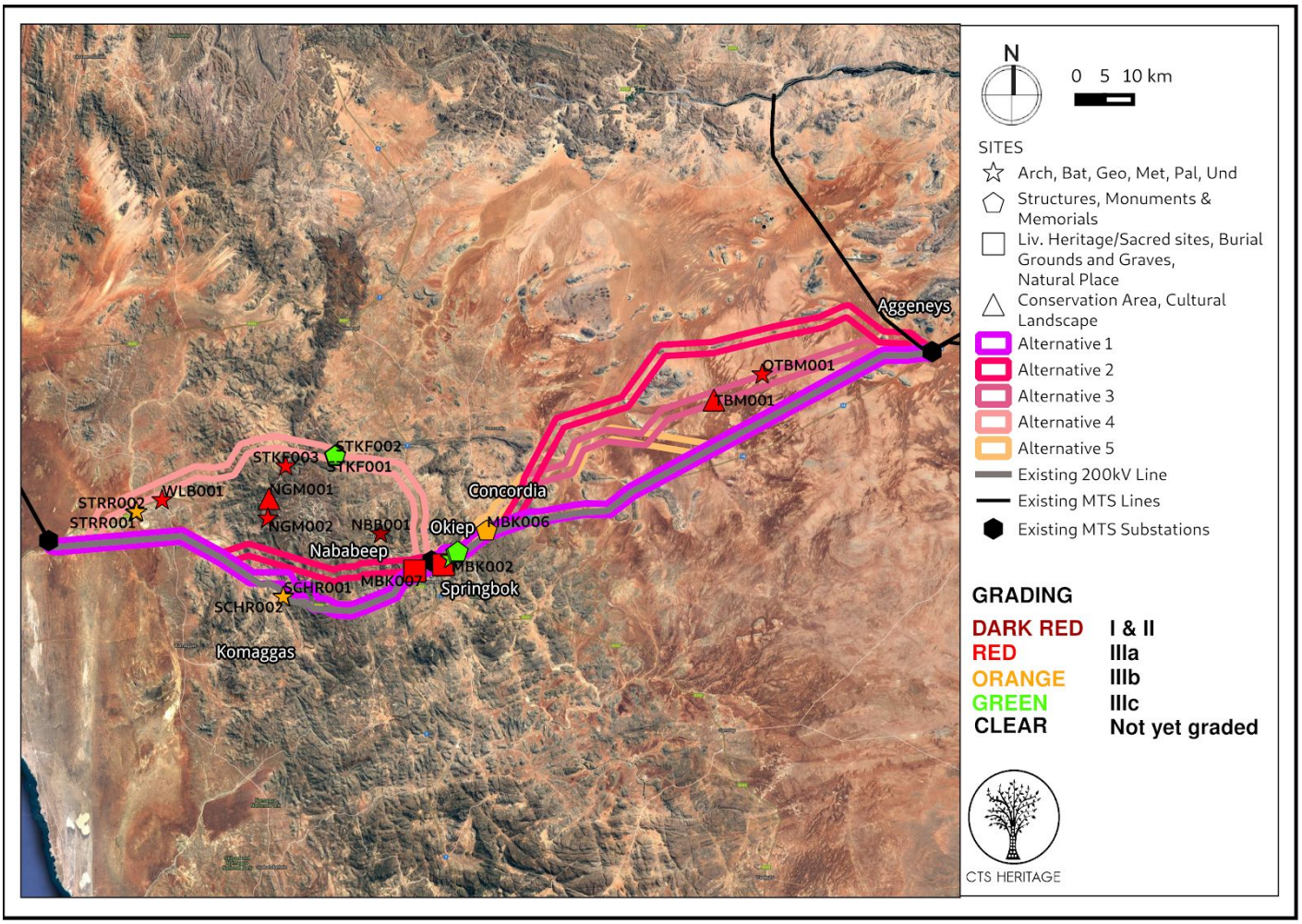
Palaeontology

Based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the development footprint. The geological structures suggest that the rocks are either much too old to contain fossils. The Tertiary calcretes and Quaternary windblown sands do not preserve fossils except in special circumstances. Since there is an extremely small chance that fossils from the nearby Vryheid Formation may be disturbed a Fossil

Chance find protocol has been added to this report. The potential impact to fossil heritage resources is extremely low.

Based on the experience of the palaeontologist and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the loose sands of the Quaternary. Nonetheless, a Fossil Chance Find Protocol should be added to the EMPr: if fossils are found once mining has commenced then they should be rescued and a palaeontologist called to assess and collect a representative sample.

4.3 Mapping and spatialisation of heritage resources



Map 10: Heritage resources recorded in the AIA in the vicinity of and within the proposed alignments

4.4 Identified Impacts

The proposed development of the 400kV powerline may result in the following impacts:

- Destruction of significant archaeological, palaeontological and built environment heritage resources through the insensitive placement of pylon footings
- Loss of sense of place through the development of large scale and intrusive infrastructure within a sensitive cultural landscape

5. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT

5.1 Assessment of impact to Heritage Resources

Alternative 1:

Ten incidences of heritage finds were recorded within and near the corridor of Alternative 1. Eight of these are located between Springbok and O'kiep, in the overlap between Alternatives 1, 2 and 5. On the Farm Melkboschkuil No. 132 Portion 38, we recorded an informal fenced cemetery consisting of at least 50 graves (MBK001) and several historic structural remains.

Structure MBK002 has a stone cement foundation built with vertically packed stones similar to Sotho-Tswana huts. The outer stone circle has a diameter of 4 m with a well-demarcated entrance. Close by is MBK003, which includes the remains of a rectangular house with a stone and cement foundation approximately 5m x 2m and a prominent ash midden 50 m east of the house's foundation. About 1.26 km to the northeast lies MBK004, a stone and daub house ruin with foundation, and two associated small stock byres or kraals constructed from stone (MBK005 and MBK008). MBK008 is situated on the Farm Melkboschkuil No. 132 Portion 23. These remains are probably associated with the historical farmscape predating the establishment of the town of Springbokfontein in 1862.

On the Farm Melkboschkuil No. 132 Portion 28, 10.6 km east of O'kiep, the remains of round stone-walled shelters were recorded on the mountain slope (MBK006). These features are of probable Khoi provenance. Approximately 5.2 km west of MBK001, lies MBK007, a municipal cemetery near Bergsig, an informal settlement, northeast of Springbok.

The remaining two sites recorded within the Alternative 1 corridor, lie to the north of Buffelsrivier, on the Farm Schaap Rivier No. 208. Sites SCHR001 and SCHR002 are both rectangular stone-walled structures. SCHR001 also contains a circular foundation constructed with vertical stones to the south of the house. The round structure could have been a hearth or additional living space connected to the house. Both these structures are of historical significance.

Alternative 2:

Apart from the heritage discussed above in the convergence of the Alternatives 1 and 5 corridors, no other heritage resources were recorded within Alternative 2. This area has been screened out due to other environmental and practical reasons.

Alternative 3:

The Nama community currently living and farming within the footprint of Alternative 3, is representative of living heritage. On the Farm Taaibosmond No. 580, privately owned farmland is being utilised by Nama farmers (TBM001), and on Ou Taaibosmond No. 66 Portion 2, an abandoned farming settlement has been recorded (OTBM001). The communities in the area, their cultural practices and their body of knowledge, is the result of generations of continuity and social memory. They are a living connection to not only the historic copper mining period but pre-colonial settlement as well. This area has been screened out due to other environmental and practical reasons.

Alternative 4:

A total of five incidences of heritage resources were documented within and adjacent to the development corridor of Alternative 4. On the Farm Stryd Rivier No. 188, approximately 16.28 km northeast from Gromis substation, two rectangular mud-brick structures (STRR001 and STRR002) with associated cultural material scattered around the structures are located just outside the development corridor. The contextual artefacts date from the late 19th century and include hole-in-cap hand-soldered tins, and historical glass and ceramics.

Further northwest, another mud-brick structure, WLB001, is located on the Farm Wolfberg No. 187, just south of the development footprint. This house ruin is close to a shut-down mine and was probably occupied by some of the first copper mine workers in the region. Artefacts from the late 19th century are scattered around the structure.

Located within the Alternative 4 corridor, 12.98 km west of the N7, on the Farm Steinkopf No. 22, the surveyors documented a stone-walled livestock byre/kraal (STKF001) of undetermined age and a house foundation younger than 60 years, and evidence of further livestock farming (STKF002).

Alternative 5:

Apart from the heritage discussed above in the convergence of the Alternatives 1, and 2 corridors, no other heritage resources were recorded within Alternative 5. It must be noted that Alternative 5 was added as an additional alternative once fieldwork was already underway and as such, Alternative 5 was not fully assessed. However, the assessment conducted has provided sufficient insight into the kinds of heritage resources that may be impacted by the proposed development along this alignment as only a small section of Alternative 5 deviates from Alternative 1, effectively avoiding the Goegaap Nature Reserve, which was fully assessed. Should this

alignment be preferred, a more detailed assessment of the corridor can take place to inform the micro-siting of the proposed pylons to ensure that no significant heritage resources are impacted.

No-Go Areas:

In addition, to the above, outside of the development corridors, in an area framed by Alternatives 1, 2, and 4, are four sites associated with the historic Namaqualand Copper Mining Landscape. These sites are of historical significance and are sensitive with regards to living heritage and regional importance. These sites include the Nigramoep settlement, ca. 1904, (NGM001) located on the Farm Nigramoep No. 136 Portion 5, the Nigramoep closed/abandoned copper mine (NGM002) located on the Farm Nigramoep No. 136 Portion 6, and the Nababeep closed copper mine (NBB001) situated on the Farm Nababeep No. 134. Furthermore, the remains of a settlement, approximately 1 ha in size, is located south of the development footprint of Alternative 4 on the Farm Steinkopf No. 22 Portion 671 (STKF003), but its extent and association with the copper mining boom in the region during the 19th century warranted documentation. The site consists of historical stonewalling and foundations with contextual artefacts, ca. 1889-1910.

The O'kiep en Nababeep copper district is regarded as the oldest mining district of colonial southern Africa, even though indigenous people have mined the area for hundreds of years before the arrival of Europeans. Prospecting has been documented since 1685. The area is a historically significant industrial landscape, not only for the copper mining but also for railway history and the extent of the labour footprint, which included both local and global stakeholders.

The Namaqualand Copper Mining Landscape, which includes O'kiep and Nababeep, was placed on the UNESCO Tentative World Heritage Listing in 2009. However, formal proclamation of the Namaqualand Copper Mining Landscape (NCML) did not take place, and in 2015, the NCML was removed from the World Heritage Listing, along with six other sites, including Pilgrim's Rest Reduction Works Industrial Heritage Site and the Kimberley Mines and Associated Early Industries.

It is recommended that the NCML be graded as a Grade II Provincial Heritage Site (and series of sites) of very high significance. The sites NGM001, NGM002, and NBB001, should be considered as part of Namaqualand Copper Mining Landscape and as such, these sites must be considered as having substantial heritage significance.

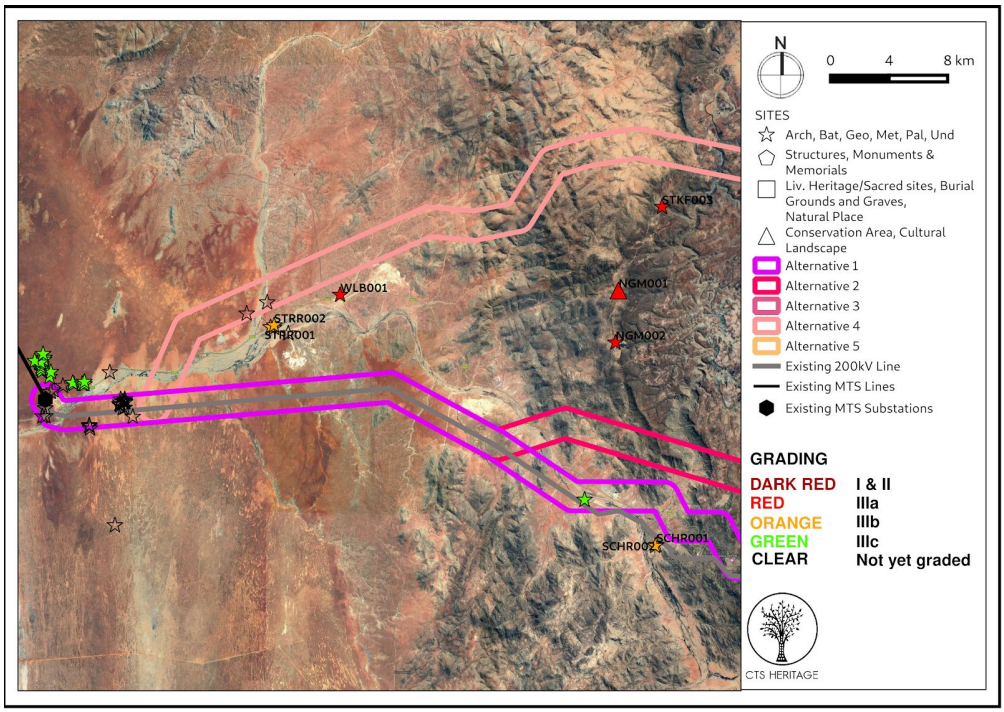
See Impact Tables below.

Table 7: Impact Tables

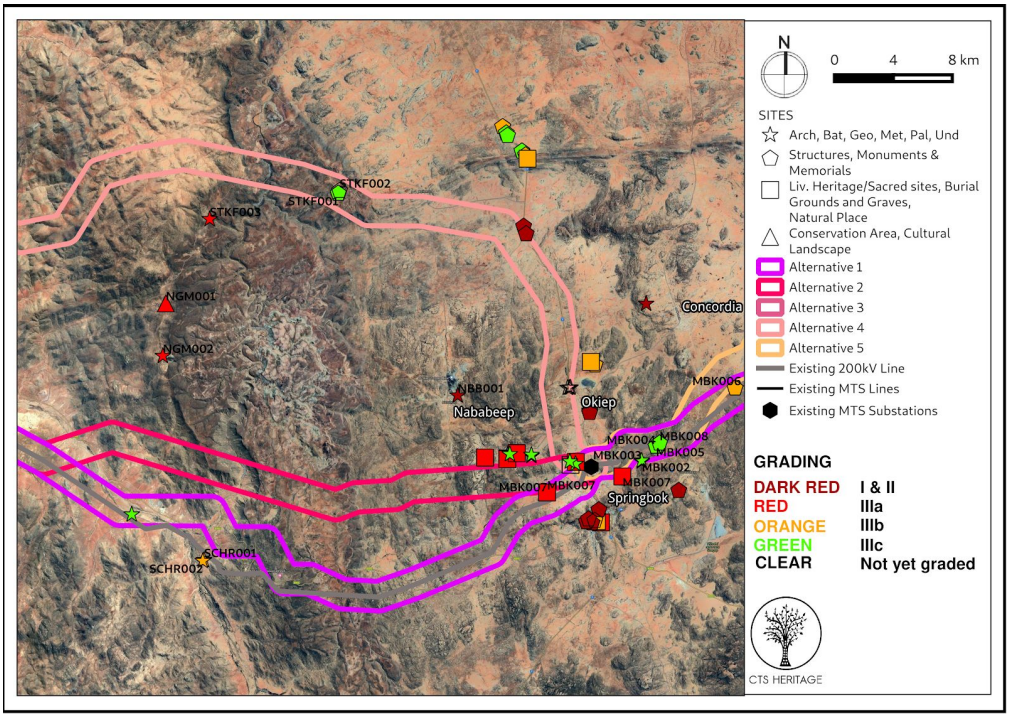
Alternative	Nature of Impact	Before Mitigation										Mitigation
Activity	*Construction Phase*	No.	M	D	E	I	R	P	Sp	S	C	
Alternative 1	Destruction of Heritage Resources	1	10	5	3	5	5	4	112	**H(-)**	H	The no-go areas identified in Map 7 are adhered to, and the sites identified in this report are not impacted by the final pylon footprints
Alternative 4	Destruction of Heritage Resources	4	10	5	3	5	5	4	112	**H(-)**	H	The no-go areas identified in Map 7 are adhered to, and the sites identified in this report are not impacted by the final pylon footprints
Alternative 5	Destruction of Heritage Resources	5	10	5	3	5	5	4	112	**H(-)**	H	The no-go areas identified in Map 7 are adhered to, and the sites identified in this report are not impacted by the final pylon footprints
		After Mitigation										
Alternative 1	Destruction of Heritage Resources	1	10	5	3	5	5	1	28	**L(-)**	H	The no-go areas identified in Map 7 are adhered to, and the sites identified in this report are not impacted by the final pylon footprints
Alternative 4	Destruction of Heritage Resources	4	10	5	3	5	5	1	28	**L(-)**	H	The no-go areas identified in Map 7 are adhered to, and the sites identified in this report are not impacted by the final pylon footprints
Alternative 5	Destruction of Heritage Resources	5	10	5	3	5	5	1	28	**L(-)**	H	The no-go areas identified in Map 7 are adhered to, and the sites identified in this report are not impacted by the final pylon footprints

		Before Mitigation										
Activity	***Construction Phase***	**No.**	**M**	**D**	**E**	**I**	**R**	**P**	**Sp**	**S**	**C**	
Alternative 1	Impacts on palaeontology	1	10	5	3	5	5	4	112	**H(-)**	H	The no-go areas identified in Map 7 are adhered to, and the Chance Fossil Finds Procedure is implemented
Alternative 4	Impacts on palaeontology	4	10	5	3	5	5	4	112	**H(-)**	H	The no-go areas identified in Map 7 are adhered to, and the Chance Fossil Finds Procedure is implemented
Alternative 5	Impacts on palaeontology	5	10	5	3	5	5	4	112	**H(-)**	H	The no-go areas identified in Map 7 are adhered to, and the Chance Fossil Finds Procedure is implemented
		After Mitigation										
Alternative 1	Impacts on palaeontology	1	10	5	3	5	5	1	28	**L(-)**	H	The no-go areas identified in Map 7 are adhered to, and the Chance Fossil Finds Procedure is implemented
Alternative 4	Impacts on palaeontology	4	10	5	3	5	5	1	28	**L(-)**	H	The no-go areas identified in Map 7 are adhered to, and the Chance Fossil Finds Procedure is implemented
Alternative 5	Impacts on palaeontology	5	10	5	3	5	5	1	28	**L(-)**	H	The no-go areas identified in Map 7 are adhered to, and the Chance Fossil Finds Procedure is implemented
		Before Mitigation										
Activity	***Operational Phase***	**No.**	**M**	**D**	**E**	**I**	**R**	**P**	**Sp**	**S**	**C**	
Alternative 1	Impact on cultural landscape	1	2	5	3	2	5	2	34	**L(-)**	L	Alternative 1 is the preferred alternative as infrastructure is concentrated. The no-go areas identified in Map 7 are adhered to, and the sites identified in this report are not impacted by the final pylon footprints
Alternative 4	Impact on cultural	4	8	5	3	4	5	4	116	**H(-)**	H	The no-go areas identified in Map 7 are

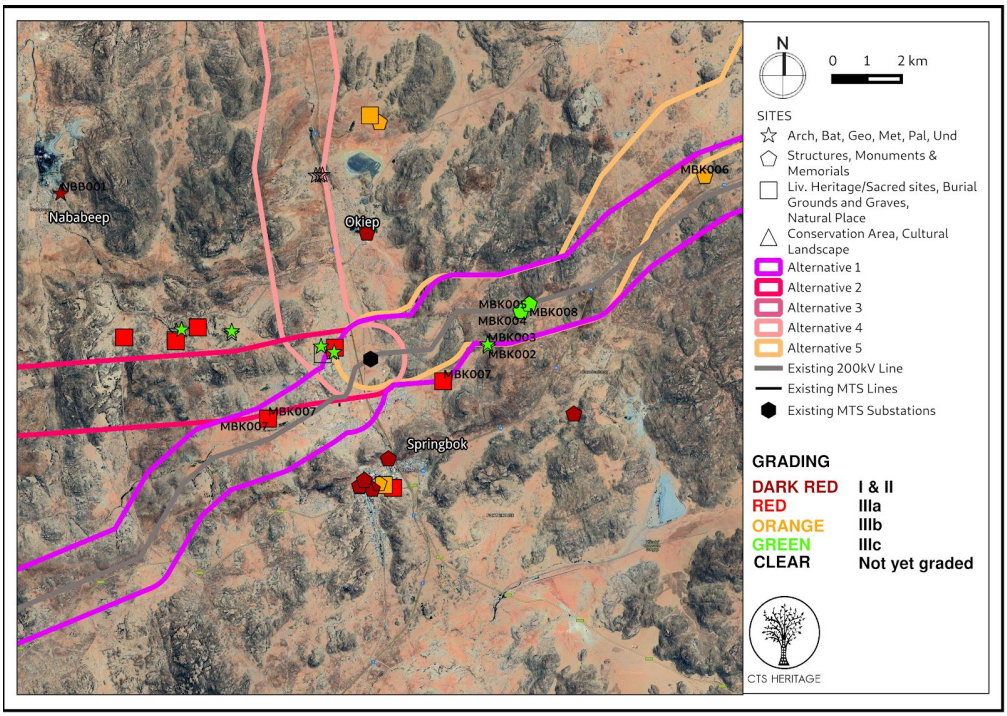
	landscape											adhered to, and the sites identified in this report are not impacted by the final pylon footprints
Alternative 5	Impact on cultural landscape	1	2	5	3	2	5	2	34	**L(-)**	L	Alternative 5 is also preferred as infrastructure is concentrated. The no-go areas identified in Map 7 are adhered to, and the sites identified in this report are not impacted by the final pylon footprints
		After Mitigation										
Activity	***Operational Phase***	**No.**	**M**	**D**	**E**	**I**	**R**	**P**	**Sp**	**S**	**C**	
Alternative 1	Impact on cultural landscape	1	2	5	3	2	5	2	34	**L(-)**	L	Alternative 1 is the preferred alternative as infrastructure is concentrated. The no-go areas identified in Map 7 are adhered to, and the sites identified in this report are not impacted by the final pylon footprints
Alternative 4	Impact on cultural landscape	4	8	5	3	4	5	4	116	**H(-)**	H	The no-go areas identified in Map 7 are adhered to, and the sites identified in this report are not impacted by the final pylon footprints
Alternative 5	Impact on cultural landscape	1	2	5	3	2	5	2	34	**L(-)**	L	Alternative 5 is also preferred as infrastructure is concentrated. The no-go areas identified in Map 7 are adhered to, and the sites identified in this report are not impacted by the final pylon footprints



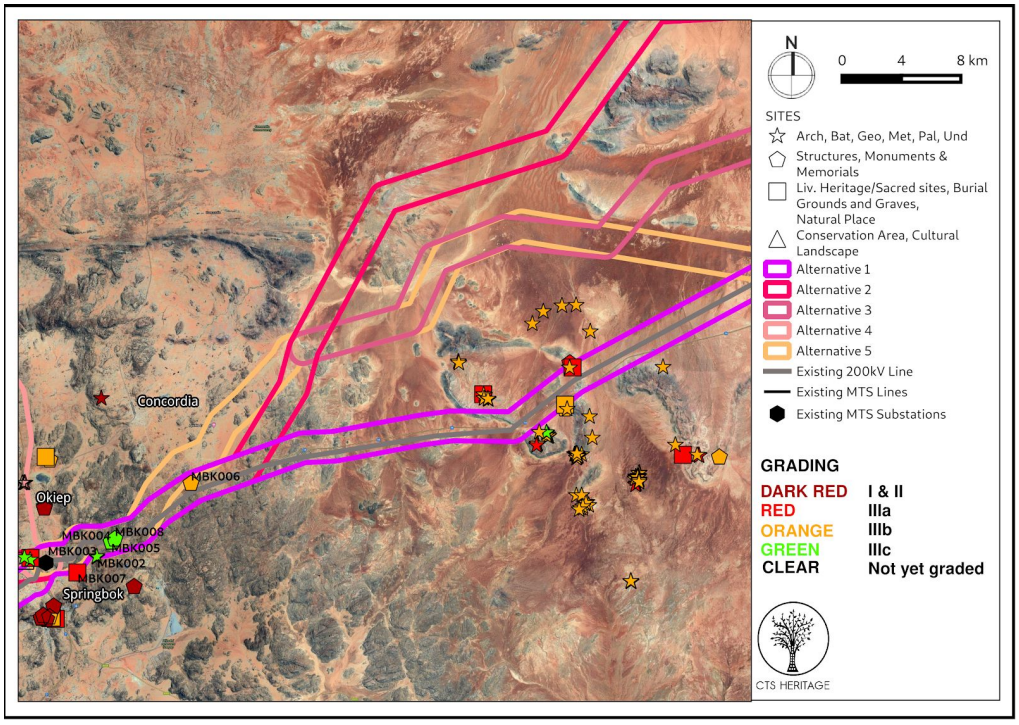
Map 10a: Heritage resources recorded in the vicinity of and within the proposed alignments



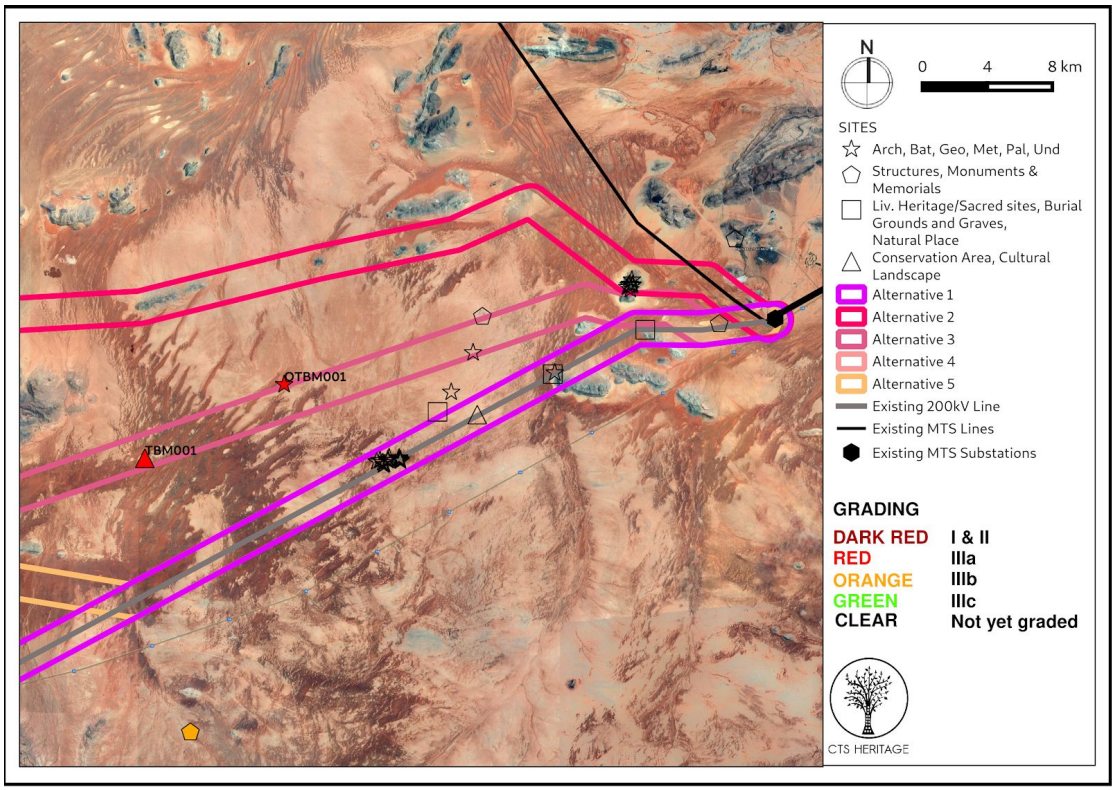
Map 10b: Heritage resources recorded in the vicinity of and within the proposed alignments



Map 10c: Heritage resources recorded in the vicinity of and within the proposed alignments



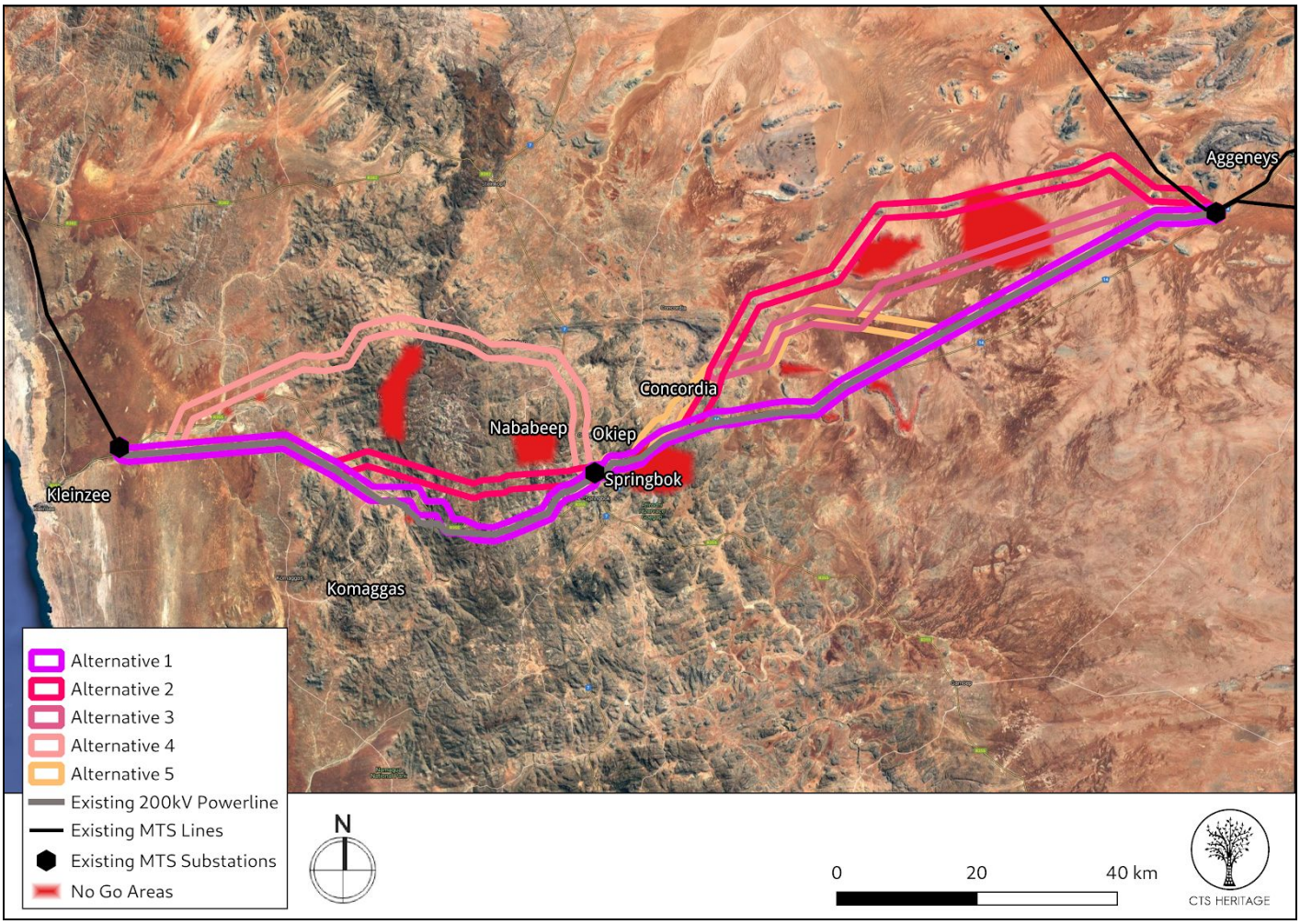
Map 10d: Heritage resources recorded in the vicinity of and within the proposed alignments



Map 10e: Heritage resources recorded in the vicinity of and within the proposed alignments

The proposed development will have a negative impact on the heritage resources situated on the five different alternative corridors proposed for this project. The majority of the resources can and should be mitigated, should they be impacted especially sites associated with the historic farmscape. The cemeteries and living heritage areas should be avoided as far as possible. The historic Namaqualand Copper Mining Landscape has high heritage significance, and sites associated with this cultural landscape must not be impacted. Even though no lithic material was documented during this survey, the presence of background scatter, or the probability of subsurface material should be taken into consideration during the construction phase of the project. The identified heritage resources have been used to develop a map of no-go areas of particularly high heritage sensitivity (Map 7) in addition to the sites identified in Table 5 and Maps 5 and 6 above.

Due to the nature of archaeological and palaeontological heritage, it is not possible to establish more detailed impact ratings for each alignment at this stage. At the Basic Assessment stage of the project, a more detailed assessment of the selected corridor can take place to inform the micro-siting of the proposed pylons to ensure that no significant heritage resources are impacted.



Map 11: Recommended No Go Areas based on results of archaeological and palaeontological assessments

5.2 Sustainable Social and Economic Benefit

Electricity Grid Infrastructure (EGI) is required to provide grid access to electricity producers, in order to be able to distribute the electricity they generate to users. Independent Power Producers (IPPs) have rapidly become key electricity producers and this has increased the demand for grid access and hence the need to construct more EGI. The establishment of large-scale renewable energy generation is becoming a primary driver of network development, particularly in the Western, Eastern and Northern Cape Provinces.

A Social Impact Assessment (SIA) has been completed for this project. The SIA assessed a number of key planning and policy documents to assess the broader planning framework applicable to this project. This in turn informs the socio-economic benefits of the project. According to the SIA, within the National Development Plan (NDP, 2030), "job creation is noted as an important factor for future development, this is key to eradicating poverty which is also one of the aims of the Northern Cape's PSDF. The proposed power line will create jobs during the construction phase. Once operational, the power line will aid job creation indirectly by providing the necessary infrastructure to support the development of further IPP projects. The power line will increase the electricity supply to the area, supporting the further industrial development."

The SIA further notes that "renewable energy developments play an important role in supporting the energy requirements of South Africa's fast-growing economy as in a sustainable manner and are key for the DoE's to achieve their goal of an energy mix with 30% clean energy sources by 2025. The proposed power line is situated in a Renewable Energy Development Zone as per the Northern Cape PSDF and will be situated in close proximity to solar and wind corridors as per the NKLM IDP."

With regard to possible impacts to tourism, the SIA notes that "with a decline in the mining industry and the looming threat of Climate Change diversifying the economy and capitalising on the Northern Cape's comparative advantages need to be considered in order to strengthen the economy and reduce poverty. Tourism is noted as an important economic contributor in the Nama Khoi IDP and the proposed power line needs to be located in such a way so as to avoid impacting the tourism industry. The NKLM IDP also identifies important ecological corridors which the proposed power line will traverse. Both the DoE's Strategic Plan and the PSDF speak to the protection and sustainable use of natural resources."

According to the SIA, "the reviewed planning documentation supports the development of the proposed a power line as it will provide the necessary infrastructure to support the future IPP developments and is situated within a Renewable Energy Development Zone. Future IPP developments will benefit the area's economy through job creation and the increased supply of electricity. The development will support the DoE's vision to improve the energy mix to 30% clean energy sources by 2025."

It is noted in the SIA that Springbok and the surrounding towns such as O'Kiep and Nababeep have a rich cultural heritage, particularly with regards to the Nama people (Khoi San). Some of the historical and cultural assets to the area include the Blue Mine, the Klip Kerk, the Namakwa Festival and two national monuments, namely the Van Der Stel Mine Shaft and Orbicule Hill. During the Construction Phase associated activities may detract from a visitor's experience if these activities take place nearby important sites. Once operational the proposed power line

may detract from the area's rustic 'sense of place' and appear as 'industrial clutter'. However, based on the information included in the SIA, the socio-economic benefits of the proposed development outweigh the potential negative impacts to heritage resources, on condition that the proposed recommendations and mitigation measures outlined below are implemented.

6. RESULTS OF PUBLIC CONSULTATION

In addition to the public consultation process that will be undertaken by the Environmental Assessment Practitioner (EAP) during the Basic Assessment (BA) process, a public consultation process has been undertaken for this preliminary phase of the project. No heritage-related comments have been received to-date (see PPP report). In terms of section 38(8) of the National Heritage Resources Act (Act 25 of 1999), the South African Heritage Resources Agency (SAHRA) is required to comment on this HIA and make recommendations prior to the granting of the Environmental Authorisation.

7. CONCLUSION

Based on the available information, the area proposed for the powerline alignments therefore constitutes a very sensitive landscape in terms of impacts to historical, archaeological and palaeontological heritage resources. The proposed development of the 400kV powerline may result in the destruction of significant archaeological, palaeontological and built environment heritage resources through the insensitive placement of pylon footings as well as the loss of a sense of place through the development of large scale and intrusive infrastructure within a sensitive cultural landscape. Each proposed alignment therefore has the potential to impact on:

- Historic townscapes and sense of place of historic cores of Springbok, Nababeep, O'Kiep, Carolusberg and Concordia
- Corbelled houses and other historic structures and farm werfs
- Archaeological heritage resources specifically heritage associated with
    - Copper Mining
    - South African War
    - ESA, MSA and LSA (including OES, grinding grooves and ceramics) sites (tend to be associated with granite outcrops and pans)
    - Engraved rock art
    - Marked and unmarked burial grounds
- Heritage associated with Korana wars and the massacre of Khoe and San peoples
- Palaeontological heritage consisting of trace fossils, mammal bone fossils, sharks teeth, mollusc fossils

The archaeological field assessment identified a number of sites of heritage significance, including cemeteries, sites associated with the living heritage of the Korana people as well as sites associated with the Namaqualand Copper Mining Cultural Landscape. Unusually, very few artefacts or sites associated with the stone age were identified in the field assessment, however such resources are likely present on the landscape. Impacts to the majority of these resources can be avoided through the sensitive placement of individual specific pylons within any of the proposed corridors. Impacts to the broader cultural landscape are more challenging to mitigate.

Based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the development footprint. The geological structures suggest that the rocks are either much too old to contain fossils. The Tertiary calcretes and Quaternary windblown sands do not preserve fossils except in special circumstances. Since there is an extremely small chance that fossils from the nearby Vryheid Formation may be disturbed a Fossil
Chance find protocol has been added to this report. The potential impact to fossil heritage resources is extremely low. Based on the experience of the palaeontologist and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the loose sands of the Quaternary.

There is an existing 200kV power line that runs along the proposed alignment for Alternative 1. Potential impacts to the cultural landscape can be mitigated by concentrating such electricity infrastructure along one alignment where the landscape is not pristine. Furthermore, a number of no-go areas have been identified (Map 7) based on the location of the known heritage resources, and incorporating the known sensitivity of rocky outcrops, mountains and waterways for heritage resources.

Of the original five proposed alternatives, Alternatives 2 and 3 have been screened out as a result of other environmental and practical reasons. Based on the outcomes of this assessment, a number of heritage resources of heritage significance were identified within the proposed alignment of Alternative 4 (Grade II, IIIA and IIIB). A number of no-go areas have been recommended within the proposed alignment of Alternative 4. While a number of heritage resources were also identified within the proposed alignment for Alternative 1, these are not as sensitive or as significant (mostly Grade IIIB and IIIC) as the resources within Alternative 4. No heritage resources that aren't also located within the proposed alignment for Alternative 1 were identified within the proposed alignment for Alternative 5. It must be noted that Alternative 5 was added as an additional alternative once fieldwork was already underway and as such, Alternative 5 was not fully assessed. However, the assessment

conducted has provided sufficient insight into the kinds of heritage resources that may be impacted by the proposed development along this alignment as only a small section of Alternative 5 deviates from Alternative 1, effectively avoiding the Goegaap Nature Reserve, which was fully assessed. Should this alignment be preferred, a more detailed assessment of the corridor can take place to inform the micro-siting of the proposed pylons to ensure that no significant heritage resources are impacted.

Based on the information assessed in this HIA, it is recommended that Alternative 1 or Alternative 5 are the preferred alignments.

8. RECOMMENDATIONS

There is no objection to the proposed development on heritage grounds and the following is recommended:

- Alternative 1 or Alternative 5 are the preferred alignments
- The no-go areas identified in Map 7 are adhered to, and the sites identified in this report are not impacted by the final pylon footprints through the adherence to the mitigation recommendations in Table 6.
- Due to the nature of archaeological and palaeontological heritage, it is not possible to establish more detailed impact ratings for each alignment at this stage. At the Basic Assessment stage of the project, a more detailed assessment of the selected corridor must take place to inform the micro-siting of the proposed pylons to ensure that no significant heritage resources are impacted.
- A Chance Fossil Finds Procedure must be implemented (see attached as part of Appendix 2)
- Although all possible care has been taken to identify sites of cultural importance during the investigation of the study area, it is always possible that hidden or subsurface sites could be overlooked during the assessment. If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Natasha Higgitt/Phillip Hine 021 462 5402) must be alerted.
- If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Mimi Seetelo 012 320 8490), must be alerted immediately as per section 36(6) of the NHRA. A professional archaeologist must be contracted as soon as possible to inspect the findings. A Phase 2 rescue excavation operation may be required subject to permits issued by SAHRA

9. REFERENCES

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4475	AIA Phase 1	Dave Halkett, Timothy Hart	01/06/1997	An Archaeological Assessment of the Coastal Strip, and a Proposed Heritage Management Plan For: De Beers Namaqualand Mines Volume 1
4476	AIA Phase 1	Dave Halkett, Timothy Hart	01/06/1997	An Archaeological Assessment of the Coastal Strip, and a Proposed Heritage Management Plan For: De Beers Namaqualand Mines Volume 2
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8282	AIA	Jonathan	08/05/2010	ARCHAEOLOGICAL SCOPING STUDY OF TWO PROPOSED WIND FARM SITES (NAMA

	Desktop	Kaplan		EAST AND NAMA WEST) NEAR SPRINGBOK, NORTHERN CAPE PROVINCE
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9086	AIA Phase 1	Celeste Booth	01/04/2012	A Phase 1 Archaeological Impact Assessment for the Proposed Establishment of the Inkululeko Solar Energy Facility on Portion 2 of the Farm Carolus Poort 167, near Noupoort, Northern Cape Province
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APPENDICES

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APPENDIX 1: Archaeological Assessment

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APPENDIX 2: Palaeontological Assessment

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APPENDIX 3: Heritage Screening Assessment

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APPENDIX 4: Specialist CVs and Declaration of Independence