HERITAGE IMPACT ASSESSMENT

In terms of Section 38(8) of the NHRA for the

Proposed development of the Grid Connection Infrastructure for the Taaibosch Puts Renewable Energy Facility near Postmasburg in the Northern Cape

Prepared by CTS Heritage

CTS HERITAGE

For

JAWS

March 2022

August 2023

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EXECUTIVE SUMMARY

1. Site Name:

Grid Connection Infrastructure for the Taaibosch Puts Energy Cluster

2. Location:

TBA

3. Locality Plan:

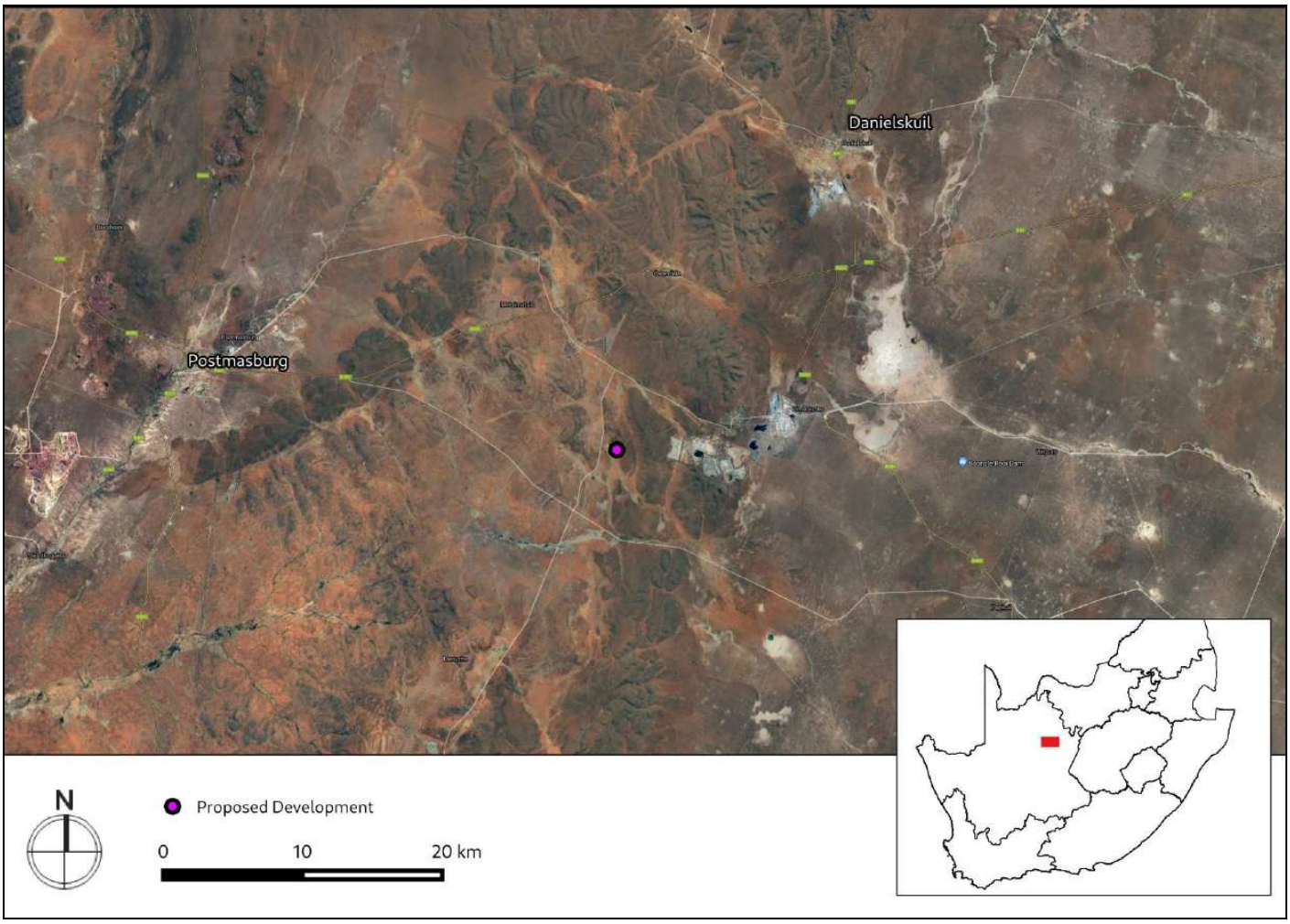

Figure 1: Location of the proposed development area

4. Description of Proposed Development:

ENERTRAG South Africa (Pty) Ltd, Reg no. 2017/143710/07 (ESA) has appointed Jones & Wagener (Pty) Ltd Engineering and Environmental Consultants (J&W) to assist with the respective permitting processes, including as relevant a Waste Management Licence (WML), Air Emissions Licence (AEL), respective applications for Environmental Authorisation (EA) and Water Use Licence application/s (WUL) (as required) for the proposed Taaibosch Puts Energy Cluster (collectively comprising the proposed projects). In addition, the applicant will apply as per Section 53 of the Mineral and Petroleum Resources Development Act (No 28 of 2002) for land use contrary to the objectives of the act.

This HIA assesses the likely impacts of the EGI to heritage resources.

5. Heritage Resources Identified:

Based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the powerline route or Energy Cluster footprint. The geological structures suggest that the rocks are the correct age and type to preserve fossils. The site visit and walk-through confirmed that there were NO FOSSILS in the project footprint. Furthermore, the material to be excavated for foundations is soils and sands and these do not preserve fossils. Since there is an extremely small chance that fossils from the Lime Acres Formation below ground may be disturbed a Fossil Chance Find Protocol has been added to this report. Taking account of the defined criteria, the potential impact to fossil heritage resources is extremely low.

The heritage field assessment identified a number of heritage resources located within the areas proposed for development. The majority of these heritage resources were determined to be not conservation-worthy and as such, no further mitigation for impacts to these heritage observations is recommended.

A number of heritage resources of significance were, however, identified. These resources range from significant archaeological sites and scatters, to burial grounds and graves as well as historic farm werfs and infrastructure such as the irrigation furrows ascribed to the work of the London Missionary Society and the local Griekwa population. The relationship between the furrows, the farm werfs and the burials form a unique and layered cultural landscape that speaks to the unique past of this area and its Griekwa inhabitants. It is important that the spatial relationship of these resources is not disrupted by the proposed development.

6. Anticipated Impacts on Heritage Resources:

As was anticipated, the archaeological field assessment revealed a great many heritage resources evident within the broader development area - 277 in total. The vast majority of these resources, consisting of individual artefacts and low density artefact scatters ascribed to the Middle and Later Stone Age as well as rural infrastructure such as wind mills, have been determined to be not conservation-worthy. No further mitigation for impacts to these heritage observations is recommended.

A number of heritage resources of significance were, however, identified. These resources range from significant archaeological sites and scatters, to burial grounds and graves as well as historic farm werfs and infrastructure such as the irrigation furrows ascribed to the work of the London Missionary Society and the local Griekwa population. The relationship between the furrows, the farm werfs and the burials form a unique and layered cultural landscape that speaks to the unique past of this area and its Griekwa inhabitants. While no direct impact is anticipated, it is important that the spatial relationship of these resources is not disrupted by the proposed development. Various mitigation measures are proposed in Table 3 above and in the recommendations below in order to mitigate these impacts.

Based on the fossil record but confirmed by the site visit and walk through there are NO FOSSILS such as stromatolites in the Lime Acres Formation (Campbell Rand Group, Ghaap Plateau, Transvaal Supergroup even though fossils have been recorded from rocks of a similar age and type in South Africa. It is extremely unlikely that any fossils would be preserved in the overlying soils and sands of the Quaternary. There is a very small chance that fossils may occur in below the ground surface in the dolomites so a Fossil Chance Find Protocol should be added to the EMPr. If fossils are found by the environmental officer, or other responsible person once excavations and drilling have commenced, then they should be rescued and a palaeontologist called to assess and collect a representative sample.

7. Recommendations:

There is no objection to the proposed development from a heritage perspective on condition that the following mitigation measures are implemented:

1. The northern grid alignment must remain along the existing road alignment as proposed to ensure no impact to Site 277 (Map 7.2)
2. The no development area identified in Figure 7.2 must be respected
3. A 20m no development buffer around Site 141 and 161 (Maps 7.1 and 7.3)

4. Should any human remains, burials or burial grounds be uncovered during construction activities, work must cease in the vicinity of the find and the SAHRA Burial Grounds and Graves Unit must be contacted regarding a way forward.
5. Should any archaeological resources be uncovered during construction activities, work must cease in the vicinity of the find and the SAHRA Archaeology, Palaeontology and Meteorites Unit must be contacted regarding a way forward.
6. The attached Chance Fossil Finds Procedure must be implemented for the duration of excavation activities.

8. Author/s and Date:

Jenna Lavin

August 2023

Details of Specialist who prepared the HIA

Jenna Lavin, an archaeologist with an MSc in Archaeology and Palaeoenvironments, heads up the heritage division of the organisation, and has a wealth of experience in the heritage management sector. Jenna's previous position as the Assistant Director for Policy, Research and Planning at Heritage Western Cape has provided her with an in-depth understanding of national and international heritage legislation. Her 8 years of experience at various heritage authorities in South Africa means that she has dealt extensively with permitting, policy formulation, compliance and heritage management at national and provincial level and has also been heavily involved in rolling out training on SAHRIS to the Provincial Heritage Resources Authorities and local authorities.

Jenna is on the Executive Committee of the Association of Professional Heritage Practitioners (APHP), and is also an active member of the International Committee on Monuments and Sites (ICOMOS) as well as the International Committee on Archaeological Heritage Management (ICAHM). In addition, Jenna has been a member of the Association of Southern African Professional Archaeologists (ASAPA) since 2009. Since 2016, Jenna has drafted over 90 Heritage Impact Assessments throughout South Africa.

CTS HERITAGE

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APPENDICES

1 Archaeological Impact Assessment 2021

2 Palaeontological Impact Assessment 2022

3 Visual Impact Assessment 2022

4 Fossil Chance Finds Procedure

5 Detailed Project Description

1. INTRODUCTION

1.1 Background Information on Project

ENERTRAG South Africa (Pty) Ltd, Reg no. 2017/143710/07 (ESA) has appointed Jones & Wagener (Pty) Ltd Engineering and Environmental Consultants (J&W) to assist with the respective permitting processes, including as relevant a Waste Management Licence (WML), Air Emissions Licence (AEL), respective applications for Environmental Authorisation (EA) and Water Use Licence application/s (WUL) (as required) for the proposed Taaibosch Puts Energy Cluster (collectively comprising the proposed projects). In addition, the applicant will apply as per Section 53 of the Mineral and Petroleum Resources Development Act (No 28 of 2002) for land use contrary to the objectives of the act.

The proposed projects are located approximately 28 km south-west of Danielskuil and 30 km east of Postmasburg in the Tsantsabane Municipality, Northern Cape. The proposed projects collectively comprise approximately 11 110 ha and consists of the following (See attached BID doc):

- Kora (I – IV) Solar PV Energy Facilities;
- Koraqua (I – V) Solar PV Energy Facilities;
- Khoemana Wind Energy Facility;
- Gorachouqua (I and II) Wind Energy Facilities;
- Korakobab Green Hydrogen Facility;
- Kei Korana Green Ammonia production facility;
- Electrical Grid Infrastructure (EGI) respectively for the proposed projects.

This HIA assesses the likely impacts of the EGI to heritage resources.

Please see Appendix 6 for a detailed project description.

1.2 Description of Property and Affected Environment

The study area is split roughly in two sections with the western side dedicated to the proposed solar farms while the eastern side consists of the proposed wind farm (WEF). Two powerline routes running for about 30km each along the southern and northern ends were also assessed that connect up the electrical generation facilities to the Olien Eskom substation east of Lime Acres. The Asbestos Mountains form a low series of hills running from the southwest to the northeast between Lime Acres and the eastern end of the proposed wind farm. Three gravel roads were used to access the main farms which included the Griquatown - Lime Acres, Postmasburg - Papkuil and Postmasburg - Lime Acres routes. An existing solar farm (Lesedi Solar Park) lies just to the north of the study area and is similar in scale to the Koraqua solar farm proposed at Springfield 470 farm and the Kora solar farm proposed at Farmersfield 572 farm. The WEF lies on the farms Sunnyside (469), Strathmore (500), Fairview and Klein Fairview (497) and Taaibosch Puts (499).

Taaibosch Puts was the only property which was predominantly flat, uniform and covered in grassland. The rest of the properties held various flat grassland areas in amongst low, gentle ridges and small koppies. The powerline routes traverse similar ground before linking up with an existing 765kV powerline route along nearly flat calcareous ground extending into the Ghaap Plateau Vaalbosveld. The Olifantshoek Plains Thornveld and Kuruman Mountain Bushveld dominate the majority of the study area with rocky, bushy vegetation and thorn trees on the ridges and grassland and low shrubbery vegetation found on the plains.

All of the farms are actively used for cattle and sheep farming as well as wild game areas used to breed various antelope species. Small-scale crop agriculture takes place closer to the homesteads and is mainly used to grow feed for the cattle and sheep. Mining has had a very significant impact on the economy of the area as many people are employed in the mining towns of Lime Acres, Kathu, Postmasburg and Danielskuil. The closest mines to the study area are the Finsch diamond mine and the PPC limestone mine at Lime Acres.

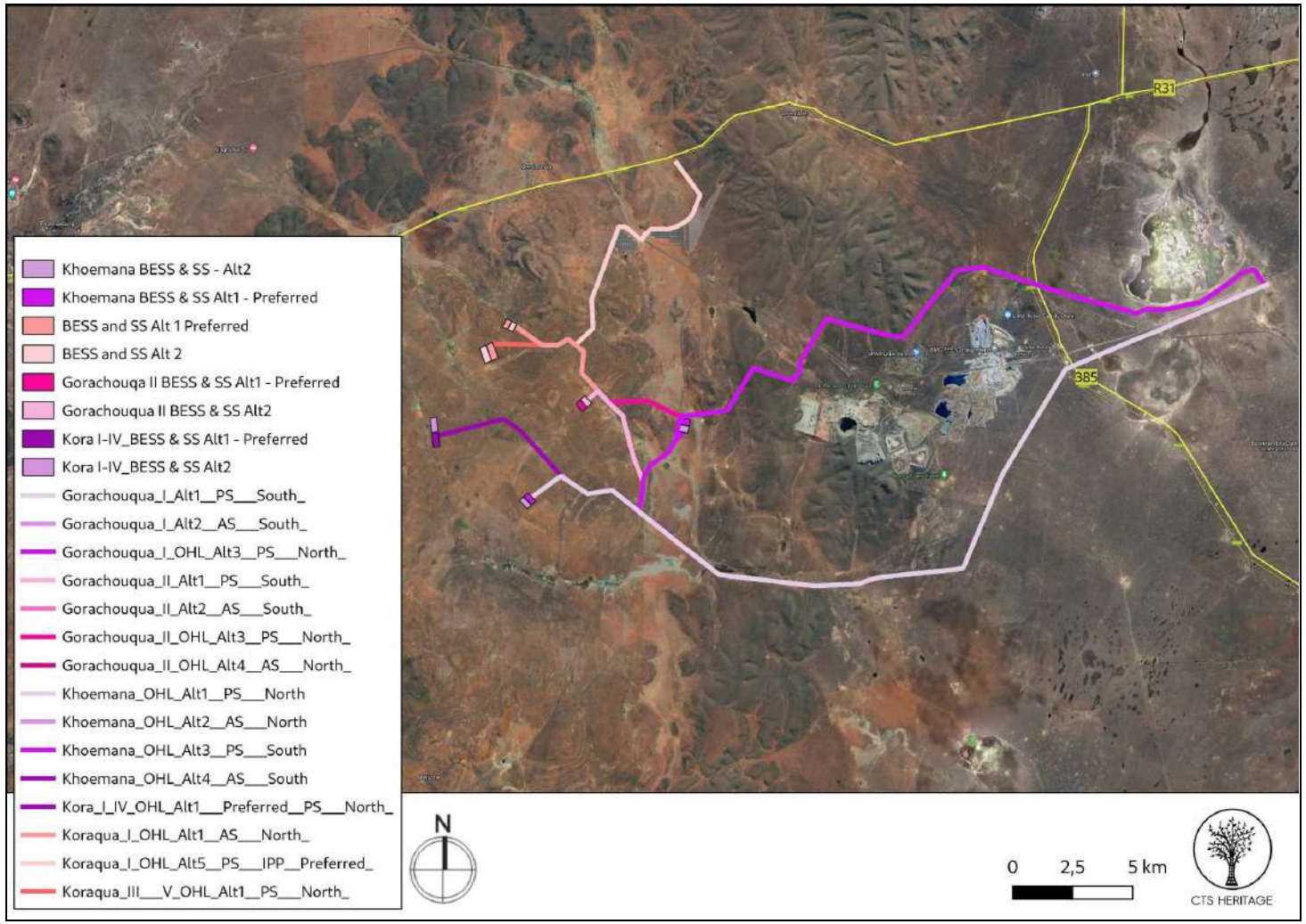

Figure 1.1: The proposed development area including all proposed grid infrastructure

2. METHODOLOGY

2.1 Purpose of HIA

The purpose of this Heritage Impact Assessment (HIA) is to satisfy the requirements of section 38(8), and therefore section 38(3) of the National Heritage Resources Act (Act 25 of 1999).

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) as part of the Scoping Phase of Assessment
- An archaeologist conducted an assessment of archaeological resources likely to be disturbed by the proposed development. The archaeologist conducted his site visit from 10 - 15 November 2021. A second archaeological field assessment was conducted on 4 March 2022 to cover a later amendment to the layout in terms of the southern grid alignment
- A palaeontologist conducted an assessment of palaeontological resources likely to be disturbed by the proposed development. The palaeontologist conducted his site visit on 28 February 2022.
- 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 at the site during construction, such activities should be halted, and it would be required that the 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 heritage sensitivity of the area.

2.4 Constraints & Limitations

Grassland and shrubbery covered much of the study area at the time of the survey and recent good rains meant the vegetation was quite dense in places. However, small patches of exposed ground were regularly encountered and this meant that the observation of visible archaeological material was not significantly impeded overall. The ground was much rockier on the ridges but despite this archaeological material was still identified without too much trouble in these areas. The survey therefore obtained a good account of the archaeological sensitivity of the area.

The experience of the heritage practitioner, the archaeological specialists and the palaeontological specialist as well as observations made during the study, allow us to predict with some accuracy the heritage sensitivity of the receiving environment.

2.5 JAWS Impact Assessment Methodology

The proposed project is anticipated to impact on a range of biophysical and socioeconomic aspects of the environment. In order to ensure uniformity, a standard impact assessment methodology will be utilised so that a wide range of impacts can be compared. The impact assessment methodology makes provision for the assessment of impacts against the following criteria:

- Significance
- Spatial scale
- Temporal scale
- Probability and
- Degree of certainty.

A combined quantitative and qualitative methodology will be used to describe impacts for each of the aforementioned assessment criteria. A summary of each of the qualitative descriptors along with the equivalent quantitative rating scale for each of the aforementioned criteria is given in **Table 1 -1.**

Table 1-1: Impact quantitative rating scale

Rating	Significance	Extent scale	Temporal scale	Probability
1	VERY LOW	Isolated area	Incidental	Practically impossible
2	LOW	Study area	Short-term	Unlikely

3	MODERATE	Local	Medium-term	Could Happen
4	HIGH	Regional / Provincial	Long-term	Very Likely
5	VERY HIGH	Global / National	Permanent	It's going to happen / has occurred

A more detailed description of each of the assessment criteria is given in the following sections.

2.5.1 Significance assessment

Significance rating (importance) of the associated impacts embraces the notion of extent and magnitude but does not always clearly define these since their importance in the rating scale is very relative. For example, the magnitude (i.e. the size) of area affected by atmospheric pollution may be extremely large (1 000 km^2) but the significance of this effect is dependent on the concentration or level of pollution. If the concentration is great, the significance of the impact would be HIGH or VERY HIGH, but if it is diluted it would be VERY LOW or LOW. Similarly, if 60 ha of a grassland type are destroyed the impact would be VERY HIGH if only 100 ha of that grassland type were known. The impact would be VERY LOW if the grassland type was common. A more detailed description of the impact significance rating scale is given in **Table 1 -2** below.

Table 1-2: Description of the significance rating scale.

Rating		Description
5	VERY HIGH	Of the highest order possible within the bounds of impacts which could occur. In the case of adverse impacts: there is no possible mitigation and/or remedial activity which could offset the impact. In the case of beneficial impacts, there is no real alternative to achieving this benefit.
4	HIGH	Impact is of substantial order within the bounds of impacts, which could occur. In the case of adverse impacts: mitigation and/or remedial activity is feasible but difficult, expensive, time-consuming or some combination of these. In the case of beneficial impacts, other means of achieving this benefit are feasible but they are more difficult, expensive, time-consuming or some combination of these.
3	MODERATE	Impact is real but not substantial in relation to other impacts, which might take effect within the bounds of those which could occur. In the case of adverse impacts: mitigation and/or remedial activity are both feasible and fairly easily possible. In the case of beneficial impacts: other means of achieving this benefit are about equal in time, cost, effort, etc.
2	LOW	Impact is of a low order and therefore likely to have little real effect. In the case of adverse impacts: mitigation and/or remedial activity is either easily achieved or little will be required, or both. In the case of beneficial impacts, alternative means for achieving this benefit are likely to be easier, cheaper, more effective, less time consuming, or some combination of these.

1	VERY LOW	Impact is negligible within the bounds of impacts which could occur. In the case of adverse impacts, almost no mitigation and/or remedial activity is needed, and any minor steps which might be needed are easy, cheap, and simple. In the case of beneficial impacts, alternative means are almost all likely to be better, in one or a number of ways, than this means of achieving the benefit. Three additional categories must also be used where relevant. They are in addition to the category represented on the scale, and if used, will replace the scale.
0	NO IMPACT	There is no impact at all - not even a very low impact on a party or system.

2.5.2 Spatial scale

The spatial scale refers to the extent of the impact i.e. will the impact be felt at the local, regional, or global scale. The spatial assessment scale is described in more detail in **Table 1 -3**.

Table 1-3: Description of the spatial rating scale

Rating		Description
5	Global/National	The maximum extent of any impact.
4	Regional/Provincial	The spatial scale is moderate within the bounds of impacts possible and will be felt at a regional scale (District Municipality to Provincial Level). The impact will affect an area up to 50km from the proposed site.
3	Local	The impact will affect an area up to 5km from the proposed site.
2	Study Area	The impact will affect a route corridor not exceeding the boundary of the site.
1	Isolated Sites / proposed site	The impact will affect an area no bigger than the site.

2.5.3 Duration scale

In order to accurately describe the impact, it is necessary to understand the duration and persistence of an impact in the environment. The temporal scale is rated according to criteria set out in **Table 1 -4**.

Table 1-4: Description of the temporal rating scale

Rating		Description
1	Incidental	The impact will be limited to isolated incidences that are expected to occur very sporadically.
2	Short-term	The environmental impact identified will operate for the duration of the construction phase or a period of less than 5 years, whichever is the greater.
3	Medium term	The environmental impact identified will operate for the duration of life of the project.

4	Long term	The environmental impact identified will operate beyond the life of operation.
5	Permanent	The environmental impact will be permanent.

2.5.4 Degree of probability

The probability or likelihood of an impact occurring will be described, as shown in **Table 1 -5**.

Table 1-5: Description of the degree of probability of an impact occurring.

Rating	Description
1	Practically impossible
2	Unlikely
3	Could happen
4	Very Likely
5	It's going to happen / has occurred

2.5.5 Degree of certainty

As with all studies it is not possible to be 100% certain of all facts, and for this reason a standard "degree of certainty" scale is used as discussed in **Table 1 -6**. The level of detail for specialist studies is determined according to the degree of certainty required for decision-making. The impacts are discussed in terms of affected parties or environmental components.

Table 1-6: Description of the degree of certainty rating scale.

RATING	DESCRIPTION
Definite	More than 90% sure of a particular fact.
Probable	Between 70 and 90% sure of a particular fact, or of the likelihood of that impact occurring.
Possible	Between 40 and 70% sure of a particular fact, or of the likelihood of that impact occurring.
Unsure	Less than 40% sure of a particular fact or the likelihood of an impact occurring.
Can't know	The consultant believes an assessment is not possible even with additional research.

2.5.6 Quantitative description of impacts

To allow for impacts to be described in a quantitative manner in addition to the qualitative description given above, a rating scale of between 1 and 5 was used for each of the assessment criteria. Thus, the total value of the impact is described as the function of significance, spatial and temporal scale as described below.

$$\textit{Impact Risk} = \frac{(\text{SIGNIFICANCE} + \textit{Spatial} + \text{Temporal})}{3} \times \frac{\text{Probability}}{5}$$

An example of how this rating scale is applied is shown in **Table 1 -7** below:

Table 1-7: Example of rating scale

Impact	Significance	Spatial scale	Temporal scale	Probability	Rating
	LOW	*Local*	*Medium Term*	*Could Happen*	
Impact to air	**2**	***3***	**3**	**3**	**1.6**

Note: *The significance, spatial and temporal scales are added to give a total of 8, that is divided by 3 to give a criteria rating of 2,67. The probability (3) is divided by 5 to give a probability rating of 0,6. The criteria rating of 2,67 is then multiplied by the probability rating (0,6) to give the final rating of 1,6.*

The impact risk is classified according to 5 classes as described in **Table 1-8**

Table 1-8: Impact risk classes

Rating	Impact class	Description - negative	Description - positive
0.1 – 1.0	1	Very low	Very low
1.1 – 2.0	2	Low	Low
2.1 – 3.0	3	Moderate	Moderate
3.1 – 4.0	4	High	High
4.1 – 5.0	5	Very high	Very high

Therefore, with reference to the example used for air quality above, an impact rating of 1.6 will fall in the Impact Class 2, which will be considered to be a low impact.

3. HISTORY AND EVOLUTION OF THE SITE AND CONTEXT

3.1 Desktop Assessment

This application is for the proposed development of the grid connection infrastructure for the proposed Taaibosch Puts Renewable Energy Cluster located 20km from Postmasburg in the Northern Cape. Originally a station of the London Missionary Society called Sibiling, it became a Griqua village with the name Blinkklip and was then proclaimed a town on 6 June 1892. Postmasburg achieved municipal status in 1936. Postmasburg had its own diamond rush. The first diamond was discovered in 1918 and as a result an open cast mine grew. The mine was permanently flooded in 1935 and as a result, just like Kimberley, Postmasburg could also boast its very own "Big Hole". This hole is over 45 m deep and filled with fish. Postmasburg also boasts spectacular architecture and many historical sites. An old blue dolomite stone Reformed Church was built in 1908. There is also a rather impressive gun known as "Howitzer Gun" which stands at the civic centre. It honours the men of Postmasburg who died during World War II. The proposed development is also located less than 10km from Lime Acres, home to the employees of the Finsch Diamond Mine located nearby.

In 1801, the London Missionary Society also established a station among the Griqua at *Leeuwenkuil*. The site proved too arid for cultivation and in about 1805 they moved the station to another spring further up the valley and called it *Klaarwater*. Their second choice was little better than their first, and for many years a lack of water prevented any further development. The name of the settlement was changed later to Griquatown or *Griekwastad* in Afrikaans. They lived among a mixed nomadic community of the Chaguriqua tribe and "bastaards" (people of mixed origin) from Piketberg. Their two leaders were Andries Waterboer and Adam Kok II. From 1813 to 17 July 1871, the town and its surrounding area functioned as Andries *Waterboer's Land*. *Griekwastad* was later the capital of British Colony Griqualand West from 1873 to 1880, with its own flag and currency, before it was annexed into the Cape Colony. The proposed Taaibosch Puts Renewable Energy Cluster is located on one of the main routes between Griekwastad and Kuruman and as such, evidence of this heritage may be impacted by the proposed development.

An archaeological assessment of the Finsch Mine was completed by Henderson in 2005 (SAHRIS ID 6780). Henderson drafted a brief history of the Finsch Mine and this is not repeated here. Suffice to note that "Recent human activity at the Finsch Mine, which would have left traces of mining and structures, therefore only dates back to 1959 on Brits. It would appear that there may be an earlier date for farming activities on Bonza". Elements of the cultural landscape that may be impacted by the proposed development include the sense of place of the historic core of Postmasburg as well as the mining and farming heritage of the area.

Due to mining activities in the area, a number of heritage impact assessments have been completed in close proximity to the development area and these are relevant here (Figure 2 and Appendix 2). The well known Taung site that preserved early hominid remains is located only some 50 kilometres to the west of the site under investigation. Wonderwerk cave near Kuruman also retains evidence of early peoples in its 6 metre midden deposit, especially in the rear portions of the cave. Towards the front rock-art from later Stone Age peoples are also preserved. Furthermore the engraving sites Wildebeestkuil, Driekopseiland and Nooitgedacht near Kimberly confirm a continued presence of Later Stone Age peoples in the general region. It is very likely that significant archaeological heritage may be impacted by the proposed development.

According to the SAHRIS Palaeosensitivity Map, the area proposed for development is predominantly underlain by sediments of moderate, very high and high palaeontological sensitivity (Figure 4.1). According to the Extract from the CGS 2822 Postmasburg Map, the development area is underlain by sediments of the Ongeluk Formation, Danielskuil Member and Kuruman Member of the Asbesberge Formation, the Lime Acres Member of the Ghaap Plateau as well as Surface Limestone Quaternary Sands.

In an assessment completed for a proposed powerline that traverses the same geological formations, Almond (2015, SAHRIS ID 344620) concluded that “On the basis of both desktop analysis and fieldwork within the broader power line study area (Almond 2013a, 2014) the palaeontological sensitivity of all power line corridors under consideration is assessed as low. This also applies to the area to the north of Lime Acres where stromatolites occur within the underlying bedrock but are rarely well-exposed at surface and are therefore unlikely to be significantly impacted by the proposed transmission lines. The Makganyene Formation outcrop area in the north-western corner of the Remainder of the Farm Nr 469, close to the R385 tar road, is of considerable scientific interest as an accessible part of the limited rock record for an Early Proterozoic (c. 2.3 billion years-old) “snowball earth” glacial event, when ice sheets may have covered much of the planet. However, fossil stromatolites do not occur within the succession here and significant palaeontological impacts are therefore not anticipated. Potential impacts on local palaeontological heritage are assessed for all power line corridor options as being of low negative significance.” It is likely that similar palaeontological sensitivities exist for the proposed development area and as such, it is recommended that potential impacts to palaeontological heritage are assessed.

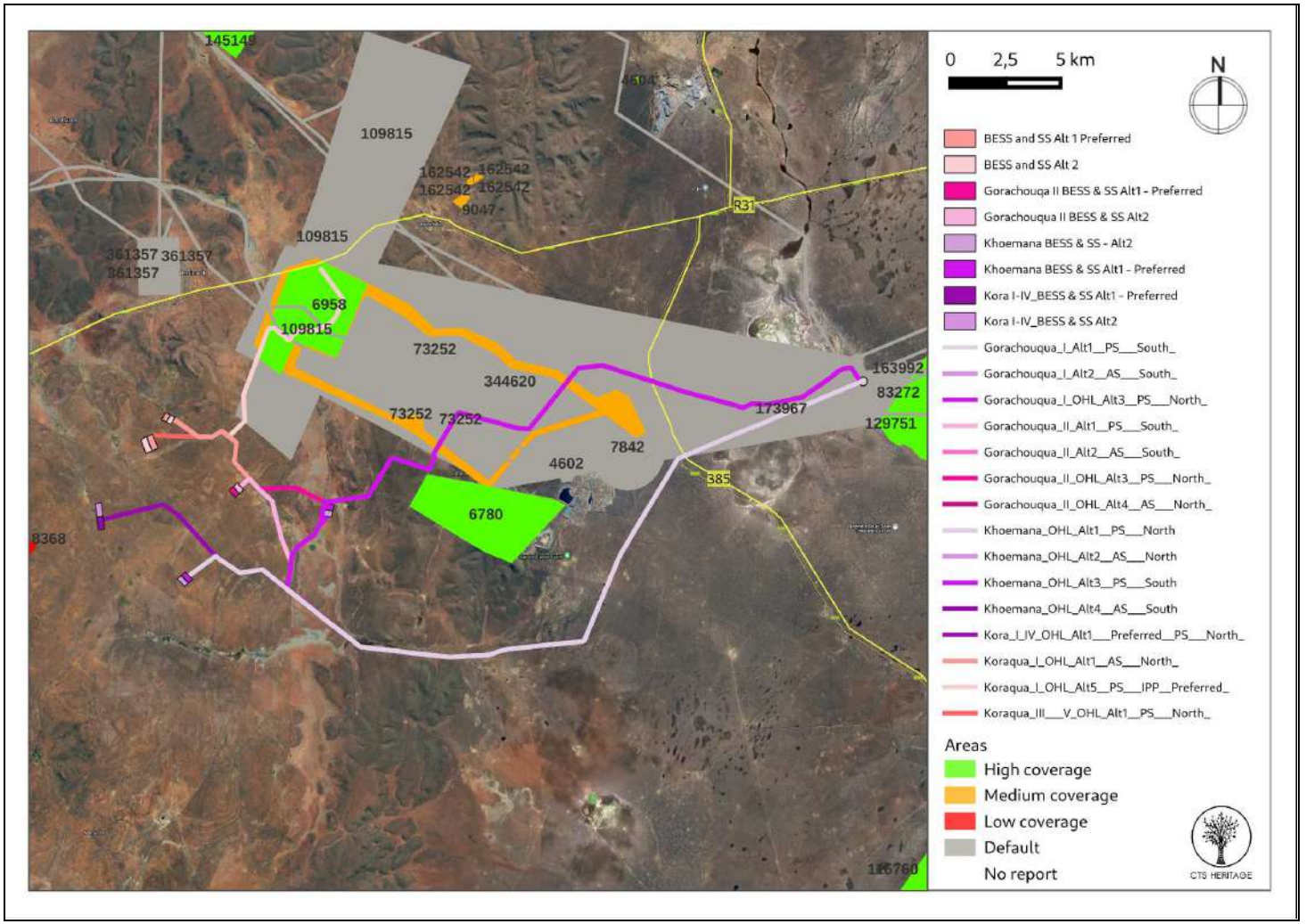

Figure 2. Spatialisation of heritage assessments conducted in proximity to the proposed development

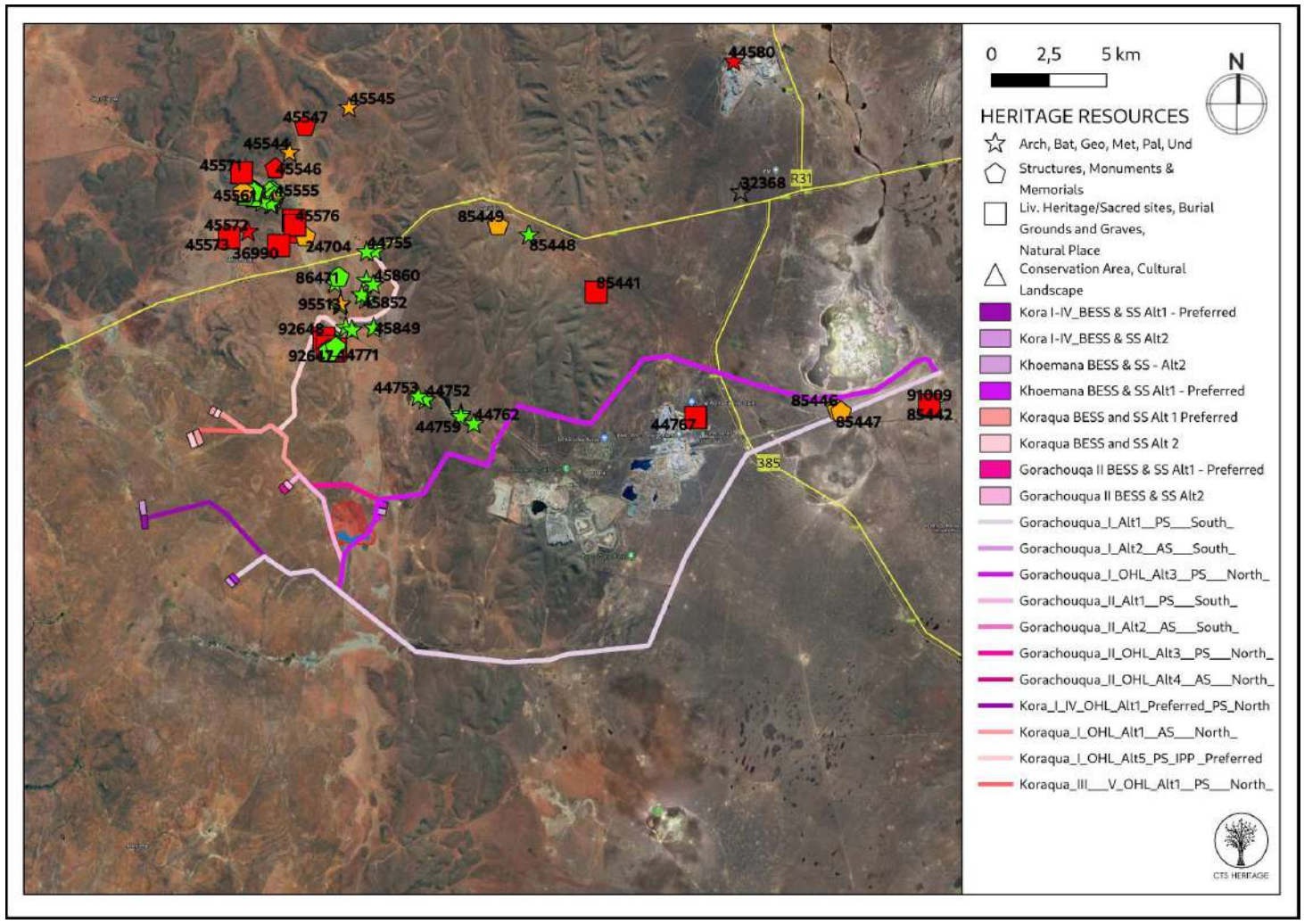

Figure 3: Spatialisation of heritage resources known in proximity to the proposed development

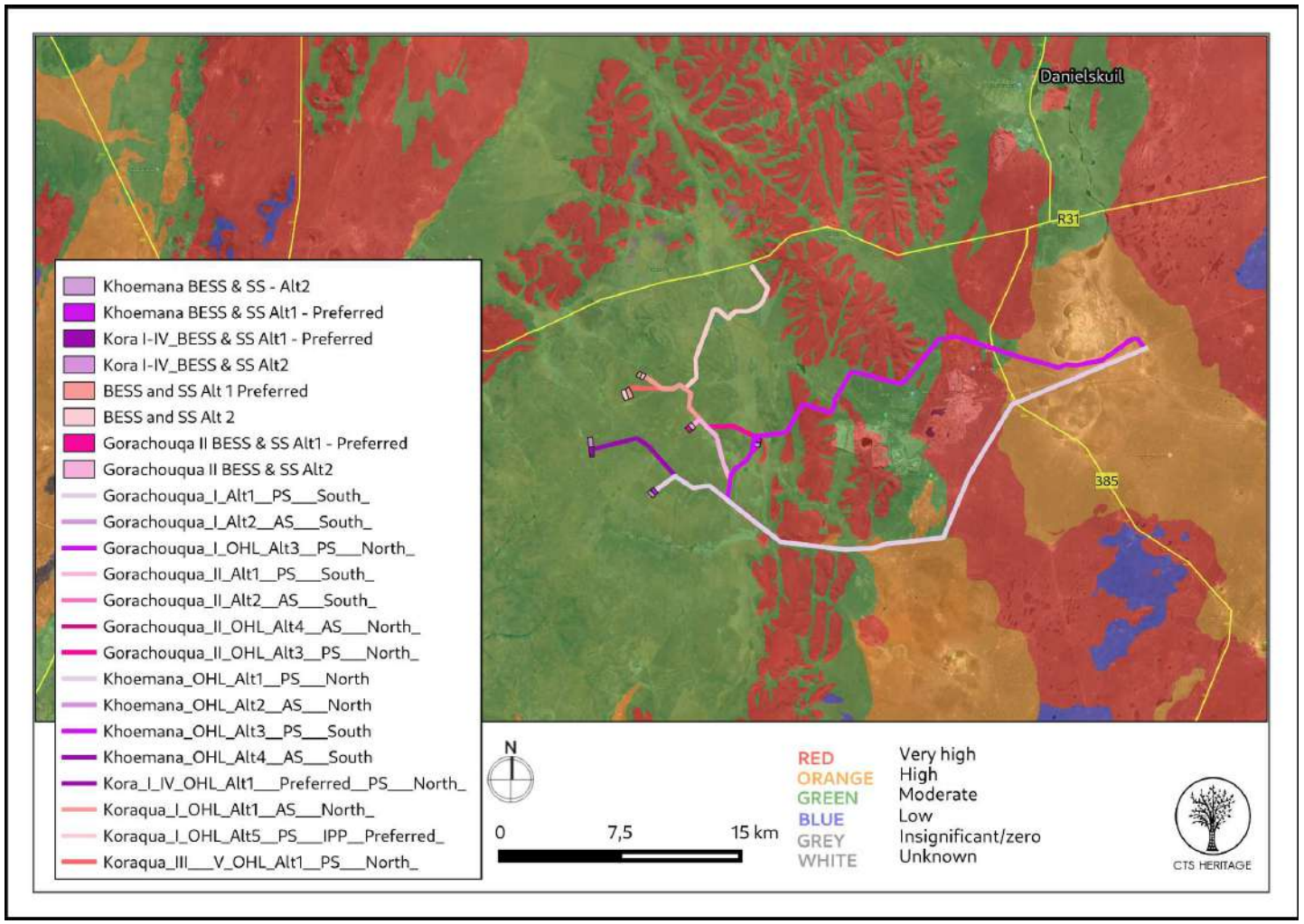

Figure 4.1: Palaeontological sensitivity of the proposed development area

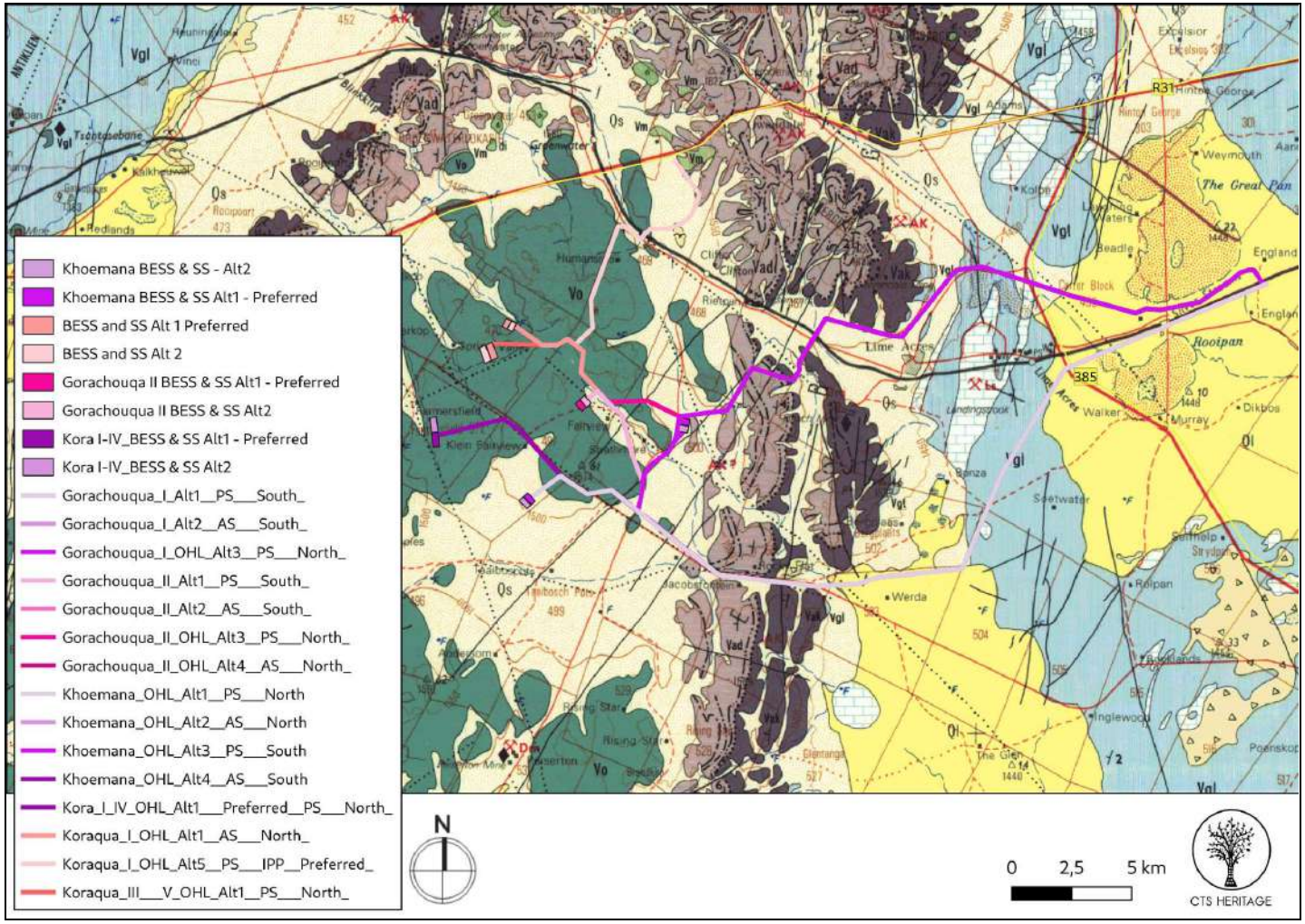

Figure 4.2. Geology Map. Extract from the CGS 2822 Postmasburg Map indicating that the development area is underlain by sediments of the Vo: Ongeluk Formation, Vad: Danielskuil Member and Vak: Kuruman Member of the Asbesberge Formation, Vgl: Lime Acres Member of the Ghaap Plateau, Ql: Surface Limestone and Qs: Quaternary Sands

Table 2: Explanation of symbols for the geological map and approximate ages

Symbol	Group/Formation	Lithology	Approximate Age
Qs	Quaternary sands	Alluvium, sand, aeolian sand	Neogene, ca 2.5 Ma to present
Ql	Quaternary limestones	Dolerite dykes, intrusive	Tertiary-Quaternary,
Vo	Ongeluk Fm, Postmasburg Group, Transvaal SG	Andesitic lava, amygdaloidal lava	2222 Ma
Vad	Danielskuil Fm, Asbestos Hills Group Subgroup, Ghaap Group, Transvaal SG	Banded ironstone	2460 – 2440 Ma
Vak	Kuruman Fm, Asbestos Hills Group Subgroup, Ghaap Group, Transvaal SG	Banded ironstone	2460 – 2440 Ma
Vgl	Lime Acres Mb, Kogelbeen Fm, Cambell Rand Subgroup, Ghaap Group, Transvaal SG.	Dolomite, limestone	>2521 Ma

4. IDENTIFICATION OF HERITAGE RESOURCES

4.1 Archaeology Heritage Resources

The area lies on one of the routes connecting Danielskuil and Kuruman to Griquatown further south. The owner (Mr Johan Lamprecht) at Strathmore farm pointed out at least 12 unmarked graves marked by piled stones along the edge of an historic irrigation furrow. He was informed that these were Griqua graves and a subsequent investigation at the Cape Archives supports this as the London Missionary Society was active in the area in the second half of the 19th century where a number of farming projects were undertaken. A further 10 possible unmarked graves were found by another specialist just 1.2km to the east of these graves on the same farm on the eastern side of the Griekwastad road. The original farmhouse complex, now abandoned and ruined, has two stone kraals and a series of historical engravings on the small koppie overlooking the homestead. One of the names engraved could be "Dennis Hinds" and some references were found linking the Hinds family in the Northern Cape to the LMS[1]. Unfortunately no dates were made with any of the engraved names but the handwriting style and emphasis on abbreviations led us to interpret these as being at least 100 years old or more.

Other graves of significance included the Lamprechts formal graveyard with at least 7 formal, marked graves, 3 marked graves of resident farm staff, the Roberts grave at the ruined Strathmore farmstead and another two small formal graveyards at Spring Valley and Farmersfield respectively. The farms are very large in the area and are separated by large tracts of land dedicated to cattle and sheep grazing and rearing wild antelope. Most of the buildings found at each homestead were relatively modern but some historical fabric remained at Spring Valley along with ruins recorded at Sunnyside and Strathmore.

The Stone Age archaeological record is widely dispersed across the entire study area and predominantly dates to the Middle Stone Age occupation of the area. However, sufficient numbers of observations were made of Later Stone Age material to conclude that the material clusters around the non-perennial streams criss-crossing the farms. No major rivers are found nearby and the Klein Riet River is at least 40km east. This doesn't appear to have significantly constrained the prehistoric inhabitants of the study area and it is possible that pans and other sources of water were readily used. As would be expected in this area, various grades of hornfels were used to make most of the artefacts observed as well as smaller contributions of CCS and red banded ironstone. Ubiquitous evidence of Levallois manufacture of flakes and blades were found. There is a notable difference in the type of hornfels used in LSA assemblages that could possibly mean these were introduced from elsewhere rather than being sourced locally as was the case for the MSA material. Various points, burins, awls, thumbnail

[1] See https://www.1820settlers.com/genealogy/familychart.php?personID=I55485&familyID=F20042&tree=master

scrapers and small bladelet cores were common within the LSA assemblages.

The majority of the stone age resources are of low density, and in the context of this area of the Northern Cape where much is known about similar archaeological resources, these observations have very limited scientific value and their recording as per Appendix 1 is considered sufficient. These observations have been determined to be not conservation-worthy and as such, are not discussed further here.

Additional heritage resources identified in the broader study area include farm werfs and farm houses, remnant railway infrastructure, some rock art and historical graffiti as well as a number of burial grounds and graves. The significant heritage resources identified within the study area are detailed in Table 3 below.

Table 3: Heritage Resources identified during the field assessment and on SAHRIS for the Grid Infrastructure

Obs #	Description	Period	Density	Co-Ordinates		Grading	Mitigation
023	Open site along stream bed with msa and LSA material. Hornfels, high grade, unifacially retouch, ccs, siltstone cores and flakes, banded ironstone	LSA, MSA	30+	-28.35176	23.34786	IIIC	NA
024	Sunnyside old farmhouse ruin, only foundation remains, gum, pepper and willow trees, near kraal	Historic	n/a	-28.35084	23.34752	IIIC	NA
114	Older Klein Fairview farmhouse	Historic	n/a	-28.391645	23.310011	IIIC	20m buffer area
161	Older cottage, clay walls exposed, corrugated iron roof	Historic	n/a	-28.442405	23.403209	IIIC	20m buffer area
277	Possible graves near Griekwastad road on the eastern end and on the de Klerk's ground. If these are graves there are about 10 in all	Historic	n/a	-28.395504	23.368983	IIIA	No-go area
053	Lamprechts family graveyard fenced off, in good state. At least 7 graves	Historic		-28.39043	23.35558	IIIA	No-go area
054	Strathmore farm, Lamprechts farmhouse complex. Some older buildings remain but mostly modern	Historic		-28.39168	23.35673	IIIC	No-go area
059	Quartz and hornfels, banded ironstone flakes, points	LSA	10-30	-28.38575	23.36219	IIIC	No-go area
082	Ruined farmhouse, "ou huis"	Historic		-28.3877	23.35775	IIIB	No-go area
083	Stone walled kraal	Historic		-28.38608	23.36116	IIIC	No-go area
084	Stone walled kraal	Historic		-28.38795	23.35951	IIIC	No-go area
155	Griqua graves 12	Historic	n/a	-28.3956	23.35636	IIIA	No-go area
156	Farm staff graves, 3 marked	Historic	n/a	-28.39455	23.35378	IIIA	No-go area
157	Ou Huis grave, Roberts. Piet Modise's father buried here too	Historic	n/a	-28.38684	23.35592	IIIA	No-go area
174	Historical graffiti on various flat rocks on top of outcrop, no dates, just initials and names and some "I love you's"	Historic	n/a	-28.384464	23.361162	IIIA	No go area

SAHRIS #	Description	Period	Density	Co-Ordinates		Grading	Mitigation
44751	Humansrus 01. 3 MSA retouched pieces.	MSA	0-10	28° 20′ 53.7″ S	23° 24′ 37.1988″ E	IIIC	NA
44759	Humansrus 09 Artificial mound of stone. It may be a grave?	Historic	n/a	28° 19′ 24.3012″ S	23° 21′ 7.4016″ E	IIIC	No impact anticipated
85446	Silverstreams railway station. The dilapidated remains of the old Silverstreams Railway Station with its associated structures and infrastructure were identified at this location. The structures include the old station building and the platform, several storerooms and workshops and a few houses for the railway employees.	Historic	n/a	28° 20′ 47.6988″ S	23° 34′ 40.1016″ E	IIIB	20m buffer area
85447	Redstone Solar Thermal Power Project to Olien MTS Heritage Report 009. The dilapidated remains of an old farmstead.	Historic	n/a	28° 20′ 50.7984″ S,	23° 34′ 45.8004″ E	IIIB	20m buffer area
44754	Redstone Solar Thermal Power Project to Olien MTS Heritage Report 009. The dilapidated remains of an old farmstead.	Historic	n/a	28° 20′ 50.7984″ S,	23° 34′ 45.8004″ E	IIIB	20m buffer area
44755	Humansrus 04 - MSA Core	MSA	0-10	28° 17′ 5.3016″ S	23° 22′ 19.4016″ E	IIIC	NA
45848	Humansrus 05 - ESA Handaxe	ESA	0-10	28° 17′ 6″ S	23° 22′ 6.0996″ E	IIIC	NA
86471	Humansrus 02 - Two large ESA Handaxes	ESA	0-10	28° 17′ 50.6004″ S	23° 21′ 15.3″ E	IIIC	NA
	Groenwater 001 - Jasper Mine	Historic	n/a	28° 17′ 41.6004″ S	23° 21′ 21.4992″ E	IIIC	20m buffer area

4.3 Palaeontology Heritage Resources

The grid connection area is located on non-fossiliferous lavas of the Ongeluk Formation and on moderately fossiliferous (green) Quaternary sands and aeolian sands. These materials do not preserve fossils because the form aerobic environments that not conducive to preservation. In addition, windblown (aeolian) sand cannot transport fossils that are large enough to see or to be recognisable. These sands, however, may cover palaeo-pans of palaeo-spring, such features that would be visible in the satellite imagery. No such feature is visible in the project footprint.

The two routes for the OHLs to the east are partly on rocks of the Lime Acres Member (Kogelbeen Formation, Campbell Rand Subgroup). Formations in this subgroup preserve a variety of stromatolites, laminites and microbial mats (Eriksson et al., 2006). Stromatolites are the trace fossils that were formed by colonies of green algae and blue-green algae (Cyanobacteria) that grew in warm, shallow marine settings. These algae were responsible for releasing oxygen via the photosynthetic process where atmospheric carbon dioxide and water, using energy from the sun, are converted into carbon chains and compounds that are the building blocks of all living organisms. The released carbon dioxide initially was taken up by the abundant reducing minerals to form oxides, e.g. iron oxide. Eventually free oxygen was released into the atmosphere and some was converted into ozone by the bombardment of cosmic rays. The ozone is critical for the filtering out of harmful ultraviolet rays.

Stromatolites are the layers upon layers of inorganic materials that were deposited during photosynthesis, namely calcium carbonate, magnesium carbonate, calcium sulphate and magnesium sulphate. These layers can be in the form of flat layers, domes or columns depending on the environment where they grew (Beukes, 1987). Some environments did not form stromatolites, just layers of limestone that later was converted to dolomite. The algae that formed the stromatolites are very rarely preserved, and they are microscopic so they can only be seen from thin sections studies under a petrographic microscope.

Laminites and microbial mats are also trace fossils formed by photosynthesising microbes. They have been variously called Microbialites (sensu Burne and Moore, 1987), or Microbially induced sedimentary structures “MISS” (sensu Noffke et al., 2001) and possibly having a non-biotic origin (Davies et al., 2016). These features are very subtle and hard to recognise.

4.4 Mapping and spatialisation of heritage resources

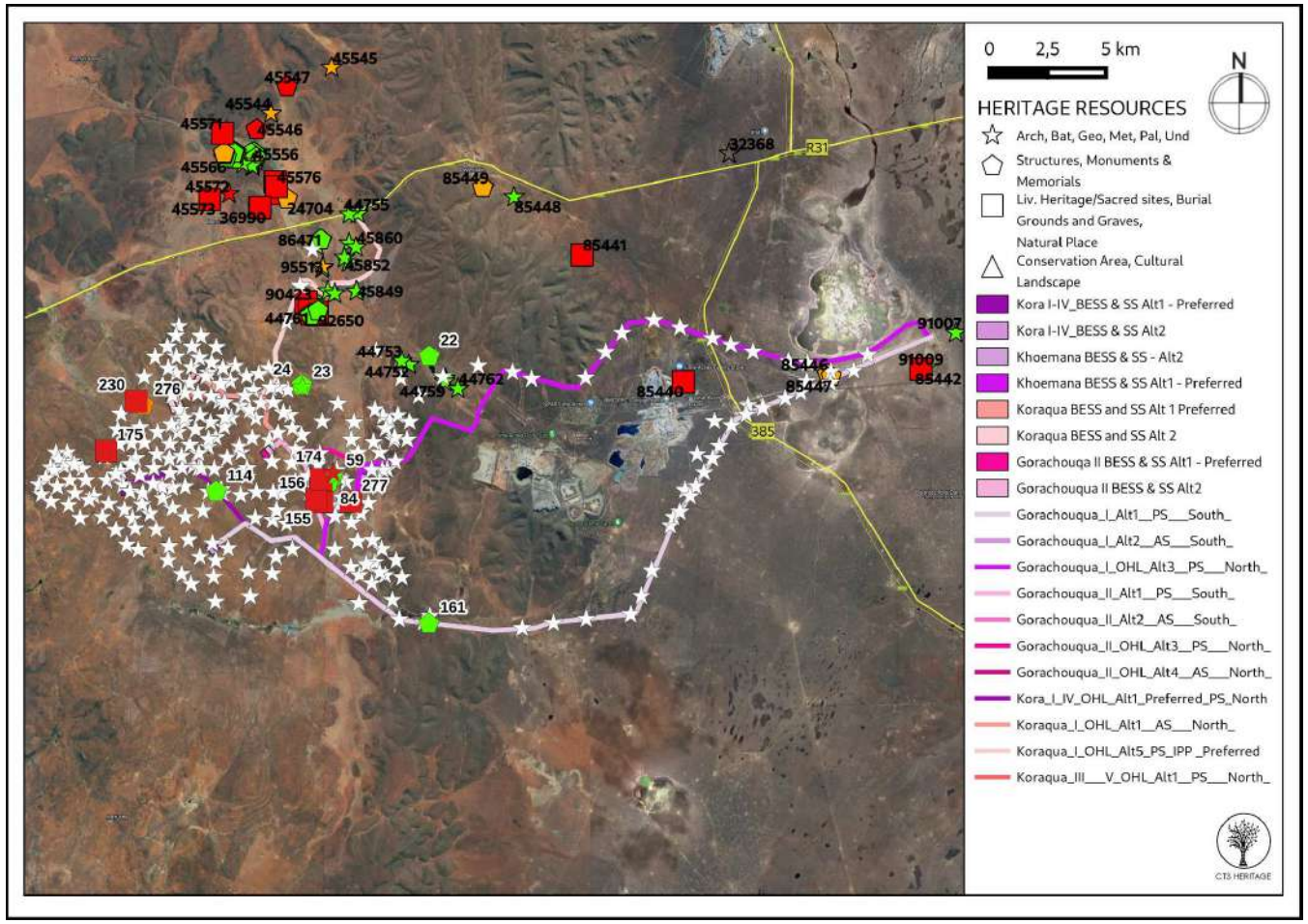

Figure 5.1: All archaeological and built environment heritage observations located within the Gorachouqua Project Site broader area (see Appendix 1)

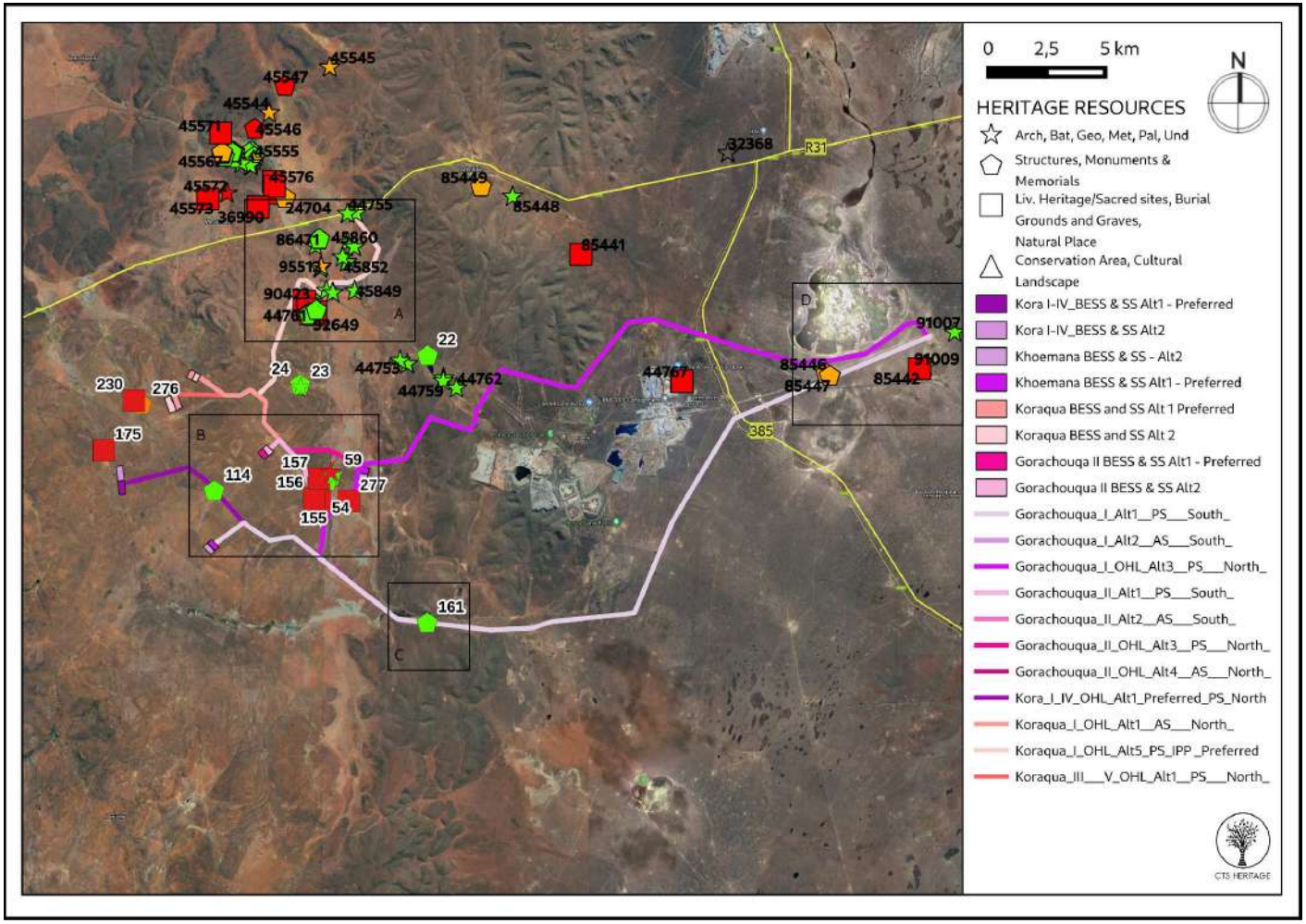

Figure 5.2: Significant archaeological and built environment heritage observations located within the grid connection areas

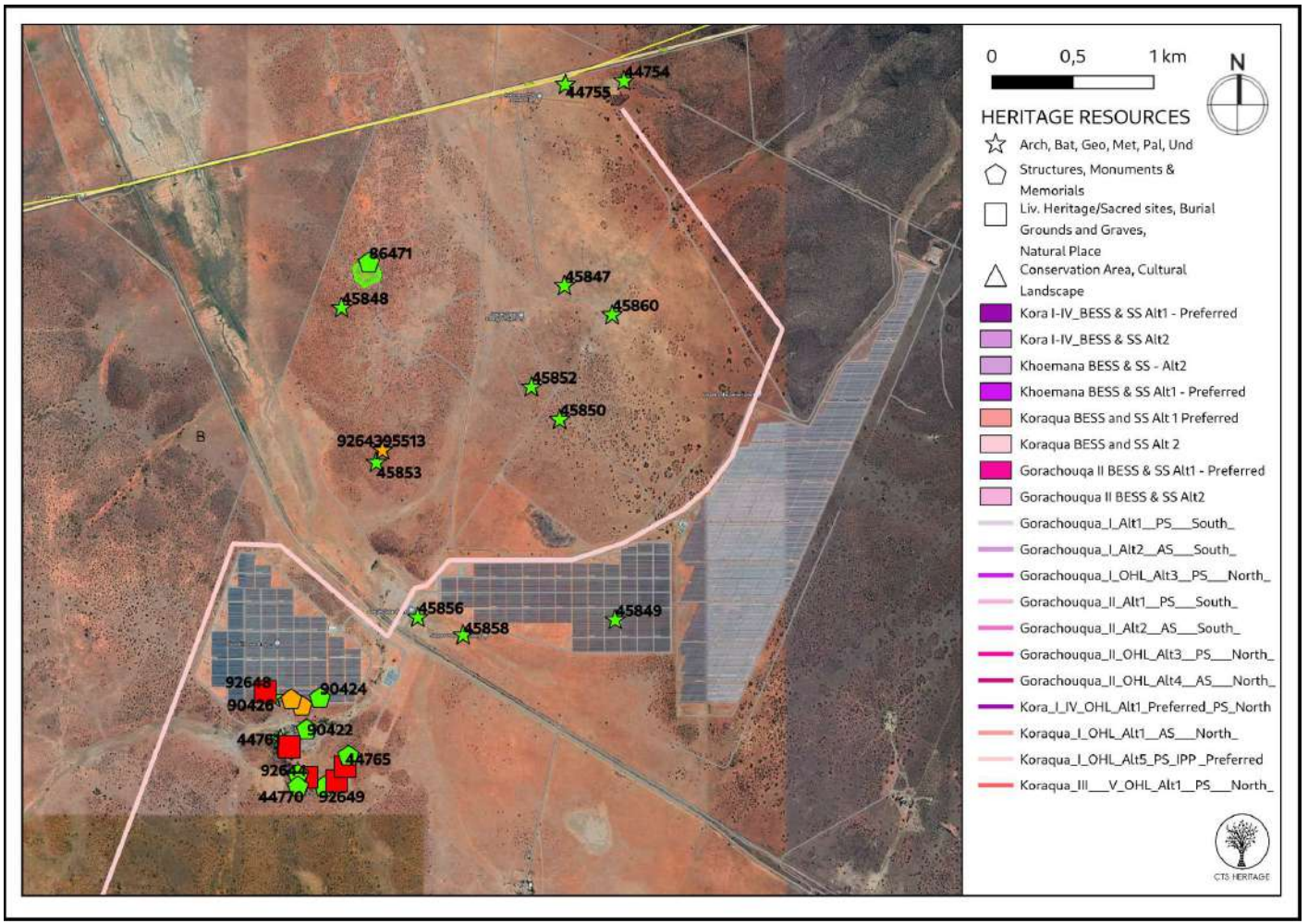

Figure 5.3: Inset A

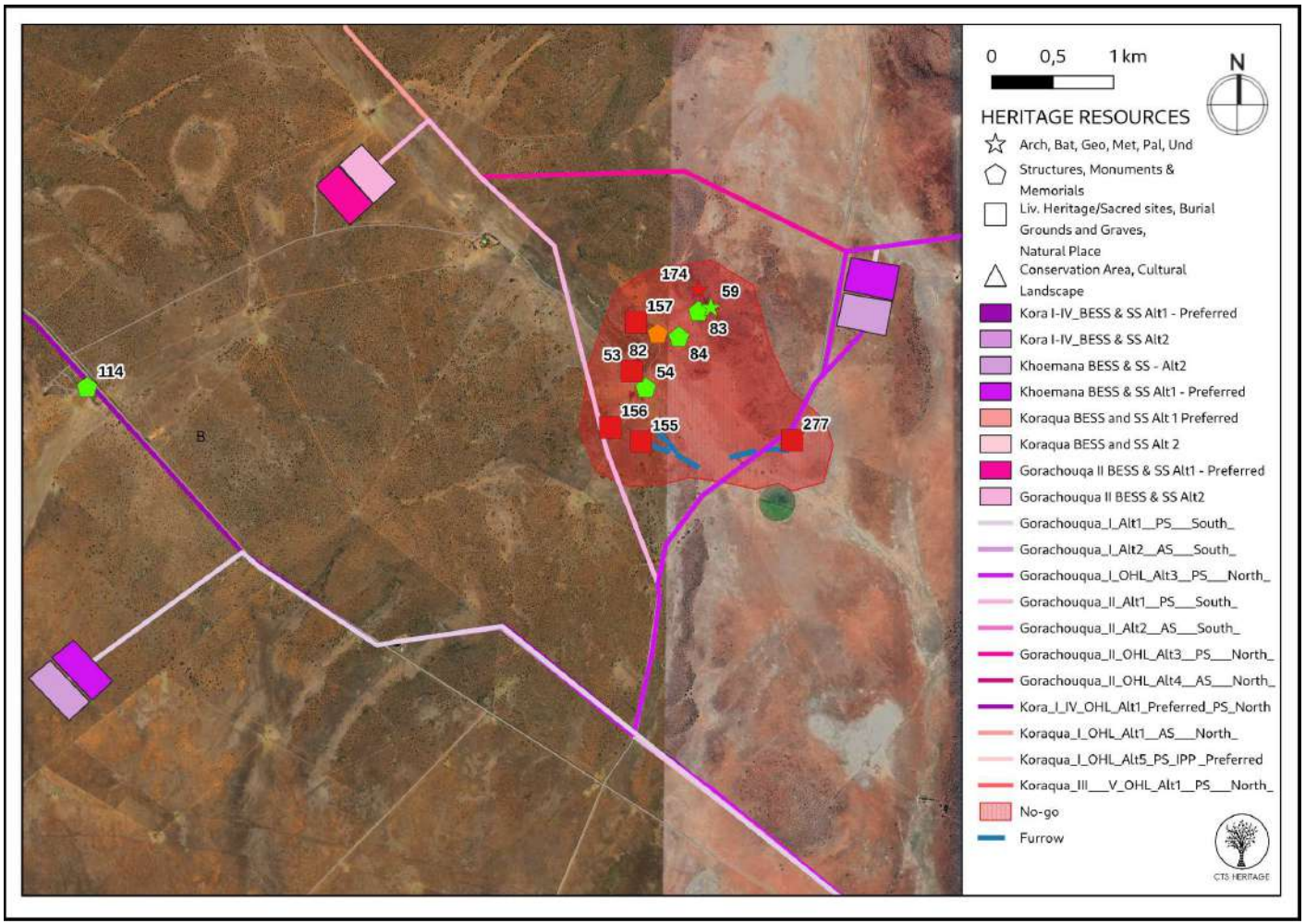

Figure 5.4: Inset B

Figure 5.5: Inset C

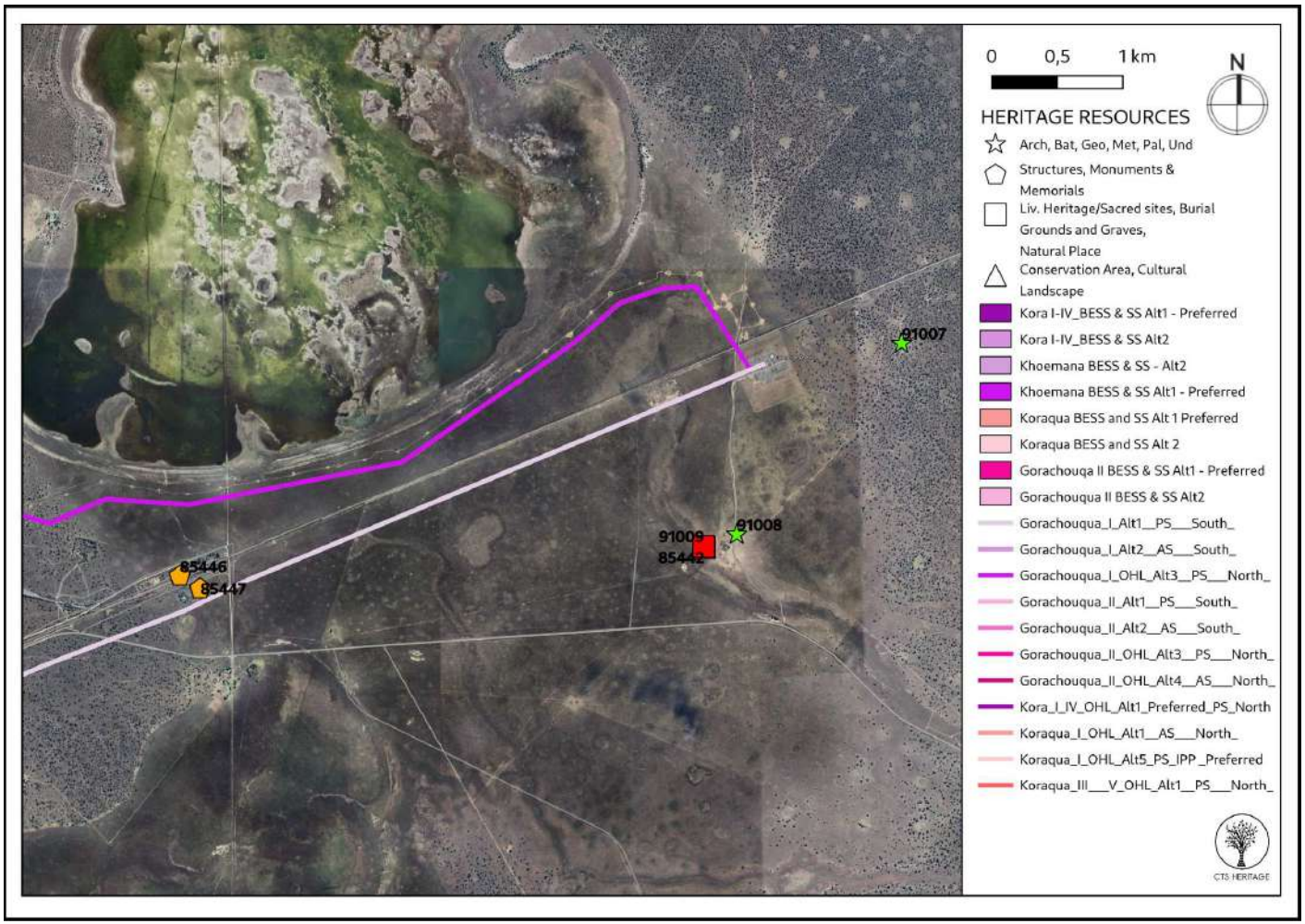

Figure 5.6: Inset D

5. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT

5.1 Assessment of impact to Heritage Resources

Palaeontology

Based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the powerline route or Energy Cluster footprint. The geological structures suggest that the rocks are the correct age and type to preserve fossils. The site visit and walk-through confirmed that there were NO FOSSILS in the project footprint. Furthermore, the material to be excavated for foundations is soils and sands and these do not preserve fossils. Since there is an extremely small chance that fossils from the Lime Acres Formation below ground may be disturbed a Fossil Chance Find Protocol has been added to this report. Taking account of the defined criteria, the potential impact to fossil heritage resources is extremely low.

Table 4.1: Impacts of the proposed development to palaeontological heritage resources

Impact	Significance	Spatial scale	Temporal scale	Probability	Rating
Before Mitigation	MODERATE	*Study area*	*Permanent*	*Could Happen*	Low Negative
	3	***2***	**5**	**3**	**2**
After Mitigation	MODERATE	*Study area*	*Permanent*	*Practically Impossible*	Very Low Negative
	3	***2***	**5**	**1**	**0.6**

Mitigation includes the implementation of the Fossil Chance Finds Procedure attached as Appendix 5.

Archaeology and Built Environment Heritage

The heritage field assessment identified a number of heritage resources located within the areas proposed for development. The majority of these heritage resources were determined to be not conservation-worthy and as such, no further mitigation for impacts to these heritage observations is recommended.

A number of heritage resources of significance were, however, identified. These resources range from significant archaeological sites and scatters, to burial grounds and graves as well as historic farm werfs and infrastructure such as the irrigation furrows ascribed to the work of the London Missionary Society and the local Griekwa population. The relationship between the furrows, the farm werfs and the burials form a unique and layered

cultural landscape that speaks to the unique past of this area and its Griekwa inhabitants. It is important that the spatial relationship of these resources is not disrupted by the proposed development.

Grid Connections

There are a number of significant heritage resources located in close proximity to the Northern Grid Alignment, most of which are oriented around Strathmore Farm (Site No. 54) and the ruined farm werf (Site No. 82). The identified heritage resources located in close proximity to the Strathmore Farm, the irrigation furrows and the ruined farm werf include a number of burial ground or graves (Site No. 53, 155, 156, 157 and 277), stone kraals (Site No. 83 and 84) and archaeological sites (Site No. 59 and 174). Site 277, a grave, is located less than 100m from the proposed grid connection, but is located on the far side of the road from the proposed grid alignment. The combination of these heritage resources in close proximity to each other form a unique cultural landscape that altogether have high levels of local cultural value (Grade IIIA).

The northern grid alignment crosses through this cultural landscape along the track of an existing road. This has the potential to disrupt the historic integrity of the landscape. As the proposed northern grid alignment follows an existing road alignment, this disruption will be kept at a minimum.

After the initial round of fieldwork was completed for this project, the client revised the layout of the southern gridline route to accommodate PPC Lime's future mining areas. The specialists went back into the field to assess the amended gridline routing.

An older clay cottage (Site No. 161) is located along the southern grid connection. This site is located along an existing road and within a proposed grid alignment. While no direct impact from the proposed development is anticipated, it is important that no pylons are placed within 20m of the structure and as such, a 20m no development buffer is recommended around this site.

Other heritage resources identified as part of previous HIA processes are known in close proximity to the grid alignments. These are mapped in Figure 3 and 5.3, and include a number of archaeological sites graded IIIC. These archaeological resources are located more than 100m from the proposed grid alignment and as such, no impact is anticipated (Map 5.3). Furthermore, SAHRIS Site 44751 describes an observation of 3 MSA artefacts which have been sufficiently recorded and as such, no mitigation is required for impacts to this resource. Structures

85446 and 85447 graded IIIB are located more than 100m from the proposed south grid alignment and as such, no impact is anticipated (Map 5.6).

Table 4.2: Impacts of the proposed development to archaeological and built environment heritage resources

Impact	Significance	Spatial scale	Temporal scale	Probability	Rating
Before Mitigation	HIGH	*Local*	*Permanent*	*Very Likely*	High Negative
	4	***3***	**5**	**4**	**3.2**
After Mitigation	HIGH	*Local*	*Permanent*	*Unlikely*	Low Negative
	4	**3**	**5**	**2**	**1.6**

Mitigation includes

- The northern grid alignment must remain along the existing road alignment as proposed to ensure no impact to Site 277 (Map 7.2)
- The no development area identified in Figure 7.2 must be respected
- A 20m no development buffer around Site 141 and 161 (Maps 7.1 and 7.3)

5.2 Sustainable Social and Economic Benefit

Socio-economic Benefits of the renewable energy developments that will be supported by this grid connection infrastructure include the following:

- The project assists to diversify the economy and electricity generation mix of South Africa through the addition of solar/wind energy.
- The renewable energy development will contribute to achieving goals for implementation of renewable energy, as indicated in the IRP, and supports a 'green' economy within South Africa.
- The project contributes towards the Provincial and Local goals for the development of renewable energy as outlined in the respective IDPs (to be verified with what the IDPs state).
- The project will result in important economic benefits at the local and regional scale through job creation, income, and other associated economic development. These will continue during all phases (i.e. pre-construction, construction, operation, and decommissioning) of the project.

Furthermore, the project is likely to create ~20 - 40 employment opportunities during construction. These employment opportunities will be temporary and will use local labour where possible. Employment opportunities

generated during the construction phase will include low skilled, semi-skilled, and skilled opportunities as may be necessary.

Based on the available information, the sustainable socio-economic benefits to be derived from the project outweigh the anticipated impacts to heritage resources on condition that the recommendations articulated below are implemented.

5.3 Proposed development alternatives

Gorachouqua and Kora Grid Alignment North

This alignment is not preferred from a heritage perspective due to its route through the proposed no-go area identified around Strathmore Farm (Site No. 54), the ruined farm werf (Site No. 82), the irrigation furrows and graves (Site No. 53, 155, 156, 157 and 277), stone kraals (Site No. 83 and 84) and archaeological sites (Site No. 59 and 174).

Gorachouqua and Kora Grid Alignment South

This alignment is preferred from a heritage perspective as no impact to significant heritage resources is anticipated from this alignment.

Koraqua Grid Connections

With regard to the Koraqua Grid Connections, there is no preferred alternative for the proposed grid alignment. No impact to heritage resources is anticipated from either the northern alternative, the middle alternative or the southern alternative alignment.

5.4 Cumulative Impacts

The cumulative impact of a development is the impact that development will have when its impact is added to the incremental impacts of other past, present or reasonably foreseeable future activities that will affect the same environment. It is important to note that the cumulative impact assessment for a particular project, like what is being done here, is not the same as an assessment of the impact of all surrounding projects. The cumulative assessment for this project is an assessment only of the impacts associated with this project, but seen in the context of all surrounding impacts. It is concerned with this project's contribution to the overall impact, within the context of the overall impact. But it is not simply the overall impact itself.

The most important concept related to a cumulative impact is that of an acceptable level of change to an environment. A cumulative impact only becomes relevant when the impact of the proposed development will lead directly to the sum of impacts of all developments causing an acceptable level of change to be exceeded in the surrounding area. If the impact of the development being assessed does not cause that level to be exceeded, then the cumulative impact associated with that development is not significant.

In REDZ areas, there is a reasonable expectation that the cultural landscape of an area will be changed to be dominated, or at least heavily altered, by renewable energy development. In fact, this is the intention of the REDZ areas. This proposed development is located outside of a REDZ area.

In terms of cumulative impacts to heritage resources, impacts to archaeological and palaeontological resources are sufficiently dealt with on a case by case basis. The primary concern from a cumulative impact perspective would be to the cultural landscape. The cultural landscape is defined as the interaction between people and the places that they have occupied and impacted. In some places in South Africa, the cultural landscape can be more than 1 million years old where we find evidence of Early Stone Age archaeology (up to 2 million years old), Middle Stone Age archaeology (up to 200 000 years old), Later Stone Age archaeology (up to 20 000 years old), evidence of indigenous herder populations (up to 2000 years old) as well as evidence of colonial frontier settlement (up to 300 years old) and more recent agricultural layers.

Modern interventions into such landscapes, such as renewable energy development, constitute an additional layer onto the cultural landscape which must be acceptable in REDZ areas. The primary risk in terms of negative impact to the cultural landscape resulting from renewable energy development lies in the eradication of older layers that make up the cultural landscape. There are various ways that such impact can be mitigated.

In terms of impacts to heritage resources, it is preferred that this kind of infrastructure development is concentrated in one location and is not sprawled across an otherwise rural landscape. The proposed development is therefore unlikely to result in unacceptable risk or loss, nor will the proposed development result in a complete change to the sense of place of the area or result in an unacceptable increase in impact due to its location as one of many renewable energy facilities in this area, and its proximity to the existing Lime Acres Mine. The landscape within which the proposed project areas are located, is not worthy of formal protection as a heritage resource and has the capacity to accommodate such development from a heritage perspective.

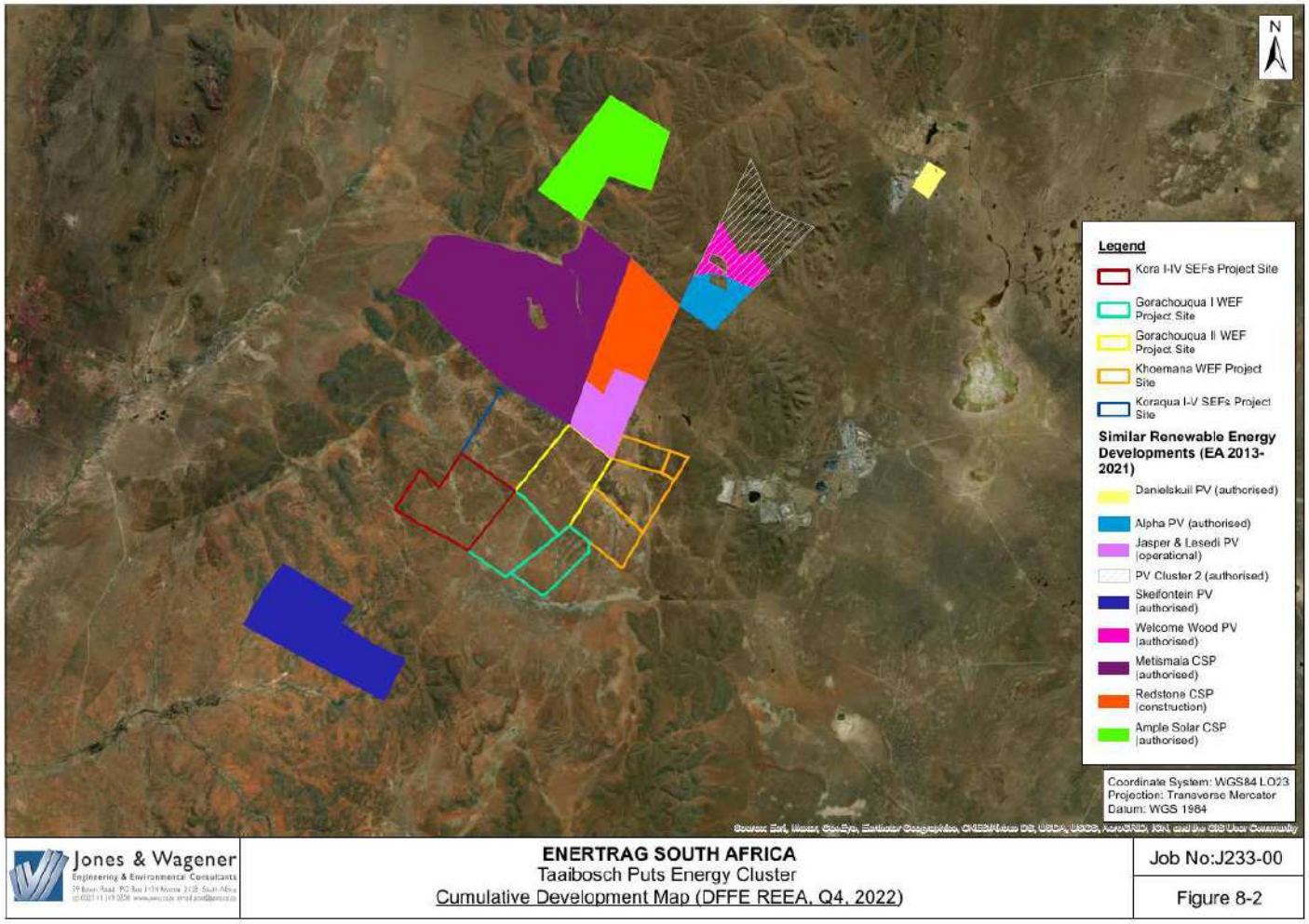

Figure 6: Authorised REF projects within 20km of the proposed development area

6. RESULTS OF PUBLIC CONSULTATION

The public consultation process will be undertaken by the EAP during the EIA. No heritage-related comments have been received to-date. SAHRA is required to comment on this HIA and make recommendations prior to the granting of the Environmental Authorisation.

7. CONCLUSION

As was anticipated, the archaeological field assessment revealed a great many heritage resources evident within the broader development area - 277 in total. The vast majority of these resources, consisting of individual artefacts and low density artefact scatters ascribed to the Middle and Later Stone Age as well as rural infrastructure such as wind mills, have been determined to be not conservation-worthy. No further mitigation for impacts to these heritage observations is recommended.

A number of heritage resources of significance were, however, identified. These resources range from significant archaeological sites and scatters, to burial grounds and graves as well as historic farm werfs and infrastructure such as the irrigation furrows ascribed to the work of the London Missionary Society and the local Griekwa population. The relationship between the furrows, the farm werfs and the burials form a unique and layered cultural landscape that speaks to the unique past of this area and its Griekwa inhabitants. While no direct impact is anticipated, it is important that the spatial relationship of these resources is not disrupted by the proposed development. Various mitigation measures are proposed in Table 3 above and in the recommendations below in order to mitigate these impacts.

Based on the fossil record but confirmed by the site visit and walk through there are NO FOSSILS such as stromatolites in the Lime Acres Formation (Campbell Rand Group, Ghaap Plateau, Transvaal Supergroup even though fossils have been recorded from rocks of a similar age and type in South Africa. It is extremely unlikely that any fossils would be preserved in the overlying soils and sands of the Quaternary. There is a very small chance that fossils may occur in below the ground surface in the dolomites so a Fossil Chance Find Protocol should be added to the EMPr. If fossils are found by the environmental officer, or other responsible person once excavations and drilling have commenced, then they should be rescued and a palaeontologist called to assess and collect a representative sample.

8. RECOMMENDATIONS

There is no objection to the proposed development from a heritage perspective on condition that the following mitigation measures are implemented:

1. The northern grid alignment must remain along the existing road alignment as proposed to ensure no impact to Site 277 (Map 7.2)
2. The no development area identified in Figure 7.2 must be respected
3. A 20m no development buffer around Site 141 and 161 (Maps 7.1 and 7.3)
4. Should any human remains, burials or burial grounds be uncovered during construction activities, work must cease in the vicinity of the find and the SAHRA Burial Grounds and Graves Unit must be contacted regarding a way forward.
5. Should any archaeological resources be uncovered during construction activities, work must cease in the vicinity of the find and the SAHRA Archaeology, Palaeontology and Meteorites Unit must be contacted regarding a way forward.
6. The attached Chance Fossil Finds Procedure must be implemented for the duration of excavation activities.

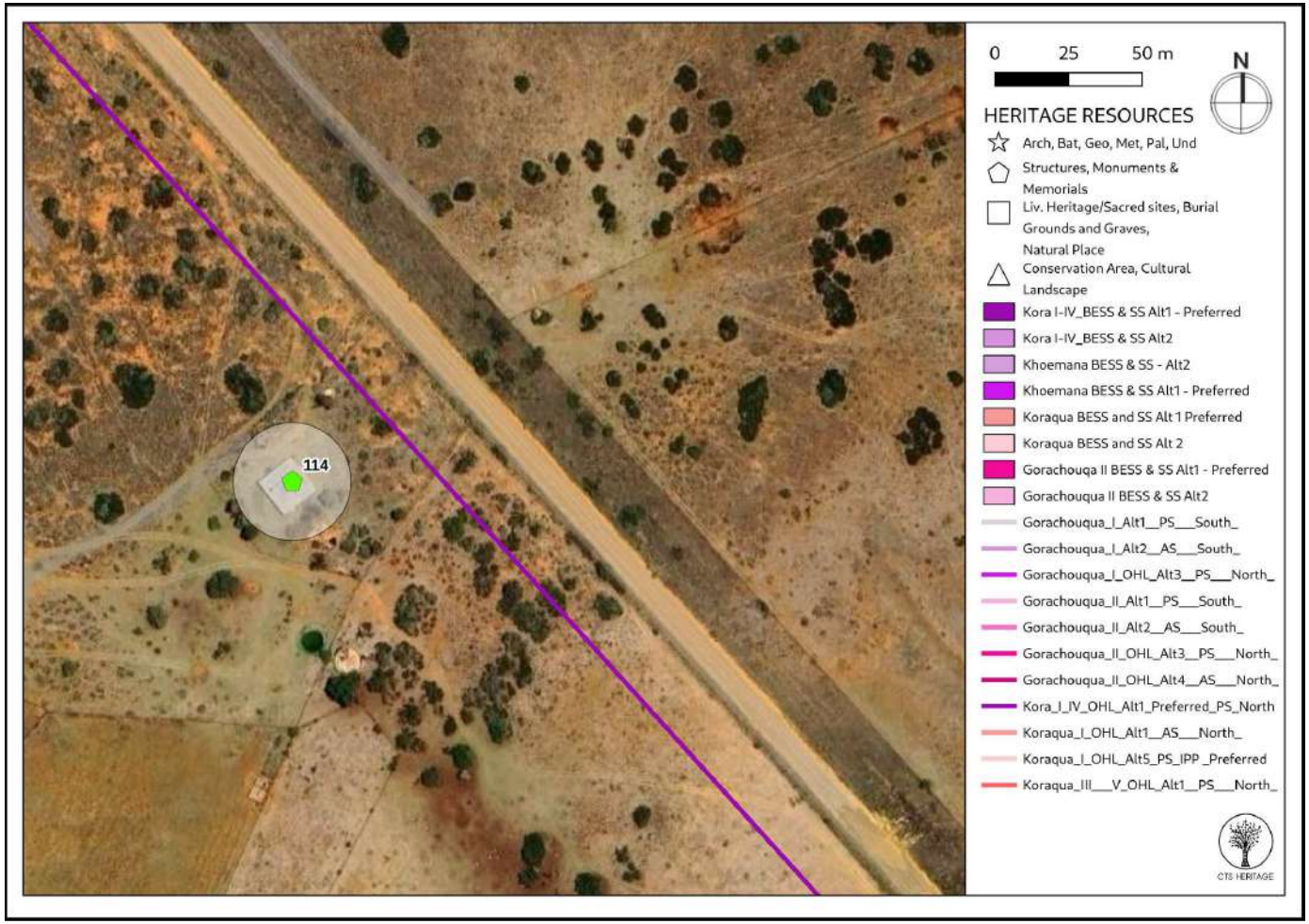

Figure 7.1: Map of significant heritage resources identified during the field assessment, and known sites, relative to the proposed development footprint including recommendations

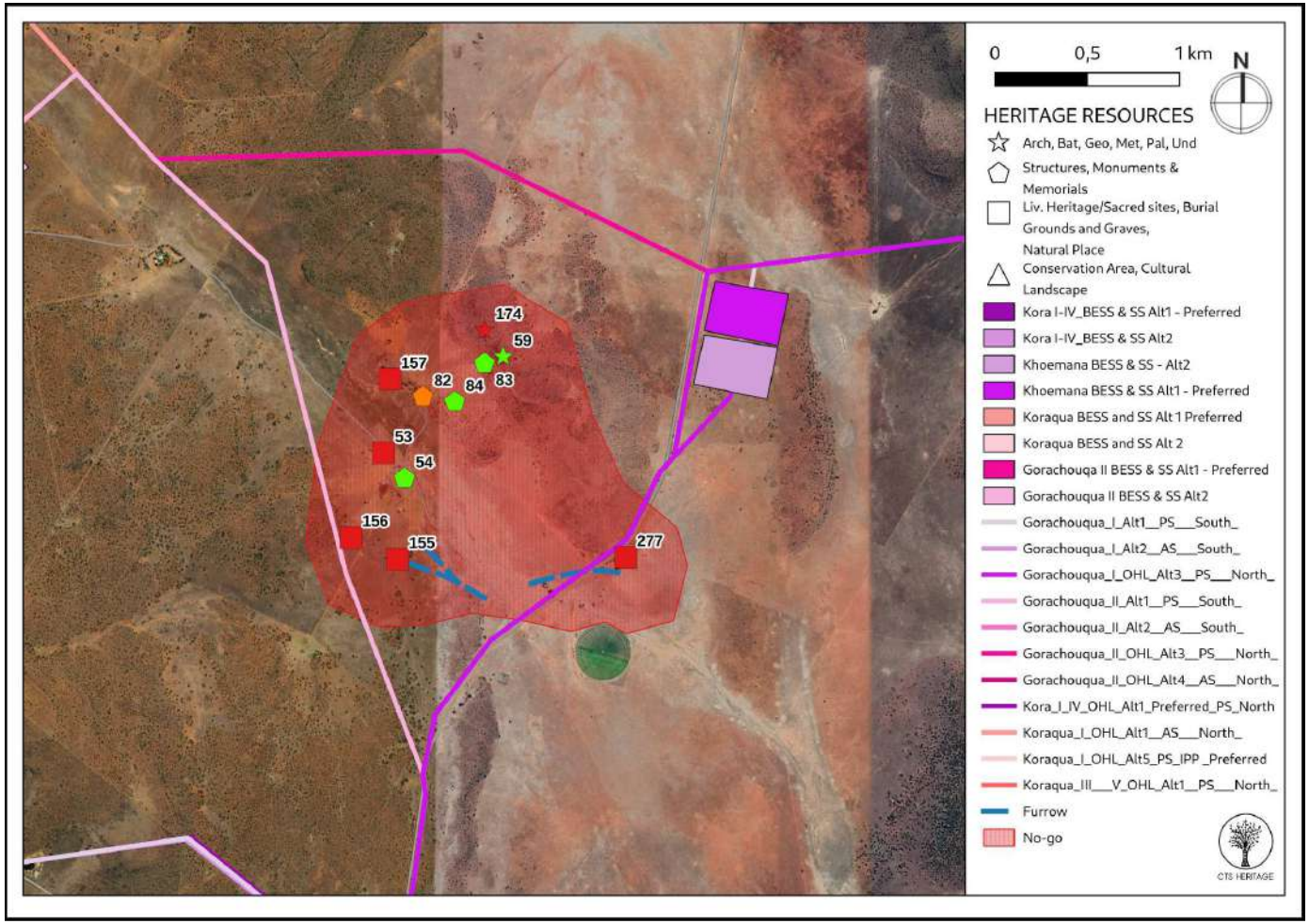

Figure 7.2: Map of significant heritage resources identified during the field assessment, and known sites, relative to the proposed development footprint including recommended no-go area

Figure 7.3: Map of significant heritage resources identified during the field assessment, and known sites, relative to the proposed development footprint including recommended 20m buffer

Figure 7.4: Map of significant heritage resources identified during the field assessment, and known sites, relative to the proposed development footprint including recommended 20m buffer

9. REFERENCES

Heritage Impact Assessments				
Nid	**Report Type**	**Author/s**	**Date**	**Title**
6780	AIA Phase 1	Zoe Henderson	01/09/2005	Cultural Heritage Assessment for Finsch Mine
7842	AIA Phase 1	Cobus Dreyer	19/11/2007	Archaeological and Historical Investigation of the Proposed Mining Activities at the Farm Rosslyn, Lime Acres, Northern Cape
4602	AIA Phase 1	David Morris	01/07/2008	Archaeological and Heritage Impact Assessment on Remainder of Carter Block 458, near Limeacres, Northern Cape
163992		Wouter Fourie	03/12/2013	Proposed Construction of the Limestone 1 - 132kV Power Line and the associated Switchyards on Portion 0 (remaining extent) of the Farm 267, Northern Cape Province
164009	Heritage Impact Assessment Specialist Reports	Wouter Fourie	03/12/2013	Proposed Decommissioning and Construction of the Limestone 2 - 132kV Power Line and the associated Switchyards on Portion 0 (remaining extent) of the Plaas 267 Arriesfontein, Northern Cape Province
6218	AIA Phase 1	Wouter Fourie	27/03/2012	Heritage Impact Assessment: The proposed 10mw Photovoltaic (PV) Power Plant on the Farm Arriesfontein (Farm 267) near Danielskuil, Northern Cape Province
6958	AIA Phase 1	Wouter Fourie	10/06/2011	Humansrus Solar Thermal Energy Power Plant, Postmasburg
8240	AIA Phase 1	David Morris	11/06/2010	Proposed development of PV Power Station at Welcome Wood, near Owendale, Northern Cape
8368	AIA Phase 1	Karen Van Ryneveld	29/06/2005	Cultural Heritage Site Inspection Report for the Purpose of a Prospecting Right EMP - (Portion of) Skeyfontein 536, Postmasburg District, Northern Cape, South Africa
8899	PIA Phase 1	John E Almond	04/05/2011	Recommended exemption from further palaeontological studies: Proposed Humansrus Solar Thermal Energy Power Plant development on Farm 469, near Postmasburg, Northern Cape Province
9047	PIA Phase 1	John E Almond	11/06/2010	Proposed photovoltaic power station adjacent to Welcome Wood Substation, Owendale near Postmasburg, Northern Cape Province
73252	HIA Phase 1	Wouter Fourie	13/09/2012	Heritage Impact Assessment - Proposed Construction of 132kv Power Line and Switchyard Associated with the Redstone Solar Thermal Energy Plant

				in the Northern Cape Province
83272	HIA Phase 1	David Morris	01/08/2012	Archaeological & Cultural Heritage Impact Assessment Phase 1: Proposed Olien Solar Project development on Portion 4 of Farm 300, Barkly West, near Limeacres, Northern Cape
83273	PIA Desktop	Jennifer Botha-Brink	26/06/2012	PALAEONTOLOGICAL IMPACT ASSESSMENT OF THE PROPOSED OLIEN SOLAR PROJECT ON FARM 300, BARKLY WEST, NORTHERN CAPE PROVINCE
109815	HIA Phase 1	Wouter Fourie	22/03/2012	132 kV Power line connection to the Humasrus Solar Thermal Energy Power plant, postmasburg.
114648	PIA Desktop	John E Almond	01/09/2012	Palaeontological specialist assessment: desktop study PROPOSED 16 MTPA EXPANSION OF TRANSNETâ€™S EXISTING MANGANESE ORE EXPORT RAILWAY LINE & ASSOCIATED INFRASTRUCTURE BETWEEN HOTAZEL AND THE PORT OF NGQURA, NORTHERN & EASTERN CAPE. Part 1: Hotazel to Kimberley, Northern Cape
122772	HIA Phase 1	Wouter Fourie	01/09/2011	Heritage Impact Assessment for the Humansrus Solar Thermal Energy Power Plant, Postmasburg
123342	HIA Phase 1	Marko Hutten	01/04/2013	Renewable Energy Generation project on the farm Grootvlei 296, Kgatelopele Local Municipality, Siyanda District Municipality, Northern Cape Province
129751	HIA Phase 1	Elize Becker	20/02/2013	Phase 1 Heritage Impact Assessment Hotazel to Kimberley and De Aar to Port of Ngqura
155262	PIA Desktop	John E Almond	22/12/2013	Palaeontological Heritage Basic Assessment: Desktop Study - Proposed construction of a 132 kV power line and switchyard associated with the Redstone Solar Thermal Energy Plant near Postmasburg, Northern Cape Province
156348	Archaeological Monitoring	Lloyd Rossouw	08/01/2014	Updated report on the Cultural Heritage Impact Assessment for Petra Diamonds Finsch Mine
162535	AIA Phase 1	David Morris	02/03/2012	Archaeological Impact Assessment Phase 1: Proposed development of a PV Power Station at Welcome Wood (extended area), near Owendale, Northern Cape
162542	PIA Desktop	John E Almond	01/02/2012	PALAEONTOLOGICAL IMPACT ASSESSMENT: DESKTOP STUDY Proposed PV power stations Welcome Wood II and III adjacent to Welcome Wood Substation, near DaniÃ«lskuil, Northern Cape Province

173943	Heritage Impact Assessment Specialist Reports	Marko Hutten, John Almond	15/07/2014	Proposed Construction of two 132kV Power Lines and Switchyards to connect the ACWA Power SolarReserve Redstone Solar Thermal Power Plant with the Olien Substation â€“ Option 1: ACWA Power SolarReserve Redstone Solar Thermal Power Plant to Olien Substation, in the ZF Ngcawu District Municipality â€“ Heritage Impact Assessment
173967	Heritage Impact Assessment Specialist Reports	Marko Hutten	15/07/2014	Proposed Construction of two 132kV Power Lines and Switchyards to connect the Redstone Solar Thermal Energy Plant with the Olien Substation in the ZF Ngcawu District Municipality â€“ Heritage Impact Assessment Option 2: Silverstreams substation to Olien Substations
344620	PIA Phase 1	John E Almond	09/11/2015	Palaeontological Heritage Report for the proposed 132 kV power lines between the ACWA Power SolarReserve Redstone Solar Thermal Energy Plant Site and Olien Main Transmission Substation near Lime Acres, Northern Cape Province
361351	AIA Phase 1	Karen Van Ryneveld	20/03/2016	Archaeological Impact Assessment Report
361357	PIA Phase 1	Lloyd Rossouw	03/05/2016	Palaeontological Impact Assessment

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APPENDICES

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APPENDIX 1 Archaeological Impact Assessment 2021

ARCHAEOLOGICAL SPECIALIST STUDY

In terms of Section 38(8) of the NHRA for a

Proposed development of the Taaibosch Puts Renewable Energy Facility Cluster and associated Electrical Grid Infrastructure near Postmasburg, Northern Cape

Prepared by

CTS HERITAGE

In Association with

JAWS

November 2021

Updated June 2022

EXECUTIVE SUMMARY

ENERTRAG South Africa (Pty) Ltd, Reg no. 2017/143710/07 (ESA) has appointed Jones & Wagener (Pty) Ltd Engineering and Environmental Consultants (J&W) to assist with the respective permitting processes, including as relevant a Waste Management License (WML), Air Emissions License (AEL), respective applications for Environmental Authorisation (EA) and Water Use License application/s (WUL) (as required) for the proposed Taaibosch Puts Energy Cluster (collectively comprising the proposed projects). In addition, the applicant will apply as per Section 53 of the Mineral and Petroleum Resources Development Act (No 28 of 2002) for land use contrary to the objectives of the act.

As was anticipated, the archaeological field assessment revealed a great many heritage resources evident within the development area - 277 in total. The vast majority of these resources, consisting of individual artefacts and low density artefact scatters ascribed to the Middle and Later Stone Age as well as rural infrastructure such as wind mills, have been determined to be not conservation-worthy. No further mitigation for impacts to these heritage observations is recommended.

A number of heritage resources of significance were, however, identified. These resources range from significant archaeological sites and scatters, to burial grounds and graves as well as historic farm werfs and infrastructure such as the irrigation furrows ascribed to the work of the London Missionary Society and the local Griekwa population. The relationship between the furrows, the farm werfs and the burials form a unique and layered cultural landscape that speaks to the unique past of this area and its Griekwa inhabitants. It is important that the spatial relationship of these resources is not disrupted by the proposed development. Various mitigation measures are proposed in Table 3 above and in the below recommendations in order to mitigate these impacts.

Recommendations

There is no objection to the proposed development from an archaeological perspective on condition that the following mitigation measures are implemented:

1. The no go area identified in Figure 9.1 must be adhered to. No turbines or associated infrastructure is permitted within this area. This includes Khoemana Turbines 25, 29, 30, 33 and 34
2. A minimum no-go development area of 200m must be implemented around Sites 175, 230 and 276 to ensure the conservation of the broader context of these resources (Figure 9.2)
3. A minimum no-go development area of 20m must be implemented around Sites 114 and 161 to ensure that no impact to these structures takes place (Figure 9.3 and Figure 9.4)
4. The Gorachouqua Turbine 34 must be removed from the layout (Figure 9.3).
5. Should any human remains, burials or burial grounds be uncovered during construction activities, work must cease in the vicinity of the find and the SAHRA Burial Grounds and Graves Unit must be contacted regarding a way forward.
6. Should any archaeological resources be uncovered during construction activities, work must cease in the vicinity of the find and the SAHRA Archaeology, Palaeontology and Meteorites Unit must be contacted regarding a way forward.

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1. INTRODUCTION

1.1 Background Information on Project

ENERTRAG South Africa (Pty) Ltd, Reg no. 2017/143710/07 (ESA) has appointed Jones & Wagener (Pty) Ltd Engineering and Environmental Consultants (J&W) to assist with the respective permitting processes, including as relevant a Waste Management License (WML), Air Emissions License (AEL), respective applications for Environmental Authorisation (EA) and Water Use License application/s (WUL) (as required) for the proposed Taaibosch Puts Energy Cluster (collectively comprising the proposed projects). In addition, the applicant will apply as per Section 53 of the Mineral and Petroleum Resources Development Act (No 28 of 2002) for land use contrary to the objectives of the act.

The proposed projects are located approximately 28 km south-west of Danielskuil and 30 km east of Postmasburg in the Tsantsabane Municipality, Northern Cape. The proposed projects collectively comprise approximately 11 110 ha and consists of the following (See attached BID doc):

- Kora (I – IV) Solar PV Energy Facilities;
- Koraqua (I – V) Solar PV Energy Facilities;
- Khoemana Wind Energy Facility;
- Gorachouqua (I and II) Wind Energy Facilities;
- Korakobab Green Hydrogen Facility;
- Kei Korana Green Ammonia production facility;
- Electrical Grid Infrastructure (EGI) respectively for the proposed projects.

This archaeology specialist report records the findings of the fieldwork conducted for the proposed Taaibosch Puts Energy Cluster (collectively comprising the proposed projects). Project-specific findings are recorded in the HIA drafted for each specific project.

After the initial round of fieldwork was completed for this project, the client revised the layout of the southern gridline route to accommodate PPC Lime's future mining areas. The specialists went back into the field to assess the amended gridline routing.

1.2 Description of Property and Affected Environment

The study area is split roughly in two sections with the western side dedicated to the proposed solar farms while the eastern side consists of the proposed wind farm (WEF). Two powerline routes running for about 30km each along the southern and northern ends were also assessed that connect up the electrical generation facilities to the Olien Eskom substation east of Lime Acres. The Asbestos Mountains form a low series of hills running from the southwest to the northeast between Lime Acres and the eastern end of the proposed wind farm. Three gravel roads were used to access the main farms which included the Griquatown - Lime Acres, Postmasburg - Papkuil and Postmasburg - Lime Acres routes. An existing solar farm (Lesedi Solar Park) lies just to the north of the study area and is similar in scale to the Koraqua solar farm proposed at Springfield 470 farm and the Kora solar farm proposed at Farmersfield 572 farm. The WEF lies on the farms Sunnyside (469), Strathmore (500), Fairview and Klein Fairview (497) and Taaibosch Puts (499).

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Taaibosch Puts was the only property which was predominantly flat, uniform and covered in grassland. The rest of the properties held various flat grassland areas in amongst low, gentle ridges and small koppies. The powerline routes traverse similar ground before linking up with an existing 765kV powerline route along nearly flat calcareous ground extending into the Ghaap Plateau Vaalbosveld. The Olifantshoek Plains Thornveld and Kuruman Mountain Bushveld dominate the majority of the study area with rocky, bushy vegetation and thorn trees on the ridges and grassland and low shrubbery vegetation found on the plains.

All of the farms are actively used for cattle and sheep farming as well as wild game areas used to breed various antelope species. Small-scale crop agriculture takes place closer to the homesteads and is mainly used to grow feed for the cattle and sheep. Mining has had a very significant impact on the economy of the area as many people are employed in the mining towns of Lime Acres, Kathu, Postmasburg and Danielskuil. The closest mines to the study area are the Finsch diamond mine and the PPC limestone mine at Lime Acres.

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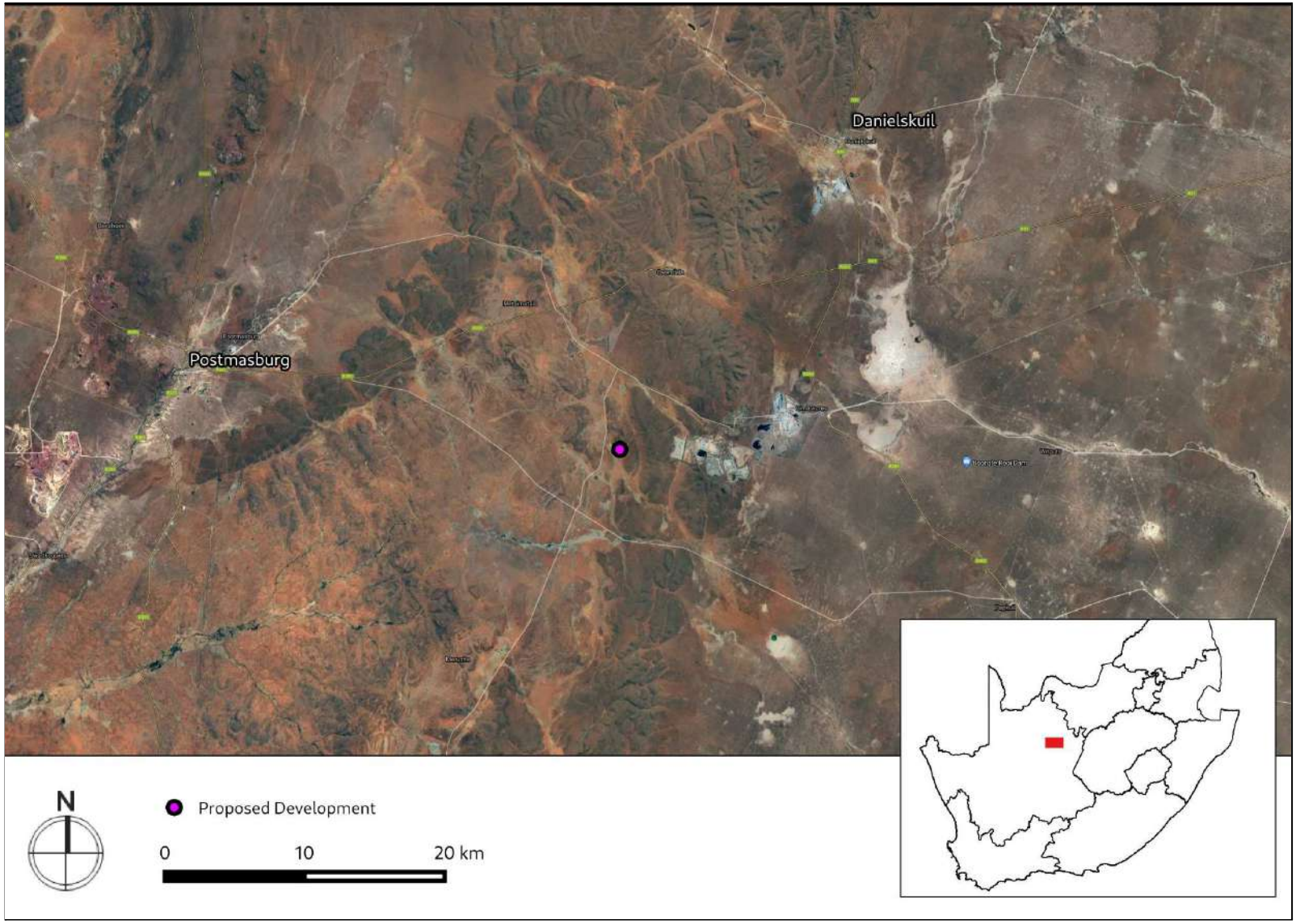

Figure 1.1: Close up satellite image indicating proposed location of development

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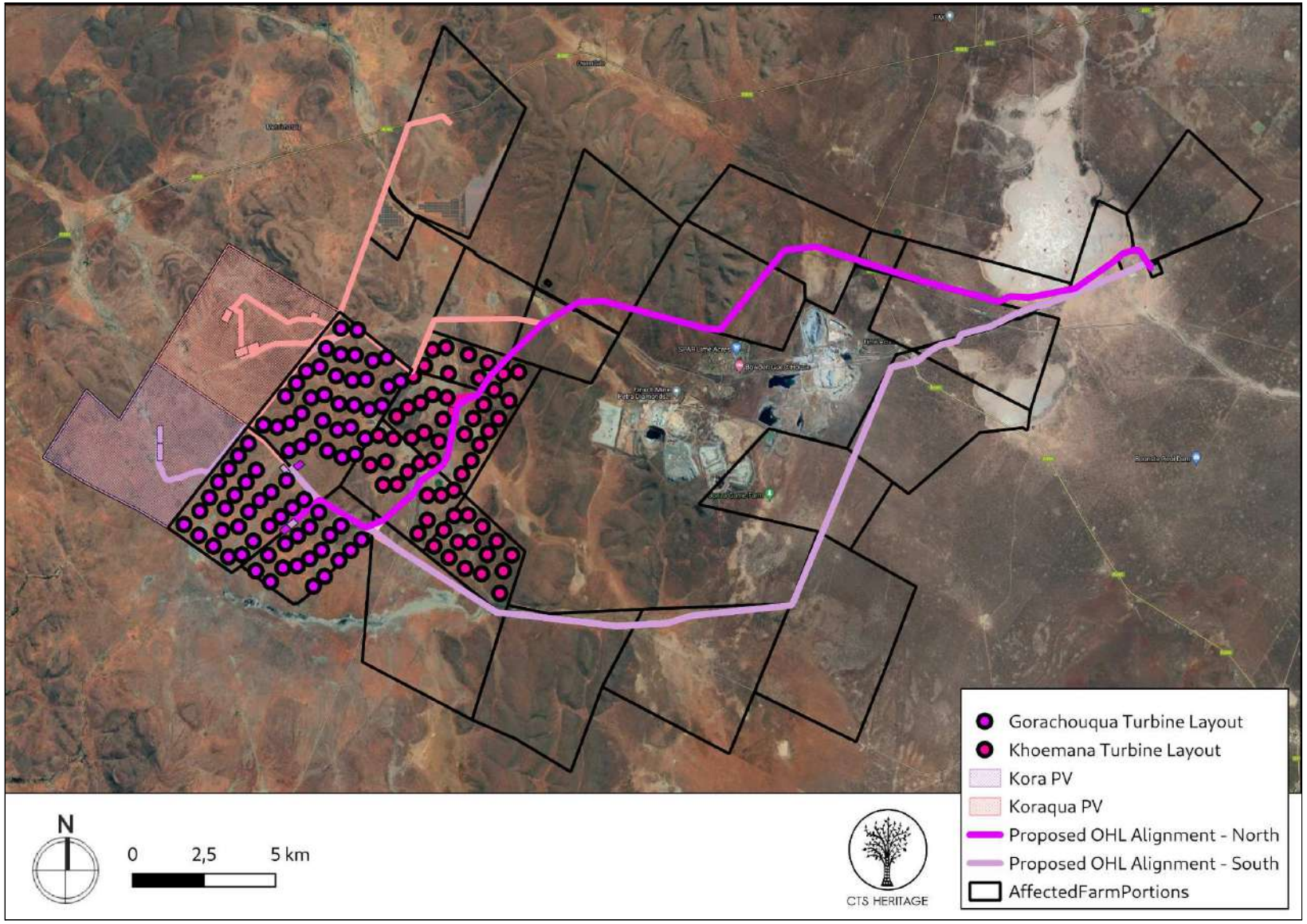

Figure 1.2: Area proposed for development including the proposed layout

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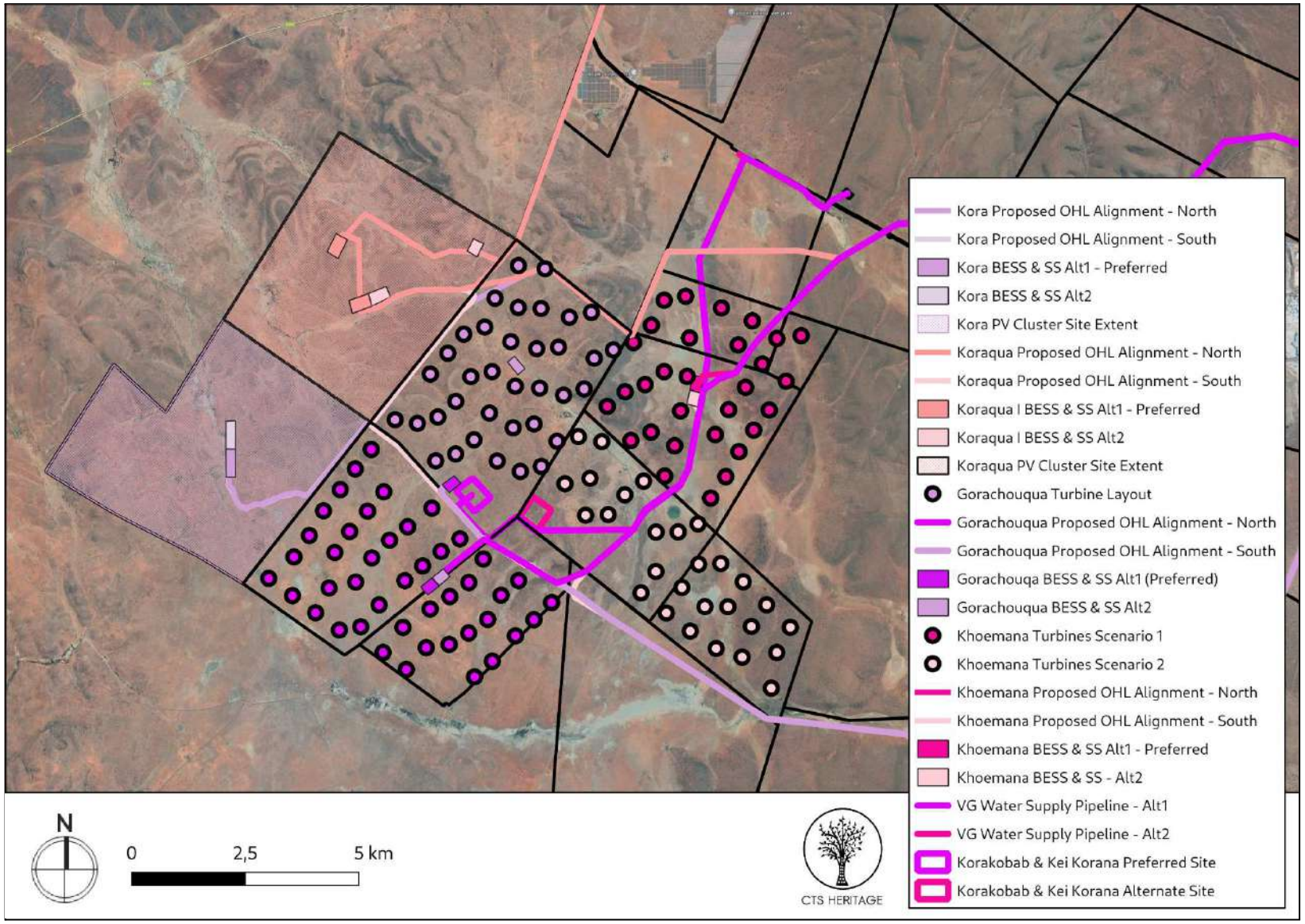

Figure 1.3: Area proposed for development including the proposed layout

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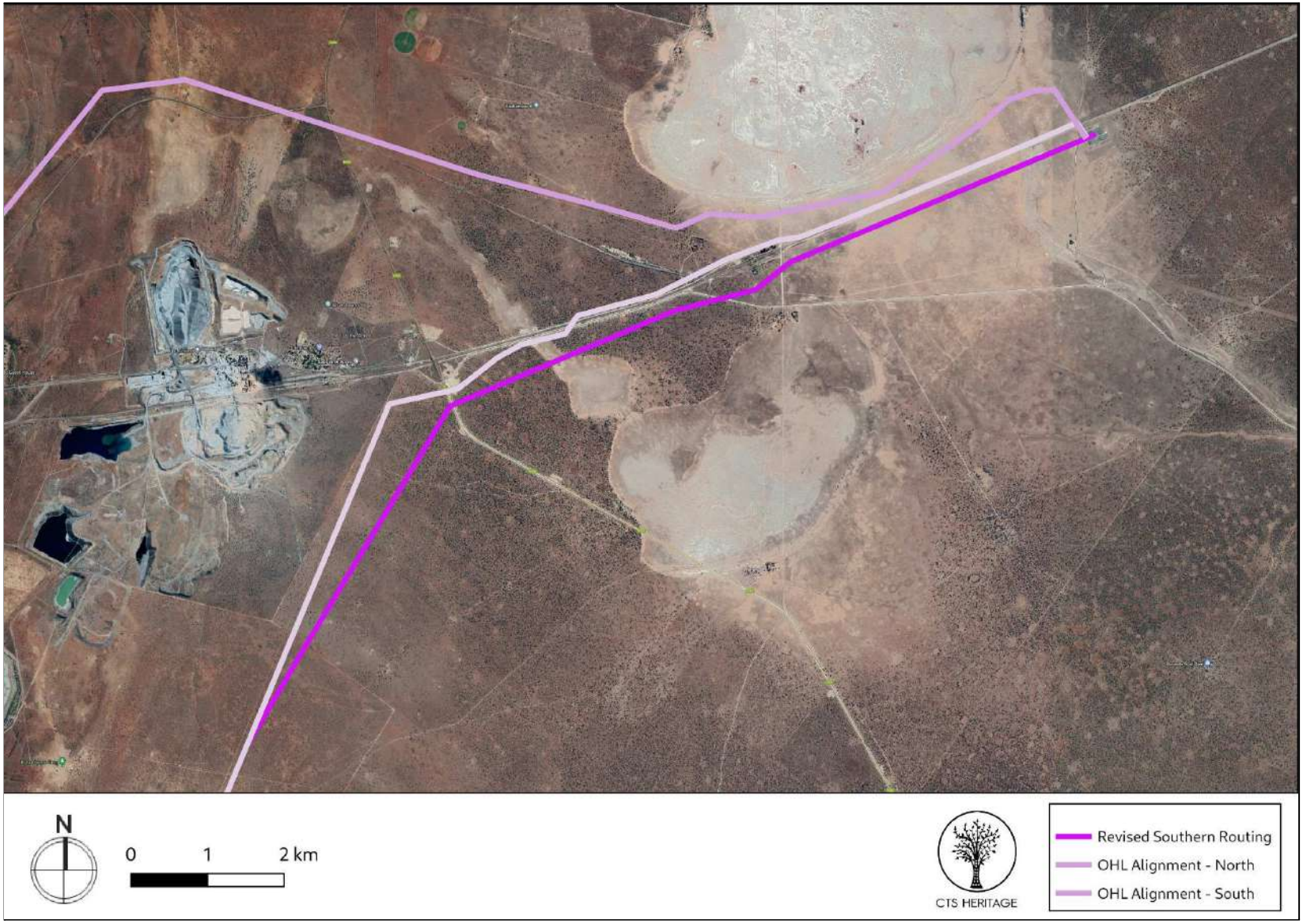

Figure 1.4: Amended southern gridline routing relative to original southern OHL alignment

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2. METHODOLOGY

2.1 Purpose of Archaeological Study

The purpose of this archaeological study is to satisfy the requirements of section 38(8), and therefore section 38(3) of the National Heritage Resources Act (Act 25 of 1999) in terms of impacts to archaeological resources.

2.2 Summary of steps followed

- An archaeologist conducted a survey of the site and its environs from 10 - 15 November 2021 to determine what archaeological resources are likely to be impacted by the proposed development.
- A second archaeological field assessment was conducted on 4 March 2022 to cover a later amendment to the layout in terms of the southern grid alignment (Figure 1.4 and 5.3)
- The area proposed for development was assessed on foot (approx. 150km), mountain bike and 4x4 vehicle, photographs of the context and finds were taken, and tracks were recorded (at 100m intervals) using a GPS.
- The identified resources were assessed to evaluate their heritage significance in terms of the grading system outlined in section 3 of the NHRA (Act 25 of 1999).
- Alternatives and mitigation options were discussed with the Environmental Assessment Practitioner.

2.3 Constraints & Limitations

Grassland and shrubbery covered much of the study area at the time of the survey and recent good rains meant the vegetation was quite dense in places. However, small patches of exposed ground were regularly encountered and this meant that the observation of visible archaeological material was not significantly impeded overall. The ground was much rockier on the ridges but despite this archaeological material was still identified without too much trouble in these areas. The survey therefore obtained a good account of the archaeological sensitivity of the area.

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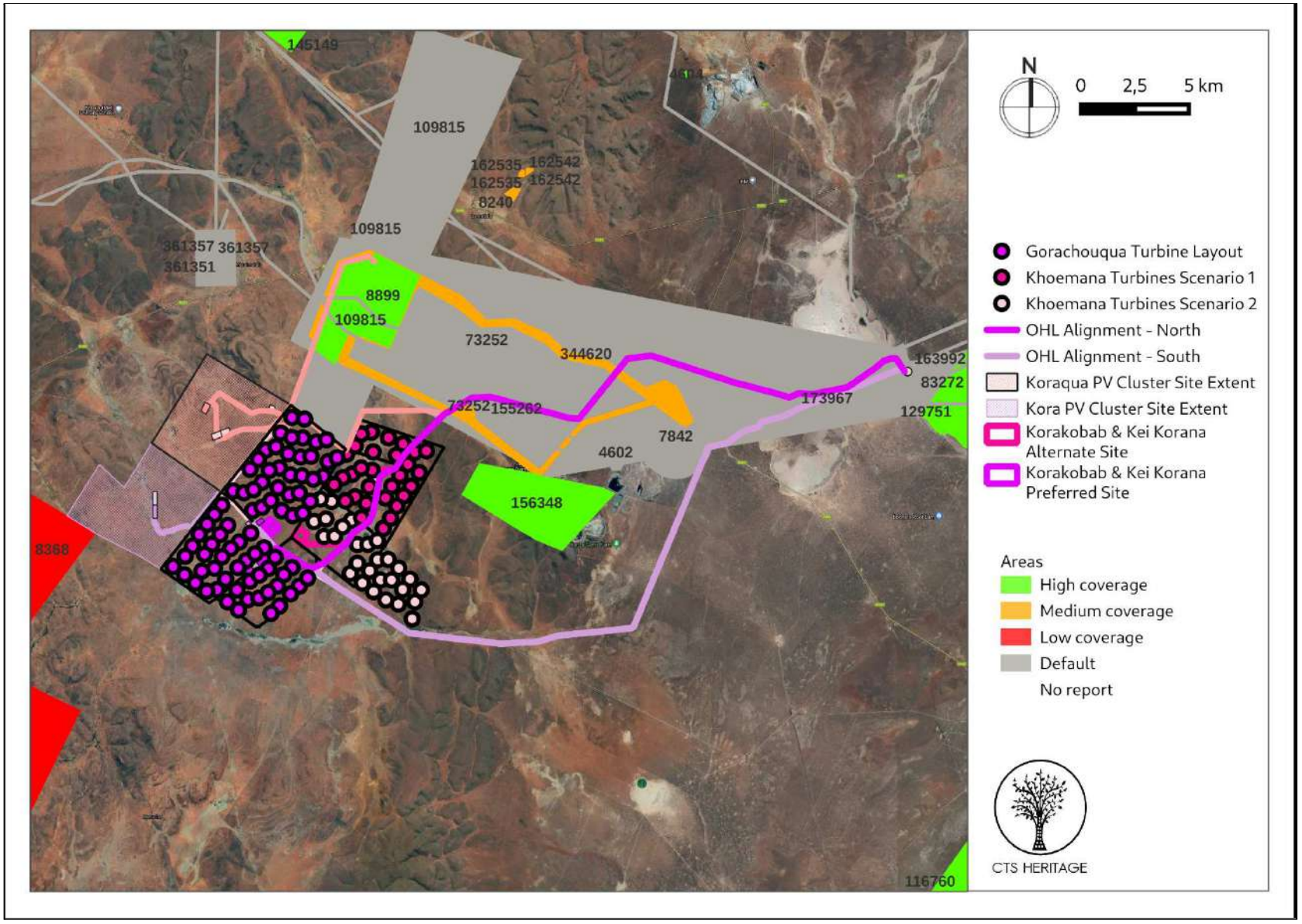

Figure 2: Close up satellite image indicating proposed location of development in relation to heritage studies previously conducted

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3. HISTORY AND EVOLUTION OF THE SITE AND CONTEXT

This application is for the proposed development of the Taaibosch Puts Renewable Energy Cluster located 20km from Postmasburg in the Northern Cape. Originally a station of the London Missionary Society called Sibiling, it became a Griqua village with the name Blinkklip and was then proclaimed a town on 6 June 1892. Postmasburg achieved municipal status in 1936. Postmasburg had its own diamond rush. The first diamond was discovered in 1918 and as a result an open cast mine grew. The mine was permanently flooded in 1935 and as a result, just like Kimberley, Postmasburg could also boast its very own “Big Hole”. This hole is over 45 m deep and filled with fish. Postmasburg also boasts spectacular architecture and many historical sites. An old blue dolomite stone Reformed Church was built in 1908. There is also a rather impressive gun known as “Howitzer Gun” which stands at the civic centre. It honours the men of Postmasburg who died during World War II. The proposed development is also located less than 10km from Lime Acres, home to the employees of the Finsch Diamond Mine located nearby.

In 1801, the London Missionary Society also established a station among the Griqua at *Leeuwenkuil*. The site proved too arid for cultivation and in about 1805 they moved the station to another spring further up the valley and called it *Klaarwater*. Their second choice was little better than their first, and for many years a lack of water prevented any further development. The name of the settlement was changed later to Griquatown or *Griekwastad* in Afrikaans. They lived among a mixed nomadic community of the Chaguriqua tribe and "bastaards" (people of mixed origin) from Piketberg. Their two leaders were Andries Waterboer and Adam Kok II. From 1813 to 17 July 1871, the town and its surrounding area functioned as Andries *Waterboer's Land*. *Griekwastad* was later the capital of British Colony Griqualand West from 1873 to 1880, with its own flag and currency, before it was annexed into the Cape Colony. The proposed Taaibosch Puts Renewable Energy Cluster is located on one of the main routes between Griekwastad and Kuruman and as such, evidence of this heritage may be impacted by the proposed development.

An archaeological assessment of the Finsch Mine was completed by Henderson in 2005 (SAHRIS ID 6780). Henderson drafted a brief history of the Finsch Mine and this is not repeated here. Suffice to note that “Recent human activity at the Finsch Mine, which would have left traces of mining and structures, therefore only dates back to 1959 on Brits. It would appear that there may be an earlier date for farming activities on Bonza”. Elements of the cultural landscape that may be impacted by the proposed development include the sense of place of the historic core of Postmasburg as well as the mining and farming heritage of the area.

Due to mining activities in the area, a number of heritage impact assessments have been completed in close proximity to the development area and these are relevant here (Figure 2 and Appendix 2). The well known Taung site that preserved early hominid remains is located only some 50 kilometres to the west of the site under investigation. Wonderwerk cave near Kuruman also retain evidence of early peoples in its 6 metre midden deposit, especially in the rear portions of the cave. Towards the front rock-art from later Stone Age peoples are also preserved. Furthermore the engraving sites Wildebeestkuil, Driekopseiland and Nooitgedacht near Kimberly confirm a continued presence of Later Stone Age peoples in the general region. It is very likely that significant archaeological heritage may be impacted by the proposed development.

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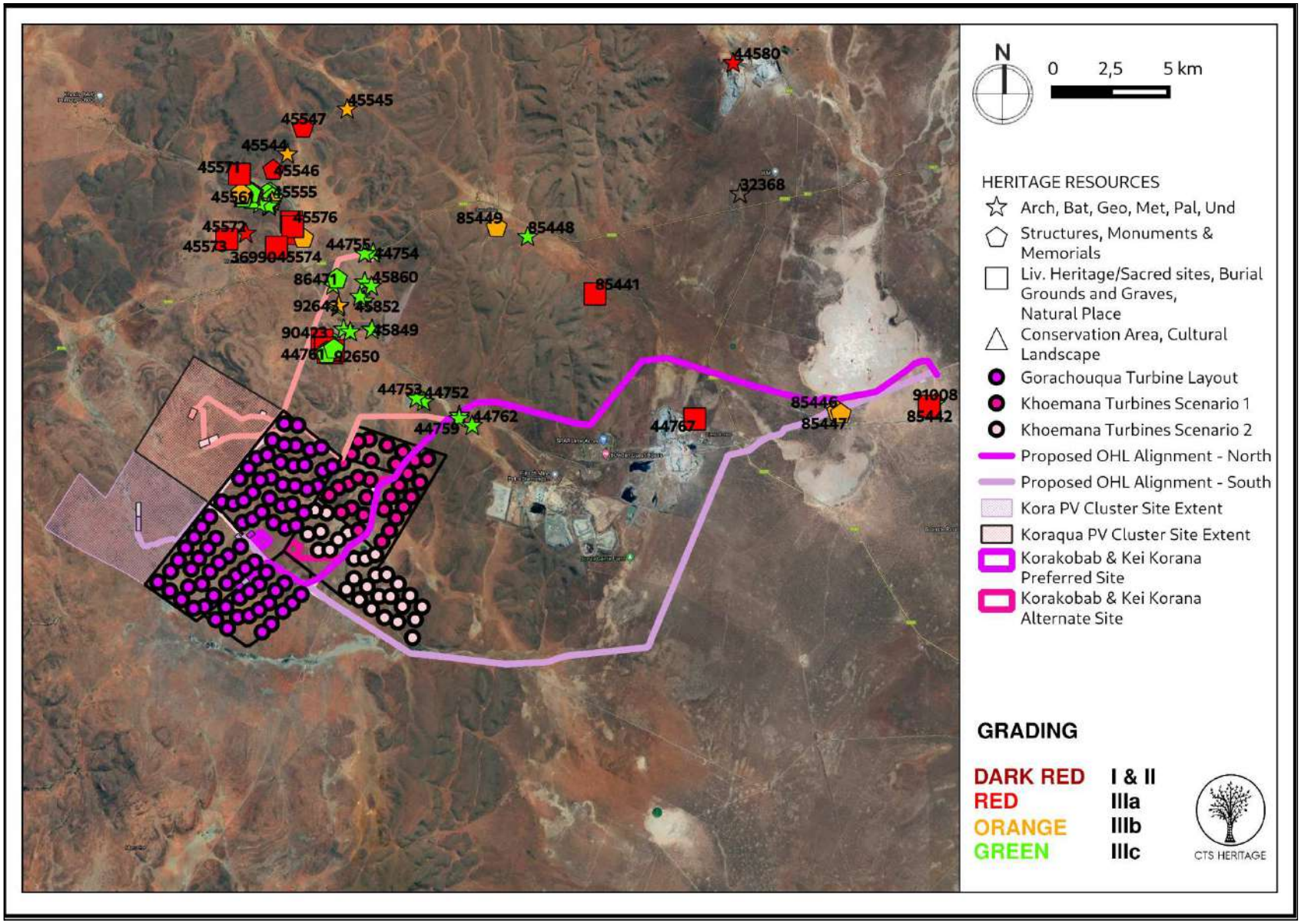

Figure 3. Heritage Resources Map. Heritage Resources previously identified in and near the study area, with SAHRIS Site IDs indicated (see Heritage Screening Assessment for insets)

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4. IDENTIFICATION OF HERITAGE RESOURCES

4.1 Field Assessment

As indicated in section 3 introducing the context of the study, the area lies on one of the routes connecting Danielskuil and Kuruman to Griquatown further south. The owner (Mr Johan Lamprecht) at Strathmore farm pointed out at least 12 unmarked graves marked by piled stones along the edge of an historic irrigation furrow. He was informed that these were Griqua graves and a subsequent investigation at the Cape Archives supports this as the London Missionary Society was active in the area in the second half of the 19th century where a number of farming projects were undertaken. A further 10 possible unmarked graves were found by another specialist just 1.2km to the east of these graves on the same farm on the eastern side of the Griekwastad road. The original farmhouse complex, now abandoned and ruined, has two stone kraals and a series of historical engravings on the small koppie overlooking the homestead. One of the names engraved could be "Dennis Hinds" and some references were found linking the Hinds family in the Northern Cape to the LMS[1]. Unfortunately no dates were made with any of the engraved names but the handwriting style and emphasis on abbreviations led us to interpret these as being at least 100 years old or more.

Other graves of significance included the Lamprechts formal graveyard with at least 7 formal, marked graves, 3 marked graves of resident farm staff, the Roberts grave at the ruined Strathmore farmstead and another two small formal graveyards at Spring Valley and Farmersfield respectively. The farms are very large in the area and are separated by large tracts of land dedicated to cattle and sheep grazing and rearing wild antelope. Most of the buildings found at each homestead were relatively modern but some historical fabric remained at Spring Valley along with ruins recorded at Sunnyside and Strathmore.

The Stone Age archaeological record is widely dispersed across the entire study area and predominantly dates to the Middle Stone Age occupation of the area. However, sufficient numbers of observations were made of Later Stone Age material to conclude that the material clusters around the non-perennial streams criss-crossing the farms. No major rivers are found nearby and the Klein Riet River is at least 40km east. This doesn't appear to have significantly constrained the prehistoric inhabitants of the study area and it is possible that pans and other sources of water were readily used. As would be expected in this area, various grades of hornfels were used to make most of the artefacts observed as well as smaller contributions of CCS and red banded ironstone. Ubiquitous evidence of Levallois manufacture of flakes and blades were found. There is a notable difference in the type of hornfels used in LSA assemblages that could possibly mean these were introduced from elsewhere rather than being sourced locally as was the case for the MSA material. Various points, burins, awls, thumbnail scrapers and small bladelet cores were common within the LSA assemblages.

[1] See https://www.1820settlers.com/genealogy/familychart.php?personID=I55485&familyID=F20042&tree=master

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Figure 4.1: Contextual Image of development area

Figure 4.2: Contextual Image of development area indicating existing electrical infrastructure

Figure 4.3: Contextual Image of development area indicating existing electrical infrastructure

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Figure 4.4: Contextual Images of Development Area

Figure 4.5: Contextual Images of Development Area

Figure 4.6: Contextual Images of Development Area

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Figure 4.8: Contextual Images of Landscape

Figure 4.9: Contextual Images of Development Area

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Figure 4.9: Contextual Images of Development Area

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Figure 4.9: Contextual Images of Development Area

Figure 4.9: Contextual Images of Development Area

Figure 4.9: Contextual Images of Development Area indicating rail and electrical infrastructure

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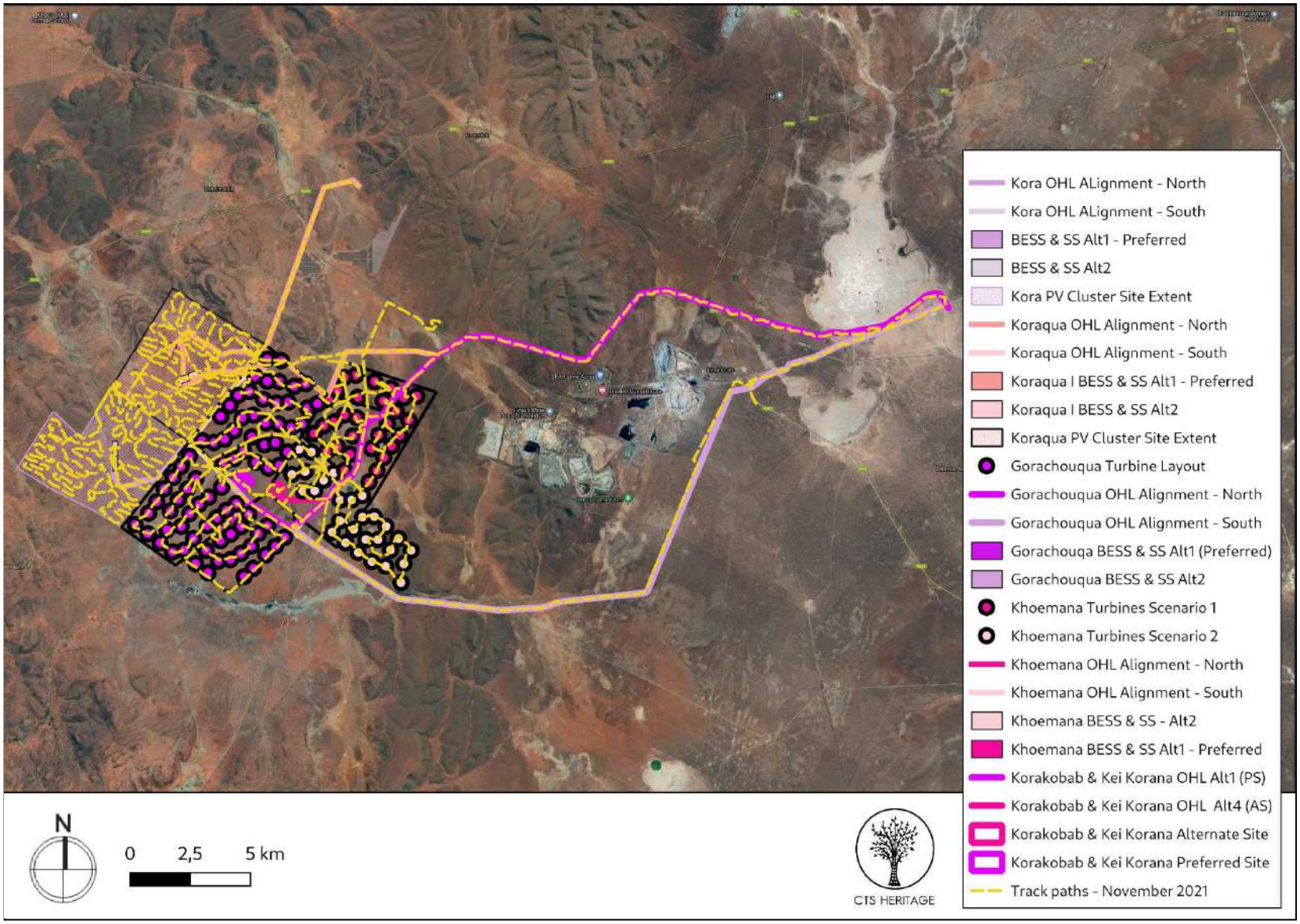

Figure 5.1: Overall track paths of foot survey

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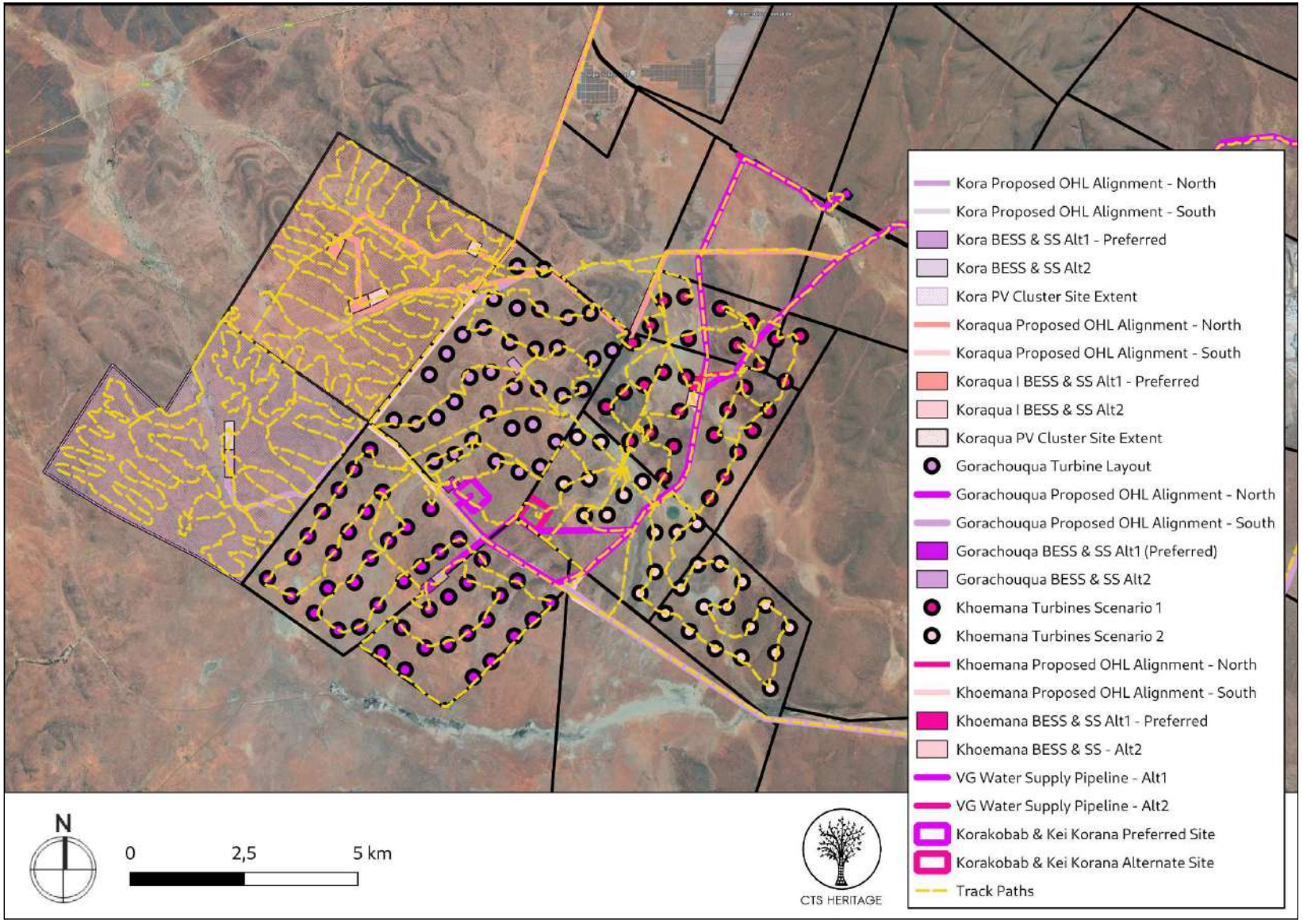

Figure 5.2: Overall track paths of foot survey

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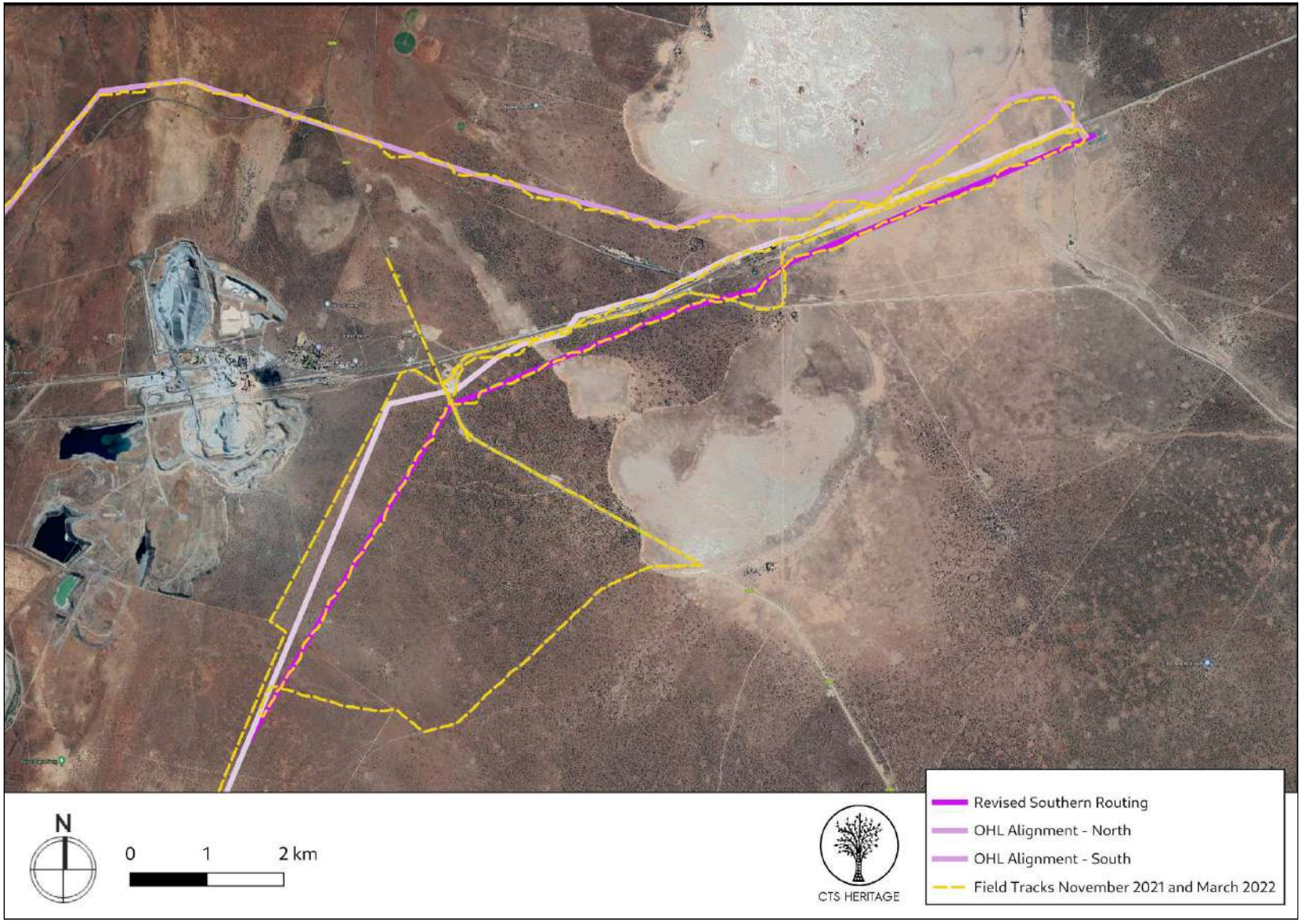

Figure 5.3: Overall track paths of foot survey in addition to tracks taken in the March 2022 assessment for the re-routed southern alignment

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4.2 Archaeological Resources identified

Table 1a: Observations noted during the field assessment in November 2021

Obs #	Project	Description	Period	Density	Co-Ordinates		Grading	Mitigation
001	Grid	Two hornfels flakes, dark brown and black, core and debitage, no retouch	LSA	0-5	-28.358578	23.543008	NCW	NA
002	Grid	Hornfels point and chunk	MSA	0-5	-28.349328	23.56869	NCW	NA
003	Grid	Series of railway staff houses abandoned, derelict and being vandalised and stripped; 15 buildings in total including garages/outbuildings. 1960's	Modern		-28.345561	23.579308	NCW	NA
004	Grid	Hornfels flake retouched	LSA	0-5	-28.339121	23.595396	NCW	NA
005	Grid	Two ccs flakes, prominent bulbs of percussion	MSA	0-5	-28.325724	23.501798	NCW	NA
006	Grid	Red banded ironstone flake, edge retouch	MSA	0-5	-28.328637	23.513211	NCW	NA
007	Grid	Ccs core flake with cortex patination	MSA	0-5	-28.332679	23.527421	NCW	NA
008	Grid	Hornfels dark black core	MSA	0-5	-28.335195	23.53548	NCW	NA
009	Grid	Brown hornfels core, several flake scars taken longitudinally	MSA	0-5	-28.337948	23.545206	NCW	NA
010	Grid	Hornfels flake, some retouch	MSA	0-5	-28.341632	23.560792	NCW	NA
011	Grid	Early MSA dark black hornfels flake, central spine on dorsal surface	MSA	0-5	-28.342318	23.569079	NCW	NA
012	Grid	Hornfels flake, early MSA, lateral retouch	MSA	0-5	-28.33071	23.487843	NCW	NA
013	Grid	Hornfels core flake with two prominent flake scars	MSA	0-5	-28.338091	23.480572	NCW	NA
014	Grid	Ccs point	LSA	0-5	-28.347881	23.471801	NCW	NA
015	Grid	Heavily patinated banded ironstone point and core	MSA	0-5	-28.348349	23.448184	NCW	NA
016	Grid	Brown banded ironstone early MSA flake, edge scraper retouch	MSA	0-5	-28.345704	23.43993	NCW	NA
017	Grid	Siltstone large early MSA flake with prominent bulb of percussion	MSA	0-5	-28.343221	23.424838	NCW	NA
018	Grid	Early MSA hornfels point lateral and end retouched	MSA	0-5	-28.347564	23.409366	NCW	NA
019	Grid	Hornfels cores	MSA	0-5	-28.354861	23.398669	NCW	NA
020	Grid	Hornfels flakes	MSA	0-5	-28.348106	23.390961	NCW	NA
021	Grid	Hornfels flaked core, possibly LSA	LSA	0-5	-28.337511	23.380222	NCW	NA
022	**Outside Footprint**	**Wiidzpan Farmhouse complex with small Dams, labourers cottages, main house and ancillary infrastructure**	**Historic**		**-28.33971**	**23.403397**	**IIIC**	**NA**
023	**Outside Footprint**	**Open site along stream bed with msa and LSA material. Hornfels, high grade, unifacially retouch, ccs, siltstone cores and flakes, banded ironstone**	**LSA, MSA**	**30+**	**-28.35176**	**23.34786**	**IIIC**	**NA**
024	**Outside Footprint**	**Sunnyside old farmhouse ruin, only foundation remains, gum, pepper and willow trees, near kraal**	**Historic**		**-28.35084**	**23.34752**	**IIIC**	**NA**
025	Gorachouqua	Ccs core, hornfels microlith	LSA	0-5	-28.35258	23.34146	NCW	NA
026	Gorachouqua	Ccs core	LSA	0-5	-28.35162	23.33711	NCW	NA
027	Gorachouqua	Hornfels cores	LSA	0-5	-28.35173	23.33396	NCW	NA
028	Grid	Siltstone point, weathered	MSA	0-5	-28.34424	23.33308	NCW	NA
029	Grid	Hornfels core flake with lateral retouch	LSA	0-5	-28.32663	23.34084	NCW	NA

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030	Grid	Blue siltstone flake, unworked	MSA	0-5	-28.312615	23.34685	NCW	NA
031	Grid	Hornfels notched flake	MSA	0-5	-28.29869	23.35222	NCW	NA
032	Koraqua	High grade hornfels retouched point, retouched both sides	MSA	0-5	-28.35257	23.32629	NCW	NA
033	Koraqua	Siltstone flakes, debitage, core, points	LSA	0-5	-28.35865	23.32083	NCW	NA
034	Koraqua	Ccs bladelet	LSA	0-5	-28.35693	23.31138	NCW	NA
035	Koraqua	Quartzite radial core	MSA	0-5	-28.34606	23.30665	NCW	NA
036	Koraqua	Quartzite core and flake prominent bulb of percussion	MSA	0-5	-28.34613	23.29254	NCW	NA
037	Koraqua	High grade hornfels retouched flake worth prepared platform, edge retouched	MSA	0-5	-28.36329	23.31669	NCW	NA
038	Koraqua	Siltstone flakes unworked	MSA	0-5	-28.36683	23.31355	NCW	NA
039	Koraqua	Siltstone core	MSA	0-5	-28.37076	23.31002	NCW	NA
040	Koraqua	Unworked siltstone flake in amongst siltstone cobbles	MSA	0-5	-28.37447	23.30663	NCW	NA
041	Koraqua	Unworked siltstone flakes	MSA	0-5	-28.38179	23.30007	NCW	NA
042	Gorachouqua	Ccs core	MSA	0-5	-28.38261	23.3024	NCW	NA
043	Gorachouqua	Hornfels segment	MSA	0-5	-28.38263	23.30351	NCW	NA
044	Gorachouqua	Siltstone core	MSA	0-5	-28.38296	23.30927	NCW	NA
045	Gorachouqua	Siltstone core	MSA	0-5	-28.37862	23.3148	NCW	NA
046	Gorachouqua	Modern farm water tank next to older ruined tank and broken windmill. Pump now solar powered	Modern		-28.376678	23.320996	NCW	NA
047	Gorachouqua	Hornfels point and siltstone flakes	MSA	0-5	-28.37423	23.32018	NCW	NA
048	Gorachouqua	Ccs core and hornfels flake	MSA	0-5	-28.37106	23.3258	NCW	NA
049	Gorachouqua	Kraal cattle water tank etc	Modern		-28.37179	23.33341	NCW	NA
050	Gorachouqua	Hornfels microlithic flake	LSA	0-5	-28.36916	23.33703	NCW	NA
051	Gorachouqua	Fairview farmhouse complex	Modern		-28.3807	23.34314	NCW	NA
052	Khoemana	Ccs core flake and hornfels flake	MSA	0-5	-28.38569	23.35035	NCW	NA
053	**Khoemana**	**Lamprechts family graveyard fenced off, in good state. At least 7 graves**	**Historic**		**-28.39043**	**23.35558**	**IIIA**	**No-go area**
054	**Khoemana**	**Strathmore farm, Lamprechts farmhouse complex. Some older buildings remain but mostly modern**	**Historic**		**-28.39168**	**23.35673**	**IIIC**	**No-go area**
055	Khoemana	Vein quartz early MSA flake	MSA	0-5	-28.39708	23.36361	NCW	NA
056	Khoemana	Banded ironstone and ccs core flakes, edge retouched on one	MSA	0-5	-28.39379	23.36498	NCW	NA
057	Khoemana	Hornfels, chert microliths	LSA	5-10	-28.38797	23.36701	NCW	NA
058	Khoemana	Hornfels point and segment (Large)	MSA	0-5	-28.38665	23.36456	NCW	NA
059	**Khoemana**	**Quartz and hornfels, banded ironstone flakes, points**	**LSA**	**10-30**	**-28.38575**	**23.36219**	**IIIC**	**No-go area**
060	Khoemana	Banded ironstone, hornfels flakes, very finely worked ; quartz core	LSA, MSA	5-10	-28.38342	23.36287	NCW	NA
061	Khoemana	Red ironstone flake, microlith	LSA	0-5	-28.38126	23.35459	NCW	NA
062	Khoemana	Siltstone core	MSA	0-5	-28.37708	23.35552	NCW	NA
063	Gorachouqua	Banded ironstone flake and hornfels point, unifacially worked	MSA	0-5	-28.3754	23.34489	NCW	NA
064	Gorachouqua	Early Msa siltstone flake, large bulb of percussion	MSA	0-5	-28.36999	23.34755	NCW	NA
065	Gorachouqua	Hornfels flakes, prepared platforms	MSA	0-5	-28.36735	23.34345	NCW	NA
066	Gorachouqua	Ccs flake, retouched and shaped for hafting	LSA	0-5	-28.36216	23.34231	NCW	NA
067	Gorachouqua	Hornfels blade point	MSA	0-5	-28.36135	23.33946	NCW	NA
068	Gorachouqua	Hornfels flakes, prepared platform	MSA	0-5	-28.36351	23.32738	NCW	NA
069	Gorachouqua	Hornfels flake	MSA	0-5	-28.36043	23.32468	NCW	NA
070	Gorachouqua	Red silcrete point	LSA	0-5	-28.35772	23.32963	NCW	NA

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071	Gorachouqua	Weathered siltstone flakes	MSA	0-5	-28.35748	23.33509	NCW	NA
072	Khoemana	Heavily weathered siltstone flake	MSA	0-5	-28.3919	23.35081	NCW	NA
073	Khoemana	Siltstone and hornfels cores	MSA	0-5	-28.3877	23.34477	NCW	NA
074	Khoemana	Two large siltstone possible flakes, may just be product of fencing damage	MSA	0-5	-28.3925	23.33846	NCW	NA
075	Gorachouqua	Large siltstone flake, prominent bulb of percussion	MSA	0-5	-28.39193	23.33516	NCW	NA
076	Gorachouqua	Hornfels flake with platform worked down into narrower section, dorsal removals	MSA	0-5	-28.39182	23.32762	NCW	NA
077	Gorachouqua	Siltstone flake	MSA	0-5	-28.39298	23.3208	NCW	NA
078	Gorachouqua	Siltstone flake with prominent bulb of percussion	MSA	0-5	-28.40185	23.32711	NCW	NA
079	Khoemana	Fine grained hornfels retouched flake	LSA	0-5	-28.4026	23.33479	NCW	NA
080	Khoemana	Hornfels core	MSA	0-5	-28.39898	23.3365	NCW	NA
081	Khoemana	Red ironstone flake, some retouch	MSA	0-5	-28.40399	23.3409	NCW	NA
082	**Khoemana**	**Ruined farmhouse, "ou huis"**	**Historic**		**-28.3877**	**23.35775**	**IIIB**	**No-go area**
083	**Khoemana**	**Stone walled kraal**	**Historic**		**-28.38608**	**23.36116**	**IIIC**	**No-go area**
084	**Khoemana**	**Stone walled kraal**	**Historic**		**-28.38795**	**23.35951**	**IIIC**	**No-go area**
085	Khoemana	Unifacial point hornfels	LSA	0-5	-28.38756	23.35856	NCW	NA
086	Gorachouqua	Hornfels core	MSA	0-5	-28.380183	23.334538	NCW	NA
087	Gorachouqua	Modern farm dam and kraal	Modern		-28.382619	23.323649	NCW	NA
088	Gorachouqua	Modern kraal	Modern		-28.385879	23.323549	NCW	NA
089	Gorachouqua	farm dam	Modern		-28.392375	23.312853	NCW	NA
090	Gorachouqua	Hornfels flake with lateral retouch on one side	MSA	0-5	-28.390952	23.31227	NCW	NA
091	Gorachouqua	Klein Fairview modern farmhouse	Modern		-28.391689	23.306539	NCW	NA
092	Gorachouqua	Fine grained quartzite flake	MSA	0-5	-28.389737	23.296519	NCW	NA
093	Gorachouqua	Fine grained quartzite flake with central spine on dorsal	MSA	0-5	-28.39803309	23.29093546	NCW	NA
094	Gorachouqua	Cream silcrete flake with other impurities colouring the material	MSA	0-5	-28.40625717	23.28382363	NCW	NA
095	Gorachouqua	CCS flake use wear on lateral surface	MSA	0-5	-28.41403614	23.27601551	NCW	NA
096	Gorachouqua	CCS core flake	LSA	0-5	-28.41811748	23.28896134	NCW	NA
097	Gorachouqua	Hornfels flake	MSA	0-5	-28.41019470	23.29795640	NCW	NA
098	Gorachouqua	Microlithic hornfels flake with retouch on ventral side	LSA	0-5	-28.39907132	23.30421540	NCW	NA
099	Gorachouqua	Hornfels flake edge retouched	MSA	0-5	-28.40135499	23.29659257	NCW	NA
100	Gorachouqua	Siltstone and CCS flakes, MSA	MSA	0-5	-28.42338189	23.29492422	NCW	NA
101	Gorachouqua	Hornfels flake with retouch	MSA	0-5	-28.41670395	23.30286131	NCW	NA
102	Gorachouqua	Hornfels cores with blade like flake scars	MSA	0-5	-28.41151275	23.30845179	NCW	NA
103	Gorachouqua	Kraal, modern	Modern		-28.412617	23.289464	NCW	NA
104	Gorachouqua	Large early MSA siltstone flake	MSA	0-5	-28.41348613	23.31523282	NCW	NA
105	Gorachouqua	Banded ironstone flake, early MSA, lateral retouch	MSA	0-5	-28.41816187	23.30995550	NCW	NA
106	Gorachouqua	Ccs point	MSA	0-5	-28.42241160	23.32400258	NCW	NA
107	Gorachouqua	Yellow hornfels core	LSA	0-5	-28.42446045	23.30894898	NCW	NA
108	Gorachouqua	Quartz core with notches on either side	MSA	0-5	-28.42720801	23.29907870	NCW	NA
109	Gorachouqua	Siltstone flake	MSA	0-5	-28.43396502	23.30976580	NCW	NA
110	Gorachouqua	Small hornfels triangular point	LSA	0-5	-28.43197166	23.32491929	NCW	NA
111	Gorachouqua	Hornfels flake	MSA	0-5	-28.42317792	23.33465571	NCW	NA
112	Gorachouqua	Large siltstone flake early MSA	MSA	0-5	-28.41685035	23.33626252	NCW	NA
113	Gorachouqua	Silstone flake core	MSA	0-5	-28.41381995	23.34344665	NCW	NA
114	**Gorachouqua**	**Older Klein Fairview farmhouse**	**Historic**		**-28.391645**	**23.310011**	**IIIC**	**20m buffer area**

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115	Gorachouqua	Siltstone flake, weathered, early MSA	MSA	0-5	-28.36470497	23.3565771	NCW	NA
116	Khoemana	Dark black hornfels flake	MSA	0-5	-28.35788992	23.36338025	NCW	NA
117	Khoemana	High grade hornfels broken blade	MSA	0-5	-28.36494353	23.37050668	NCW	NA
118	Khoemana	Ccs radial core on dorsal with bipolar reduction on ventral	MSA	0-5	-28.37167082	23.36932924	NCW	NA
119	Khoemana	Two siltstone artefacts, flake and core	MSA	0-5	-28.37678871	23.37214916	NCW	NA
120	Khoemana	Quartz core and hornfels bladelet	LSA	0-5	-28.362711	23.38311	NCW	NA
121	Khoemana	Hornfels flakes, patinated and weathered	MSA	0-5	-28.360145	23.379655	NCW	NA
122	Khoemana	Modern kraal, solar panels and pump further away to west	Modern	n/a	-28.364498	23.386007	NCW	NA
123	Khoemana	Ccs core, LSA, hornfels flake, MSA	LSA+MSA	0-5	-28.362266	23.38967	NCW	NA
124	Khoemana	Hornfels flakes and cores	MSA	0-5	-28.364821	23.394798	NCW	NA
125	Khoemana	Dark hornfels flakes and cores, some LSA	LSA+MSA	0-5	-28.371594	23.393722	NCW	NA
126	Khoemana	Hornfels flakes showing some edge retouch but discarded	LSA	0-5	-28.380079	23.388556	NCW	NA
127	Khoemana	Hornfels flake weathered, siltstone core	MSA	0-5	-28.383075	23.384883	NCW	NA
128	Khoemana	Modern kraal	Modern	n/a	-28.38335	23.382923	NCW	NA
129	Khoemana	Quartz and dark hornfels cores, hornfels flake	LSA	0-5	-28.387509	23.381724	NCW	NA
130	Khoemana	Dark hornfels flake, weathered	MSA	0-5	-28.389954	23.380802	NCW	NA
131	Khoemana	Ccs flake with parallel dorsal scars	MSA	0-5	-28.396098	23.376725	NCW	NA
132	Khoemana	Ccs flake, edge retouch, crater on dorsal from flake removal	MSA	0-5	-28.399938	23.373423	NCW	NA
133	Khoemana	Hornfels flake and ccs core flake with retouched edge along lateral side	MSA	0-5	-28.383245	23.378173	NCW	NA
134	Khoemana	Banded ironstone point, MSA/LSA	LSA+MSA	0-5	-28.376715	23.381692	NCW	NA
135	Khoemana	Hornflakes flakes from blade reduction	MSA	0-5	-28.372581	23.378975	NCW	NA
136	Khoemana	Hornfels segment, edge retouched	MSA	0-5	-28.371693	23.387703	NCW	NA
137	Khoemana	Siltstone early Msa flake	MSA	0-5	-28.370794	23.388205	NCW	NA
138	Khoemana	Hornfels cores and flakes, early MSA biface	MSA	0-5	-28.367467	23.384353	NCW	NA
139	Khoemana	Windmill and tank	Modern	n/a	-28.401142	23.362084	NCW	NA
140	Khoemana	Hornfels core	MSA	0-5	-28.403605	23.369336	NCW	NA
141	Khoemana	Large broken msa blade, lateral retouch	MSA	0-5	-28.413891	23.362006	NCW	NA
142	Khoemana	Ccs flakes, retouched	MSA	0-5	-28.420589	23.369097	NCW	NA
143	Khoemana	Patinated hornfels flake	MSA	0-5	-28.410778	23.372015	NCW	NA
144	Khoemana	Early Msa siltstone flakes, large, notched	MSA	0-5	-28.423777	23.372762	NCW	NA
145	Khoemana	Patinated hornfels flake and ccs point	MSA	0-5	-28.426919	23.378229	NCW	NA
146	Khoemana	Long hornfels flake, pointed with curved end	MSA	0-5	-28.433338	23.387221	NCW	NA
147	Khoemana	Large weathered siltstone flake and hornfels radial core	MSA	0-5	-28.424638	23.391482	NCW	NA
148	Khoemana	Chert/ccs point and flake, edge retouch	MSA	0-5	-28.418097	23.38885	NCW	NA
149	Khoemana	Small ccs core	LSA	0-5	-28.423807	23.384052	NCW	NA
150	Khoemana	Red and dark blue ccs flakes, core	LSA+MSA	0-5	-28.418954	23.379532	NCW	NA
151	Khoemana	Hornfels core and siltstone large early MSA flake	MSA	0-5	-28.413714	23.382633	NCW	NA
152	Khoemana	Red ccs flake with prominent bulb of percussion	LSA	0-5	-28.410396	23.378617	NCW	NA

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153	Khoemana	Windmill and tank	Modern	n/a	-28.419661	23.375724	NCW	NA
154	Khoemana	Modern building,likely a hunting hide	Modern	n/a	-28.422713	23.381777	NCW	NA
155	**Khoemana**	**Griqua graves 12**	**Historic**	**n/a**	**-28.3956**	**23.35636**	**IIIA**	**No-go area**
156	**Khoemana**	**Farm staff graves, 3 marked**	**Historic**	**n/a**	**-28.39455**	**23.35378**	**IIIA**	**No-go area**
157	**Khoemana**	**Ou Huis grave, Roberts. Piet Modise's father buried here too**	**Historic**	**n/a**	**-28.38684**	**23.35592**	**IIIA**	**No-go area**
158	Grid	Taaibosputs farm, modern farmhouse on southern side of road	Modern	n/a	-28.434514	23.372546	NCW	NA
159	Khoemana	Ubiquitous hornfels gravels from road, some artefactual flakes and cores	MSA	0-5	-28.440754	23.390283	NCW	NA
160	Grid	Jacobsfontein, poor state farmhouse est 1950s with garage. Opposite side (north) of road is a modern incomplete shed and kraals	Modern	n/a	-28.442004	23.400752	NCW	NA
161	**Grid**	**Older cottage, clay walls exposed, corrugated iron roof**	**Historic**	**n/a**	**-28.442405**	**23.403209**	**IIIC**	**20m buffer area**
162	Grid	Rocky Flats, Main farmhouse tucked behind trees	Modern	n/a	-28.439585	23.403717	NCW	NA
163	Khoemana	Dark hornfels flake with edge retouch	MSA	0-5	-28.44412985	23.44402707	NCW	NA
164	Khoemana	Triangular hornfels flake	MSA	0-5	-28.44222381	23.45773858	NCW	NA
165	Khoemana	CCS point	LSA	0-5	-28.44060263	23.47212043	NCW	NA
166	Khoemana	Weathered ccs flake	LSA	0-5	-28.4388576	23.4915764	NCW	NA
167	Khoemana	Hornfels scraper, edge retouch	MSA	0-5	-28.4317788	23.49626923	NCW	NA
168	Kora	CCS core	LSA	0-5	-28.42192371	23.5008643	NCW	NA
169	Kora	CCS flakes and cores, primary discard – not much retouch	LSA	0-5	-28.40469398	23.50895285	NCW	NA
170	Kora	Hornfels flake and core	LSA	0-5	-28.4014453	23.51047102	NCW	NA
171	Kora	High grade hornfels point	LSA	0-5	-28.39108537	23.51534076	NCW	NA
172	Kora	CCS flake and core	LSA	0-5	-28.37734345	23.52073556	NCW	NA
173	Kora	Hornfels flake	MSA	0-5	-28.36457698	23.52826619	NCW	NA
174	**Khoemana**	**Historical graffiti on various flat rocks on top of outcrop, no dates, just initials and names and some "I love you's"**	**Historic**	**n/a**	**-28.384464**	**23.361162**	**IIIA**	**No go area**
175	**Kora**	**Farm graveyard; Brits, van den Berg, 2 marked graves fenced off**	**Historic**	**n/a**	**-28.376**	**23.2618**	**IIIA**	**200m Buffer area**
176	Kora	Farmersfield farmhouse complex, mainly modern buildings	Modern	n/a	-28.37693	23.26088	NCW	NA
177	Kora	More outbuildings related to the farm	Modern	n/a	-28.37833	23.26089	NCW	NA
178	Kora	Siltstone core, early MSA	MSA	0-5	-28.38273	23.25147	NCW	NA
179	Kora	Siltstone flake, prominent bulb of percussion, core	MSA	0-5	-28.38024	23.24666	NCW	NA
180	Kora	Siltstone /hornfels core and struck flake	MSA	0-5	-28.37663	23.2447	NCW	NA
181	Kora	Siltstone core	MSA	0-5	-28.37679	23.24003	NCW	NA
182	Kora	Hornfels core, scars on either side forming wedge	LSA	0-5	-28.37949	23.24105	NCW	NA
183	Kora	Ccs core, only partially reduced	LSA	0-5	-28.38179	23.24343	NCW	NA
184	Kora	Kraal, windmill and tank	Modern	n/a	-28.38137	23.248	NCW	NA
185	Kora	Quartzite flake and quartz core	LSA	0-5	-28.38234	23.23759	NCW	NA
186	Kora	Ccs core	LSA	0-5	-28.38361	23.23918	NCW	NA
187	Kora	Black ccs point, edge retouched, dorsal scars showing reduction	LSA	0-5	-28.38656	23.23542	NCW	NA
188	Kora	Kraal, windmill and tank	Modern	n/a	-28.39341	23.2565	NCW	NA
189	Kora	Siltstone cores and hammerstone	MSA	0-5	-28.38905	23.23244	NCW	NA
190	Kora	Siltstone flakes and cores	MSA	0-5	-28.39272	23.23346	NCW	NA
191	Kora	Yellow hornfels point	LSA	0-5	-28.39559	23.23776	NCW	NA

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192	Kora	Siltstone core	MSA	0-5	-28.38979	23.24051	NCW	NA
193	Kora	Fine grained quartzite flake	MSA	0-5	-28.38738	23.24599	NCW	NA
194	Kora	Broken hornfels blade with lateral retouch	MSA	0-5	-28.38738	23.25299	NCW	NA
195	Kora	Siltstone core extensively flaked	MSA	0-5	-28.39228	23.24829	NCW	NA
196	Kora	Quartzsite flake	MSA	0-5	-28.39686	23.24539	NCW	NA
197	Kora	Siltstone core and flake	MSA	0-5	-28.40179	23.25054	NCW	NA
198	Kora	Hornfels point, retouched edges	LSA	0-5	-28.39486	23.25441	NCW	NA
199	Kora	windmill	Modern	n/a	-28.39862	23.26985	NCW	NA
200	Kora	Quartz, Silcrete, hornfels microliths	LSA	5-10	-28.39638	23.26306	NCW	NA
201	Kora	quartzite core	LSA	0-5	-28.40136	23.26024	NCW	NA
202	Kora	Kraal and tank	Modern	n/a	-28.40199	23.2735	NCW	NA
203	Kora	Siltstone core and flake, early MSA	MSA	0-5	-28.41205	23.27087	NCW	NA
204	Kora	Fine grained quartzite flakes, curved retouched edges	MSA	0-5	-28.40637	23.2661	NCW	NA
205	Kora	Dark hornfels point with lateral retouch	MSA	0-5	-28.4058	23.27468	NCW	NA
206	Kora	Hornfels point and quartz core	MSA	0-5	-28.40018	23.28099	NCW	NA
207	Kora	Quartzite flake, prominent bulb of percussion	MSA	0-5	-28.39666	23.27758	NCW	NA
208	Kora	Hornfels flake with narrowed platform, probably hafted	MSA	0-5	-28.38911	23.26911	NCW	NA
209	Kora	Green chalcedony points	LSA	0-5	-28.38357	23.26817	NCW	NA
210	Kora	Fine grained quartzite flake	LSA	0-5	-28.38742	23.26223	NCW	NA
211	Kora	Hornfels point and flake	MSA	0-5	-28.39158	23.2724	NCW	NA
212	Kora	Hornfels microlithic point	LSA	0-5	-28.39222	23.27787	NCW	NA
213	Kora	Chalcedony flake, pointed, patinated hornfels blade	MSA	0-5	-28.39418	23.2867	NCW	NA
214	Kora	Banded quartz core	LSA	0-5	-28.39023	23.29089	NCW	NA
215	Kora	Green chalcedony cores and flakes	LSA+MSA	0-5	-28.38975	23.28648	NCW	NA
216	Kora	Brown and black hornfels cores and flakes	MSA	0-5	-28.38869	23.28243	NCW	NA
217	Kora	Weathered quartzite flake, early MSA	MSA	0-5	-28.38538	23.27661	NCW	NA
218	Kora	Broken hornfels blade and quartzite flake	MSA	0-5	-28.37892	23.27485	NCW	NA
219	Kora	Early Msa triangular flake, siltstone	MSA	0-5	-28.3826	23.28278	NCW	NA
220	Kora	Hornfels core	LSA	0-5	-28.38452	23.28989	NCW	NA
221	Kora	Ccs core flake	MSA	0-5	-28.38249	23.29518	NCW	NA
222	Kora	Ccs bladelet core	MSA	0-5	-28.37908	23.28955	NCW	NA
223	Kora	Hornfels point	LSA	0-5	-28.3774	23.28408	NCW	NA
224	Kora	Serrated ccs flake with curved point	MSA	0-5	-28.37283	23.27857	NCW	NA
225	Kora	Hornfels blade core	LSA	0-5	-28.37303	23.2731	NCW	NA
226	Kora	Windmill and tank	Modern	n/a	-28.38503	23.26609	NCW	NA
227	Kora	Kraal and tank	Modern	n/a	-28.38124	23.27254	NCW	NA
228	Kora	Siltstone cores and flakes	MSA	0-5	-28.36784	23.26686	NCW	NA
229	Kora	Siltstone cores and flakes	MSA	0-5	-28.3735	23.26762	NCW	NA
230	**Koraqua**	**Graves, 2 young girls in formal graves and at least 2 other graves marked with stones**	**Historic**	**n/a**	**-28.35683**	**23.27494**	**IIIA**	**200m Buffer area**
231	Koraqua	Ccs core and triangular flake, some edge retouch	MSA	0-5	-28.36179	23.26839	NCW	NA
232	Koraqua	Hornfels flake point reworked	LSA	0-5	-28.36703	23.27666	NCW	NA
233	Koraqua	Yellow hornfels flake and ccs microlithic core	LSA+MSA	0-5	-28.36885	23.28443	NCW	NA
234	Koraqua	Vein quartz flake with large dorsal scar	MSA	0-5	-28.37326	23.28982	NCW	NA
235	Koraqua	Quartzite flakes	MSA	0-5	-28.37804	23.29487	NCW	NA
236	Koraqua	Red ironstone early Msa flake with	MSA	0-5	-28.37702	23.30237	NCW	NA

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		faceted platform						
237	Koraqua	Blade point hornfels, some retouch on ventral surface	MSA	0-5	-28.37361	23.29855	NCW	NA
238	Koraqua	Ccs flake showing step hinge terminations	MSA	0-5	-28.36879	23.29337	NCW	NA
239	Koraqua	Long patinated hornfels core with flaking and recovered flake scars	MSA	0-5	-28.36505	23.29634	NCW	NA
240	Koraqua	Quartzite core	MSA	0-5	-28.36795	23.30104	NCW	NA
241	Koraqua	Hornfels core	LSA	0-5	-28.37147	23.30669	NCW	NA
242	Koraqua	Red ironstone pointed flake	MSA	0-5	-28.36508	23.3076	NCW	NA
243	Koraqua	Red ironstone core and flake blade	MSA	0-5	-28.36225	23.30289	NCW	NA
244	Koraqua	Red ironstone and quartz mixed flake, early msa	MSA	0-5	-28.36041	23.29415	NCW	NA
245	Koraqua	Kraal, windmill and tank	Modern	n/a	-28.36587	23.29043	NCW	NA
246	Koraqua	Tank and kraal	Modern	n/a	-28.36321	23.29623	NCW	NA
247	Koraqua	Quartz core, very fine flake scars	LSA	0-5	-28.36314	23.31407	NCW	NA
248	Koraqua	Red banded ironstone core	MSA	0-5	-28.3574	23.31362	NCW	NA
249	Koraqua	Unworked siltstone flakes, discard	MSA	0-5	-28.35503	23.30788	NCW	NA
250	Koraqua	Curled hornfels flake with retouch	MSA	0-5	-28.3547	23.32272	NCW	NA
251	Koraqua	Microliths, siltstone, quartz, Silcrete, chert	LSA	0-5	-28.34732	23.32342	NCW	NA
252	Koraqua	Hornfels flake with edge retouch	MSA	0-5	-28.34649	23.32871	NCW	NA
253	Koraqua	Hornfels adze	MSA	0-5	-28.34328	23.31838	NCW	NA
254	Koraqua	Siltstone and hornfels cores	MSA	0-5	-28.34916	23.31621	NCW	NA
255	Koraqua	Siltstone flake and core	MSA	0-5	-28.35033	23.31194	NCW	NA
256	Koraqua	Kraal, windmill and tank	Modern	n/a	-28.34748	23.30555	NCW	NA
257	Koraqua	Tank	Modern	n/a	-28.34381	23.29924	NCW	NA
258	Koraqua	Kraal and tanks	Modern	n/a	-28.3398	23.29255	NCW	NA
259	Koraqua	Siltstone and hornfels flakes	MSA	0-5	-28.3442	23.31298	NCW	NA
260	Koraqua	Quartz flake and core	LSA	0-5	-28.34204	23.30812	NCW	NA
261	Koraqua	Long siltstone flake patinated with retouched end, similar to a large adze	MSA	0-5	-28.33611	23.31019	NCW	NA
262	Koraqua	Siltstone core	MSA	0-5	-28.3319	23.30335	NCW	NA
263	Koraqua	Hornfels microliths	LSA	0-5	-28.32812	23.29371	NCW	NA
264	Koraqua	Hornfels flakes, some only debitage, thumbnail scraper	LSA	0-5	-28.33173	23.29239	NCW	NA
265	Koraqua	Hornfels flake with a lot of cortex remaining and siltstone flake	MSA	0-5	-28.33597	23.29956	NCW	NA
266	Koraqua	Siltstone chopper	MSA	0-5	-28.3402	23.30266	NCW	NA
267	Koraqua	Hornfels core and flake	LSA	0-5	-28.33596	23.28873	NCW	NA
268	Koraqua	Hornfels flake	MSA	0-5	-28.33984	23.28331	NCW	NA
269	Koraqua	Quartz, ccs and hornfels flakes	MSA	0-5	-28.3476	23.2785	NCW	NA
270	Koraqua	Siltstone flakes	MSA	0-5	-28.35044	23.28666	NCW	NA
271	Koraqua	Hornfels flakes with longitudinal scars on dorsal	MSA	0-5	-28.34433	23.2891	NCW	NA
272	Koraqua	Hornfels core	MSA	0-5	-28.34994	23.29852	NCW	NA
273	Koraqua	Hornfels flakes	MSA	0-5	-28.35408	23.30197	NCW	NA
274	Koraqua	Quartz crystal, core and hornfels flakes	LSA	0-5	-28.35377	23.29645	NCW	NA
275	Koraqua	Hornfels flakes	MSA	0-5	-28.35477	23.29095	NCW	NA
276	**Koraqua**	**Spring Valley farmhouse complex, modern buildings on eastern end, some older historic buildings on western end**	**Historic**	**n/a**	**-28.35844**	**23.27824**	**IIIB**	**200m no development buffer**
277	**Khoemana**	**Possible graves near Griekwastad road on the eastern end and on the de Klerk's ground. If these are graves there are about 10 in all**	**Historic**	**n/a**	**-28.395504**	**23.368983**	**IIIA**	**No-go area**

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Table 1b: Observations noted during the field assessment in March 2022 for the amended southern grid alignment

Obs #	Project	Description	Period	Density	Co-Ordinates		Grading	Mitigation
278	Grid	Light brown hornfels with most of the edge retouched	LSA	0 to 5	-28.34516239	23.58926686	NCW	NA
279	Grid	Hornfels debitage	LSA	0 to 5	-28.349886	23.579093	NCW	NA
280	Grid	Chert core	LSA	0 to 5	-28.35348421	23.56608137	NCW	NA
281	Grid	Fine grained hornfels point, retouch	LSA	0 to 5	-28.355791	23.559362	NCW	NA
282	Grid	Hornfels core	MSA	0 to 5	-28.35951154	23.54945785	NCW	NA
283	Grid	Reddish hornfels core flake, edge retouched	MSA	0 to 5	-28.36196068	23.54219168	NCW	NA
284	Grid	Chert flake, lateral edge retouch	MSA	0 to 5	-28.36620806	23.5357312	NCW	NA
285	Grid	Chert point	MSA	0 to 5	-28.37410031	23.53031145	NCW	NA
286	Grid	Light brown hornfels core	LSA	0 to 5	-28.37894424	23.52739722	NCW	NA
287	Grid	Microlithic hornfels core and flake	LSA	0 to 5	-28.38426512	23.52375533	NCW	NA
288	Grid	Large red hornfels core	MSA	0 to 5	-28.38968236	23.52012152	NCW	NA
289	Grid	Light brown hornfels point	LSA	0 to 5	-28.39339719	23.51762844	NCW	NA
290	Grid	Hornfels flake	MSA	0 to 5	-28.39951785	23.51313933	NCW	NA

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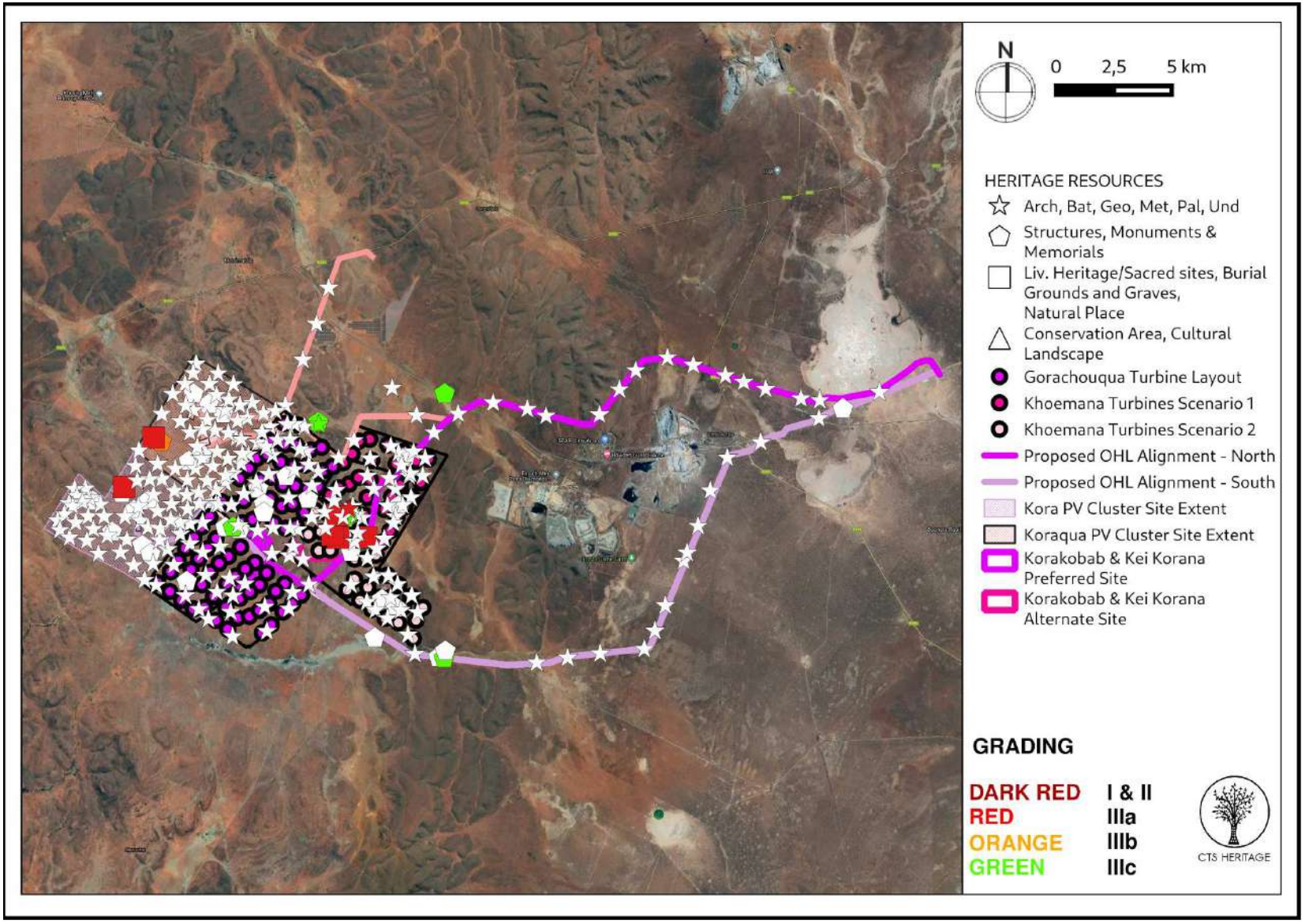

Figure 6: Map of heritage resources identified during the field assessment, and known sites, relative to the proposed development footprint

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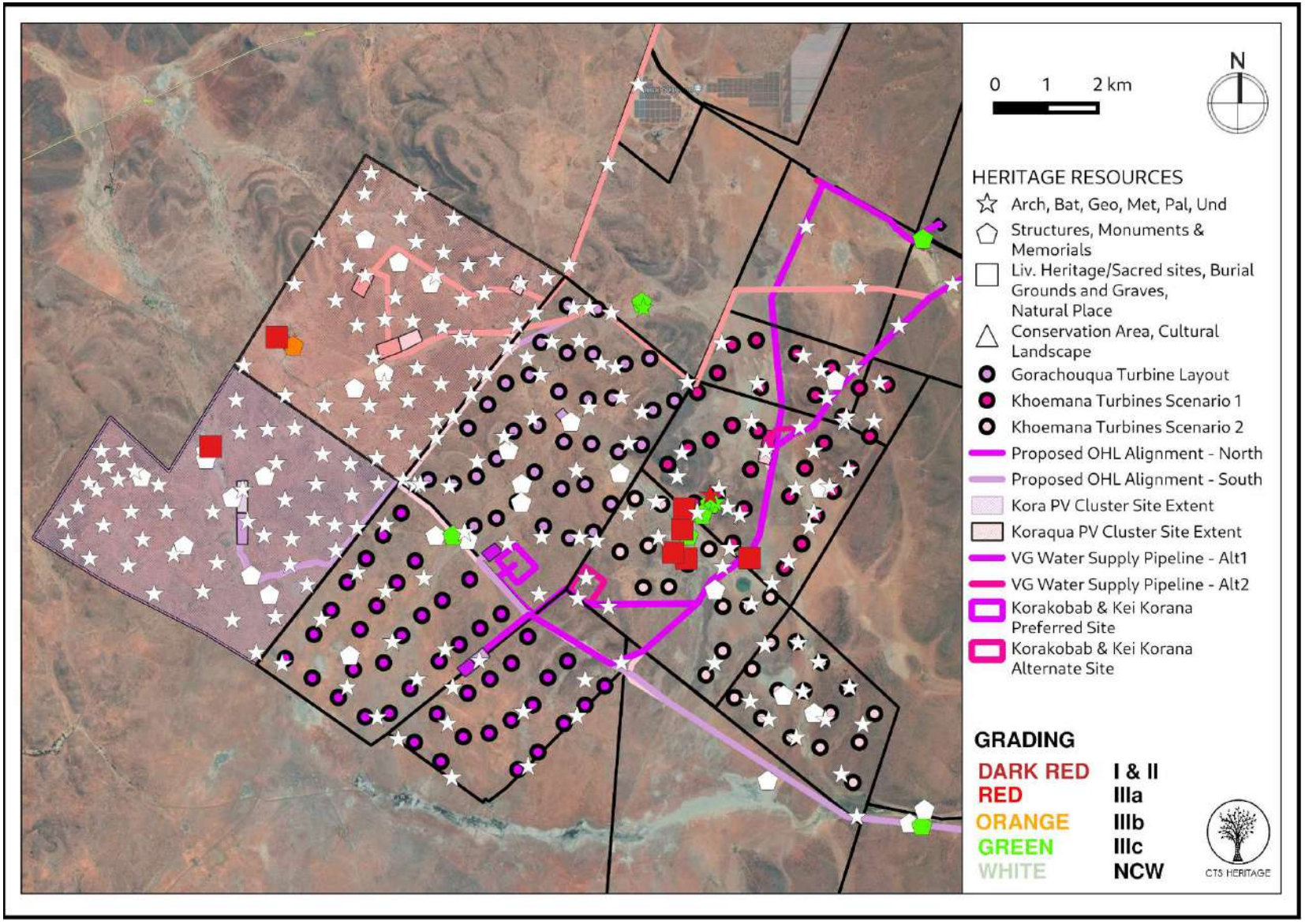

Figure 6.1: Map of heritage resources identified during the field assessment, and known sites, relative to the proposed development footprint

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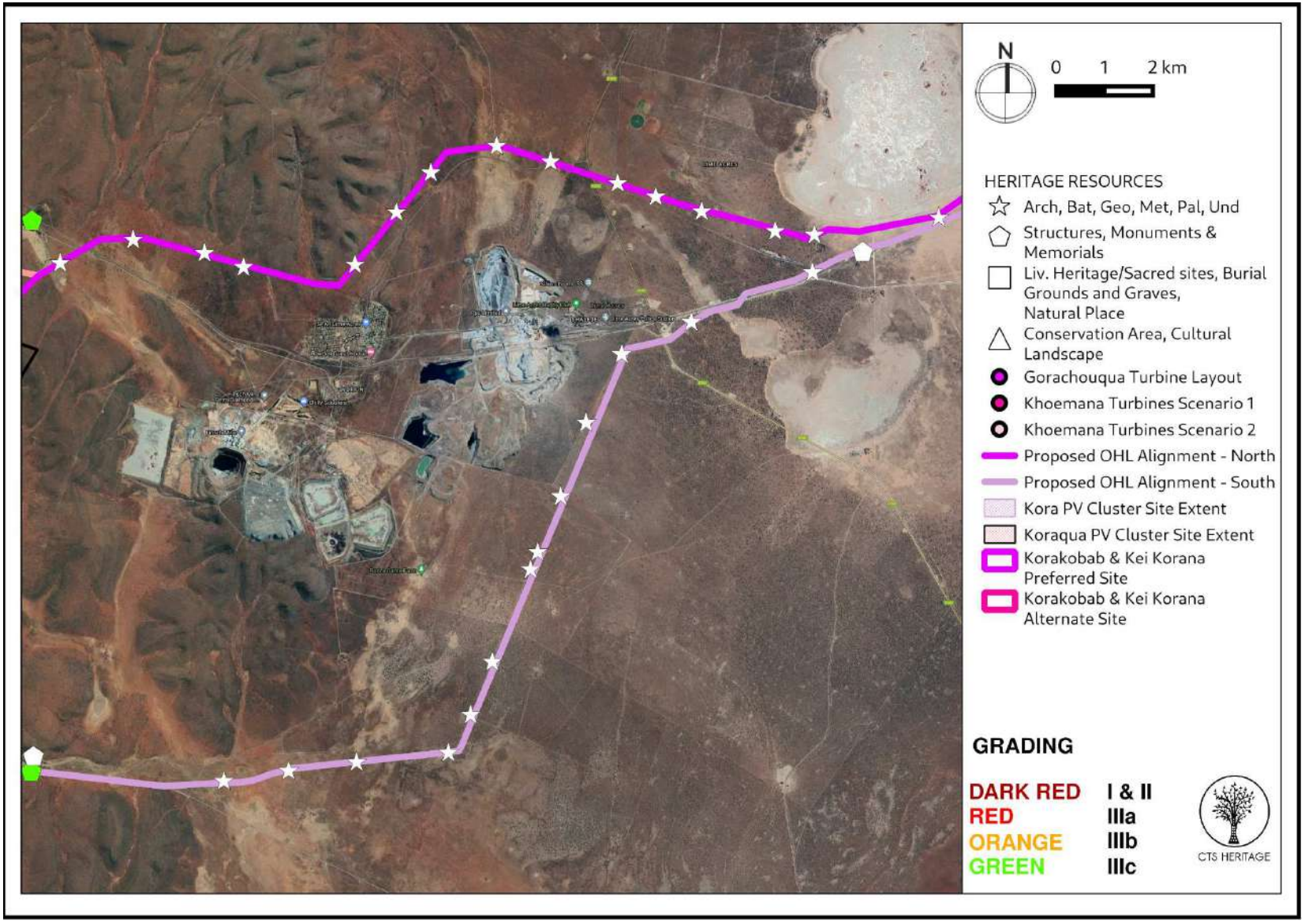

Figure 6.2: Map of heritage resources identified during the field assessment, and known sites, relative to the proposed development footprint

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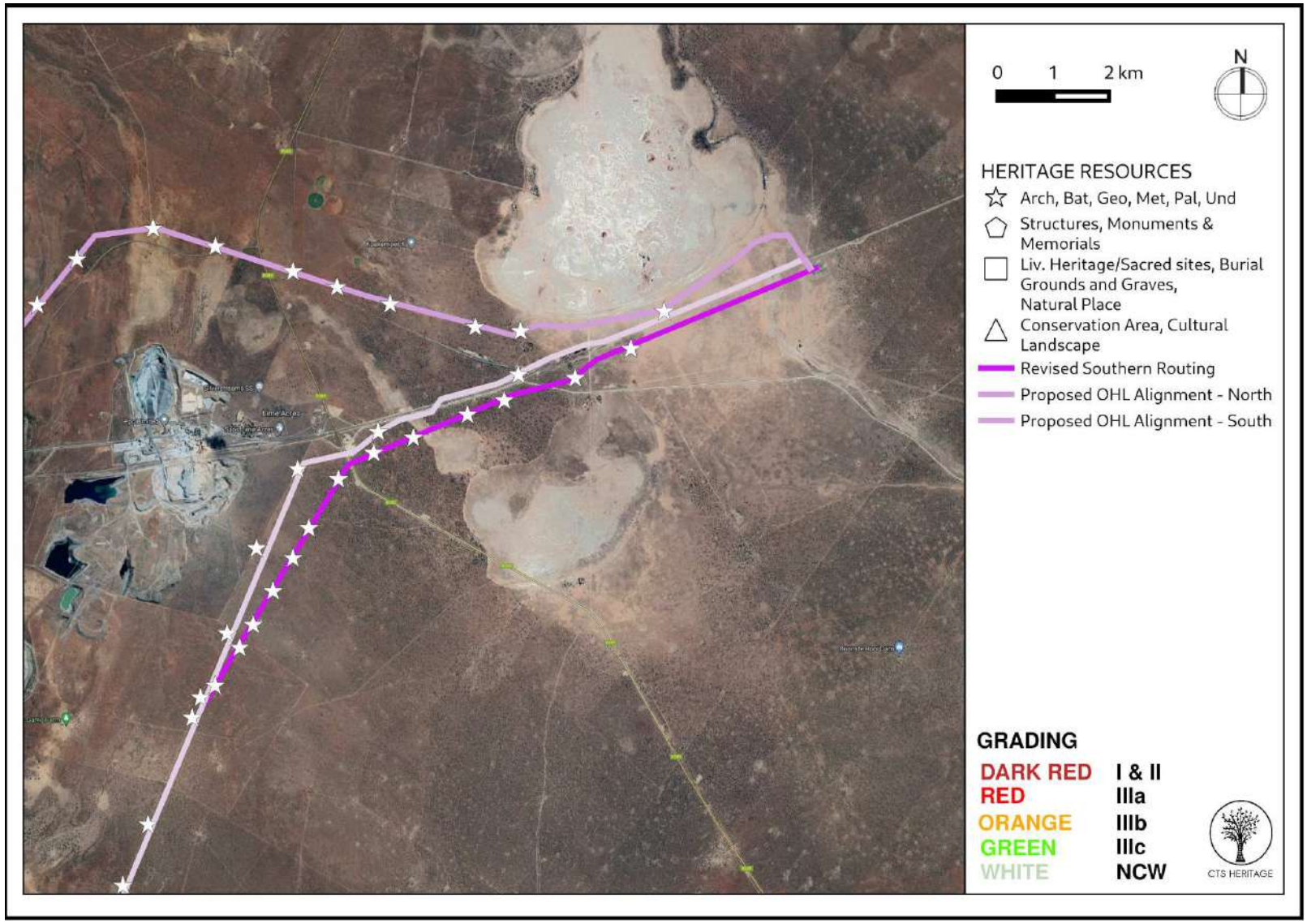

Figure 6.3: Map of heritage resources identified during the field assessment, relative to the proposed development footprint of the revised southern OHL routing. All observations made were determined to be Not Conservation-Worthy

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4.3 Selected photographic record

(a full photographic record is available upon request)

Figure 7.1: Site No. 22

Figure 7.2: Site No. 23

Figure 7.3: Site No. 24

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Figure 7.4: Site No. 53

Figure 7.5 Site No. 54

Figure 7.6 Site No. 59

Figure 7.7 Site No. 82

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Figure 7.8 Site No. 82

Figure 7.9 Site No. 83

Figure 7.10 Site No. 84

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Figure 7.11 Site No. 114

Figure 7.12 Site No. 155

Figure 7.13 Site No. 156

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Figure 7.14 Site No. 157

Figure 7.15 Site No. 161

Figure 7.16 Site No. 174

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Figure 7.17 Site No. 174

Figure 7.18 Site No. 174

Figure 7.19 Site No. 174

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Figure 7.20 Site No. 175

Figure 7.21 Site No. 230

Figure 7.22 Site No. 230

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5. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT

5.1 Assessment of impact to Archaeological Resources

The heritage field assessment identified a number of heritage resources located within the areas proposed for development. The majority of these heritage resources were determined to be not conservation-worthy and as such, no further mitigation for impacts to these heritage observations is recommended.

A number of heritage resources of significance were, however, identified. These resources range from significant archaeological sites and scatters, to burial grounds and graves as well as historic farm werfs and infrastructure such as the irrigation furrows ascribed to the work of the London Missionary Society and the local Griekwa population. The relationship between the furrows, the farm werfs and the burials form a unique and layered cultural landscape that speaks to the unique past of this area and its Griekwa inhabitants. It is important that the spatial relationship of these resources is not disrupted by the proposed development.

Below, we detail the specific heritage resources identified within each proposed project associated with the Taaibosch Puts Renewable Energy Development.

Khoemana WEF

There are a number of significant heritage resources located within the footprint of the Khoemana WEF development, most of which are oriented around Strathmore Farm (Site No. 54) and the ruined farm werf (Site No. 82). The identified heritage resources located in close proximity to the Strathmore Farm, the irrigation furrows and the ruined farm werf include a number of burial ground or graves (Site No. 53, 155, 156, 157 and 277), stone kraals (Site No. 83 and 84) and archaeological sites (Site No. 59 and 174).

In the layout provided, a number of turbines are proposed to be located in very close proximity to these resources, thereby disrupting the historic integrity of the landscape. In order to conserve these resources and the unique spatial relationship that they have, a no development zone is proposed around these sites (Figure 9.1). Turbines 25, 29, 30, 33 and 34 fall within this no-development zone and as such, it is recommended that they be removed from the layout proposal as they are not supported from a heritage perspective.

Gorachouqua WEF

The older Klein Fairview farmhouse is located within this development layout (Site No. 114). This site is located along an existing road and within a proposed grid alignment. While no direct impact from the proposed development is anticipated, the nearest turbine to this heritage resource is Turbine 34 located only 450m away. It is recommended that this turbine be removed from the layout in order to conserve the context of this heritage resource.

Koraqua PV

The Springvalley Farm Complex (Site No. 276) and a burial (Site No. 230) are located within the Koraqua PV. In the layout that has been provided these sites are located within the PV area however it is recommended that no impact to

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these sites is permitted. A no development buffer of 200m around each site is recommended to ensure that no impact occurs.

Kora PV

The van den Berg historic homestead (Site No. 175) is located within the area proposed for the Kora PV Facility. In the layout that has been provided this site is located within the PV area however it is recommended that no impact to this site is permitted. A no development buffer of 200m around this site is recommended to ensure that no impact occurs.

Grid Connections

An older clay cottage (Site No. 161) is located along the southern grid connection. This site is located along an existing road and within a proposed grid alignment. While no direct impact from the proposed development is anticipated, it is important that no pylons are placed within 20m of the structure and as such, a 20m no development buffer is recommended around this site.

Other heritage resources identified as part of previous HIA processes are known in close proximity to the grid alignments. These are mapped in Figure 3 and include archaeological sites 44751, 44759 and 44762 graded IIIC. These archaeological resources are located more than 100m from the proposed north grid alignment and as such, no impact is anticipated.

Structures 85446 and 85447 graded IIIB are located more than 100m from the proposed south grid alignment and as such, no impact is anticipated.

No heritage resources of significance were identified along the proposed amended southern grid routing.

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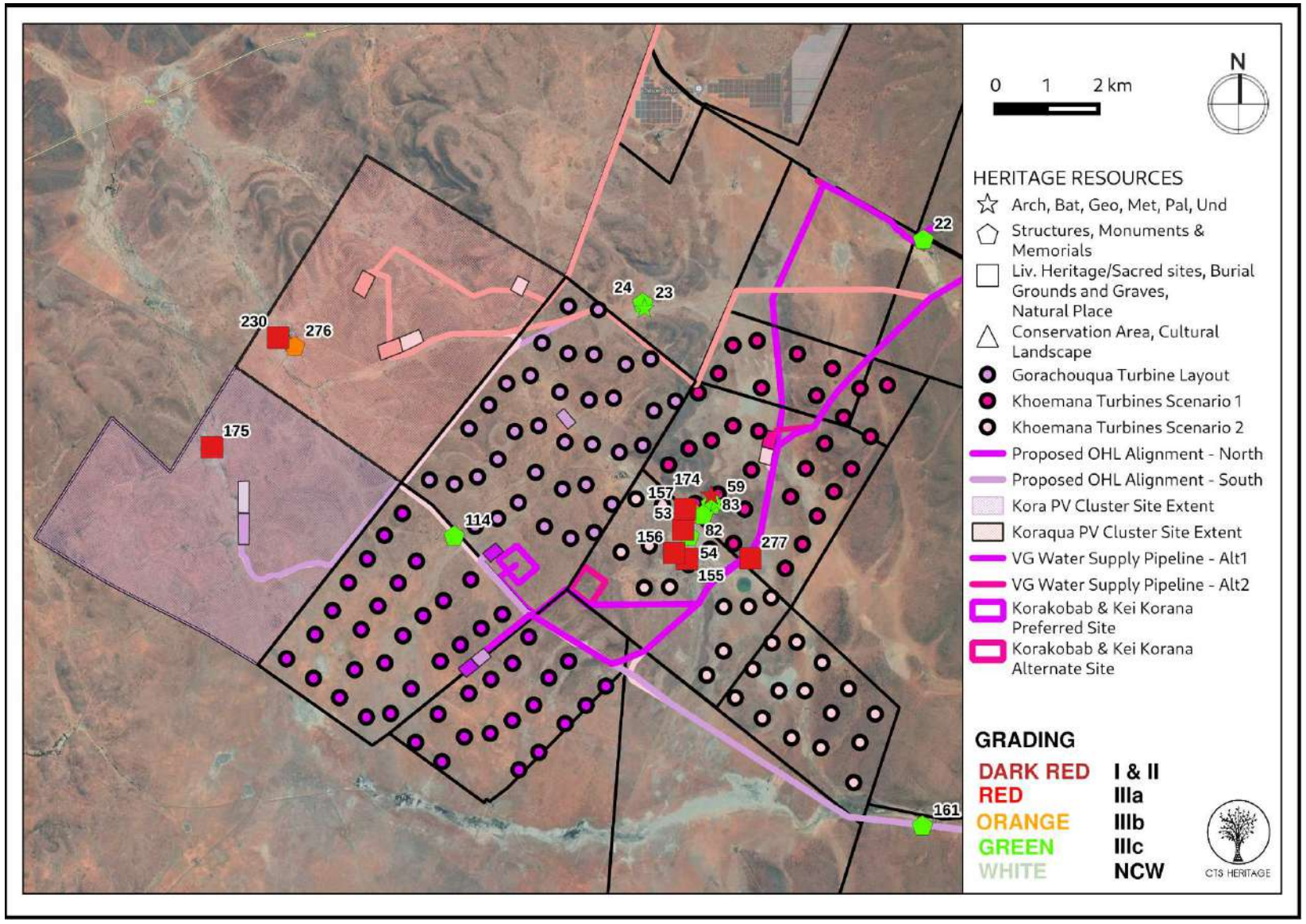

Figure 8: Map of significant heritage resources identified during the field assessment, and known sites, relative to the proposed development footprint

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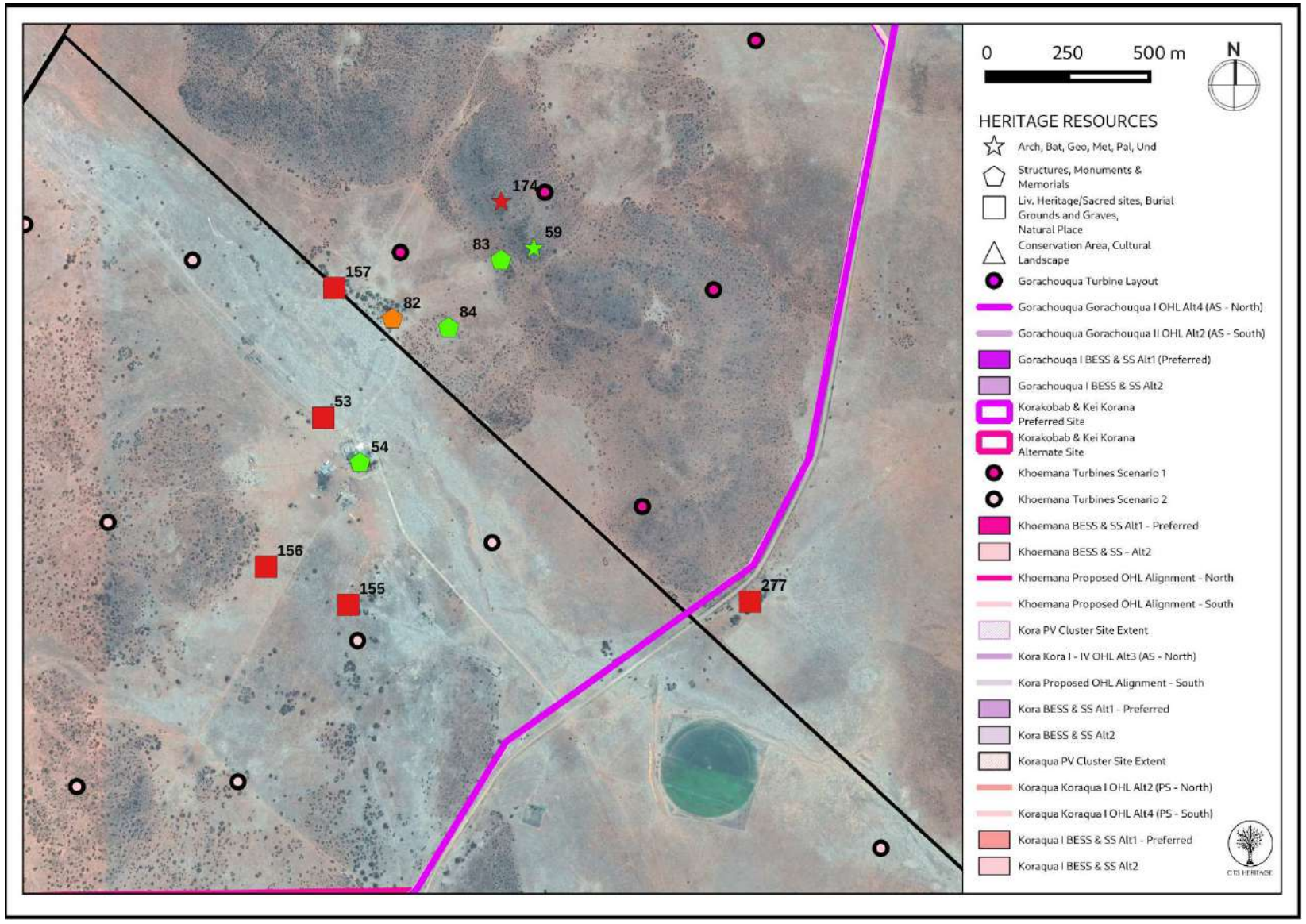

Figure 8.1: Map of significant heritage resources identified during the field assessment, and known sites, relative to the proposed development footprint

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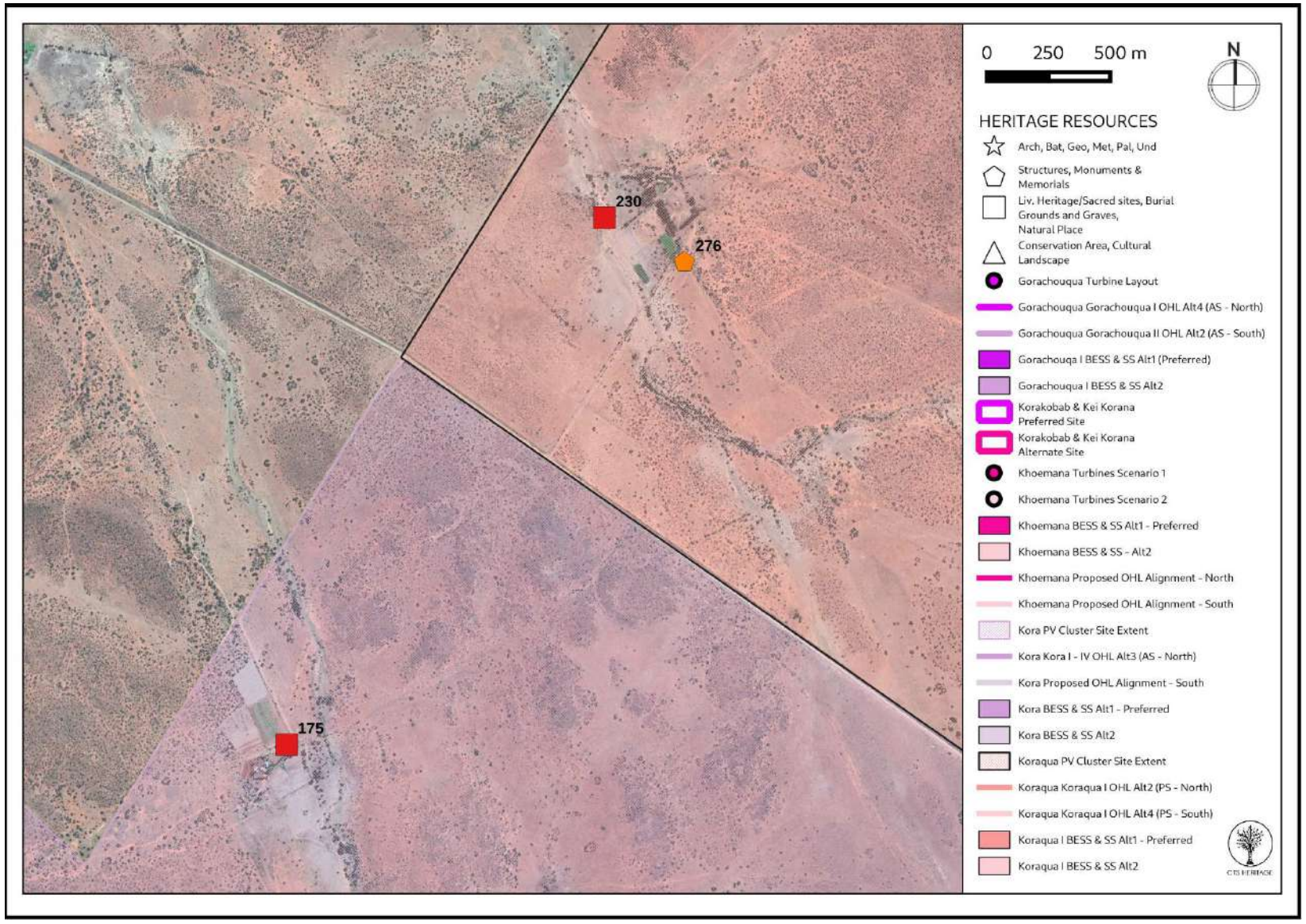

Figure 8.2: Map of significant heritage resources identified during the field assessment, and known sites, relative to the proposed development footprint

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6. CONCLUSION AND RECOMMENDATIONS

As was anticipated, the archaeological field assessment revealed a great many heritage resources evident within the development area - 277 in total. The vast majority of these resources, consisting of individual artefacts and low density artefact scatters ascribed to the Middle and Later Stone Age as well as rural infrastructure such as wind mills, have been determined to be not conservation-worthy. No further mitigation for impacts to these heritage observations is recommended.

A number of heritage resources of significance were, however, identified. These resources range from significant archaeological sites and scatters, to burial grounds and graves as well as historic farm werfs and infrastructure such as the irrigation furrows ascribed to the work of the London Missionary Society and the local Griekwa population. The relationship between the furrows, the farm werfs and the burials form a unique and layered cultural landscape that speaks to the unique past of this area and its Griekwa inhabitants. It is important that the spatial relationship of these resources is not disrupted by the proposed development. Various mitigation measures are proposed in Table 3 above and in the below recommendations in order to mitigate these impacts.

Recommendations

There is no objection to the proposed development from an archaeological perspective on condition that the following mitigation measures are implemented:

1. The no go area identified in Figure 9.1 must be adhered to. No turbines or associated infrastructure is permitted within this area. This includes Khoemana Turbines 25, 29, 30, 33 and 34
2. A minimum no-go development area of 200m must be implemented around Sites 175, 230 and 276 to ensure the conservation of the broader context of these resources (Figure 9.2)
3. A minimum no-go development area of 20m must be implemented around Sites 114 and 161 to ensure that no impact to these structures takes place (Figure 9.3 and Figure 9.4)
4. The Gorachouqua Turbine 34 must be removed from the layout (Figure 9.3).
5. Should any human remains, burials or burial grounds be uncovered during construction activities, work must cease in the vicinity of the find and the SAHRA Burial Grounds and Graves Unit must be contacted regarding a way forward.
6. Should any archaeological resources be uncovered during construction activities, work must cease in the vicinity of the find and the SAHRA Archaeology, Palaeontology and Meteorites Unit must be contacted regarding a way forward.

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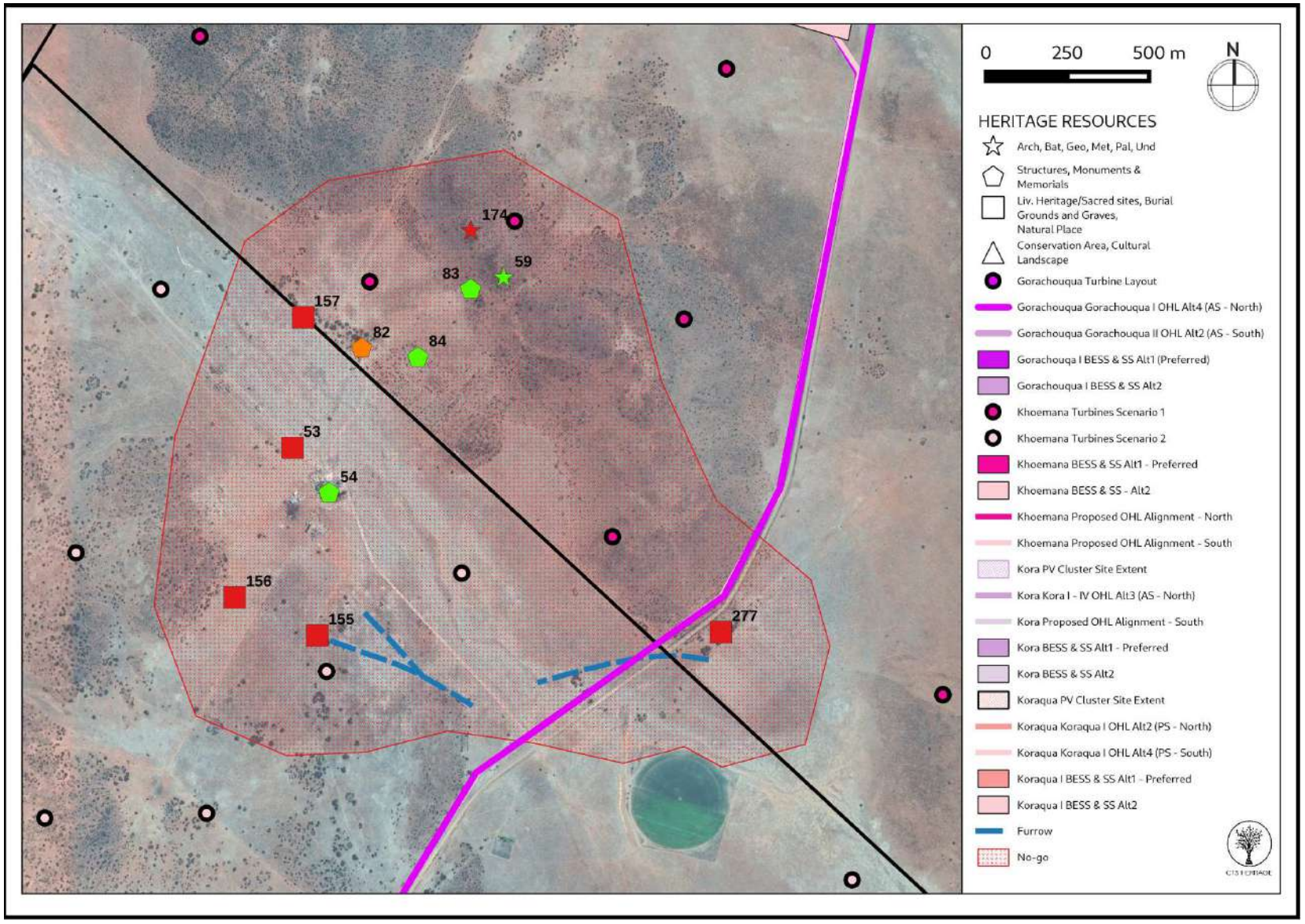

Figure 9.1: Map of significant heritage resources identified during the field assessment, and known sites, relative to the proposed development footprint including recommended no-go area

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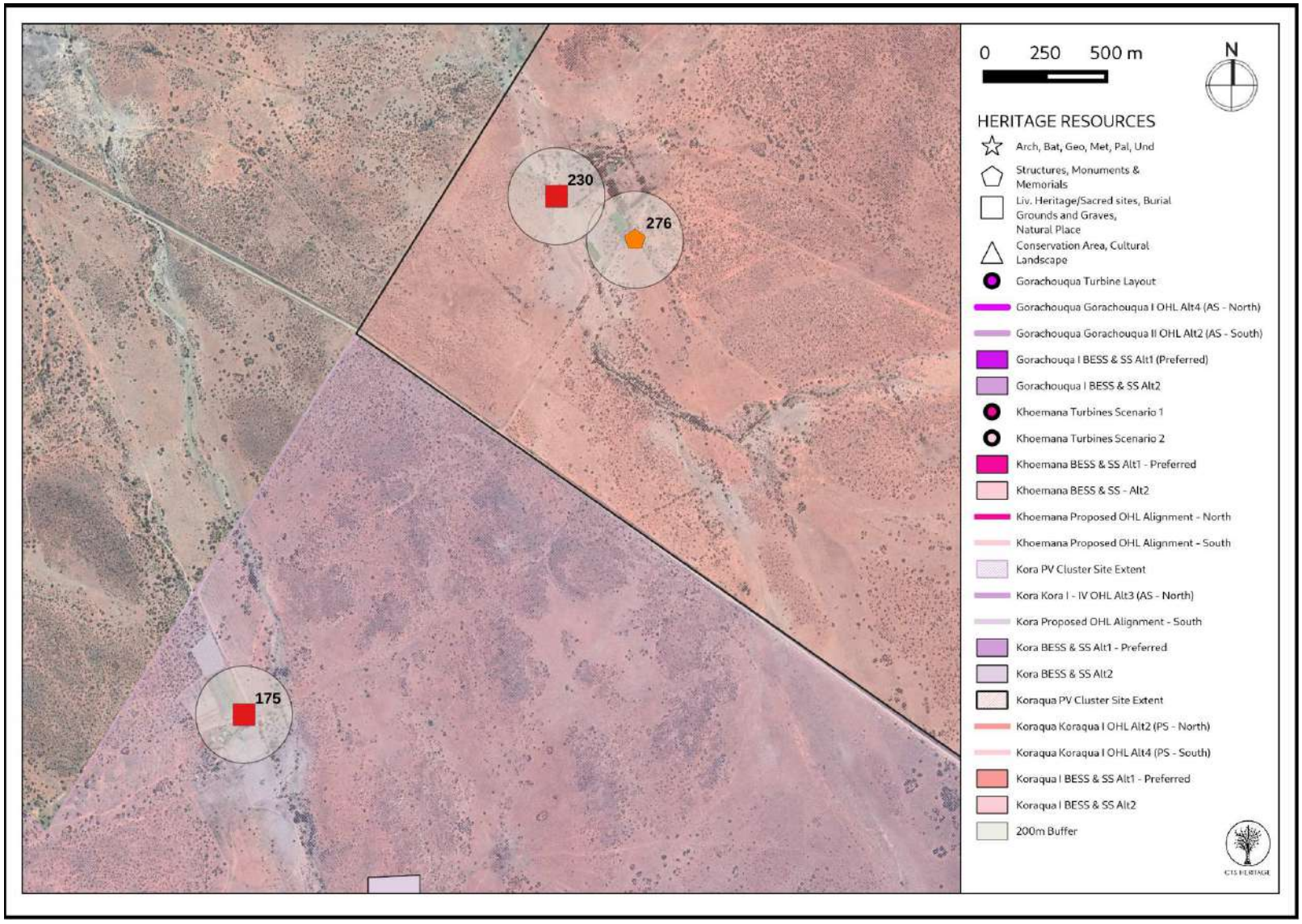

Figure 9.2: Map of significant heritage resources identified during the field assessment, and known sites, relative to the proposed development footprint including recommended 200m buffers

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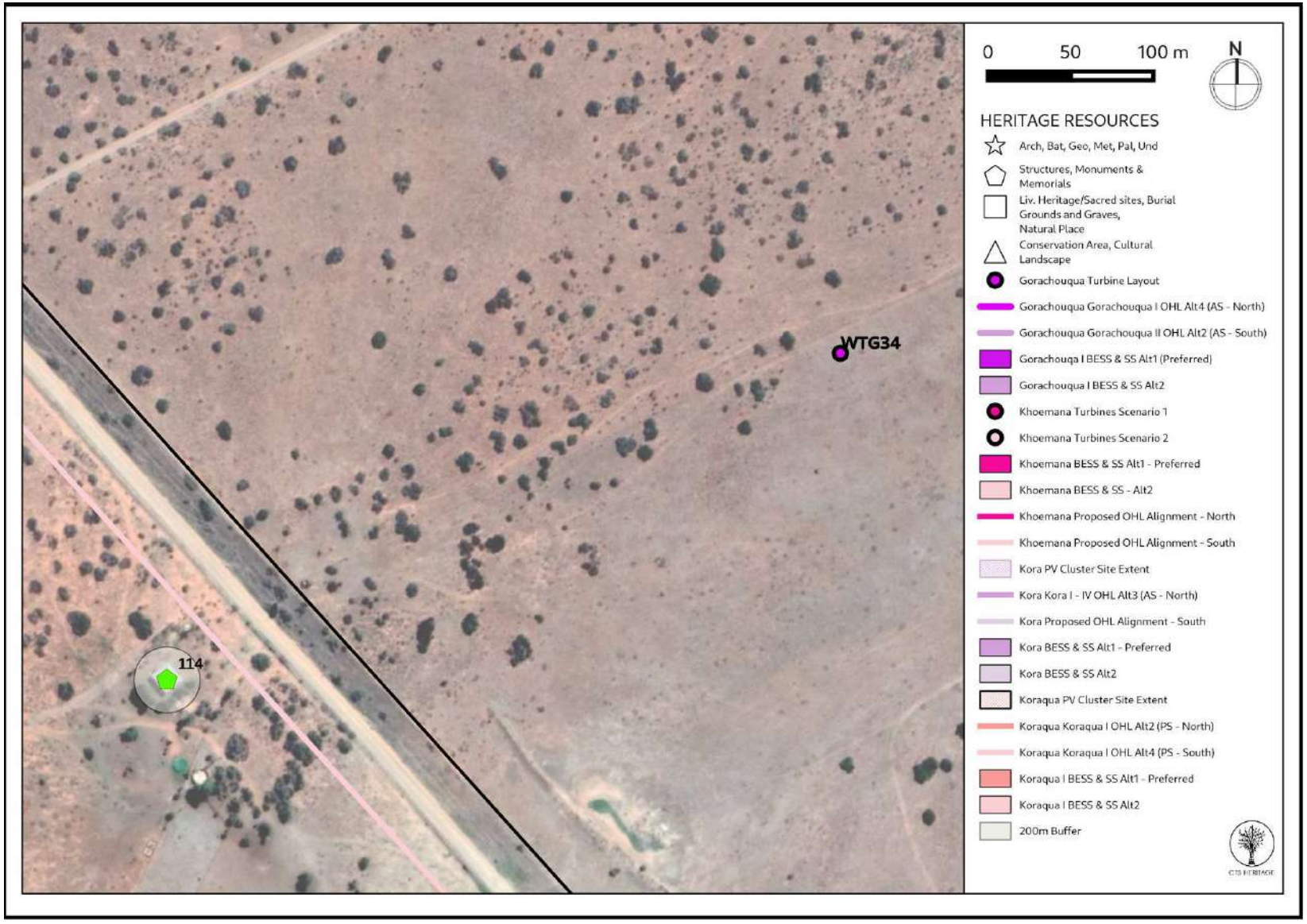

Figure 9.3: Map of significant heritage resources identified during the field assessment, and known sites, relative to the proposed development footprint including recommended 20m buffers

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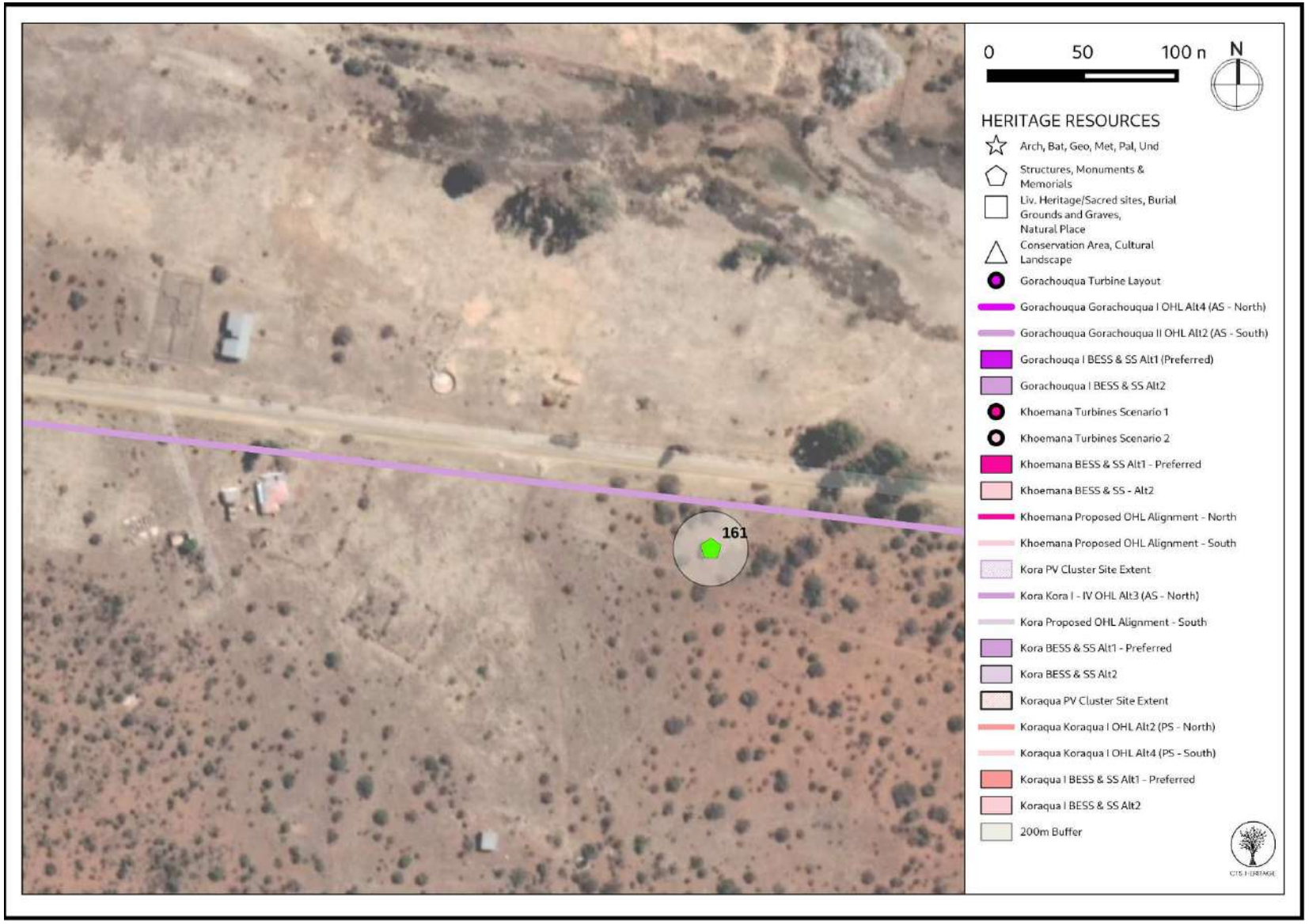

Figure 9.4: Map of significant heritage resources identified during the field assessment, and known sites, relative to the proposed development footprint including recommended 20m buffers

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7. REFERENCES

Heritage Impact Assessments				
Nid	**Report Type**	**Author/s**	**Date**	**Title**
6780	AIA Phase 1	Zoe Henderson	01/09/2005	Cultural Heritage Assessment for Finsch Mine
7842	AIA Phase 1	Cobus Dreyer	19/11/2007	Archaeological and Historical Investigation of the Proposed Mining Activities at the Farm Rosslyn, Lime Acres, Northern Cape
4602	AIA Phase 1	David Morris	01/07/2008	Archaeological and Heritage Impact Assessment on Remainder of Carter Block 458, near Limeacres, Northern Cape
163992		Wouter Fourie	03/12/2013	Proposed Construction of the Limestone 1 - 132kV Power Line and the associated Switchyards on Portion 0 (remaining extent) of the Farm 267, Northern Cape Province
164009	Heritage Impact Assessment Specialist Reports	Wouter Fourie	03/12/2013	Proposed Decommissioning and Construction of the Limestone 2 - 132kV Power Line and the associated Switchyards on Portion 0 (remaining extent) of the Plaas 267 Arriesfontein, Northern Cape Province
6218	AIA Phase 1	Wouter Fourie	27/03/2012	Heritage Impact Assessment: The proposed 10mw Photovoltaic (PV) Power Plant on the Farm Arriesfontein (Farm 267) near Danielskuil, Northern Cape Province
6958	AIA Phase 1	Wouter Fourie	10/06/2011	Humansrus Solar Thermal Energy Power Plant, Postmasburg
8240	AIA Phase 1	David Morris	11/06/2010	Proposed development of PV Power Station at Welcome Wood, near Owendale, Northern Cape
8368	AIA Phase 1	Karen Van Ryneveld	29/06/2005	Cultural Heritage Site Inspection Report for the Purpose of a Prospecting Right EMP - (Portion of) Skeyfontein 536, Postmasburg District, Northern Cape, South Africa
8899	PIA Phase 1	John E Almond	04/05/2011	Recommended exemption from further palaeontological studies: Proposed Humansrus Solar Thermal Energy Power Plant development on Farm 469, near Postmasburg, Northern Cape Province
9047	PIA Phase 1	John E Almond	11/06/2010	Proposed photovoltaic power station adjacent to Welcome Wood Substation, Owendale near Postmasburg, Northern Cape Province
73252	HIA Phase 1	Wouter Fourie	13/09/2012	Heritage Impact Assessment - Proposed Construction of 132kv Power Line and Switchyard Associated with the Redstone Solar Thermal Energy Plant in the Northern Cape Province
83272	HIA Phase 1	David Morris	01/08/2012	Archaeological & Cultural Heritage Impact Assessment Phase 1: Proposed Olien Solar Project development on Portion 4 of Farm 300, Barkly West, near Limeacres, Northern Cape
83273	PIA Desktop	Jennifer Botha-Brink	26/06/2012	PALAEONTOLOGICAL IMPACT ASSESSMENT OF THE PROPOSED OLIEN SOLAR PROJECT ON FARM 300, BARKLY WEST, NORTHERN CAPE PROVINCE
109815	HIA Phase 1	Wouter Fourie	22/03/2012	132 kV Power line connection to the Humasrus Solar Thermal Energy Power plant, postmasburg.
114648	PIA Desktop	John E Almond	01/09/2012	Palaeontological specialist assessment: desktop study PROPOSED 16 MTPA EXPANSION OF TRANSNETâ€™S EXISTING MANGANESE ORE EXPORT RAILWAY LINE & ASSOCIATED INFRASTRUCTURE BETWEEN HOTAZEL AND THE PORT OF NGQURA, NORTHERN & EASTERN CAPE.

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				Part 1: Hotazel to Kimberley, Northern Cape
122772	HIA Phase 1	Wouter Fourie	01/09/2011	Heritage Impact Assessment for the Humansrus Solar Thermal Energy Power Plant, Postmasburg
123342	HIA Phase 1	Marko Hutten	01/04/2013	Renewable Energy Generation project on the farm Grootvlei 296, Kgatelopele Local Municipality, Siyanda District Municipality, Northern Cape Province
129751	HIA Phase 1	Elize Becker	20/02/2013	Phase 1 Heritage Impact Assessment Hotazel to Kimberley and De Aar to Port of Ngqura
155262	PIA Desktop	John E Almond	22/12/2013	Palaeontological Heritage Basic Assessment: Desktop Study - Proposed construction of a 132 kV power line and switchyard associated with the Redstone Solar Thermal Energy Plant near Postmasburg, Northern Cape Province
156348	Archaeological Monitoring	Lloyd Rossouw	08/01/2014	Updated report on the Cultural Heritage Impact Assessment for Petra Diamonds Finsch Mine
162535	AIA Phase 1	David Morris	02/03/2012	Archaeological Impact Assessment Phase 1: Proposed development of a PV Power Station at Welcome Wood (extended area), near Owendale, Northern Cape
162542	PIA Desktop	John E Almond	01/02/2012	PALAEONTOLOGICAL IMPACT ASSESSMENT: DESKTOP STUDY Proposed PV power stations Welcome Wood II and III adjacent to Welcome Wood Substation, near DaniÃ«lskuil, Northern Cape Province
173943	Heritage Impact Assessment Specialist Reports	Marko Hutten, John Almond	15/07/2014	Proposed Construction of two 132kV Power Lines and Switchyards to connect the ACWA Power SolarReserve Redstone Solar Thermal Power Plant with the Olien Substation â€“ Option 1: ACWA Power SolarReserve Redstone Solar Thermal Power Plant to Olien Substation, in the ZF Ngcawu District Municipality â€“ Heritage Impact Assessment
173967	Heritage Impact Assessment Specialist Reports	Marko Hutten	15/07/2014	Proposed Construction of two 132kV Power Lines and Switchyards to connect the Redstone Solar Thermal Energy Plant with the Olien Substation in the ZF Ngcawu District Municipality â€“ Heritage Impact Assessment Option 2: Silverstreams substation to Olien Substations
344620	PIA Phase 1	John E Almond	09/11/2015	Palaeontological Heritage Report for the proposed 132 kV power lines between the ACWA Power SolarReserve Redstone Solar Thermal Energy Plant Site and Olien Main Transmission Substation near Lime Acres, Northern Cape Province
361351	AIA Phase 1	Karen Van Ryneveld	20/03/2016	Archaeological Impact Assessment Report
361357	PIA Phase 1	Lloyd Rossouw	03/05/2016	Palaeontological Impact Assessment

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CTS HERITAGE

APPENDIX 2 Palaeontological Impact Assessment 2022

Palaeontological Impact Assessment for the proposed Taaibosch Puts Energy Cluster, Postmasburg, Northern Cape Province

CTS21_084

Site Visit Report (Phase 2)

For

CTS Heritage

12 March 2022

Prof Marion Bamford
Palaeobotanist
P Bag 652, WITS 2050
Johannesburg, South Africa
Marion.bamford@wits.ac.za

Expertise of Specialist

The Palaeontologist Consultant: Prof Marion Bamford
Qualifications: PhD (Wits Univ, 1990); FRSSAf, ASSAf
Experience: 33 years research; 25 years PIA studies

Declaration of Independence

This report has been compiled by Professor Marion Bamford, of the University of the Witwatersrand, sub-contracted by CTS Heritage, Cape Town, South Africa. The views expressed in this report are entirely those of the author and no other interest was displayed during the decision making process for the Project.

Specialist: Prof Marion Bamford

Signature: 

Executive Summary

A Palaeontological Impact Assessment was requested for the proposed Taaibosch Puts Energy Cluster Facility (SEFs, WEFs, Green Hydrogen Facility and Green Ammonia production facility) to the east of Postmasburg, Northern Cape Province, and overhead power lines to feed into the existing Olien substation northeast of Lime Acres.

To comply with the regulations of the South African Heritage Resources Agency (SAHRA) in terms of Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), a site visit (Phase 2) Palaeontological Impact Assessment (PIA) was completed for the proposed development.

The proposed SEF and WEF sites lie on the moderately fossiliferous Quaternary sands but it is unlikely that any fossil traps such as palaeo-pans and paleao-springs occur in the project footprint. The proposed OHL routes to connect the Taaibosch Puts Energy Cluster facility to Olien Substation, the Northern and Southern, lie on potentially fossiliferous Campbell Rand Subgroup dolomites that could preserve trace fossils such as stromatolites. The site visit by palaeontologists on 27-28 February 2022 confirmed that there are **NO FOSSILS of any kind** along these routes. Nonetheless, a Fossil Chance Find Protocol should be added to the EMPr. Based on this information it is recommended that no further palaeontological impact assessment is required unless fossils are found by the contractor/ environmental officer/ other designated responsible person once excavations/drilling/activities for pole foundations have commenced.

The western energy cluster site can be considered as non-fossiliferous. The two eastern OHL routes have no fossils on the surface as confirmed by the site visit. The impact on the palaeontological heritage therefore is very low for the west and low for the eastern routes. As far as the palaeontology is concerned, the project should be authorised.

Table of Contents

i. Background

ENERTRAG South Africa (Pty) Ltd, Reg no. 2017/143710/07 (ESA) has appointed Jones & Wagener (Pty) Ltd Engineering and Environmental Consultants (J&W) to assist with the respective permitting processes, including as relevant a Waste Management License (WML), Air Emissions License (AEL), respective applications for Environmental Authorisation (EA) and Water Use License application/s (WUL) (as required) for the proposed Taaibosch Puts Energy Cluster (collectively comprising the proposed projects). In addition, the applicant will apply as per Section 53 of the Mineral and Petroleum Resources Development Act (No 28 of 2002) for land use contrary to the objectives of the act.

The proposed projects are located approximately 28 km south-west of Danielskuil and 30 km east of Postmasburg in the Tsantsabane Municipality, Northern Cap (Figure 1). The proposed projects collectively comprise approximately 11 110 ha and consist of the following:

- Kora (I – IV) Solar PV Energy Facilities;
- Koraqua (I – V) Solar PV Energy Facilities;
- Khoemana Wind Energy Facility;
- Gorachouqua (I and II) Wind Energy Facilities;
- Korakobab Green Hydrogen Facility;
- Kei Korana Green Ammonia production facility;
- Electrical Grid Infrastructure (EGI) respectively for the proposed projects.

This palaeontology specialist report records the findings of the fieldwork conducted for the proposed Taaibosch Puts Energy Cluster (collectively comprising the proposed projects) but focuses on the EGI powerline routes eastwards to the existing Eskom Olien substation. There are two routes, namely the proposed Overhead line (OHL) alignment – North and the OHL alignment – South (Figure 2). The Energy Cluster is on Quaternary sands that are moderately sensitive and do not require a site visit, while the EGI north and south OHL alignments are partly along very highly sensitive rocks of the Lime Acres Formation (Figures 3, 4)

The Taaibosch Puts Energy Cluster area is split roughly in two sections with the western side dedicated to the proposed solar farms (SEFs) while the eastern side consists of the proposed wind farm (WEFs).

Two powerline routes running for about 30km each along the southern and northern ends that connect up the electrical generation facilities to the Olien Eskom substation east of Lime Acres were assessed. The Asbestos Mountains form a low series of hills running from the southwest to the northeast between Lime Acres and the eastern end of the proposed wind farm.

An existing solar farm (Lesedi Solar Park) lies just to the north of the study area and is similar in scale to the Koraqua solar farm proposed at Springfield 470 farm and the Kora solar farm proposed at Farmersfield 572 farm. The WEF lies on the farms Sunnyside (469), Strathmore (500), Fairview and Klein Fairview (497) and Taaibosch Puts (499).

Taaibosch Puts is the only property which is predominantly flat, uniform and covered in grassland. The rest of the properties have various flat grassland areas in amongst low, gentle ridges and small koppies.

The powerline routes goes along similar ground before linking up with an existing 765kV powerline route along nearly flat calcareous ground extending into the Ghaap Plateau Vaalbosveld, the Olifantshoek Plains Thornveld and Kuruman Mountain Bushveld vegetation types (Mucina and Rutherford, 2009).

A Palaeontological Impact Assessment was requested for the Taaibosch Puts Energy Cluster project. To comply with the regulations of the South African Heritage Resources Agency (SAHRA) in terms of Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), a site visit and walkthrough (Phase 2) Palaeontological Impact Assessment (PIA) was completed for the proposed development, focussed on the potentially very highly fossiliferous powerline routes and is reported herein.

Table 1: Specialist report requirements in terms of Appendix 6 of the EIA Regulations (amended 2017)

	A specialist report prepared in terms of the Environmental Impact Regulations of 2017 must contain:	**Relevant section in report**
ai	Details of the specialist who prepared the report	Appendix B
aii	The expertise of that person to compile a specialist report including a curriculum vitae	Appendix B
b	A declaration that the person is independent in a form as may be specified by the competent authority	Page 1
c	An indication of the scope of, and the purpose for which, the report was prepared	Section i.
ci	An indication of the quality and age of the base data used for the specialist report: SAHRIS palaeosensitivity map accessed – date of this report	Yes
cii	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change	Section 5

	A specialist report prepared in terms of the Environmental Impact Regulations of 2017 must contain:	**Relevant section in report**
d	The date and season of the site investigation and the relevance of the season to the outcome of the assessment	N/A
e	A description of the methodology adopted in preparing the report or carrying out the specialised process	Section ii.
f	The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure	Section 4
g	An identification of any areas to be avoided, including buffers	N/A
h	A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	N/A
i	A description of any assumptions made and any uncertainties or gaps in knowledge;	Section viii.
j	A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment	Section vii.
k	Any mitigation measures for inclusion in the EMPr	Section 8, Appendix A
l	Any conditions for inclusion in the environmental authorisation	N/A
m	Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 8, Appendix A
ni	A reasoned opinion as to whether the proposed activity or portions thereof should be authorised	Section 6
nii	If the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	Sections 6, 8
o	A description of any consultation process that was undertaken during the course of carrying out the study	N/A
p	A summary and copies if any comments that were received during any consultation process	N/A
q	Any other information requested by the competent authority.	N/A

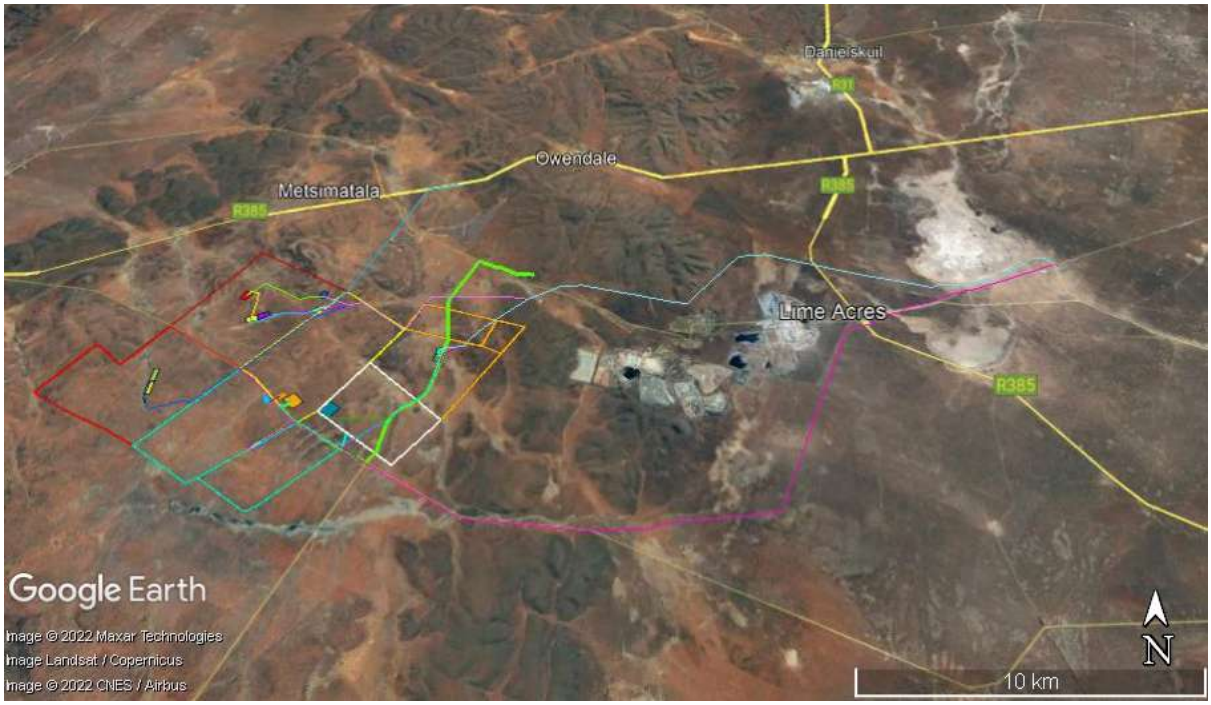

Figure 1: Google Earth map of the proposed development showing the relevant land marks. The SEFs and WEFs will be to the west.

Figure 2: Google Earth map of the eastern powerline routes that fall on very highly sensitive strata showing the Northern OHL route (blue) and Southern OHL route (lilac).

ii. Methods and Terms of Reference

The Terms of Reference (ToR) for this study were to undertake a PIA and provide feasible management measures to comply with the requirements of SAHRA.

The methods employed to address the ToR included:

1. Consultation of geological maps, literature, palaeontological databases, published and unpublished records to determine the likelihood of fossils occurring in the affected areas. Sources included records housed at the Evolutionary Studies Institute at the University of the Witwatersrand and SAHRA databases;
2. Where necessary, site visits by a qualified palaeontologist to locate any fossils and assess their importance, as is the case here;
3. Where appropriate, collection of unique or rare fossils with the necessary permits for storage and curation at an appropriate facility (*not applicable to this assessment*); and
4. Determination of fossils' representivity or scientific importance to decide if the fossils can be destroyed or a representative sample collected (*not applicable to this assessment*).

iii. Geology and Palaeontology

iv. Project location and geological context

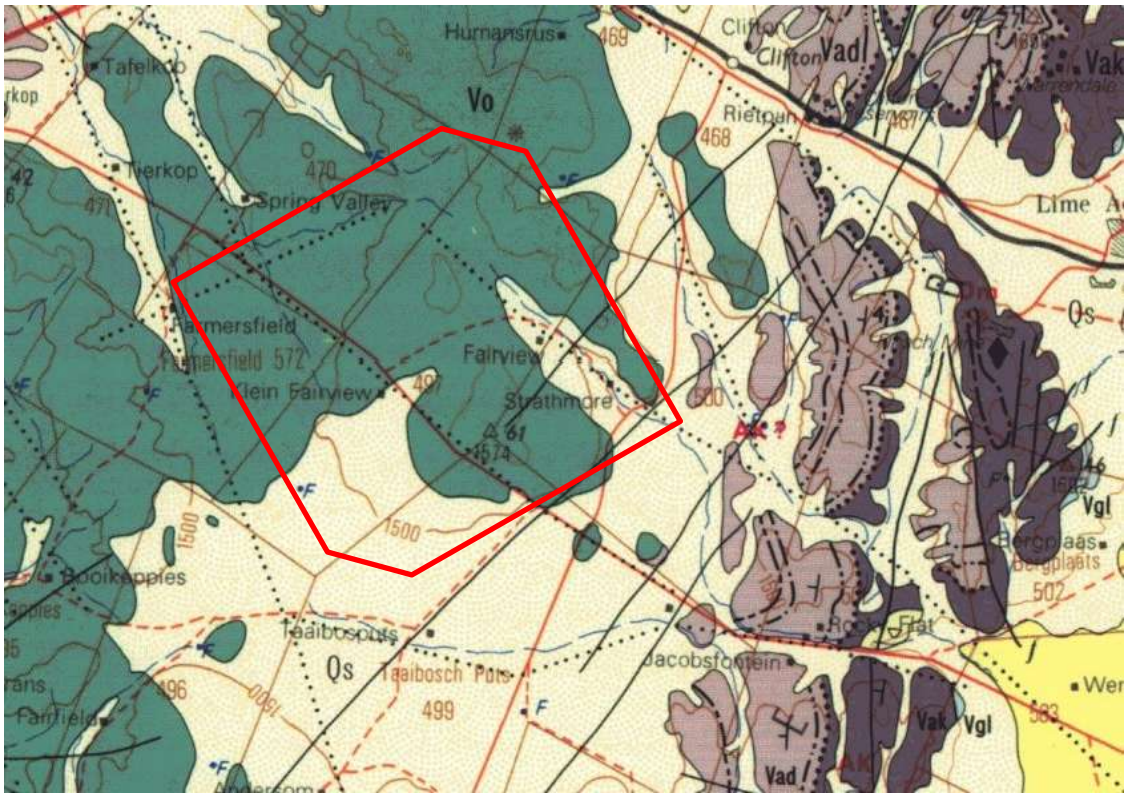

Figure 3: Geological map of the area around the western SEFs and WEFs for the Taaibosch Puts Energy cluster indicated within the yellow rectangle. Abbreviations of the rock types are explained in Table 2. Map enlarged from the Geological Survey 1: 250 000 map 2822 Postmasburg.

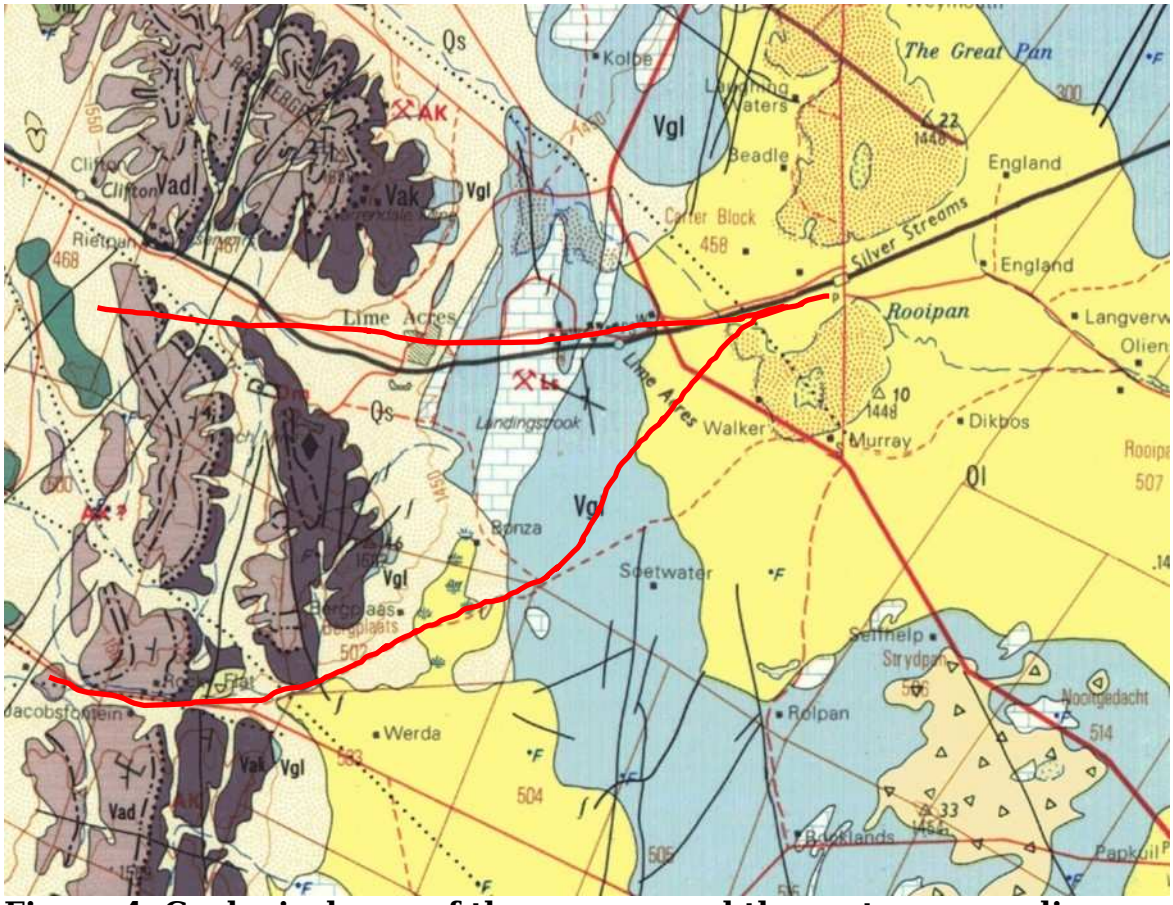

Figure 4: Geological map of the area around the eastern powerline routes the Taaibosch Puts Energy cluster indicated by the red lines. Abbreviations of the rock types are explained in Table 2. Map enlarged from the Geological Survey 1: 250 000 map 2822 Postmasburg.

Table 2: Explanation of symbols for the geological map and approximate ages (Eriksson et al., 2006. Johnson et al., 2006; Schroder et al., 2016). SG = Supergroup; Fm = Formation; Mb = Member; Ma = million years; grey shading = formations impacted by the project.

Symbol	Group/Formation	Lithology	Approximate Age
Qs	Quaternary sands	Alluvium, sand, aeolian sand	Neogene, ca 2.5 Ma to present
Ql	Quaternary limestones	Dolerite dykes, intrusive	Tertiary-Quaternary,
Vo	Ongeluk Fm, Postmasburg Group, Transvaal SG	Andesitic lava, amygdaloidal lava	2222 Ma

Symbol	Group/Formation	Lithology	Approximate Age
Vad	Danielskuil Fm, Asbestos Hills Group Subgroup, Ghaap Group, Transvaal SG	Banded ironstone	2460 – 2440 Ma
Vak	Kuruman Fm, Asbestos Hills Group Subgroup, Ghaap Group, Transvaal SG	Banded ironstone	2460 – 2440 Ma
Vgl	Lime Acres Mb, Kogelbeen Fm, Cambell Rand Subgroup, Ghaap Group, Transvaal SG.	Dolomite, limestone	>2521 Ma

The site lies in the Griqualand West Basin that preserves sediments of the Transvaal Supergroup. Overlying these rocks are much younger sands of the Quaternary Kalahari Group (Figures 3, 4).

The Late Archaean to early Proterozoic Transvaal Supergroup is preserved in three structural basins on the Kaapvaal Craton (Eriksson et al., 2006). In South Africa are the Transvaal and Griqualand West Basins, and the Kanye Basin is in southern Botswana. The Griqualand West Basin is divided into the Ghaap Plateau sub-basin and the Prieska sub-basin. Sediments in the lower parts of the basins are very similar but they differ somewhat higher up the sequences. Several tectonic events have greatly deformed the south western portion of the Griqualand West Basin between the two sub-basins

The Transvaal Supergroup comprises one of world's earliest carbonate platform successions (Beukes, 1987; Eriksson et al., 2006; Zeh et al., 2020). In some areas there are well preserved stromatolites that are evidence of the photosynthetic activity of blue green bacteria and green algae. These microbes formed colonies in warm, shallow seas.

The Transvaal Supergroup rocks in the Griqualand West Basin can be correlated with the rocks in the Transvaal Basin, closely according to Beukes and colleagues, or not so closely according to Moore and colleagues. Nonetheless, these rocks represent on a very large scale, a sequence of sediments filling the basins under conditions of lacustrine, fluvial, volcanic and glacial cycles in a tectonically active region. The predominantly carbonaceous sediments are evidence of the increase in the atmosphere of oxygen produced by algal colony photosysnthesis, the so-called Great Oxygen Event (ca 2.40 – 2.32 Ga) and precursor to an environment where diverse life forms could evolve. The Neoarchean-

Paleoproterozoic Transvaal Supergroup in South Africa contains the well-preserved stromatolitic Campbellrand -Malmani carbonate platform (Griqualand West Basin – Transvaal Basin respectively), which was deposited in shallow seawater shortly before the Great Oxidation Event (GOE).

In the Griqualand West sub-basin are the basal Schmidtsdrift Subgroup, Campbell Rand Subgroup and Asbestos Hills Subgroup.

The Campbell Rand Subgroup has been divided into seven formations based on the different environmental settings that produced stromatolites, microbial mats, laminates, chert and carbonate platform.

The Monteville Formation of the Campbell Rand Subgroup in the Ghaap Plateau Sub-basin overlies the Clearwater Formation and is composed of up to 200m thickness of stromatolitic domes, then microbial laminites (laminated stromatolitic carbonate rocks)with fenestrae and carbonate argillites, all with intercalated shales and siltstones (Eriksson et al., 2006). The environment is interpreted as successive transgressive-regressive cycles superimposed on a lower-order shallowing upward cycle as the basin filled stromatolitic carbonates and shales.

Next in the sequence is the Reivilo Formation and is the most extensive component of the Campbell Rand Subgroup. It is up to 900m thick, represents a renewed transgressive phase with the upper Kamden Member BIF-like part; the rest is composed of dolomite with giant stromatolitic domes intercalated with cycles of columnar stromatolites (Eriksson et al., 2006).

The overlying Fairfield Formation represents shallow platform conditions again with the clastic laminated carbonate beds passing upward in unto columnar stromatolites and fenestrated laminates. The next two formations, the Klipfonteinheuwel and Papkuil Formations are also composed of platform carbonates with columnar stromatolites and oolitic beds.

The lower Klippan Formation has small stromatolites that pass upwards to form microbial laminates representing a transgression to deep water facies in a lagoonal setting. The overlying Kogelbeen Formation has varying dolomite, limestone and chert lithologies, then domal to columnar stromatolites, laminates and chert. The limestone-rich **Lime Acres Member** that contains economically important limestone, completes this formation,

Next are the Gamohaan and Tsineng Formations with microbial mats, laminates and chert for the top strata of the Campbell Rand Group.

The Asbestos Hills Subgroup has three formations, the lower Kliphuis formation, the **Kuruman Formation** and the **Danielskuil Formation**.

They are all banded iron formations and have vast economically important reserves,

Above the Asbestos Hills Subgroup is the Postmasburg Group. The Makganyene Formation has diamictites and shales from the moraine of glacial conditions. Disconformably overlying these are the **Ongeluk Formation** basaltic andesitic lavas. According to Cornell et al. (1996) and Schroder et al. (2016) the Ongeluk Formation is equivalent to the lavas of the Hekpoort Formation in the Transvaal Basin.

v. Palaeontological context

The palaeontological sensitivity of the area under consideration is presented in Figure 5. The western part, the SEF and WEF area are on non-fossiliferous lavas of the Ongeluk Formation and on moderately fossiliferous (green) Quaternary sands and aeolian sands. These materials do no preserve fossils because the form aerobic environments that not conducive to preservation. In addition, windblown (aeolian) sand cannot transport fossils that are large enough to see or to be recognisable. These sands, however, may cover palaeo-pans of palaeo-spring, such features that would be visible in the satellite imagery. No such feature is visible in the project footprint.

The two routes for the OHLs to the east are partly on rocks of the Lime Acres Member (Kogelbeen Formation, Campbell Rand Subgroup). Formations in this subgroup preserve a variety of stromatolites, laminites and microbial mats (Eriksson et al., 2006). Stromatolites are the trace fossils that were formed by colonies of green algae and blue-green algae (Cyanobacteria) that grew in warm, shallow marine settings. These algae were responsible for releasing oxygen via the photosynthetic process where atmospheric carbon dioxide and water, using energy from the sun, are converted into carbon chains and compounds that are the building blocks of all living organisms. The released carbon dioxide initially was taken up by the abundant reducing minerals to form oxides, e.g. iron oxide. Eventually free oxygen was released into the atmosphere and some was converted into ozone by the bombardment of cosmic rays. The ozone is critical for the filtering out of harmful ultraviolet rays.

Stromatolites are the layers upon layers of inorganic materials that were deposited during photosynthesis, namely calcium carbonate, magnesium carbonate, calcium sulphate and magnesium sulphate. These layers can be in the form of flat layers, domes or columns depending on the environment where they grew (Beukes, 1987). Some environments did not form stromatolites, just layers of limestone that later was converted to dolomite. The algae that formed the stromatolites are very rarely preserved, and they are microscopic so they can only be seen from thin sections studies under a petrographic microscope.

Laminites and microbial mats are also trace fossils formed by photosynthesising microbes. They have been variously called Microbialites (sensu Burne and Moore, 1987), or Microbially induced sedimentary structures “MISS” (sensu Noffke et al., 2001) and possibly having a non-biotic origin (Davies et al., 2016). These features are very subtle and hard to recognise.

Figure 5: SAHRIS palaeosensitivity map for the site for the proposed Taaibosch Puts Energy Cluster with the SEFs and WEFs within the yellow rectangle (west) and the Northern and Southern OHL routes shown by the lines to the. Background colours indicate the following degrees of sensitivity: red = very highly sensitive; orange/yellow = high; green = moderate; blue = low; grey = insignificant/zero.

From the SAHRIS map above the eastern area is indicated as very highly sensitive (red) for the whole of the Ghaap Group although there are different facies in the different formations that make u this group. A site visit was completed on 27-28 February 2022 along the northern and southern OHL routes.

vi. Site visit observations

Table 3: Site observations, and relevant figures. GPS points in separate Exel Spreadsheet

Observations	Figures
North OHL route, west to east: the topography is flat, no rocky outcrops and no dolomite where there could be stromatolites; some carbonaceous outcrops but powdery	6, 8 - d
South OHL route west to east– same as northern route	7, 9a – d
NE route to Olien Substation – same as first part of northern route but less dense grass cover, possibly less gravel than the southern route	6, 10a - d

Figure 6: Annotated Google Earth map for the site stops and observations for the Northern OHL route (refer to Table 3 and Figures 8 and 10).

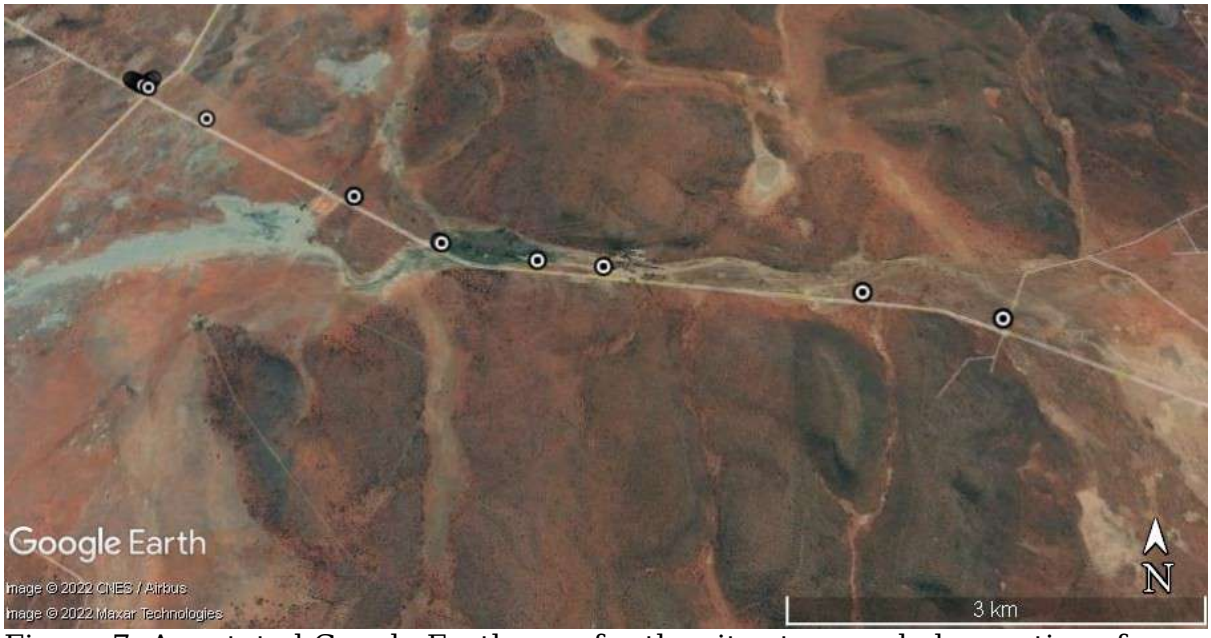

Figure 7: Annotated Google Earth map for the site stops and observations for the Southern OHL route (refer to Table 3 and Figure 9).

Figure 8: Taaibosch Puts Energy Cluster site visit photographs – **Northern OHL** alignment, from west to east. Note the generally flat topography, grasslands with some shrubs in places, sandy soil or carbonaceous soils exposed (B). No exposures of dolomite or any potential outcrops with stromatolites.

Figure 9: Taaibosch Puts Energy Cluster site visit photographs – **Southern OHL alignment** route, from west to east. Note the generally flat topography, grasslands and rare shrubs. Sols is sandy with minor gravel. No dolomite outcrops and no stromatolites.

Figure 10: Taaibosch Puts Energy Cluster site visit photographs – **northeast to Olien Substation** near the railway line. Note the generally flat topography, grasslands and patches of shrubs. Calcrete is visible in some of the roads but may have been brought in make the roads. No exposures of dolomite or any stromatolites anywhere along the route.

vii. Impact assessment

An assessment of the potential impacts to possible palaeontological resources considers the criteria encapsulated in Table :

Table 4a: Criteria for assessing impacts

PART A: DEFINITION AND CRITERIA		
Criteria for ranking of the SEVERITY/NATURE of environmental impacts	**H**	Substantial deterioration (death, illness or injury). Recommended level will often be violated. Vigorous community action.
	M	Moderate/ measurable deterioration (discomfort). Recommended level will occasionally be violated. Widespread complaints.
	L	Minor deterioration (nuisance or minor deterioration). Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	L+	Minor improvement. Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	M +	Moderate improvement. Will be within or better than the recommended level. No observed reaction.
	H +	Substantial improvement. Will be within or better than the recommended level. Favourable publicity.
Criteria for ranking the DURATION of impacts	**L**	Quickly reversible. Less than the project life. Short term
	M	Reversible over time. Life of the project. Medium term
	H	Permanent. Beyond closure. Long term.
Criteria for ranking the SPATIAL SCALE of impacts	**L**	Localised - Within the site boundary.
	M	Fairly widespread – Beyond the site boundary. Local
	H	Widespread – Far beyond site boundary. Regional/ national
PROBABILITY (of exposure to impacts)	**H**	Definite/ Continuous
	M	Possible/ frequent
	L	Unlikely/ seldom

Table 4b: Impact Assessment

PART B: Assessment		
SEVERITY/ NATURE	**H**	-
	M	-

PART B: Assessment		
	L	Soils and sands do not preserve plant fossils; so far there are no records from the Lime Acres Fm of stromatolites in this region so it is very unlikely that fossils occur on the site. The impact would be very unlikely.
	L+	-
	M+	-
	H+	-
DURATION	**L**	-
	M	-
	H	Where manifest, the impact will be permanent.
SPATIAL SCALE	**L**	Since the only possible fossils within the area would be trace fossils such as stromatolites in the dolomites, the spatial scale will be localised within the site boundary.
	M	-
	H	-
PROBABILITY	**H**	**-**
	M	**-**
	L	It is extremely unlikely that any fossils would be found in the loose sand or soils that will be excavated for pole foundations. **The site visit confirmed that there were no fossils**. Nonetheless, a Fossil Chance Find Protocol should be added to the eventual EMPr.

Based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the powerline route or Energy Cluster footprint. The geological structures suggest that the rocks are the correct age and type to preserve fossils. The site visit and walk through confirmed that there were NO FOSSILS in the project footprint. Furthermore, the material to be excavated for foundations is soils and sands and these do not preserve fossils. Since there is an extremely small chance that fossils from the Lime Acres Formation below ground may be disturbed a Fossil Chance Find Protocol has been added to this report. Taking account of the defined criteria, the potential impact to fossil heritage resources is extremely low.

viii. Assumptions and uncertainties

Based on the geology of the area and the palaeontological record as we know it, it can be assumed that the formation and layout of the dolomites,

sandstones, shales and sands are typical for the country and only the dolomites might contain trace fossils such as stromatolites. The site visit and walk through on 27-28 February 2022 by palaeontologists Rick Tolchard and Bailey Weiss confirmed that there are NO FOSSILS along the proposed powerline routes from the northeast corner of the Taaibosch Puts Energy Cluster eastwards towards Lime Acres or along the southern route. The Energy cluster footprint is on non-fossiliferous rocks except for the northeast corner. Although this property was not accessible, from road it was possible to see that it had the same vegetation and topography as the first section of the northern powerline route, therefore it can be assumed that the geology is the same and no dolomite was visible. The sands of the Quaternary period would not preserve fossils.

ix. Recommendation

Based on the fossil record but confirmed by the site visit and walk through there are NO FOSSILS such as stromatolites in the Lime Acres Formation (Campbell Rand Group, Ghaap Plateau, Transvaal Supergroup even though fossils have been recorded from rocks of a similar age and type in South Africa. It is extremely unlikely that any fossils would be preserved in the overlying soils and sands of the Quaternary. There is a very small chance that fossils may occur in below the ground surface in the dolomites so a Fossil Chance Find Protocol should be added to the EMPr. If fossils are found by the environmental officer, or other responsible person once excavations and drilling have commenced, then they should be rescued and a palaeontologist called to assess and collect a representative sample.

x. References

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Eriksson, P.G., Altermann, W., Hartzer, F.J., 2006. The Transvaal Supergroup and its pre-cursors. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). The Geology of South Africa. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. pp 237-260.

Johnson, M.R., van Vuuren, C.J., Visser, J.N.J., Cole, D.I., Wickens, H.deV., Christie, A.D.M., Roberts, D.L., Brandl, G., 2006. Sedimentary rocks of the Karoo Supergroup. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). The Geology of South Africa. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. Pp 461 – 499.

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xi. Chance Find Protocol

Monitoring Programme for Palaeontology – to commence once the excavations / drilling activities begin.

1. The following procedure is only required if fossils are seen on the surface and when drilling/excavations commence.
2. When excavations begin the rocks and must be given a cursory inspection by the environmental officer or designated person. Any fossiliferous material (trace fossils, fossils of plants, insects, bone or coalified material) should be put aside in a suitably protected place. This way the project activities will not be interrupted.
3. Photographs of similar fossils must be provided to the developer to assist in recognizing the fossil plants, vertebrates, invertebrates or trace fossils in the shales and mudstones (for example see Figure 11). This information will be built into the EMP's training and awareness plan and procedures.
4. Photographs of the putative fossils can be sent to the palaeontologist for a preliminary assessment.
5. If there is any possible fossil material found by the developer/environmental officer then the qualified palaeontologist sub-contracted for this project, should visit the site to inspect the selected material and check the dumps where feasible.
6. Fossil plants or vertebrates that are considered to be of good quality or scientific interest by the palaeontologist must be removed, catalogued and housed in a suitable institution where they can be made available for further study. Before the fossils are removed from the site a SAHRA permit must be obtained.

Annual reports must be submitted to SAHRA as required by the relevant permits.

7. If no good fossil material is recovered then no site inspections by the palaeontologist will be necessary. A final report by the palaeontologist must be sent to SAHRA once the project has been completed and only if there are fossils.
8. If no fossils are found and the excavations have finished then no further monitoring is required.

xii. Appendix A – Examples of trace fossils from the Transvaal Supergoup.

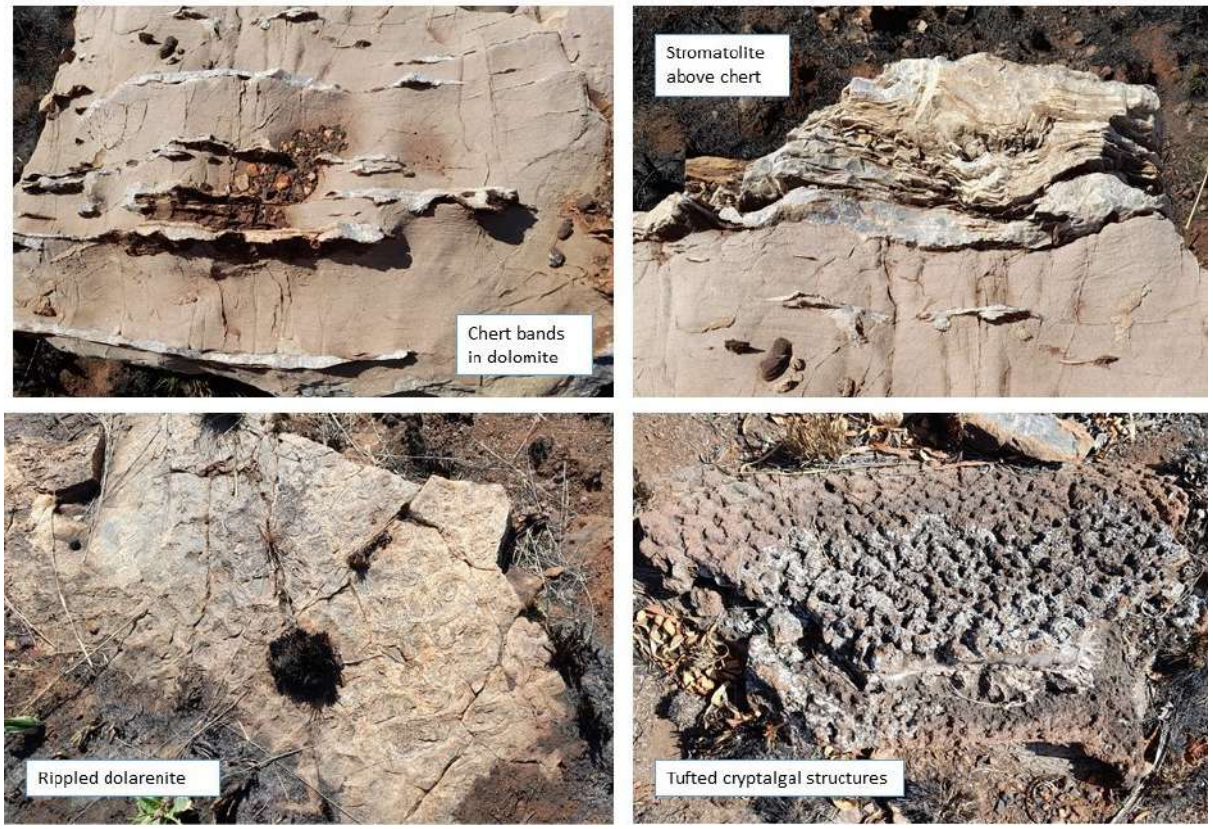

Figure 11: Photographs of different types of stromolitic structures in dolomite (from the Malmani Subgroup).

xiii. Appendix B – Details of specialists

Marion Bamford (PhD)

Short CV for PIAs – Jan 2022

I) **Personal details**

Present employment : Professor; Director of the Evolutionary Studies Institute.
Member Management Committee of the NRF/DST Centre of Excellence Palaeosciences, University of the Witwatersrand, Johannesburg, South Africa
Telephone : +27 11 717 6690
Fax : +27 11 717 6694
Cell : 082 555 6937
E-mail : marion.bamford@wits.ac.za ; marionbamford12@gmail.com

ii) **Academic qualifications**

Tertiary Education: All at the University of the Witwatersrand:
1980-1982: BSc, majors in Botany and Microbiology. Graduated April 1983.
1983: BSc Honours, Botany and Palaeobotany. Graduated April 1984.
1984-1986: MSc in Palaeobotany. Graduated with Distinction, November 1986.
1986-1989: PhD in Palaeobotany. Graduated in June 1990.

iii) **Professional qualifications**

Wood Anatomy Training (overseas as nothing was available in South Africa):
1994 - Service d'Anatomie des Bois, Musée Royal de l'Afrique Centrale, Tervuren, Belgium, by Roger Dechamps
1997 - Université Pierre et Marie Curie, Paris, France, by Dr Jean-Claude Koeniguer
1997 - Université Claude Bernard, Lyon, France by Prof Georges Barale, Dr Jean-Pierre Gros, and Dr Marc Philippe

iv) **Membership of professional bodies/associations**

Palaeontological Society of Southern Africa
Royal Society of Southern Africa - Fellow: 2006 onwards
Academy of Sciences of South Africa - Member: Oct 2014 onwards
International Association of Wood Anatomists - First enrolled: January 1991
International Organization of Palaeobotany – 1993+
Botanical Society of South Africa
South African Committee on Stratigraphy – Biostratigraphy - 1997 - 2016
SASQUA (South African Society for Quaternary Research) – 1997+
PAGES - 2008 –onwards: South African representative
ROCEEH / WAVE – 2008+
INQUA – PALCOMM – 2011+onwards

vii) **Supervision of Higher Degrees**

All at Wits University

Degree	Graduated/ completed	Current
Honours	11	0
Masters	12	4
PhD	11	4
Postdoctoral fellows	12	2

viii) **Undergraduate teaching**
Geology II – Palaeobotany GEOL2008 – average 65 students per year
Biology III – Palaeobotany APES3029 – average 25 students per year
Honours – Evolution of Terrestrial Ecosystems; African Plio-Pleistocene Palaeoecology; Micropalaeontology – average 12 - 20 students per year.

ix) **Editing and reviewing**
Editor: Palaeontologia africana: 2003 to 2013; 2014 – Assistant editor
Guest Editor: Quaternary International: 2005 volume
Member of Board of Review: Review of Palaeobotany and Palynology: 2010 –
Associate Editor: Cretaceous Research: 2018-2020
Associate Editor: Royal Society Open: 2021 -
Review of manuscripts for ISI-listed journals: 25 local and international journals

x) **Palaeontological Impact Assessments**
Selected from recent project only – list not complete:
- Mala Mala 2017 for Henwood
- Modimolle 2017 for Green Vision
- Klipoortjie and Finaalspan 2017 for Delta BEC
- Ledjadja borrow pits 2018 for Digby Wells
- Lungile poultry farm 2018 for CTS
- Olienhout Dam 2018 for JP Celliers
- Isondlo and Kwasobabili 2018 for GCS
- Kanakies Gypsum 2018 for Cabanga
- Nababeep Copper mine 2018
- Glencore-Mbali pipeline 2018 for Digby Wells
- Remhoogte PR 2019 for A&HAS
- Bospoort Agriculture 2019 for Kudzala
- Overlooked Quarry 2019 for Cabanga
- Richards Bay Powerline 2019 for NGT
- Eilandia dam 2019 for ACO
- Eastlands Residential 2019 for HCAC
- Fairview MR 2019 for Cabanga
- Graspan project 2019 for HCAC
- Lieliefontein N&D 2019 for Enviropro
- Skeerpoort Farm Mast 2020 for HCAC
- Vulindlela Eco village 2020 for 1World
- KwaZamakhule Township 2020 for Kudzala

- Sunset Copper 2020 for Digby Wells
- McCarthy-Salene 2020 for Prescali
- VLNR Lodge 2020 for HCAC
- Madadeni mixed use 2020 for Enviropro
- Frankfort-Windfield Eskom Powerline 2020 for 1World
- Beaufort West PV Facility 2021 for ACO Associates
- Copper Sunset MR 2021 for Digby Wells
- Sannaspos PV facility 2021 for CTS Heritage
- Smithfield-Rouxville-Zastron PL 2021 for TheroServe
- Glosam Mine 2021 for AHSA

Xi) **Research Output**
Publications by M K Bamford up to January 2022 peer-reviewed journals or scholarly books: over 160 articles published; 5 submitted/in press; 10 book chapters.
Scopus h-index = 30; Google Scholar h-index = 36; -i10-index = 95
Conferences: numerous presentations at local and international conferences.

Mr Frederick Tolchard
Brief Curriculum Vitae – January 2022

Academic training
BA Archaeology – University of the Witwatersrand, graduated 2015
BSc (Honours) Palaeontology – University of the Witwatersrand, 2017 with distinction
MSc Palaeontology – University of the Witwatersrand, 2018 – 2019. Graduated 2020 with Distinction
PhD Palaeontology – Wits – 2020 - current

Field Experience
Honours Fieldtrip – Karoo biostratigraphy – April 2017
Research fieldwork – Elliot Formation with Prof Choiniere – April 2018, Nov 2018; April 2019; Sept 2021

Publications
Tolchard, F., Nesbitt, S.J., Desojo, J.B., Viglietti, P.A., Butler, R.J. and Choiniere, J.N., 2019. 'Rauisuchian' material from the lower Elliot Formation of South Africa: Implications for late Triassic biogeography and biostratigraphy. Journal of African Earth Sciences, 160, 103610.

Viglietti, P.A., McPhee, B.W., Bordy, E.M., Sciscio, L., Barrett, P.M., Benson, R.B.J., Wills, F., Tolchard, F., Choiniere, J.N., 2020. Biostratigraphy of the Scalenodontoides Assemblage Zone (Stormberg Group, Karoo Supergroup), South Africa. South African Journal of Geology 123, 239-248.

Tolchard F., Kammerer C., Butler R.J., Abdala F., Hendrickx C., Benoit J., Choinière J.N. (2021.) A very large new trirachodontid from the Triassic of South Africa and its implications for Gondwanan biostratigraphy. Journal of Vertebrate Paleontology. DOI: 10.1080/02724634.2021.1929265.

PIA fieldwork projects

2018 May – Williston area – SARAO project, Digby Wells
2018 September – Lichtenburg PVs – CTS Heritage
2018 November – Nomalanga farming – Digby Wells
2019 January – Thubelisha coal – Digby Wells
2019 March – Matla coal – Digby Wells
2019 March – Musina-Machado SEZ – Digby Wells
2019 June – Temo coal – Digby Wells
2019 September – Makapanstad Agripark – Plantago
2020 January – Hendrina, Kwazamakuhle – Kudzala
2020 February – Hartebeestpoort Dam - Prescali
2020 March – Twyfelaar Coal mine – Digby Wells
2020 March – Ceres Borrow Pits – ACO Associates
2020 March – Copper Sunset Sand – Digby Wells
2020 October – Belfast loop and Expansion – Nsovo
2020 October – VLNR lodge Mapungubwe – HCAC
2020 November – Delmore Park BWSS - HCAC
2020 December – Kromdraai commercial – HCAC
2021 January – Welgedacht Siding – Elemental Sustainability
2021 March – Shango Kroonstad – Digby Wells
2021 May – Copper Sunset sand mining – Digby Wells
2021 August – New Largo Pit – Golder
2021 August – Khutsong Ext 8 housing, Carletonville, for Afzelia
2021 September – Lichtenburg PV facility – CTS Heritage
2021 October – Ogies South MR – beyondgreen
2021 October – Nooitgedacht Colliery MR – Shangoni
2022 January – Sigma PVs Sasolburg – CTS Heritage

Bailey M. Weiss CV

January 2022

I am currently enrolled as an MSc student, at the University of the Free State (UFS), completing a research project entitled: *Bone microanatomy of Anomodontia (Synapsida: Therapsida) from the Karoo Basin of South Africa*. This project is supervised by Dr Jennifer Botha (National Museum, Bloemfontein) and Co-Supervised by Dr Alexandra Houssaye (Muséum national d'Histoire naturelle, Paris). I completed my BSc honours degree in which I completed a research project entitled: *Limb bone histology of theropod dinosaurs from the Early Jurassic of South Africa*. This project was supervised by Dr Jennifer Botha. I majored in Genetics and Zoology for my BSc degree. I have worked as an Osteohistology Technician at the National Museum, Bloemfontein, as well as a Laboratory Assistant at the UFS. I have been on two Palaeontological field trips one with the National

Museum in the Balfour and Katberg Formations. The other with the University of the Witwatersrand in the Lower Elliot Formation of South Africa.

Qualifications

BSc – Majors: Genetics and Geology - University of the Free State – 2018
BSc Honours – Palaeontology – University of the Free State – 2019
MSc – Palaeontology – University of the Free State – registered 2020, in progress.

PIA fieldwork Experience

July 2021 – Sannaspos PV Facility, Free State for CTS Heritage
October 2021 – Beatrix Mine-Theunissen Eskom powerline for 1World

References:

Dr Jennifer Botha, Head of Palaeontology, National Museum, Bloemfontein
jbotha@nasmus.ac.za

Prof Jonah Choiniere, Evolutionary Studies Institute, University of the Witwatersrand, Johannesburg
Jonah.choiniere@wits.ac.za

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APPENDIX 3 Visual Impact Assessment 2022

APPENDIX 4 Fossil Chance Finds Procedure

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CHANCE FINDS OF PALAEONTOLOGICAL MATERIAL

(Adopted from the HWC Chance Fossils Finds Procedure: June 2016)

Introduction

This document is aimed to inform workmen and foremen working on a construction and/or mining site. It describes the procedure to follow in instances of accidental discovery of palaeontological material (please see attached poster with descriptions of palaeontological material) during construction/mining activities. This protocol does not apply to resources already identified under an assessment undertaken under s. 38 of the National Heritage Resources Act (no 25 of 1999).

Fossils are rare and irreplaceable. Fossils tell us about the environmental conditions that existed in a specific geographical area millions of years ago. As heritage resources that inform us of the history of a place, fossils are public property that the State is required to manage and conserve on behalf of all the citizens of South Africa. Fossils are therefore protected by the National Heritage Resources Act and are the property of the State. Ideally, a qualified person should be responsible for the recovery of fossils noticed during construction/mining to ensure that all relevant contextual information is recorded.

Heritage Authorities often rely on workmen and foremen to report finds, and thereby contribute to our knowledge of South Africa's past and contribute to its conservation for future generations.

Training

Workmen and foremen need to be trained in the procedure to follow in instances of accidental discovery of fossil material, in a similar way to the Health and Safety protocol. A brief introduction to the process to follow in the event of possible accidental discovery of fossils should be conducted by the designated Environmental Control Officer (ECO) for the project, or the foreman or site agent in the absence of the ECO It is recommended that copies of the attached poster and procedure are printed out and displayed at the site office so that workmen may familiarise themselves with them and are thereby prepared in the event that accidental discovery of fossil material takes place.

Actions to be taken

One person in the staff must be identified and appointed as responsible for the implementation of the attached protocol in instances of accidental fossil discovery and must report to the ECO or site agent. If the ECO or site agent is not present on site, then the responsible person on site should follow the protocol correctly in order to not jeopardize the conservation and well-being of the fossil material.

Once a workman notices possible fossil material, he/she should report this to the ECO or site agent.Procedure to follow if it is likely that the material identified is a fossil:

- The ECO or site agent must ensure that all work ceases immediately in the vicinity of the area where the fossil or fossils have been found;
- The ECO or site agent must inform SAHRA of the find immediately. This information must include photographs of the findings and GPS co-ordinates;
- The ECO or site agent must compile a Preliminary Report and fill in the attached Fossil Discoveries: Preliminary Record Form within 24 hours without removing the fossil from its original position. The Preliminary Report records basic information about the find including:
    - The date
    - A description of the discovery
    - A description of the fossil and its context (e.g. position and depth of find)
    - Where and how the find has been stored
    - Photographs to accompany the preliminary report (the more the better):
        - A scale must be used
        - Photos of location from several angles
        - Photos of vertical section should be provided
        - Digital images of hole showing vertical section (side);
        - Digital images of fossil or fossils.

Upon receipt of this Preliminary Report, SAHRA will inform the ECO or site agent whether or not a rescue excavation or rescue collection by a palaeontologist is necessary.

- Exposed finds must be stabilised where they are unstable and the site capped, e.g. with a plastic sheet or sand bags. This protection should allow for the later excavation of the finds with due scientific care and diligence. SAHRA can advise on the most appropriate method for stabilisation.
- If the find cannot be stabilised, the fossil may be collect with extreme care by the ECO or the site agent and put aside and protected until SAHRA advises on further action. Finds collected in this way must be safely and securely stored in tissue paper and an appropriate box. Care must be taken to remove the all fossil material and any breakage of fossil material must be avoided at all costs.

No work may continue in the vicinity of the find until SAHRA has indicated, in writing, that it is appropriate to proceed.

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FOSSIL DISCOVERIES: PRELIMINARY RECORDING FORM		
Name of project:		
Name of fossil location:		
Date of discovery:		
Description of situation in which the fossil was found:		
Description of context in which the fossil was found:		
Description and condition of fossil identified:		
GPS coordinates:	*Lat:*	*Long:*
If no co-ordinates available then please describe the location:		
Time of discovery:		
Depth of find in hole		
Photographs (tick as appropriate and indicate number of the photograph)	*Digital image of vertical section (side)*	
	Fossil from different angles	
	Wider context of the find	
Temporary storage (where it is located and how it is conserved)		
Person identifying the fossil Name:		
Contact:		
Recorder Name:		
Contact:		
Photographer Name:		
Contact:		

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APPENDIX 5 Detailed Project Description