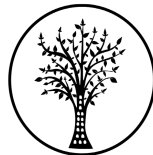


# HERITAGE IMPACT ASSESSMENT

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

## **Proposed Development of the Quantum 1 Solar Energy Facility (SEF) Facility Near Krugersdorp, Gauteng Province**

**Prepared by CTS Heritage**



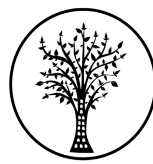
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Jenna Lavin

**For**

**Savannah Environmental**

**August 2023**



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## EXECUTIVE SUMMARY

### 1. Site Name:

Quantum 1 SEF

### 2. Location:

Adjacent to the N14 northwest of Johannesburg

### 3. Locality Plan:

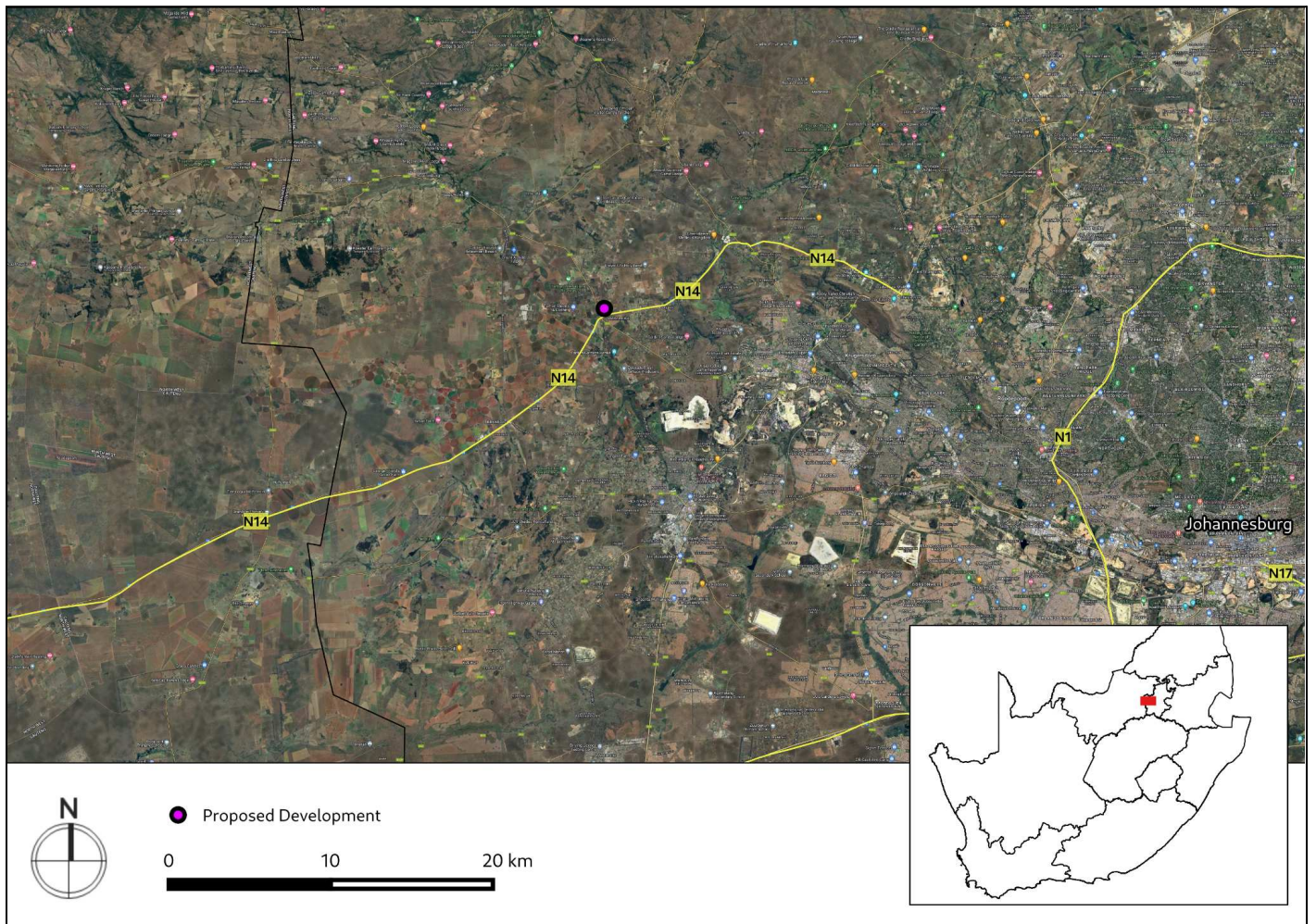


Figure 1: Location of the proposed development area

### 4. Description of Proposed Development:

South Africa Mainstream Renewable Power Developments (Pty) Ltd is proposing the construction and operation of a solar photovoltaic (PV) facility and associated infrastructure on Portion 285 (a portion of portion 19) of the

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Farm Vlakplaats 160, located approximately 7.2km west of Krugersdorp, within the Mogale City Local Municipality in the West Rand District Municipality in the Gauteng Province. The facility will have a contracted capacity of up to 10MW and will be known as Quantum 1 Solar Energy Facility.

## **5. Anticipated Impacts on Heritage Resources:**

As noted by the VIA completed for this project, “The greater landscape of the study area is transformed, characterised by agricultural activities and urban development therefore this highly developed landscape is not considered to have a high visual quality.” While the cultural value of the development area is moderate, the location of the facility within the COHWHS buffer zone, and at the junction of the N14 and the R24 adds to the cultural landscape significance of this site. Recommendations are made below in order to mitigate negative impacts to the cultural landscape significance of the area.

Even though the broader area is rich in history, no significant archaeological heritage resources were identified during the field assessment. No Stone Age or Iron Age heritage resources of significance were identified during the survey. In addition, no structures of cultural value or graves were identified. As such, this development is not considered to be a sensitive archaeological landscape.

Based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the development footprint. The geological structures suggest that the rocks are the correct age and type to preserve fossils. The site visit and walk through confirmed that there were NO FOSSILS in the project footprint. Since there is an extremely small chance that trace fossils from the Malmani Subgroup 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.

On condition that the recommendations outlined below are implemented, there is no objection to the proposed development from a heritage perspective.

## **6. Recommendations:**

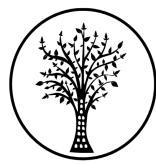
Based on the outcomes of this report, it is not anticipated that the proposed development of the solar energy facility and its associated infrastructure will negatively impact on significant heritage resources on condition that:

- A 250m no development buffer should be implemented along the N14. The layout provided complies with this requirement.
- Specific engagement with the MA for the COHWHS should take place regarding development within the identified WHS buffer



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- The attached Chance Fossil Finds Procedure must be implemented for all excavation activities
- Although all possible care has been taken to identify sites of cultural importance during the investigation of the study area, it is always possible that hidden or subsurface sites could be overlooked during the assessment. If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils, burials or other categories of heritage resources are found during the proposed development, work must cease in the vicinity of the find and SAHRA must be alerted immediately to determine an appropriate way forward.



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### **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 since 2016, 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 previous 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 a member 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 250 Screening and Heritage Impact Assessments throughout South Africa.



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## APPENDICES

1	Archaeological Impact Assessment 2023
2	Palaeontological Impact Assessment 2023
3	Chance Fossil Finds Procedure
4	Heritage Screening Assessment



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## 1. INTRODUCTION

### 1.1 Background Information on Project

South Africa Mainstream Renewable Power Developments (Pty) Ltd is proposing the construction and operation of a solar photovoltaic (PV) facility and associated infrastructure on Portion 285 (a portion of portion 19) of the Farm Vlakplaats 160, located approximately 7.2km west of Krugersdorp, within the Mogale City Local Municipality in the West Rand District Municipality in the Gauteng Province. The facility will have a contracted capacity of up to 10MW and will be known as Quantum 1 Solar Energy Facility.

A preferred development area with an extent of ~94.1479ha has been identified by South Africa Mainstream Renewable Power Developments (Pty) Ltd as technically suitable for the development of the Quantum 1 Solar Energy Facility. The facility will comprise the following infrastructure:

- » Solar PV array comprising solar modules.
- » Mounting System Technology
- » Inverters and transformers.
- » Low voltage cabling between the PV modules to the inverters.
- » Overhead power lines
- » Onsite substation, switching substation and laydown areas.
- » Battery Energy Storage System (BESS) and associated infrastructure.
- » Internal access roads.
- » Fence around the project development areas.

**Table 1: Details of typical infrastructure required for the 10MW Quantum 1 SEF.**

Component	Description / Dimensions
District Municipality	West Rand District Municipality
Local Municipality	Mogale City Local Municipality
Ward Number (s)	Ward 30
Nearest town(s)	Krugersdorp (7.2km east)
Farm name(s) and number(s) of properties affected by the PV Facility, incl SG 21 Digit Code (s)	Portion 265 (a portion of portion 19) of the Farm Vlakplaats 160 (T0IQ00000000016000265)
Current zoning	Agriculture
Site Coordinates (centre of development area)	26° 4'8.17"S, 27°38'55.89"E



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Total extent of the Affected Properties, also referred to as the project site <sup>1</sup>	~94.1479ha
Total extent of the Development area <sup>2</sup>	~94.1479ha
Total extent of the Development footprint <sup>3</sup>	To be confirmed following specialist input during the scoping phase
Contracted capacity of the PV facility	10MW
PV panels	Height: up to 5m from ground level (installed)
Power line capacity	11kV
Power line servitude width	Up to 18m
Grid connection	» To be evacuated from the onsite substation via 11kV Monopole or lattice structure pylons to the Eskom Tarlton 132/44/11kV substation located on the same land parcel as the proposed PV facility. This will form part of a separate EA process.
On-site Facility Substation, and O&M buildings	» Located within the development area. » Approximately 1.5ha in extent.
Battery Energy Storage System (BESS)	» The BESS area will form part of the 1.5ha allocated for other infrastructure.
Access roads and internal roads	» Existing roads will be used as far as possible. There are existing gravel roads that can be utilized for site access (width of up to 6m). Upgrading of existing roads or new roads may be required.

The Quantum 1 SEF is proposed in response to the identified objectives of the national and provincial government and local and district municipalities to develop renewable energy facilities for power generation purposes. It is the developer's intention to submit a bid in terms of a regulated power purchase procurement process (e.g., REIPPPP) with the aim of evacuating the generated power into the national grid or obtaining a commercial PPA (Power Purchase Agreement). This will aid in the diversification and stabilisation of the country's electricity supply, in line with the objectives of the Integrated Resource Plan (IRP) with the Quantum 1 SEF set to inject up to 10MW (peak AC power) into the national grid.

<sup>1</sup> The project site is that identified area within which the development area and development footprint are located. The project site is ~93ha in extent and only consist of one affected property.

<sup>2</sup> The development area is that identified area where the 10MW PV facility is planned to be located. This area has been selected as a practicable option for the facility, considering technical preference and constraints. The development area is ~94.1479ha in extent.

<sup>3</sup> The development footprint is the defined area (located within the development area) where the PV panel array and other associated infrastructure for the Quantum 1 Solar Energy Facility is planned to be constructed. This is the actual footprint of the facility, and the area which would be disturbed.





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From a regional perspective, the area within the West Rand District Municipality identified for the project is considered favourable for the development of a commercial PV facility due to the low environmental sensitivity of the identified site, excellent solar resource, and availability of land on which the development can take place. There is also potential for evacuating the power to the national grid via a direct grid connection at the Eskom Tarlton 132/44/11kV substation which is adjacent to the proposed site located within the development area. The site is also in proximity to large electricity users which opens opportunities for commercial PPAs (Behind the metre connection Or Wheeling to a 3<sup>rd</sup> party off-taker).



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## 1.2 Description of Property and Affected Environment

As included in the VIA (du Plessis 2023), “The proposed **Quantum 1 SEF** and associated infrastructure is located approximately 7.2km west of Krugersdorp, within the Mogale City Local Municipality in the West Rand District Municipality in the Gauteng Province.

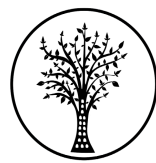
The study area occurs on land that ranges in elevation from approximately 1470m above sea level along the drainage lines in the north eastern and north western portions of the study area to 1770m a.s.l associated with the mining activities in the south east. The terrain surrounding the proposed property is generally flat, sloping gently towards the drainage line located to the south of the site. The terrain morphological unit identified for the entire study area is described as *slightly undulating plains dissected by prominent rocky chert ridges*.

“There are a number of non-perennial rivers or streams throughout the study area. One such river is located on the southern portion of the site. The study area is characterised by flat or gently undulating terrain, species rich grasslands and has a tropical or subtropical climate with a mean annual rainfall of approximately 593mm. There are also a number of man-made dams either related to the agricultural or mining activities of the region.

Access to the site is from a secondary road via the R24, the National Road N14 also bisects the southern portion of the site. Numerous other secondary roads traverse the study area. Other industrial infrastructure within the study area includes existing high voltage power lines and substations. The substations located within the study area include the Tarlton (located on the site), Groenvlakte, (designed), Magaliesburg /Tarlton Feeder and Elim Substations. Additionally, the following powerlines are found to be traversing the study area:

- Elim / Tarlton 1 132kV
- Westgat / Tarlton 1 132kV
- Lulamisa / Pluto 1 400kV
- Apollo / Pluto 1 400kV
- Magaliesburg / Tarlton 1 44kV

The greater landscape of the study area is transformed, characterised by agricultural activities and urban development.”



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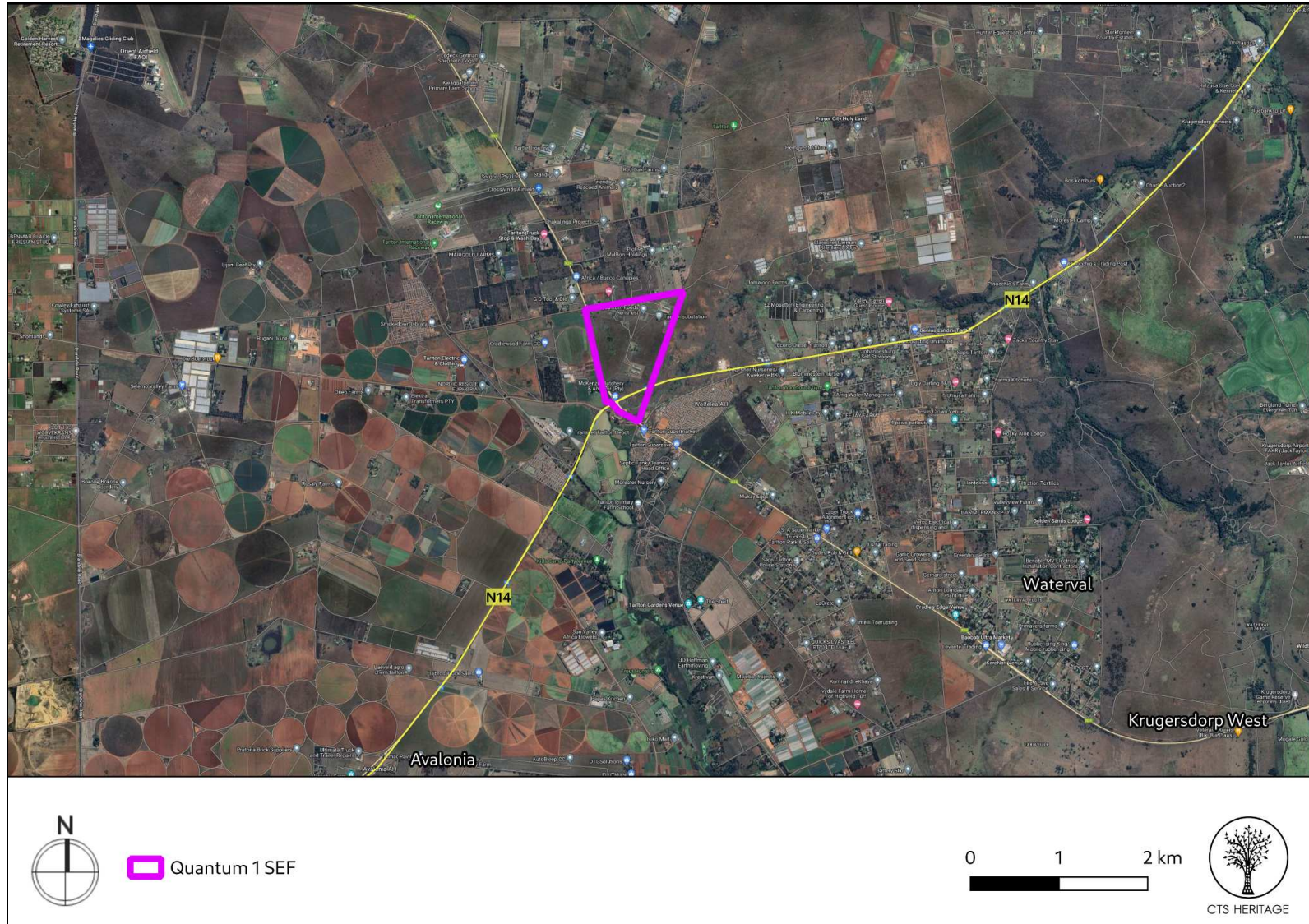
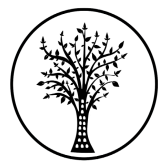


Figure 1.1: Proposed development relative to the N14

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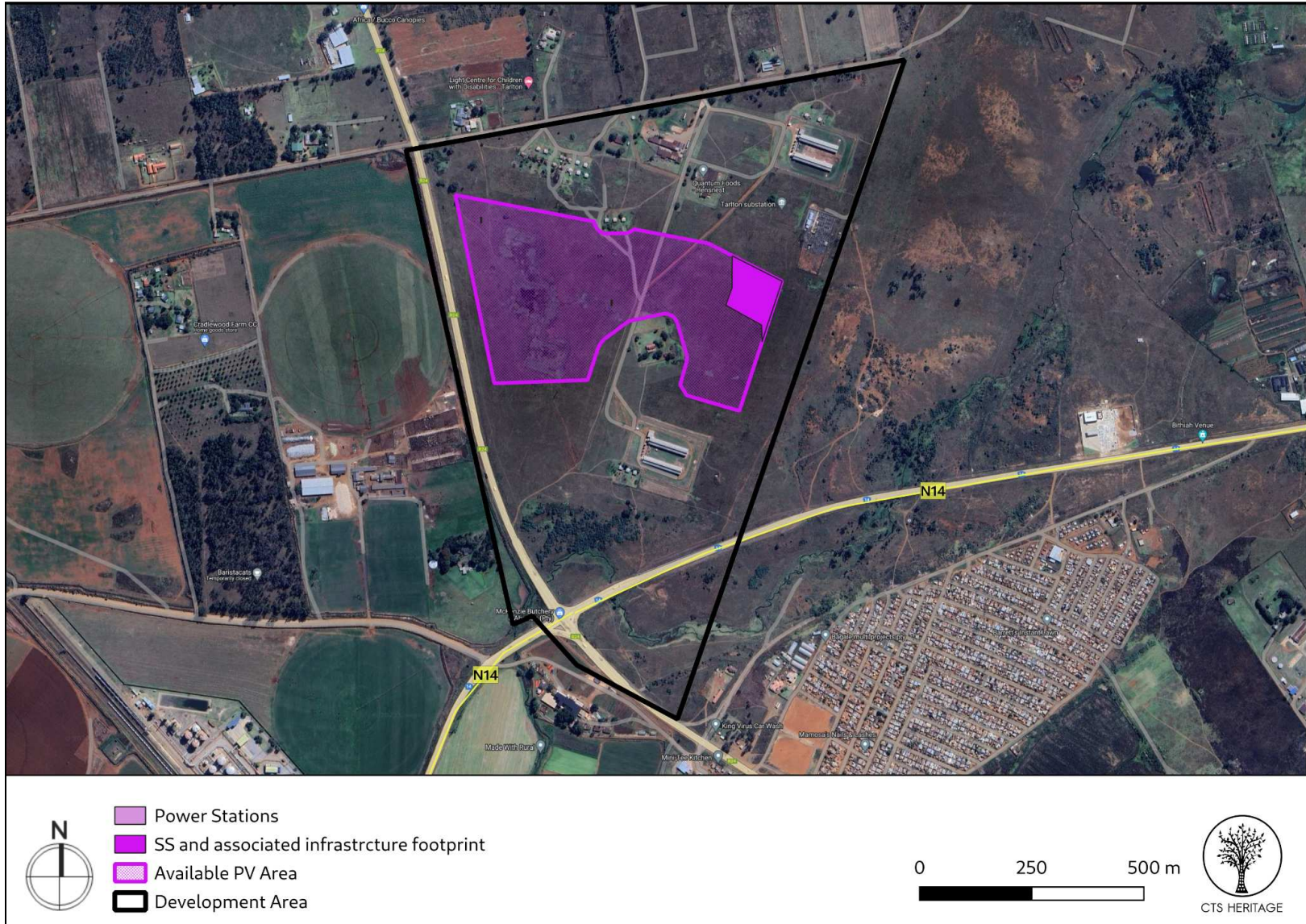
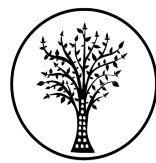


Figure 1.2: Proposed development relative to the N14

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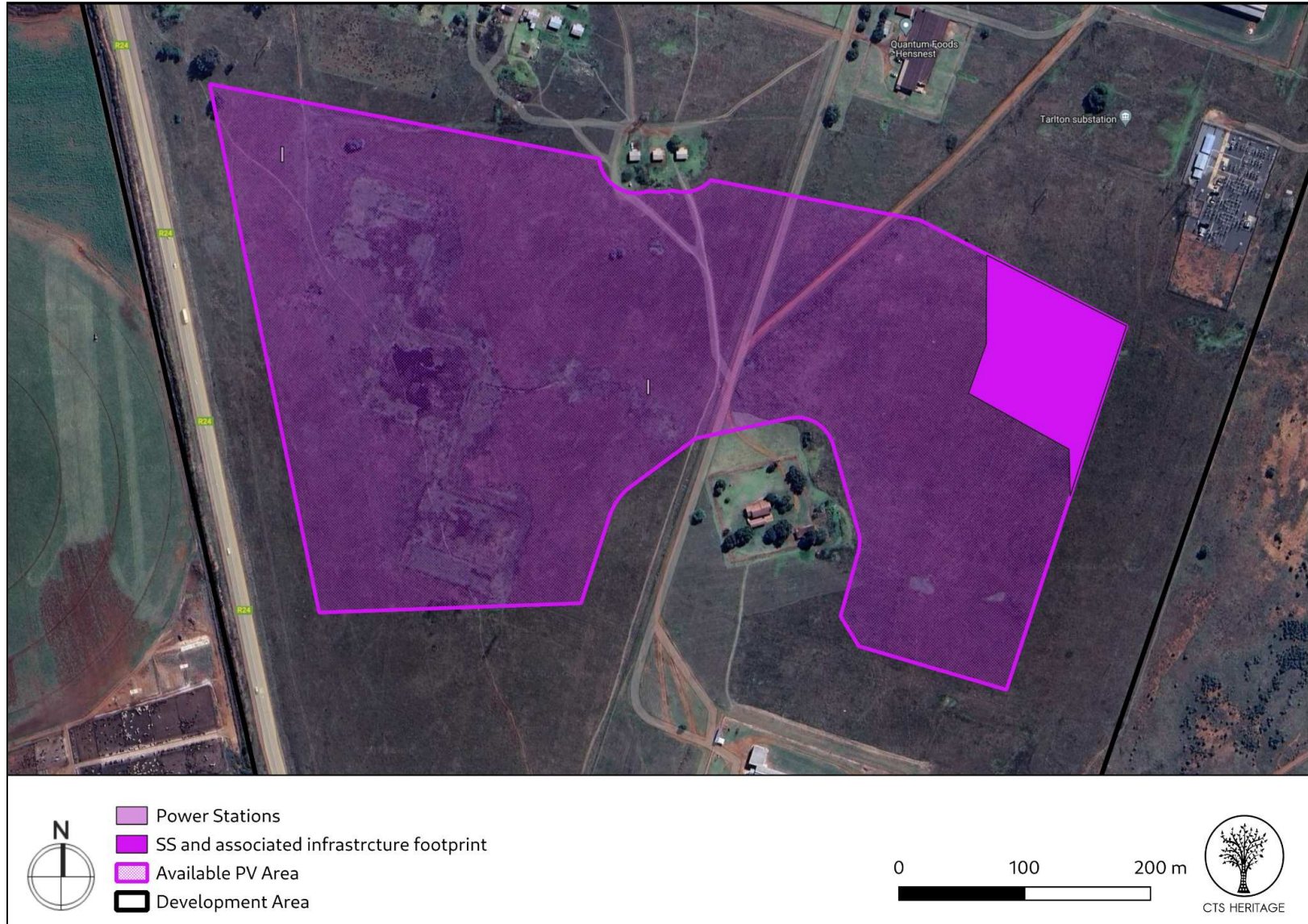
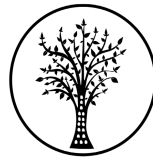


Figure 1.3: Proposed development

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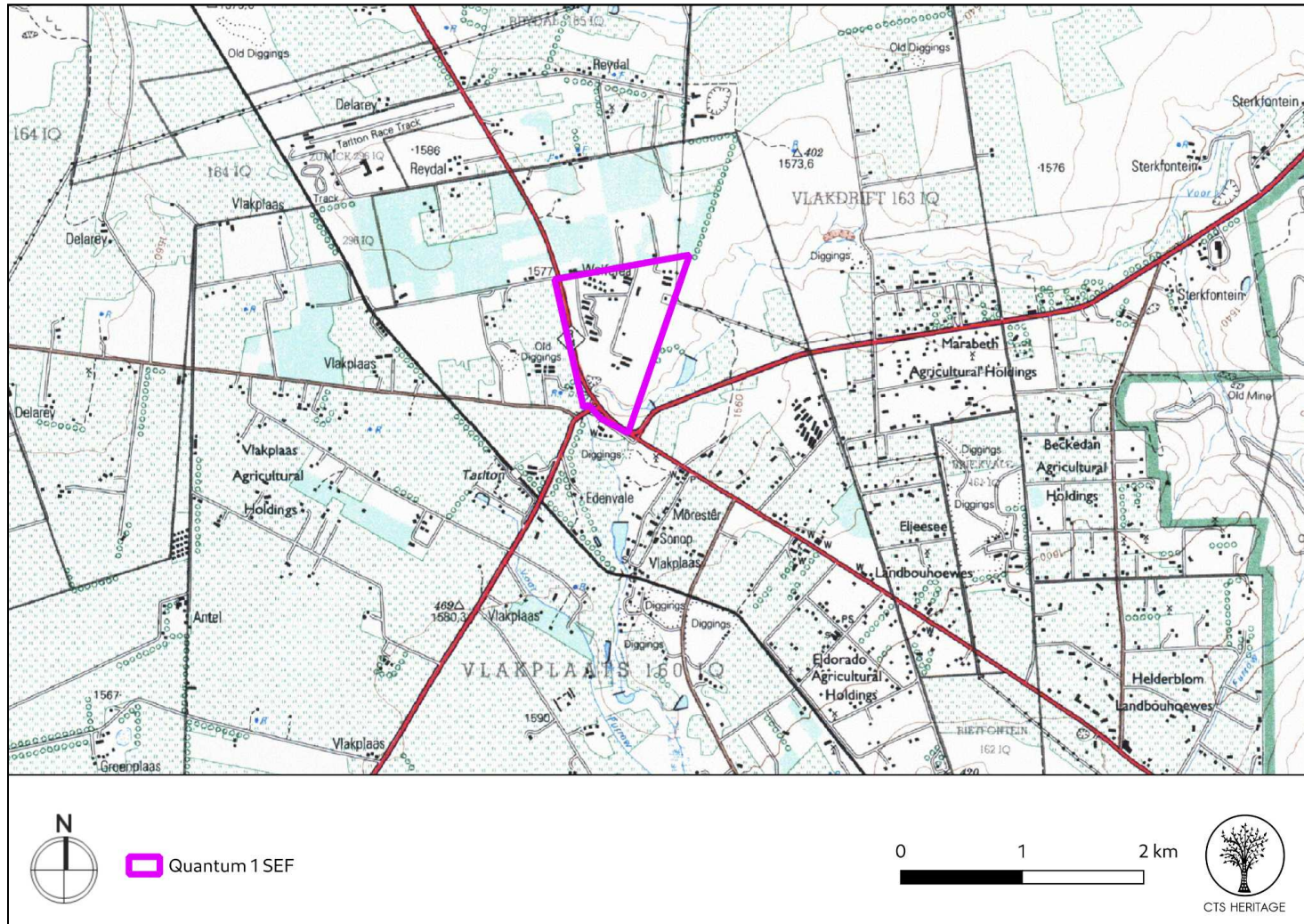
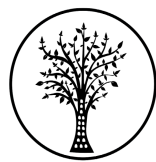


Figure 1.4: Project boundary on the 1:50 000 Topo Map

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## 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)
- An archaeologist conducted an assessment of archaeological resources likely to be disturbed by the proposed development. The archaeologist conducted his site visit on 9 June 2023.
- A palaeontologist conducted an assessment of palaeontological resources likely to be disturbed by the proposed development. The palaeontologist conducted her site visit on 25 June 2023
- The identified resources were assessed to evaluate their heritage significance and impacts to these resources were assessed.
- 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

There were no major constraints experienced during the survey. The property is very small compared to many of the PV developments surveyed by CTS and the access roads through the site provided easy points from which to



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walk the area proposed for the facility. The ground has been completely levelled for farming and building foundations in the past and is highly transformed as a result. Some higher stands of veld grass cover the eastern side but did not pose too many issues in terms of assessing the heritage impacts expected by this proposed development.

## 2.5 Savannah Impact Assessment Methodology

Direct, indirect and cumulative impacts of the issues identified through the Scoping study, as well as all other issues identified in the EIA phase were assessed in terms of the following criteria:

- The nature, which shall include a description of what causes the effect, what will be affected and how it will be affected.
- The extent, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 will be assigned as appropriate (with 1 being low and 5 being high).
- The duration, wherein it will be indicated whether:
  - The lifetime of the impact will be of a very short duration (0 – 1 years) – assigned a score of 1.
  - The lifetime of the impact will be of a short duration (2 – 5 years) – assigned a score of 2.
  - Medium-term (5 – 15 years) – assigned a score of 3.
  - Long term (> 15 years) – assigned a score of 4.
  - Permanent – assigned a score of 5.
- The consequences (magnitude), quantified on a scale from 0 – 10, where 0 is small and will have no effect on the environment, 2 is minor and will not result in an impact on processes, 4 is low and will cause a slight impact on processes, 6 is moderate and will result in processes continuing but in a modified way, 8 is high (processes are altered to the extent that they temporarily cease), and 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
- The probability of occurrence, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale of 1 – 5, where 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but low likelihood), 3 is probable (distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures).
- The significance, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high.
- The status, which will be described as either positive, negative or neutral.
- The degree to which the impact can be reversed.
- The degree to which the impact may cause irreplaceable loss of resources.





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- The degree to which the impact can be mitigated.

The significance is calculated by combining the criteria in the following formula:

$$S = (E + D + M) \times P$$

S = Significance weighting

E = Extent

D = Duration

M = Magnitude

P = Probability

The significance weightings for each potential impact are as follows:

- < 30 points: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area).
- 30 – 60 points: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated).
- > 60 points: High (i.e. where the impact must have an influence on the decision process to develop in the area).



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### **3. HISTORY AND EVOLUTION OF THE SITE AND CONTEXT**

#### **3.1 Desktop Assessment**

The study area borders Magaliesburg to the south, while Krugersdorp is located 15 km to the east and Carletonville 32 km to the southwest. Krugersdorp was established on the farm Paardekraal in 1887 after the discovery of gold in the area. The discovery of gold and the mining boom had an impact on the establishment of all the towns in the area and on the evolution and development of South Africa more generally. Krugersdorp also played a significant role in the Transvaal War of Independence and the Second Boer War, during which the British established a concentration camp on the then outskirts of the city. The exact location of the site of the concentration camp is unknown however it is expected that the camp was located at the site of the present Coronation Park, located far from the area proposed for development here.

The area proposed for development is located approximately 32km northeast of Carltonville within the Mogale City Local Municipality. Carltonville was developed by various mining companies from 1937 onwards, but was not officially incorporated until 1959, and was subsequently recognised as a provincial town in 1967. Surrounding Carltonville are a number of privately owned gold-mining township villages and contractor labour quarters established by the mining companies on land owned by the mines. The area surrounding Carltonville is dominated by a cultural landscape that is shaped and defined by the historic and on-going mining activities associated with the Witwatersrand. A detailed archaeological background of the area is provided by Du Pisanie and Nel (2012, SAHRIS NID 104305) and is therefore not repeated here. It is sufficient to note that no significant Early, Middle or Later Stone Age sites are known from this broader area, however sites representing the Iron Age occupation of the region are present in the broader context.

#### **Archaeology and the Cultural Landscape**

Tobais (2021) notes that “the general region is significant from a heritage perspective. Heritage sites are likely to include cemeteries/graves, Stone Age Sites, Iron Age and historical sites. Since gold mining can be dated to at least 1874 on the Farm Blaauwbank that is located directly north of the study area, it can be assumed that similar mining activities took place in the general area during the same time. Remnants of the South African War of 1899 – 1902 are also likely to be encountered within the study area.”

Birkholtz and Groenewald (2016, SAHRIS NID 369805) describe the broader areas as “generally undulating with a number of extensive pans located within this area... While the overall study area is mostly utilised for agricultural activities, the proposed development bulk sample area that was assessed in the field is characterised by agricultural fields (maize), a large number of small livestock camps associated with stud farming (cattle) as well



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as Eskom power lines.” The N14 is an historic scenic route that runs between Ventersdorp and Pretoria and is likely based on the original wagon route used for this journey. This route is located immediately adjacent to the proposed development area. In general, for the development of PV infrastructure and its associated grid connection infrastructure, it is preferred for such development to be clustered with existing development, such as mining or residential development, in order to reduce the perception of urban and infrastructure sprawl across an otherwise agricultural landscape and a no-development buffer of 500m for PV infrastructure is recommended along significant access routes such as the N14. However, in this instance, due to the already transformed nature of the broader area, a 250m buffer is appropriate (Figure 6).

Birkholtz and Groenewald (2016) go on to note that examples of published excavated archaeological sites from the general surroundings of the study area include the Later Stone Age and Iron Age sites located along the Magaliesberg Mountains and sites of international palaeoanthropological significance such as Sterkfontein and Kromdraai, both located within the Cradle of Humankind World Heritage Site. The area proposed for the PV development is located within the buffer area of the COH WHS (Figure 5). The COH WHS site is managed by a Management Authority on behalf of the State Party represented by the South African Minister of Environmental Affairs. The Management Authority is responsible for day to day management and falls under the MEC for Economic Development in Gauteng Province. To achieve long term sustainability and effectiveness, a Master Plan was developed in 2000 and has since then guided all conservation, development and research work at the site. According to the COH WHS Management Plan (2014-2017), the primary aim of the Management Authority is to protect and preserve the site, promote further scientific research, encourage community participation and stimulate tourism development that will benefit local communities and ultimately contribute to Local Economic Development (LED). Specific engagement with the MA for the COH WHS should take place regarding development within the identified WHS buffer.

## **Palaeontology**

According to the SAHRIS Palaeosensitivity Map, the Proposed Development Areas are located within areas that have variable palaeontological sensitivity but all areas have sediments that have high and very high palaeontological sensitivity. According to the extract from the Council of GeoScience Map for West Rand 2626, the very highly sensitive formations that may be impacted include the Malmani Subgroup. The Malmani Subgroup is known to preserve a range of shallow marine to intertidal stromatolites (domes, columns *etc*), organic-walled microfossils and includes FOSSILIFEROUS LATE CAENOZOIC CAVE BRECCIAS such as in the Cradle of Humankind.



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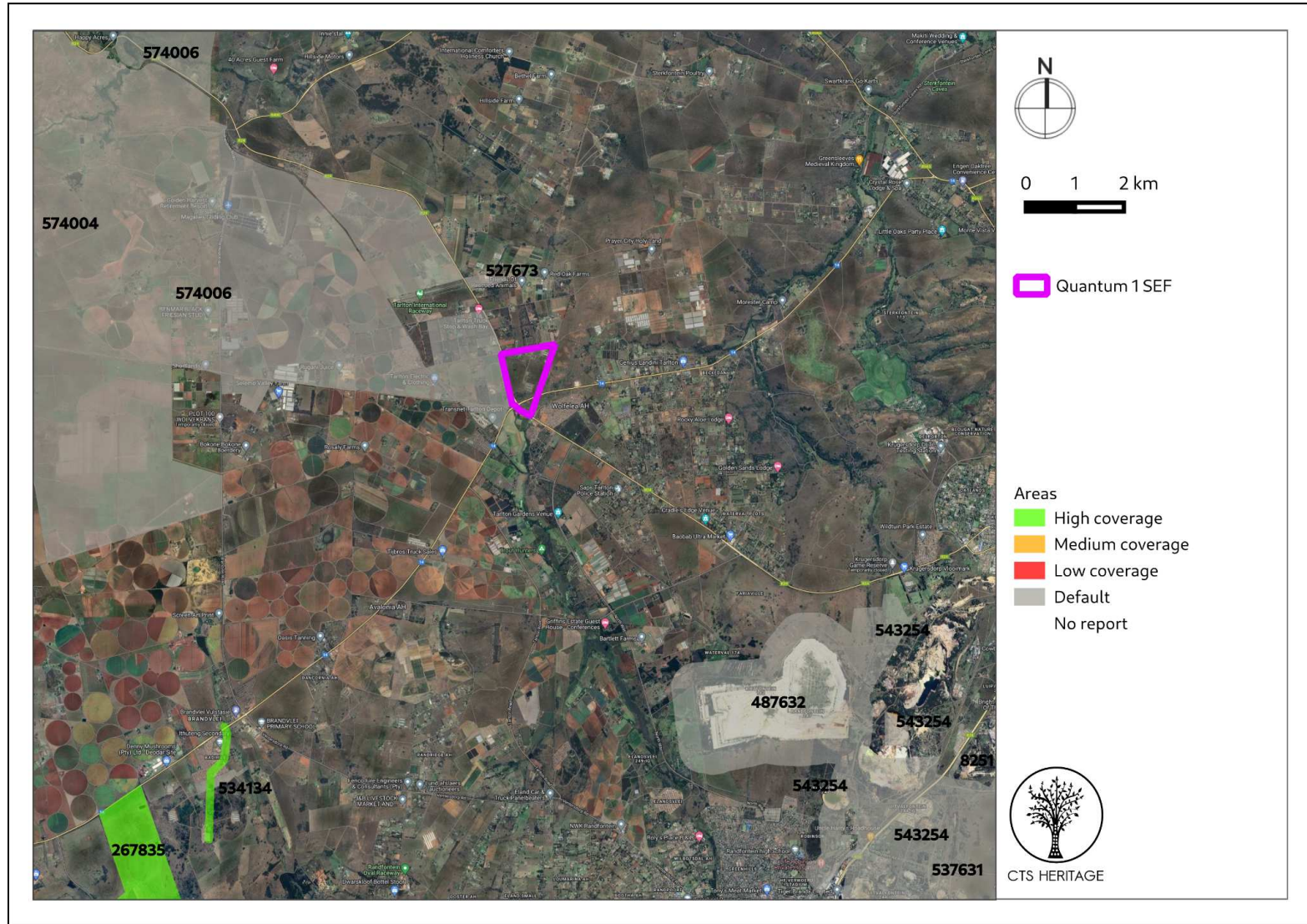
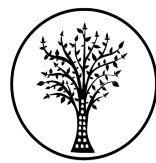


Figure 2: Spatialisation of heritage assessments conducted in proximity to the proposed development

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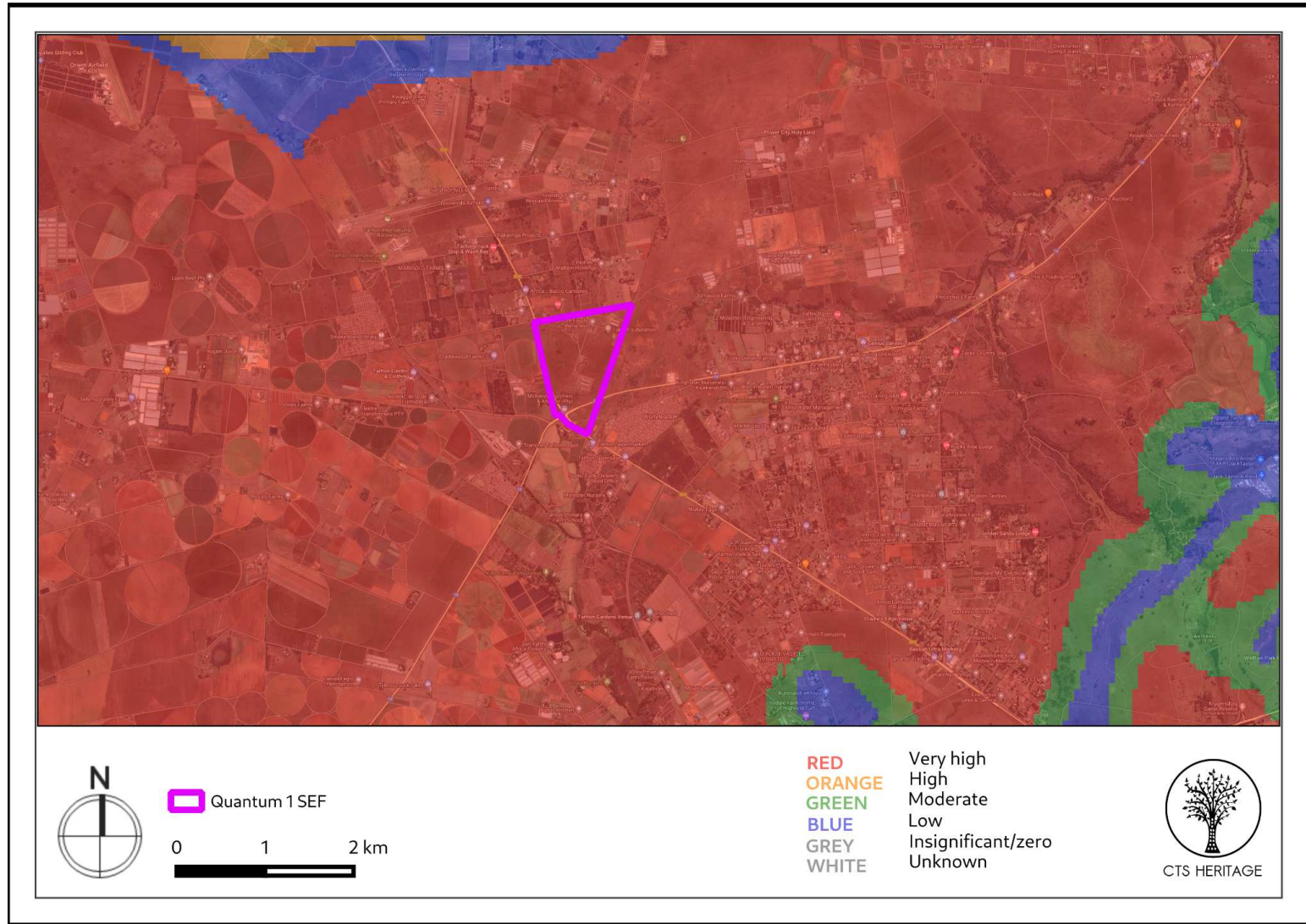


Figure 3.1: Palaeontological sensitivity of the proposed development area

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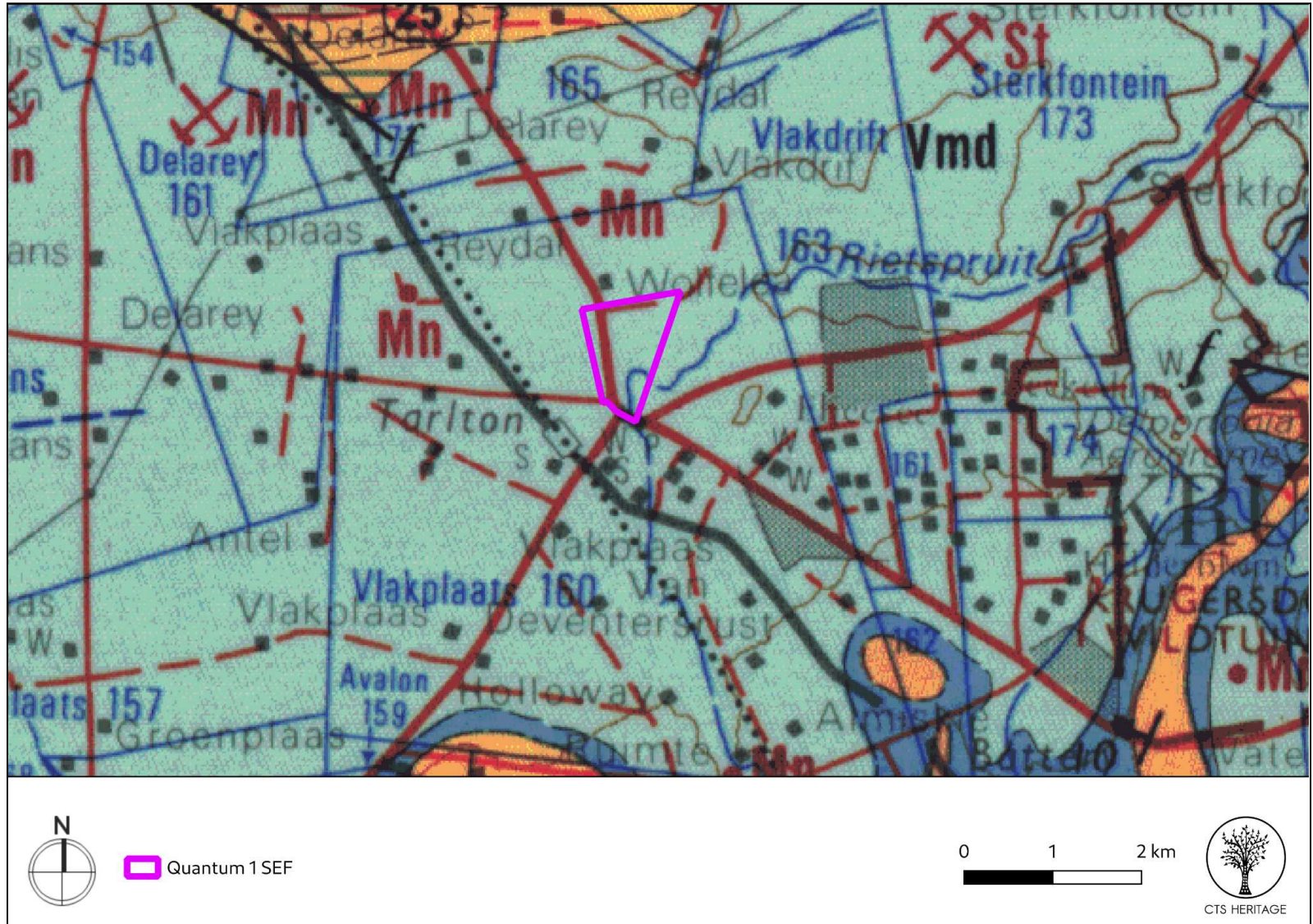


Figure 3.2: Geology Map. Extract from the CGS Map 2626 for West Rand indicating that the development area is underlain by Vmd: Malmani Subgroup sediments of the Chuniespoort Group

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## 4. IDENTIFICATION OF HERITAGE RESOURCES

### 4.1 Summary of findings of Specialist Reports

#### *Archaeology (Appendix 1)*

As can be seen from the photo deck, the area is completely transformed and lies very much within a smallholding/semi-industrial pocket of ground on the outskirts of Krugersdorp. The existing large scale food production facilities owned and run by Quantum foods will be immediately alongside the new PV facility. Foundations of buildings along the western side have been completely levelled and demolished and likely dated to the mid 20th century when more intensive commercial activities were established on this property. The buildings that are still intact are not conservation-worthy and the foundations have therefore been given a similar assessment (NCW).

A few quartz flakes were found near the stream in the southern portion as well as some isolated flakes in the middle of the property - these lie in highly disturbed areas. The site is otherwise sterile of any heritage resources.

#### *Palaeontology (Appendix 2)*

The site proposed for development is in the very highly sensitive Malmani Subgroup (Transvaal Supergroup). The Transvaal Supergroup 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 photosynthesis, the so-called Great Oxygen Event (ca 2.40 – 2.32 Ga) and precursor to an environment where diverse life forms could evolve. The Neoproterozoic 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).

The Transvaal Supergroup comprises one of the 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 and deposited layer upon layer of minerals, often in domes or columns. The minerals are predominantly calcium carbonate, calcium sulphate, magnesium carbonate and magnesium sulphate. Only very rarely are the bacteria and algae preserved but the stromatolites are traces of their activity, hence called trace fossils. These fossils are protected by legislation, therefore the Malmani Subgroup palaeosensitivity is very high.



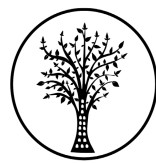
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The field assessment revealed no rocky outcrops of any kind. There were no outcrops of dolomites and hence no trace fossils such as stromatolites or microbialites.

#### **4.2 Heritage Resources identified**

No significant heritage resources were identified within the development area.





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### 4.3 Mapping and spatialisation of heritage resources

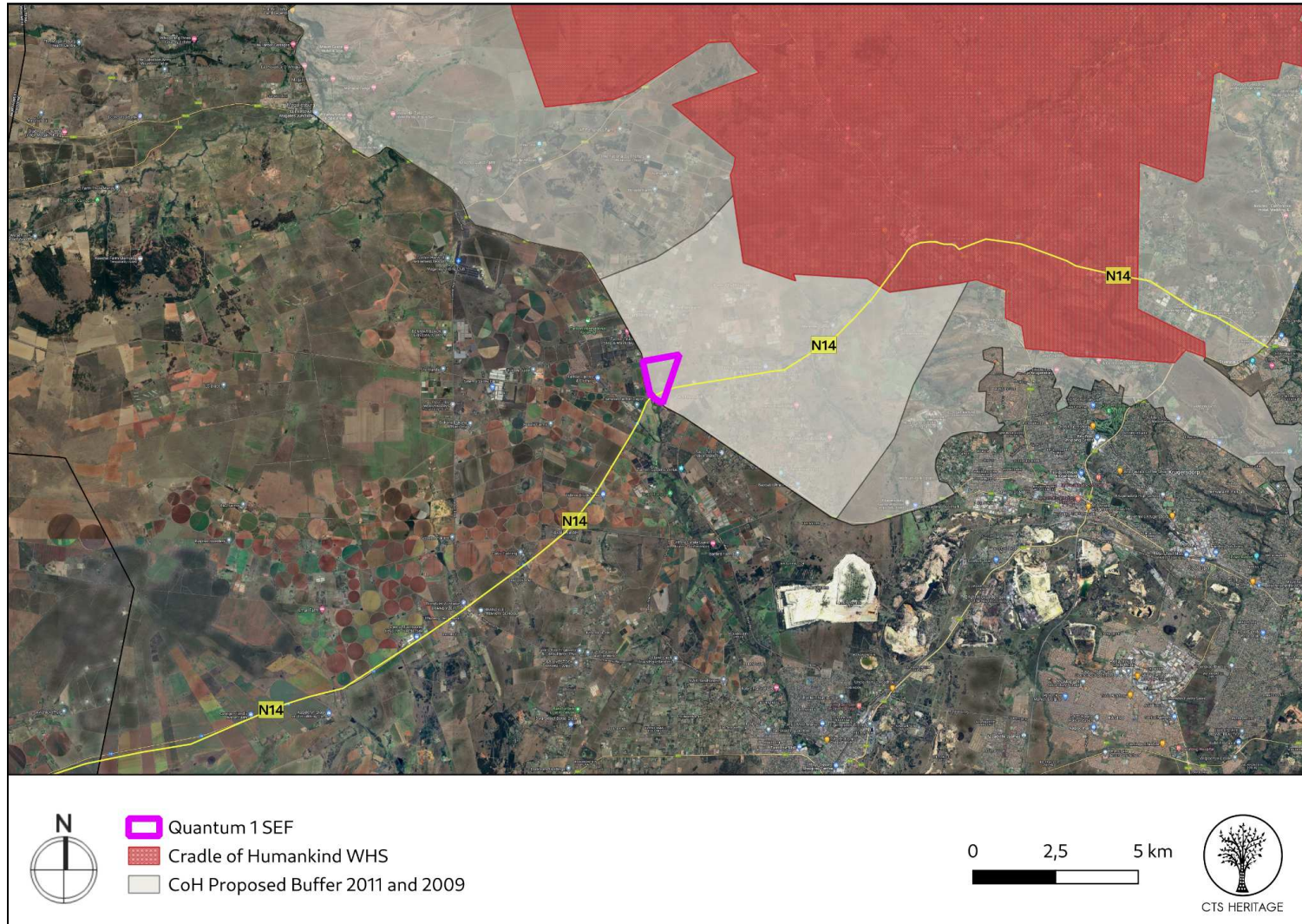
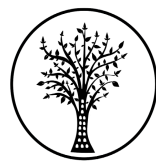


Figure 4.1: Map of the development area relative to the Cradle of Humankind and its buffer

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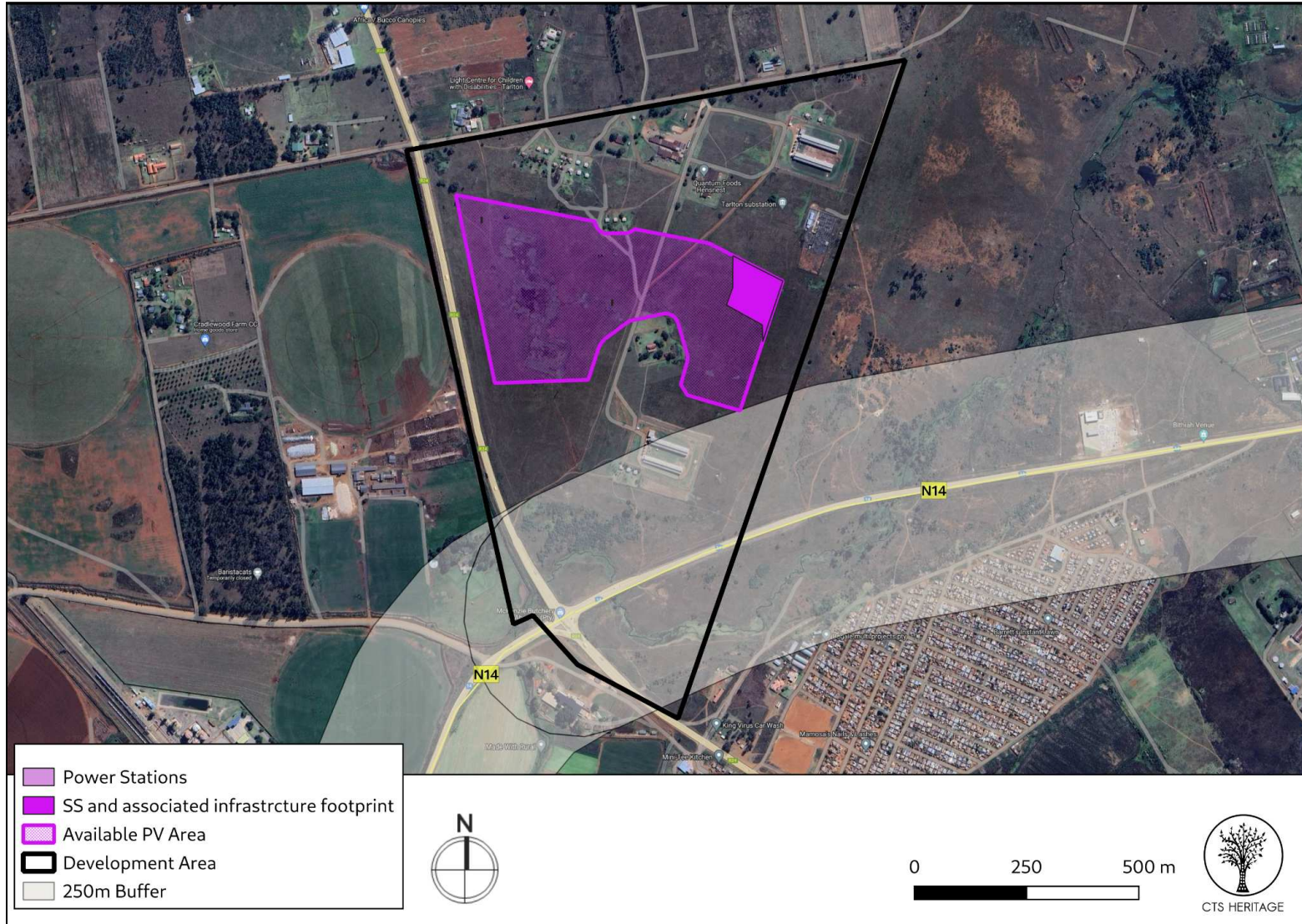


Figure 4.2: Map of significant landscape features

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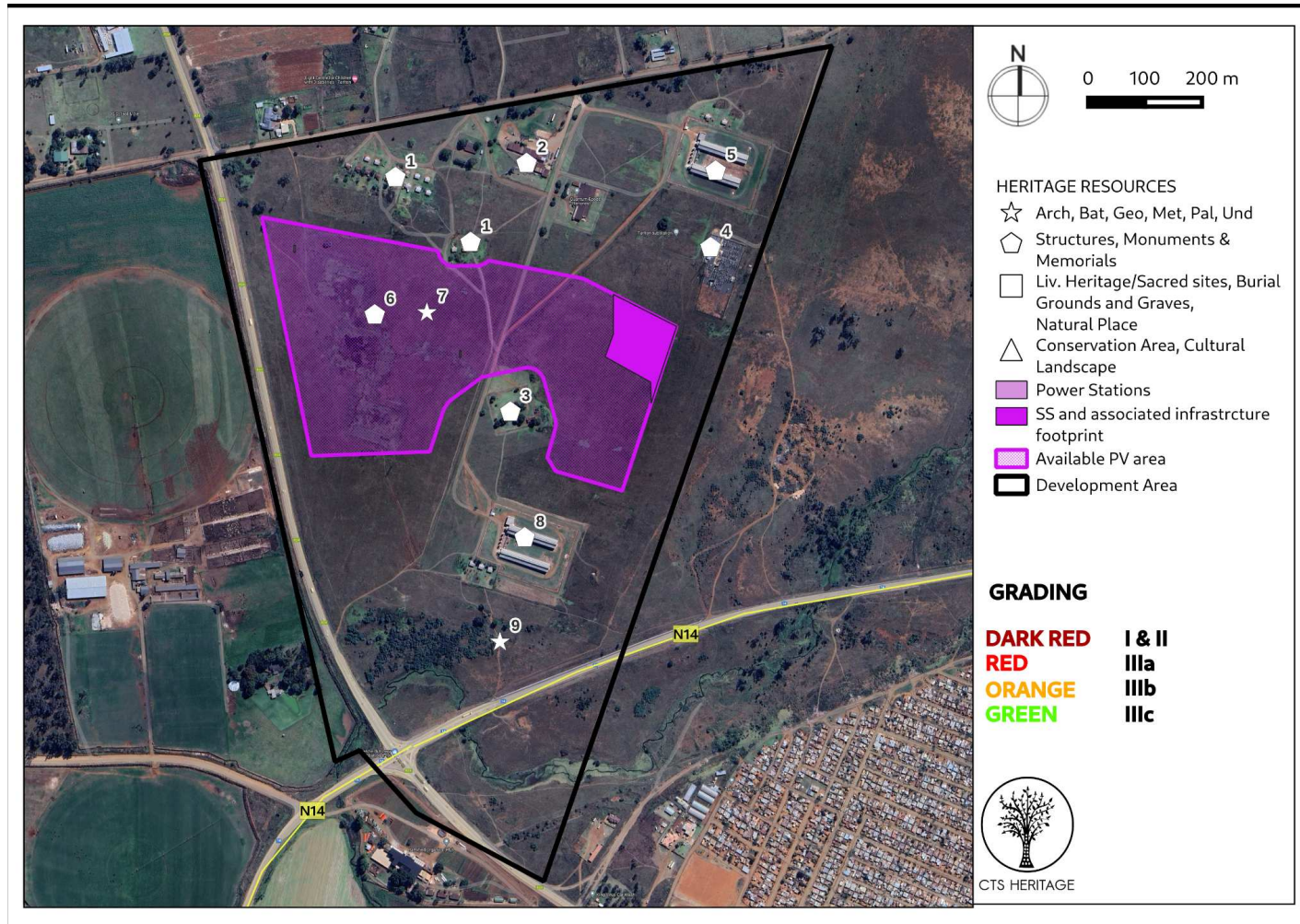


Figure 4.3: Map of all sites and observations noted within the development area - white indicates that the sites are Not Conservation-Worth

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## 5. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT

### 5.1 Assessment of impact to Heritage Resources

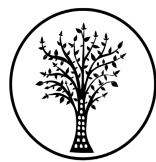
#### 5.1.1 Cultural Landscape and Visual Impacts

According to the VIA completed for this project, “Sense of place refers to a unique experience of an environment by a user, based on his or her cognitive experience of the place. Visual criteria, specifically the visual character of an area (informed by a combination of aspects such as topography, level of development, vegetation, noteworthy features, cultural / historical features, etc.), play a significant role. An impact on the sense of place is one that alters the visual landscape to such an extent that the user experiences the environment differently, and more specifically, in a less appealing or less positive light.

The greater landscape of the study area is transformed, characterised by agricultural activities and urban development therefore this highly developed landscape is not considered to have a high visual quality. The anticipated significance of the visual impacts on the sense of place within the region (i.e. beyond a 6km radius of the development and within the greater region), and by implication, on the sense of place, is difficult to quantify, but is generally expected to be of **moderate** significance.” Visual Impacts are fully assessed in the VIA completed by Du Plessis (2023).

Additionally, it must be noted that the N14 runs immediately south of the development area, and the R24 runs along the west of the development area. While the N14 is not a particularly significant road, precedent for a buffer along national routes to ensure that such routes are not dominated by intense infrastructure has been established elsewhere (Winter and Wilson, 2022, 2023). In the layout provided, the proposed facility is located more than 250m from the N14. This will mitigate any potential negative impacts to this route.

As noted above, the area proposed for the PV development is located within the buffer area of the COH WHS (Figure 5). The COH WHS site is managed by a Management Authority on behalf of the State Party represented by the South African Minister of Environmental Affairs. The Management Authority is responsible for day to day management and falls under the MEC for Economic Development in Gauteng Province. To achieve long term sustainability and effectiveness, a Master Plan was developed in 2000 and has since then guided all conservation, development and research work at the site. According to the COH WHS Management Plan (2014-2017), the primary aim of the Management Authority is to protect and preserve the site, promote further scientific research, encourage community participation and stimulate tourism development that will benefit local communities and ultimately contribute to Local Economic Development (LED). Specific engagement with the MA for the COH WHS should take place regarding development within the identified WHS buffer.



However, based on the existing infrastructure located within the development area, and the distance of the development from the COH WHS, it is not anticipated that the proposed PV development will negatively impact on the integrity or authenticity of the COH WHS.

**Table 5: Impact table for Cultural Landscape Heritage Resources impacted by the Solar Energy Facility**

<b>NATURE:</b> The broader context of the area proposed for development has cultural significance that may be impacted by the proposed development				
		<b>Before Mitigation</b>		<b>After Mitigation</b>
<b>MAGNITUDE</b>	<b>M (5)</b>	While the cultural value of the development area is moderate, the location of the facility within the COHWHS buffer zone, and at the junction of the N14 and the R24 adds to the cultural landscape significance of this site.	<b>M (5)</b>	While the cultural value of the development area is moderate, the location of the facility within the COHWHS buffer zone, and at the junction of the N14 and the R24 adds to the cultural landscape significance of this site.
<b>DURATION</b>	<b>H (4)</b>	Where manifest, the impact will be long term - for the duration of the PV lifetime	<b>H (4)</b>	Where manifest, the impact will be long term - for the duration of the PV lifetime
<b>EXTENT</b>	<b>H (5)</b>	Regional	<b>H (5)</b>	Regional
<b>PROBABILITY</b>	<b>M (2)</b>	It is unlikely that significant cultural landscape resources will be impacted	<b>L (1)</b>	It is unlikely that any significant cultural landscape resources will be impacted
<b>SIGNIFICANCE</b>	<b>L</b>	$(5+4+5) \times 2 = 28$	<b>L</b>	$(5+4+5) \times 1 = 14$
<b>STATUS</b>		Neutral		Neutral
<b>REVERSIBILITY</b>	<b>L</b>	Any impacts to heritage resources that do occur are reversible once the WEF infrastructure is removed	<b>L</b>	Any impacts to heritage resources that do occur are reversible once the WEF infrastructure is removed
<b>IRREPLACEABLE LOSS OF RESOURCES?</b>	<b>L</b>	Unlikely	<b>L</b>	Unlikely
<b>CAN IMPACTS BE MITIGATED</b>		Yes		
<b>MITIGATION:</b>				
<ul style="list-style-type: none"> <li>- A 250m no development buffer should be implemented along the N14</li> <li>- Specific engagement with the MA for the COHWHS should take place regarding development within the identified WHS buffer</li> </ul>				
<b>RESIDUAL RISK:</b>				
NA				



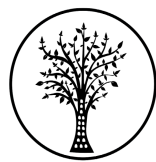
### 5.1.2 Archaeology

No significant archaeological heritage resources were identified within the area proposed for development. This is likely a result of the extensive and intensive agricultural activities that have taken place here in the past. As a result, the development area is not considered to be a sensitive archaeological landscape.

Two examples of quartz flakes were identified during the assessment, these are isolated artefacts with no stratigraphic association. As such, these artefacts have limited scientific value and their recording herein is considered sufficient. These artefacts are determined to be not conservation-worthy. It is likely that these artefacts were visible due to the recent burning in the vicinity and as such, similar artefacts may be present within the development area where burning has not recently occurred. However, it is very likely that any artefacts that are present will also be of limited scientific value and will be considered to be not conservation-worthy.

**Table 6: Impact table for Archaeological Heritage Resources impacted by the Solar Energy Facility**

<b>NATURE:</b> The area proposed for development is known to conserve heritage resources of archaeological significance that may be impacted by the proposed development				
		<b>Before Mitigation</b>		<b>After Mitigation</b>
<b>MAGNITUDE</b>	<b>L (1)</b>	No significant archaeological resources were identified within the development area	<b>L (1)</b>	No significant archaeological resources were identified within the development area
<b>DURATION</b>	<b>H (5)</b>	Where manifest, the impact will be permanent	<b>H (5)</b>	Where manifest, the impact will be permanent
<b>EXTENT</b>	<b>L (1)</b>	Localised within the site boundary	<b>L (1)</b>	Localised within the site boundary
<b>PROBABILITY</b>	<b>L (1)</b>	It is unlikely that any significant archaeological resources will be impacted	<b>L (1)</b>	It is unlikely that any significant archaeological resources will be impacted
<b>SIGNIFICANCE</b>	<b>L</b>	(1+5+1)x1=7	<b>L</b>	(1+5+1)x1=7
<b>STATUS</b>		Neutral		Neutral
<b>REVERSIBILITY</b>	<b>L</b>	Any impacts to heritage resources that do occur are irreversible	<b>L</b>	Any impacts to heritage resources that do occur are irreversible
<b>IRREPLACEABLE LOSS OF RESOURCES?</b>	<b>L</b>	Unlikely	<b>L</b>	Unlikely
<b>CAN IMPACTS BE MITIGATED</b>		Yes		
<b>MITIGATION:</b>				
Although all possible care has been taken to identify sites of cultural importance during the investigation of the study area, it is always possible that hidden or subsurface sites could be overlooked during the assessment. If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils, burials or other categories of heritage resources are found during the proposed development, work must cease in the vicinity of the find and SAHRA must be alerted immediately to determine an appropriate way forward.				



**RESIDUAL RISK:**

Should any significant archaeological resources be impacted (however unlikely) residual impacts may occur, including a negative impact due to the loss of potentially scientific cultural resources

**5.1.3 Palaeontology**

Based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the development footprint. The geological structures suggest that the rocks are the correct age and type to preserve fossils. The site visit and walk through confirmed that there were NO FOSSILS in the project footprint. Since there is an extremely small chance that trace fossils from the Malmani Subgroup 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.

Based on the fossil record but confirmed by the site visit and walk through there are NO FOSSILS of the project footprint. Although stromatolites have been recorded from some exposures of the Malmani Subgroup, enabling the recognition of the Formations within this group, stromatolites, oolitic and algal dolomite are absent from this region. 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 trace fossils may occur below the ground surface in the dolomites of the Malmani Subgroup so a Fossil Chance Find Protocol should be added to the EMP. 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.

**Table 7: Impact table for Palaeontological Heritage Resources impacted by the Solar Energy Facility**

<b>NATURE:</b> The area proposed for development is known to conserve heritage resources of palaeontological significance that may be impacted by the proposed development				
		<b>Before Mitigation</b>		<b>After Mitigation</b>
<b>MAGNITUDE</b>	<b>M (5)</b>	No highly significant palaeontological resources were identified within the development area; however the geology underlying the development area is sensitive for impacts to significant fossils	<b>M (5)</b>	No highly significant palaeontological resources were identified within the development area; however the geology underlying the development area is sensitive for impacts to significant fossils
<b>DURATION</b>	<b>H (5)</b>	Where manifest, the impact will be permanent.	<b>H (5)</b>	Where manifest, the impact will be permanent.
<b>EXTENT</b>	<b>L (1)</b>	Localised within the site boundary	<b>L (1)</b>	Localised within the site boundary
<b>PROBABILITY</b>	<b>L (1)</b>	It is extremely unlikely that any significant paleontological resources will be negatively impacted	<b>L (1)</b>	It is extremely unlikely that any significant paleontological resources will be negatively impacted
<b>SIGNIFICANCE</b>	<b>L</b>	(5+5+2)x1=12	<b>L</b>	(5+5+2)x1=12
<b>STATUS</b>		Neutral		Neutral



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<b>REVERSIBILITY</b>	<b>L</b>	Any impacts to heritage resources that do occur are irreversible	<b>L</b>	Any impacts to heritage resources that do occur are irreversible
<b>IRREPLACEABLE LOSS OF RESOURCES?</b>	<b>L</b>	Unlikely	<b>L</b>	Unlikely
<b>CAN IMPACTS BE MITIGATED</b>		Yes		
<b>MITIGATION:</b> The attached Chance Fossil Finds Procedure must be implemented for all excavations				
<b>RESIDUAL RISK:</b> Should any significant palaeontological resources be impacted (however unlikely) residual impacts may occur, including a negative impact due to the loss of potentially scientific cultural resources				

## 5.2 Sustainable Social and Economic Benefit

According to information received from the developer, the anticipated socio-economic benefits that the proposed Quantum 1 Solar PV Facility will include but are not limited to:

- The generation of green, renewable energy (namely solar energy);
- Affected landowners generate income;
- Creation of employment during the construction and operational phases;
- Skills-development opportunities created during the operational phase;

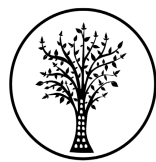
The identification of Socio-Economic needs within the local community and the curation of Socio-Economic Development Plans as outlined in the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) and other such renewable energy procurement programmes”

As the anticipated impacts to heritage resources are negligible, the identified socio-economic benefits outweigh the negative impacts to heritage resources based on the information made available.

## 5.3 Proposed development alternatives

While no specific alternatives are proposed for this project, a rationalised layout that is informed by the sensitivities identified through the Impact Assessment process has been developed. This rationalised layout is mapped herein. This rationalised layout is preferred in terms of impacts to heritage resources and the optimised layout does not encroach into any no-go areas.





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## 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. It is noted that this project falls 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. 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 agricultural

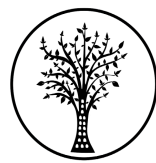


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landscape. The proposed development is therefore unlikely to result in unacceptable risk or loss, nor will the proposed development result in a complete change to the sense of place of the area or result in an unacceptable increase in impact due to its location within a semi-rural area with existing industrial infrastructure common in the broader context. 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.

**Table 8: Cumulative Impact Table**

<b>NATURE:</b> Cumulative Impact to the sense of place				
		<b>Overall impact of the proposed project considered in isolation</b>		<b>Cumulative impact of the project and other projects in the area</b>
<b>MAGNITUDE</b>	<b>M (5)</b>	Moderate	<b>M (5)</b>	Moderate
<b>DURATION</b>	<b>M (3)</b>	Medium-term	<b>H (4)</b>	Long-term
<b>EXTENT</b>	<b>L (1)</b>	Low	<b>L (1)</b>	Low
<b>PROBABILITY</b>	<b>H (3)</b>	Probable	<b>H (3)</b>	Probable
<b>SIGNIFICANCE</b>	<b>M</b>	$(5+3+1) \times 3 = 36$	<b>M</b>	$(5+4+1) \times 3 = 30$
<b>STATUS</b>		Negative		Negative
<b>REVERSIBILITY</b>	<b>H</b>	High	<b>L</b>	Low
<b>IRREPLACEABLE LOSS OF RESOURCES?</b>	<b>M</b>	Possible	<b>M</b>	Possible
<b>CAN IMPACTS BE MITIGATED</b>		NA		NA
<b>CONFIDENCE IN FINDINGS:</b> High				
<b>MITIGATION:</b> Implementation of recommended no development buffers along major routes				



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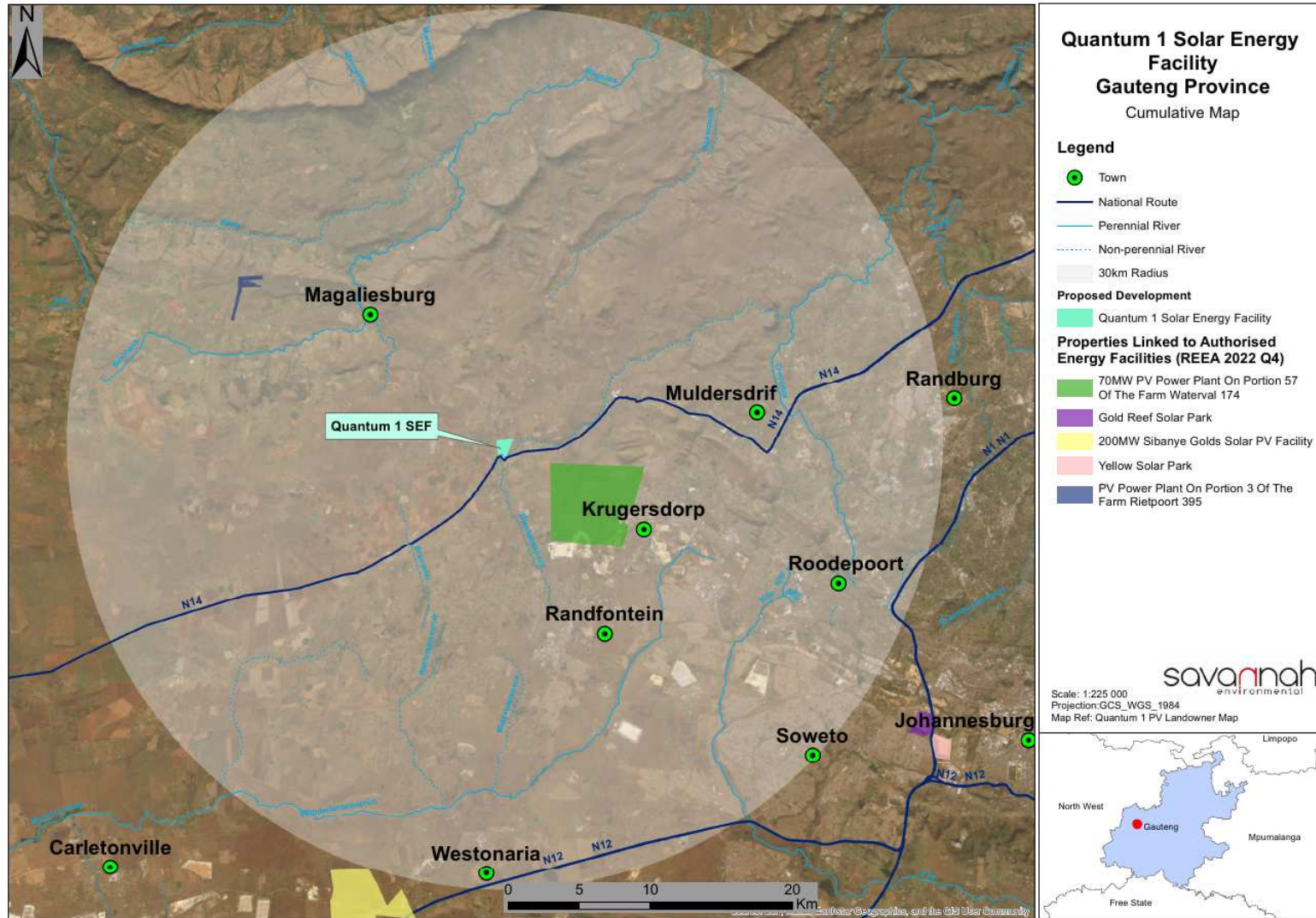
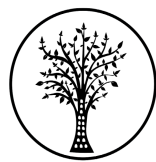


Figure 5: Cumulative Impacts Map (Savannah)

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## 5.5 Site Verification

According to the DFFE Screening Tool analysis, the development area has Very High levels of sensitivity for impacts to palaeontological heritage and Low levels of sensitivity for impacts to archaeological and cultural heritage resources. The results of this assessment in terms of site sensitivity are summarised below:

- The cultural value of the broader area is low (Low)
- No significant archaeological resources were identified within the development area (Low)
- No highly significant palaeontological resources were identified within the development area, however the geology underlying the development area is very sensitive for impacts to significant fossils (Very High)

As per the findings of this assessment, and its supporting documentation, the outcome of the sensitivity verification confirms the results of the DFFE Screening Tool for Palaeontology and for archaeology and cultural heritage. This evidence is provided in the body of this report and in the appendices (Appendix 1, 2 and 3).

## 6. RESULTS OF PUBLIC CONSULTATION

As this application is made in terms of NEMA, the public consultation on the HIA will take place with the broader public consultation process required for the Environmental Impact Assessment process and will be managed by the lead environmental consultants on the project. Specific engagement with the MA for the COH WHS should take place regarding development within the identified WHS buffer.

## 7. CONCLUSION

As noted by the VIA completed for this project, “The greater landscape of the study area is transformed, characterised by agricultural activities and urban development therefore this highly developed landscape is not considered to have a high visual quality.” While the cultural value of the development area is moderate, the location of the facility within the COH WHS buffer zone, and at the junction of the N14 and the R24 adds to the cultural landscape significance of this site. Recommendations are made below in order to mitigate negative impacts to the cultural landscape significance of the area.

Even though the broader area is rich in history, no significant archaeological heritage resources were identified during the field assessment. No Stone Age or Iron Age heritage resources of significance were identified during the survey. In addition, no structures of cultural value or graves were identified. As such, this development is not considered to be a sensitive archaeological landscape.



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Based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the development footprint. The geological structures suggest that the rocks are the correct age and type to preserve fossils. The site visit and walk through confirmed that there were NO FOSSILS in the project footprint. Since there is an extremely small chance that trace fossils from the Malmani Subgroup 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.

On condition that the recommendations outlined below are implemented, there is no objection to the proposed development from a heritage perspective.

## **8. RECOMMENDATIONS**

Based on the outcomes of this report, it is not anticipated that the proposed development of the solar energy facility and its associated infrastructure will negatively impact on significant heritage resources on condition that:

- A 250m no development buffer should be implemented along the N14. The layout provided complies with this requirement.
- Specific engagement with the MA for the COH WHS should take place regarding development within the identified WHS buffer
- The attached Chance Fossil Finds Procedure must be implemented for all excavation activities
- Although all possible care has been taken to identify sites of cultural importance during the investigation of the study area, it is always possible that hidden or subsurface sites could be overlooked during the assessment. If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils, burials or other categories of heritage resources are found during the proposed development, work must cease in the vicinity of the find and SAHRA must be alerted immediately to determine an appropriate way forward.



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## 9. REFERENCES

Heritage Impact Assessments				
Nid	Report Type	Author/s	Date	Title
5106	AIA Phase 1	Johnny Van Schalkwyk	01/11/2003	Heritage Impact Assessment for the Waterval West 510 JQ Development, Krugersdorp District, Gauteng Province
5114	AIA Phase 1	Anton van Vollenhoven, Anton Pelser	01/09/2007	A Report on a Cultural Heritage Impact Assessment on Erf 85, Chamdor, Krugersdorp for the William Tell Particle Boards and Medium Density Manufacturing Plant
5118	AIA Phase 1	Johnny Van Schalkwyk	01/02/2008	Heritage Survey Report for the Development of Water Pipelines for the Droogeheuvel and Middelvlei Townships, Randfontein, Gauteng Province
6271	AIA Phase 1	Wouter Fourie, M Ramsden	01/08/2002	Blaauwbank Historic Gold Mine, Magaliesberg: Cultural Heritage Scoping
6340	AIA Phase 1	Wouter Fourie, Jaco van der Walt	08/12/2005	Portion of the Proposed Pipeline from Brandvlei to Krugersdorp on the Farm Brandvlei 261 IQ, District Mogale City, Gauteng Province
6402	AIA Phase 1	Wouter Fourie	03/09/2007	Archaeological Impact Assessment: Proposed Township - Chancliff Ridge Extension 34, Mogale City
7795	AIA Phase 1	Johnny Van Schalkwyk, Frank Teichert	04/06/2007	Heritage Impact Assessment for the Planned Rietvallei 180 IQ Development, Krugersdorp Municipal District, Gauteng Province
8056	AIA Phase 1	Polke Birkholtz	23/06/2008	Heritage Scoping: Proposed Second Dwelling, Thorny Valley Estate 240 (Portion 240 a Portion of 264) of the Farm Honingklip 178 IQ, Mogale City, Gauteng Province
8251	AIA Phase 1	Johnny Van Schalkwyk	01/11/2007	Heritage Survey Report for the Proposed West Village Outfall Sewer, Mogale City Local Municipality, Gauteng
110292	AIA Phase 1		13/02/2013	Ntshona Heritage Reports
195364	HIA Phase 1	Wouter Fourie	26/01/2015	THE RAND EN DAL EXT13 PROPOSED DEVELOPMENT ON PORTION 29 OF THE FARM PAARDEPLAATS 177 IQ, KRUGERSDORP, MOGALE CITY DISTRICT, GAUTENG PROVINCE
195364	HIA Phase 1	Wouter Fourie	26/01/2015	THE RAND EN DAL EXT13 PROPOSED DEVELOPMENT ON PORTION 29 OF THE FARM PAARDEPLAATS 177 IQ, KRUGERSDORP, MOGALE CITY DISTRICT, GAUTENG PROVINCE



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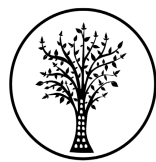
269462	Heritage Impact Assessment Specialist Reports	Dominic Stratford	20/11/2014	Basic Heritage Impact Assessment for the proposed upgrades to the Maropeng Interpretive Centre
364744	AIA Phase 1	Jaco van der Walt	17/05/2016	ARCHAEOLOGICAL IMPACT ASSESSMENT FOR THE PROPOSED PROTEA RIDGE DEVELOPMENT, GAUTENG PROVINCE
375227	AIA Phase 1	Jaco van der Walt	04/10/2016	ARCHAEOLOGICAL IMPACT ASSESSMENT For the Proteadal Mixed Use Township, Proteadal Extension 1, Portion 216 (a Portion of Portion 214) , Paardeplaats 177 IQ, Gauteng Province
375715	HIA Phase 2	Jaco van der Walt, Sidney Miller	04/10/2016	2nd Phase documentation report of the Farmyard On Portion 216 Of Paardekraal 177 IQ, Proteadal Extension 1. Mogale City/Krugersdorp, Gauteng Province.



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## APPENDICES





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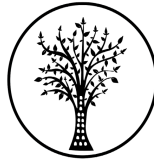
## APPENDIX 1: Archaeological Assessment (2022)

# ARCHAEOLOGICAL SPECIALIST STUDY

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

## **Proposed development of the Quantum PV Facility and Grid Connection near Krugersdorp**

**Prepared by**



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**Jenna Lavin**

**And Nic Wiltshire**

In Association with

**Savannah Environmental**

June 2023



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## EXECUTIVE SUMMARY

South Africa Mainstream Renewable Power Developments (Pty) Ltd is proposing the construction and operation of a solar photovoltaic (PV) facility and associated infrastructure on Portion 285 (a portion of portion 19) of the Farm Vlakplaats 160, located approximately 7.2km west of Krugersdorp, within the Mogale City Local Municipality in the West Rand District Municipality in the Gauteng Province. The facility will have a contracted capacity of up to 10MW and will be known as Quantum 1 Solar Energy Facility.

Even though the broader area is rich in history, no significant archaeological heritage resources were identified during the field assessment. No Stone Age or Iron Age heritage resources of significance were identified during the survey. In addition, no structures of cultural value or graves were identified. As such, this development is not considered to be a sensitive archaeological landscape.

It is unlikely that the proposed development will impact significant archaeological heritage.

### ***Recommendations***

Based on the outcomes of this report, it is not anticipated that the proposed development of the solar energy facility will negatively impact on significant archaeological heritage on condition that:

- Although all possible care has been taken to identify sites of cultural importance during the investigation of the study area, it is always possible that hidden or subsurface sites could be overlooked during the assessment. If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils, burials or other categories of heritage resources are found during the proposed development, work must cease in the vicinity of the find and SAHRA must be alerted immediately to determine an appropriate way forward.



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## 1. INTRODUCTION

### 1.1 Background Information on Project

South Africa Mainstream Renewable Power Developments (Pty) Ltd is proposing the construction and operation of a solar photovoltaic (PV) facility and associated infrastructure on Portion 285 (a portion of portion 19) of the Farm Vlakplaats 160, located approximately 7.2km west of Krugersdorp, within the Mogale City Local Municipality in the West Rand District Municipality in the Gauteng Province. The facility will have a contracted capacity of up to 10MW and will be known as Quantum 1 Solar Energy Facility.

A preferred development area with an extent of ~94.1479ha has been identified by South Africa Mainstream Renewable Power Developments (Pty) Ltd as technically suitable for the development of the Quantum 1 Solar Energy Facility. The facility will comprise the following infrastructure:

- » Solar PV array comprising solar modules.
- » Mounting System Technology
- » Inverters and transformers.
- » Low voltage cabling between the PV modules to the inverters.
- » Overhead power lines
- » Onsite substation, switching substation and laydown areas.
- » Battery Energy Storage System (BESS) and associated infrastructure.
- » Internal access roads.
- » Fence around the project development areas.

**Table 1: Details of typical infrastructure required for the 10MW Quantum 1 SEF.**

Component	Description / Dimensions
District Municipality	West Rand District Municipality
Local Municipality	Mogale City Local Municipality
Ward Number (s)	Ward 30
Nearest town(s)	Krugersdorp (7.2km east)
Farm name(s) and number(s) of properties affected by the PV Facility, incl SG 21 Digit Code (s)	Portion 265 (a portion of portion 19) of the Farm Vlakplaats 160 (T0IQ0000000016000265)
Current zoning	Agriculture
Site Coordinates (centre of development area)	26° 4'8.17"S, 27°38'55.89"E
Total extent of the Affected Properties, also referred to as the project site <sup>1</sup>	~94.1479ha
Total extent of the Development area <sup>2</sup>	~94.1479ha
Total extent of the Development footprint <sup>3</sup>	To be confirmed following specialist input during the scoping phase
Contracted capacity of the PV facility	10MW
PV panels	Height: up to 5m from ground level (installed)
Power line capacity	11kV

<sup>1</sup> The project site is that identified area within which the development area and development footprint are located. The project site is ~93ha in extent and only consist of one affected property.

<sup>2</sup> The development area is that identified area where the 10MW PV facility is planned to be located. This area has been selected as a practicable option for the facility, considering technical preference and constraints. The development area is ~94.1479ha in extent.

<sup>3</sup> The development footprint is the defined area (located within the development area) where the PV panel array and other associated infrastructure for the Quantum 1 Solar Energy Facility is planned to be constructed. This is the actual footprint of the facility, and the area which would be disturbed.



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Power line servitude width	Up to 18m
Grid connection	» To be evacuated from the onsite substation via 11kV Monopole or lattice structure pylons to the Eskom Tarlton 132/44/11kV substation located on the same land parcel as the proposed PV facility. This will form part of a separate EA process.
On-site Facility Substation, and O&M buildings	» Located within the development area. » Approximately 1.5ha in extent.
Battery Energy Storage System (BESS)	» The BESS area will form part of the 1.5ha allocated for other infrastructure.
Access roads and internal roads	» Existing roads will be used as far as possible. There are existing gravel roads that can be utilized for site access (width of up to 6m). Upgrading of existing roads or new roads may be required.

The Quantum 1 SEF is proposed in response to the identified objectives of the national and provincial government and local and district municipalities to develop renewable energy facilities for power generation purposes. It is the developer's intention to submit a bid in terms of a regulated power purchase procurement process (e.g., REIPPPP) with the aim of evacuating the generated power into the national grid or obtaining a commercial PPA (Power Purchase Agreement). This will aid in the diversification and stabilisation of the country's electricity supply, in line with the objectives of the Integrated Resource Plan (IRP) with the Quantum 1 SEF set to inject up to 10MW (peak AC power) into the national grid.

From a regional perspective, the area within the West Rand District Municipality identified for the project is considered favourable for the development of a commercial PV facility due to the low environmental sensitivity of the identified site, excellent solar resource, and availability of land on which the development can take place. There is also potential for evacuating the power to the national grid via a direct grid connection at the Eskom Tarlton 132/44/11kV substation which is adjacent to the proposed site. The site is also in proximity to large electricity users which opens opportunities for commercial PPAs (Behind the meter connection Or Wheeling to a 3<sup>rd</sup> party off-taker).



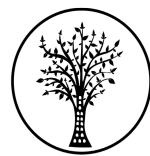
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## 1.2 Description of Property and Affected Environment

The Quantum PV project lies 10km west of Krugersdorp in Gauteng near the intersection of the N14 highway and the R24 Main road. The study site is surrounded by smallholdings in Tarlton to the north and northwest of, larger farms to the west and south west, and the Wolfelea settlement to the east over the other side of the N14 highway.

Much of the site has been developed over the years for semi-industrial activities. Quantum Foods has their offices towards the northern end of the site and a number of staff houses immediately adjacent. The Tarlton substation lies in the northeast side as well as a number of chicken broilers/egg laying buildings. A small stream flows through the southern end of the site near as stand of alien trees and bush on the fringe of the highway. Older ruins that have been completely levelled are visible using aerial satellite imagery along the western side and scattered bricks and broken concrete were observed in these areas during the survey.

Some gravel roads crisscross the property besides the current industrial farming activities, accommodation and ruined remnants of previous buildings related to Wolfelea.



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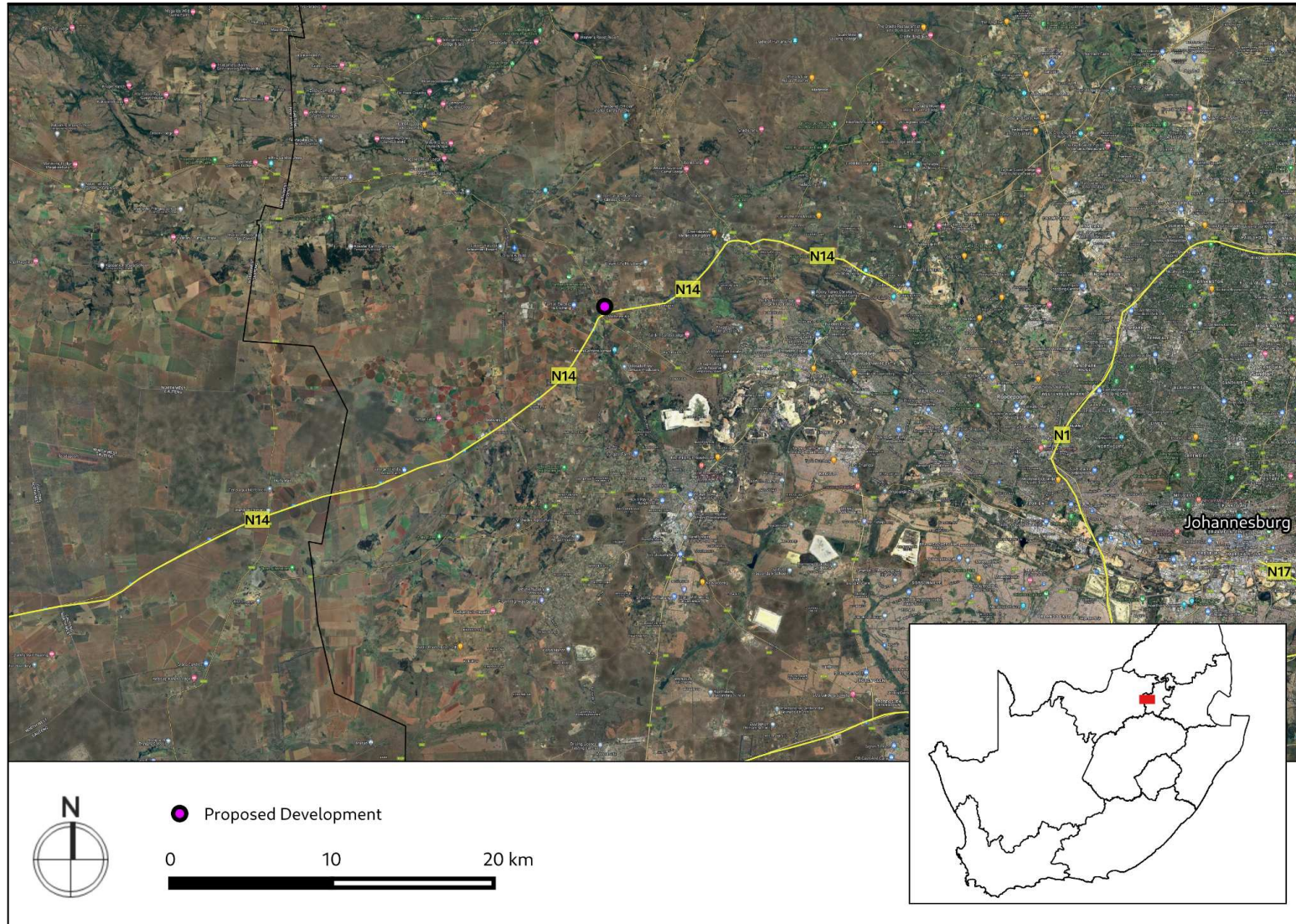
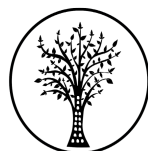


Figure 1.1: Satellite image indicating proposed location of development





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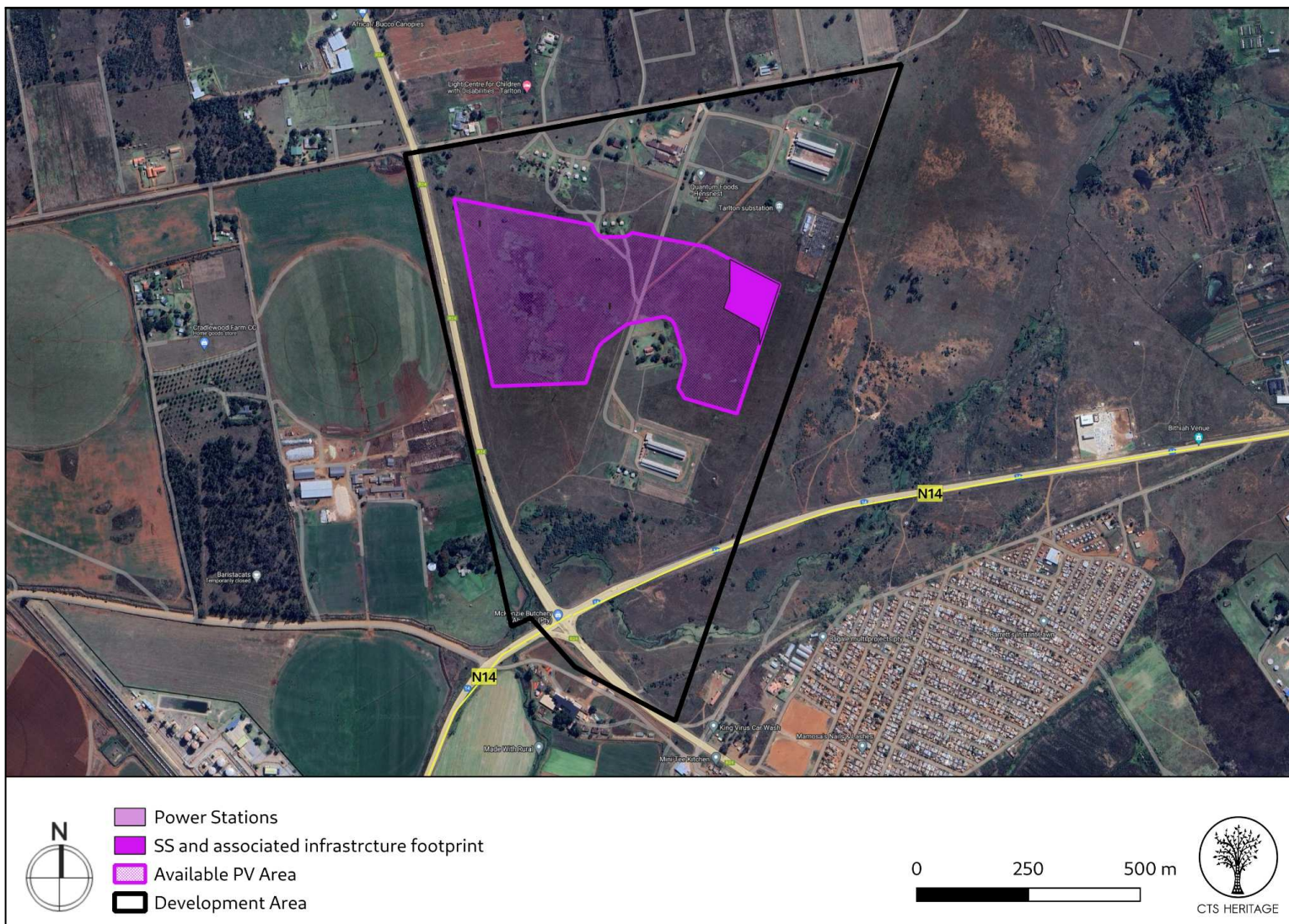
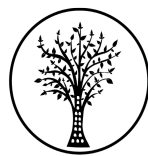


Figure 1.2: Project boundary with proposed layout



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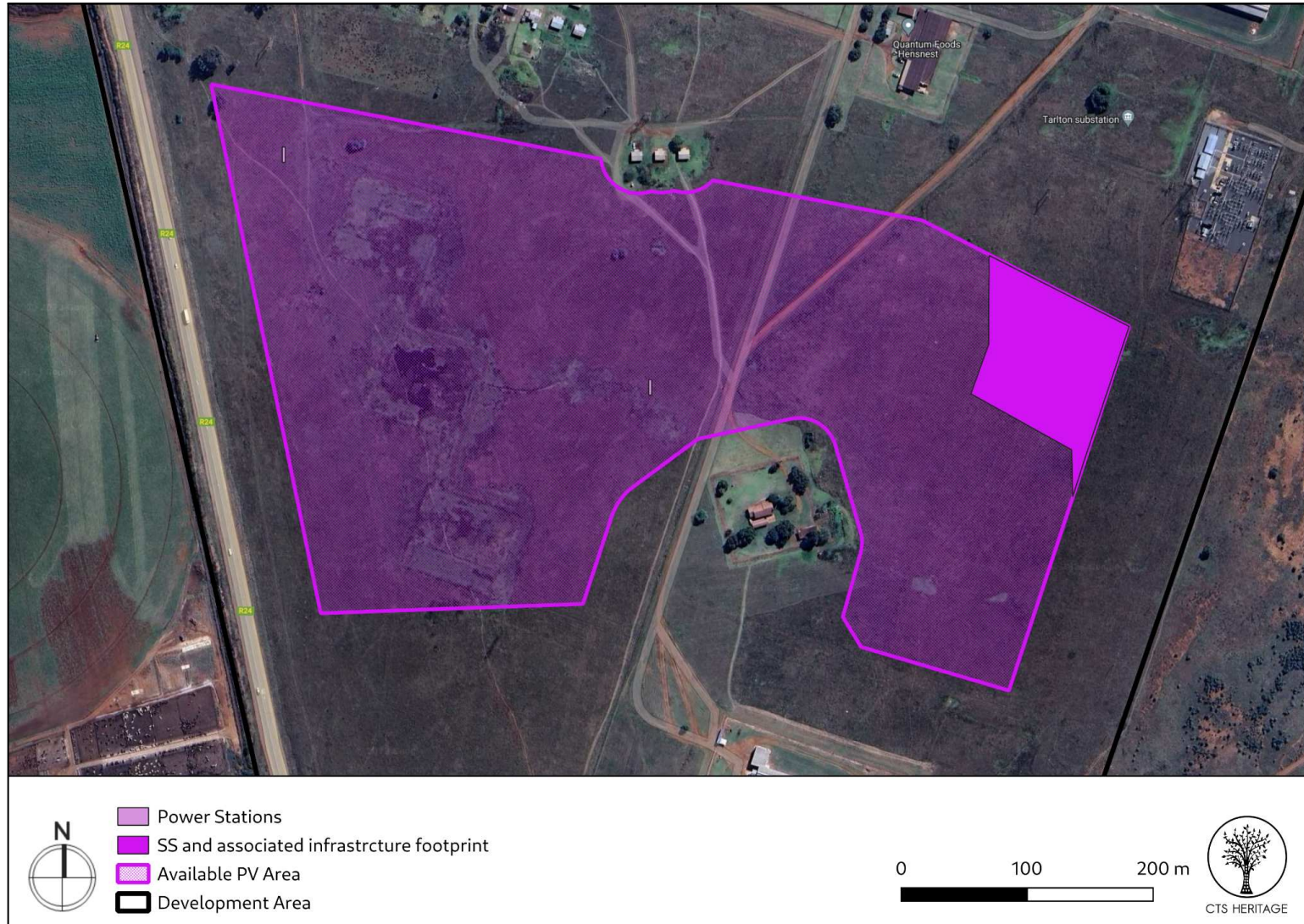


Figure 1.3: Project boundary with proposed layout



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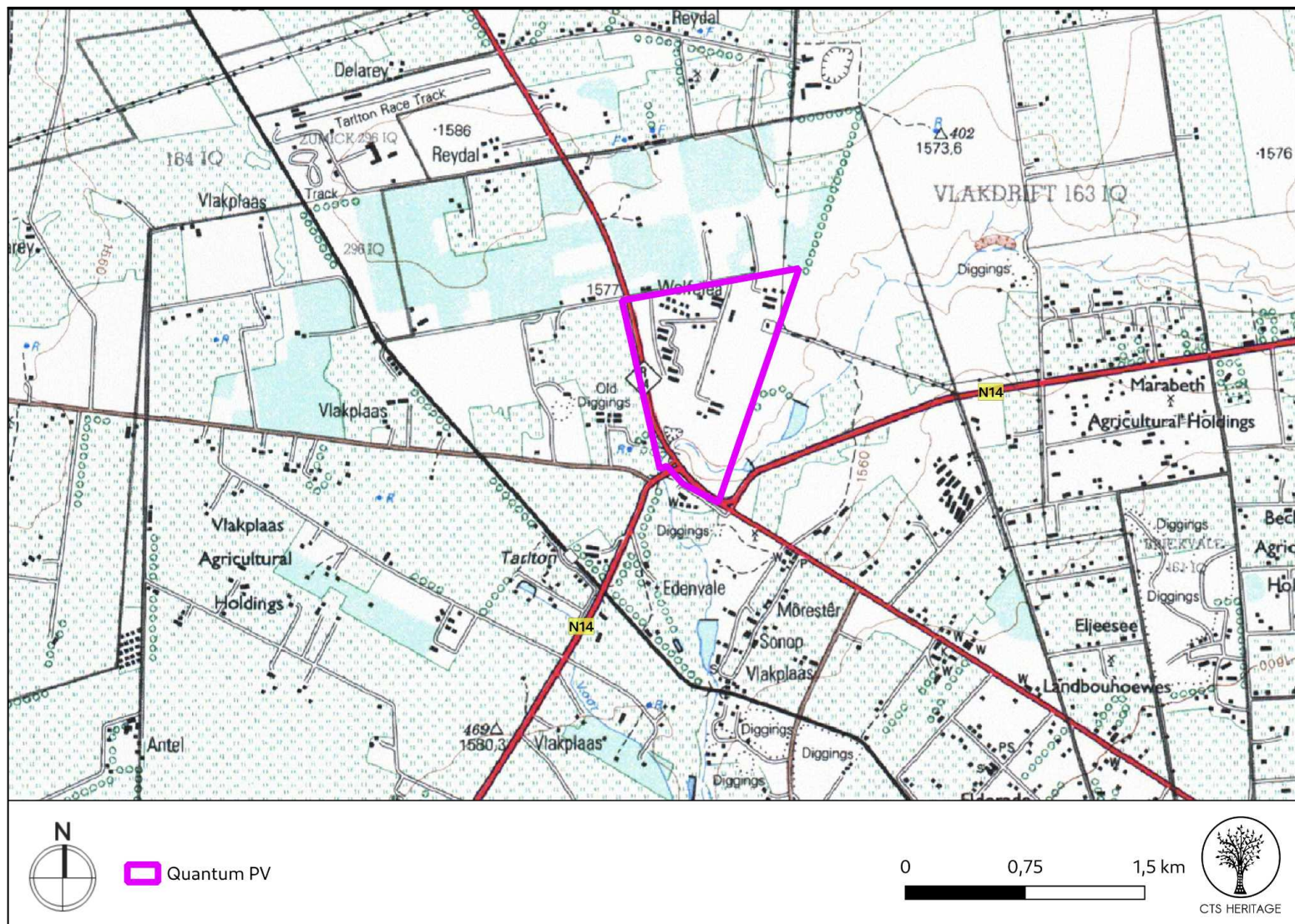


Figure 1.4: Project boundary on the 1:50 000 Topo Map



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## **2. METHODOLOGY**

### **2.1 Purpose of Archaeological Study**

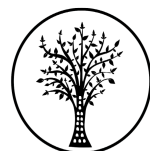
The purpose of this archaeological study is to satisfy the requirements of section 38(8), and therefore section 38(3) of the National Heritage Resources Act (Act 25 of 1999) in terms of impacts to archaeological resources.

### **2.2 Summary of steps followed**

- An archaeologist conducted a survey of the site and its environs on 09 June 2023 to determine what archaeological resources are likely to be impacted by the proposed development.
- The area proposed for development was assessed on foot, photographs of the context and finds were taken, and tracks were recorded 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**

There were no major constraints experienced during the survey. The property is very small compared to many of the PV developments surveyed by CTS and the access roads through the site provided easy points from which to walk the area proposed for the facility. The ground has been completely levelled for farming and building foundations in the past and is highly transformed as a result. Some higher stands of veld grass cover the eastern side but did not pose too many issues in terms of assessing the heritage impacts expected by this proposed development.



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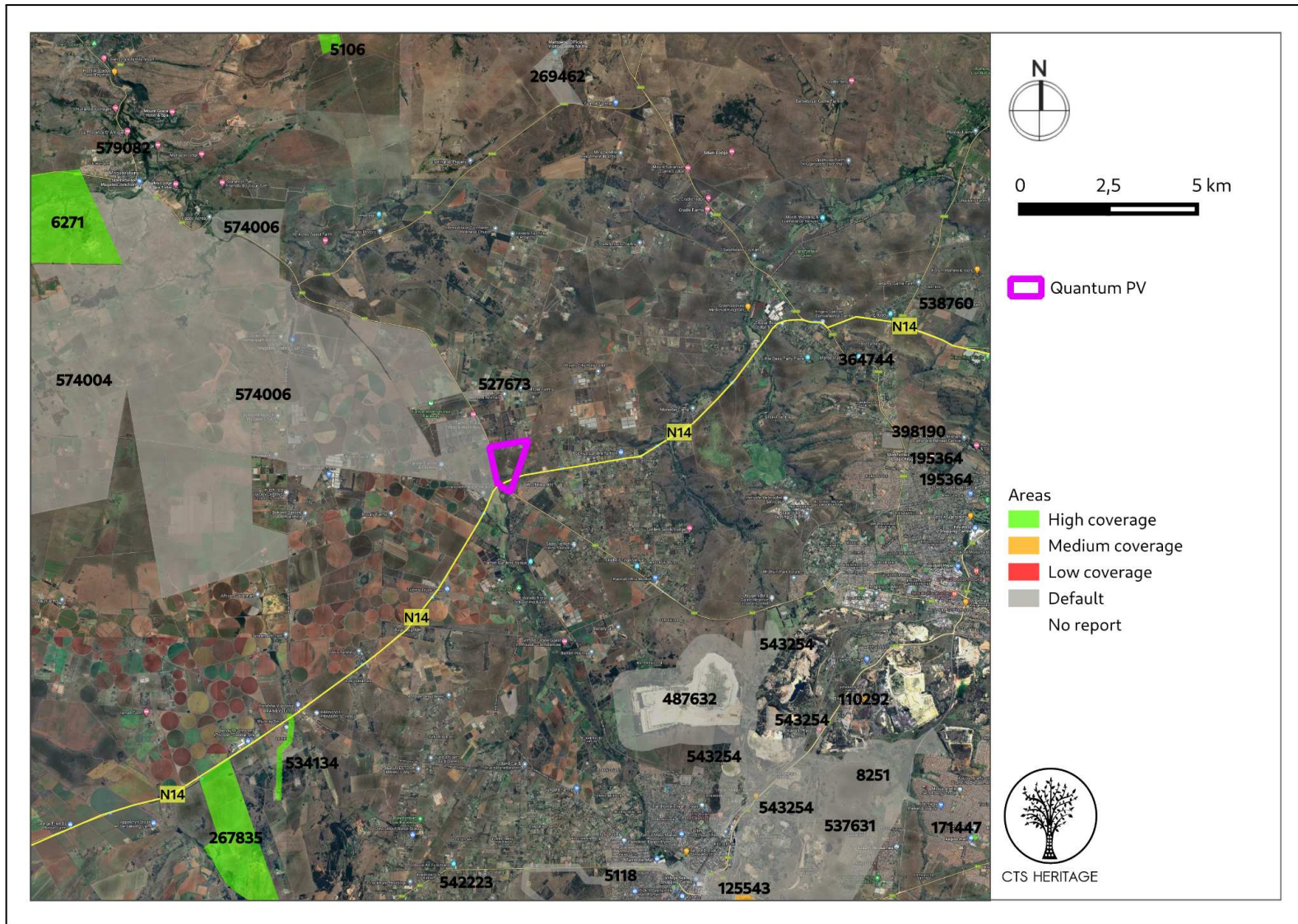


Figure 2: Close up satellite image indicating proposed location of development in relation to heritage studies previously conducted



### 3. HISTORY AND EVOLUTION OF THE SITE AND CONTEXT

The study area borders Magaliesburg to the south, while Krugersdorp is located 15 km to the east and Carletonville 32 km to the southwest. Krugersdorp was established on the farm Paardekraal in 1887 after the discovery of gold in the area. The discovery of gold and the mining boom had an impact on the establishment of all the towns in the area and on the evolution and development of South Africa more generally. Krugersdorp also played a significant role in the Transvaal War of Independence and the Second Boer War, during which the British established a concentration camp on the then outskirts of the city. The exact location of the site of the concentration camp is unknown however it is expected that the camp was located at the site of the present Coronation Park, located far from the area proposed for development here.

The area proposed for development is located approximately 32km northeast of Carltonville within the Merafong Municipality. Carltonville was developed by various mining companies from 1937 onwards, but was not officially incorporated until 1959, and was subsequently recognised as a provincial town in 1967. Surrounding Carltonville are a number of privately owned gold-mining township villages and contractor labour quarters established by the mining companies on land owned by the mines. The area surrounding Carltonville is dominated by a cultural landscape that is shaped and defined by the historic and on-going mining activities associated with the Witwatersrand. A detailed archaeological background of the area is provided by Du Pisanie and Nel (2012, SAHRIS NID 104305) and is therefore not repeated here. It is sufficient to note that no significant Early, Middle or Later Stone Age sites are known from this broader area, however sites representing the Iron Age occupation of the region are present in the broader context.

#### **Archaeology and the Cultural Landscape**

Tobais (2021) notes that “the general region is significant from a heritage perspective. Heritage sites are likely to include cemeteries/graves, Stone Age Sites, Iron Age and historical sites. Since gold mining can be dated to at least 1874 on the Farm Blaauwbank that is located directly north of the study area, it can be assumed that similar mining activities took place in the general area during the same time. Remnants of the South African War of 1899 – 1902 are also likely to be encountered within the study area.”

Birkholtz and Groenewald (2016, SAHRIS NID 369805) describe the broader areas as “generally undulating with a number of extensive pans located within this area... While the overall study area is mostly utilised for agricultural activities, the proposed development bulk sample area that was assessed in the field is characterised by agricultural fields (maize), a large number of small livestock camps associated with stud farming (cattle) as well as Eskom power lines.” The N14 is an historic scenic route that runs between Ventersdorp and Pretoria and is likely based on the original wagon route used for this journey. This route is located immediately adjacent to the proposed development area. In general, for the development of PV infrastructure and its associated grid connection infrastructure, it is preferred for such development to be clustered with existing development, such as mining or residential development, in order to reduce the perception of urban and infrastructure sprawl across an otherwise agricultural landscape and a no-development buffer of 500m for PV infrastructure is recommended along significant access routes such as the N14. However, in this instance, due to the already transformed nature of the broader area, a 250m buffer is appropriate



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(Figure 6).

Birkholtz and Groenewald (2016) go on to note that examples of published excavated archaeological sites from the general surroundings of the study area include the Later Stone Age and Iron Age sites located along the Magaliesberg Mountains and sites of international palaeoanthropological significance such as Sterkfontein and Kromdraai, both located within the Cradle of Humankind World Heritage Site. The area proposed for the PV development is located within the buffer area of the COHWHS (Figure 5). The COHWHS site is managed by a Management Authority on behalf of the State Party represented by the South African Minister of Environmental Affairs. The Management Authority is responsible for day to day management and falls under the MEC for Economic Development in Gauteng Province. To achieve long term sustainability and effectiveness, a Master Plan was developed in 2000 and has since then guided all conservation, development and research work at the site. According to the COHWHS Management Plan (2014-2017), the primary aim of the Management Authority is to protect and preserve the site, promote further scientific research, encourage community participation and stimulate tourism development that will benefit local communities and ultimately contribute to Local Economic Development (LED). Specific engagement with the MA for the COHWHS should take place regarding development within the identified WHS buffer.



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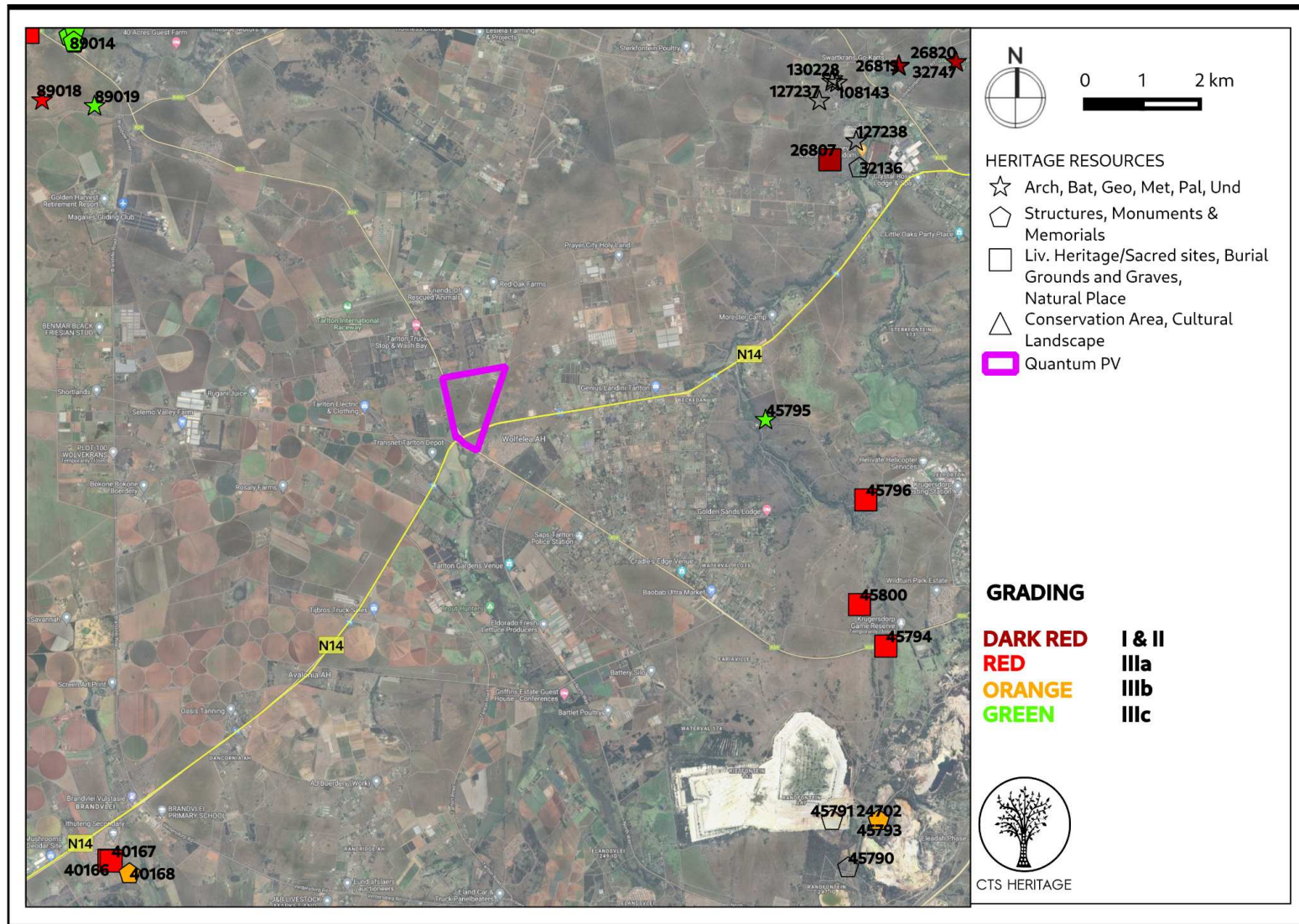
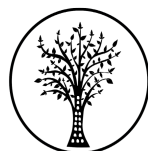


Figure 3.1 Heritage Resources Map. Heritage Resources previously identified in and near the study area, with SAHRIS Site IDs indicated





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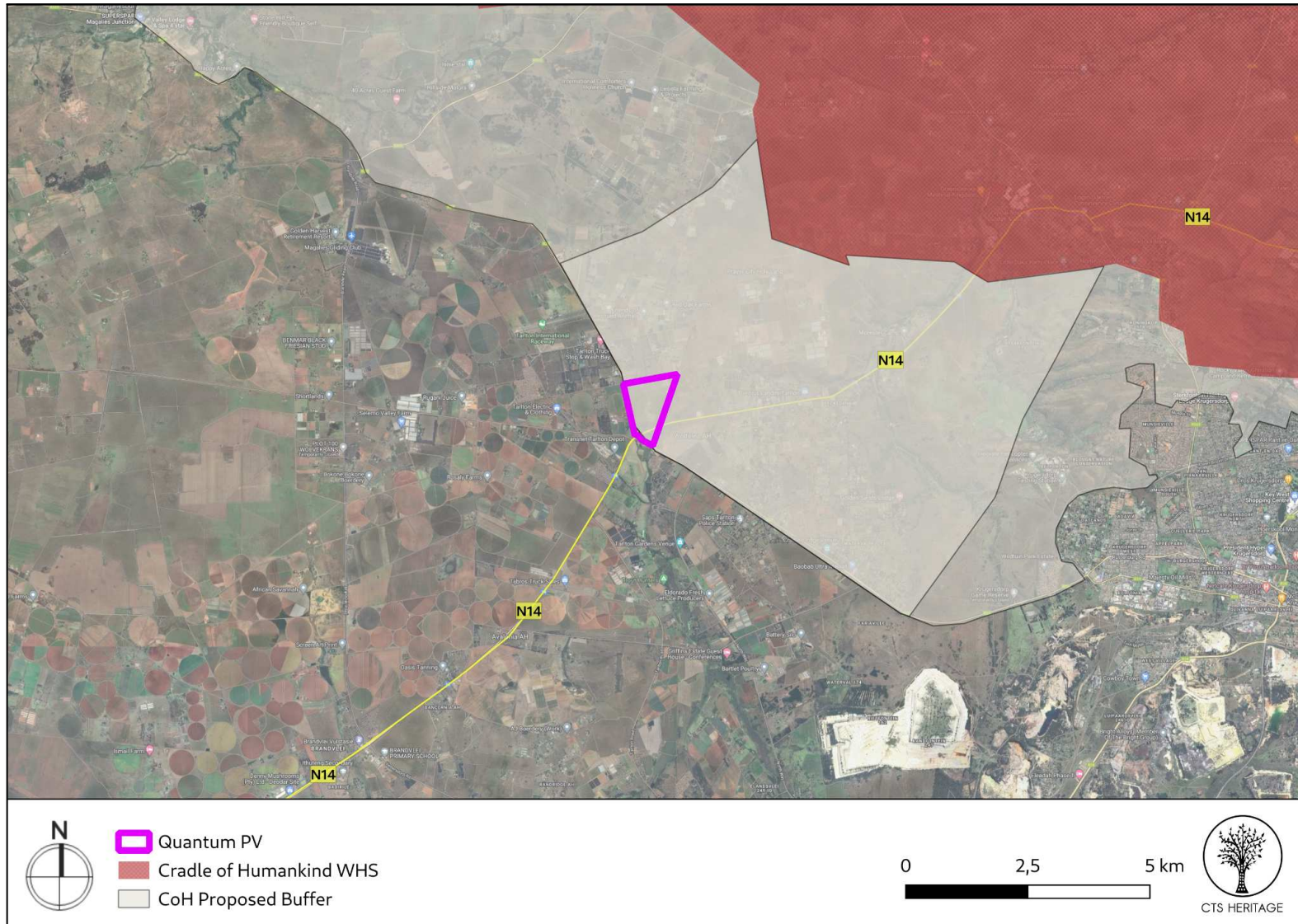


Figure 3.2. Heritage Resources Map. Proximity of the development to the COH WHS



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#### 4. IDENTIFICATION OF HERITAGE RESOURCES

##### 4.1 Field Assessment

As can be seen from the photo deck, the area is completely transformed and lies very much within a smallholding/semi-industrial pocket of ground on the outskirts of Krugersdorp. The existing large scale food production facilities owned and run by Quantum foods will be immediately alongside the new PV facility. Foundations of buildings along the western side have been completely levelled and demolished and likely dated to the mid 20th century when more intensive commercial activities were established on this property. The buildings that are still intact are not conservation-worthy and the foundations have therefore been given a similar assessment (NCW).

A few quartz flakes were found near the stream in the southern portion as well as some isolated flakes in the middle of the property - these lie in highly disturbed areas. The site is otherwise sterile of any heritage resources.



Figure 4.1: View of the grounds in front of the residence in the middle of the site looking to the south.



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Figure 4.2: View of a patch of higher grass between the substation and the residence.



Figure 4.3: View of the large overhead powerlines running through the site onto and onwards from Tarlton substation.



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Figure 4.4: View of Tarlton substation



Figure 4.5: View of the burnt veld near the ruined foundations of earlier factory buildings.



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Figure 4.6: View of Tarlton substation and the Quantum factories to the left.



Figure 4.7: View of the residential home in the middle of the site flanked by the broilers/egg-laying buildings.



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Figure 4.8: View of some of the staff buildings and chicken factory production facilities in the southern end.



Figure 4.9: View of a mining dump in the distance beyond Wolfelea.



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Figure 4.10: View along the northern side of the study site.



Figure 4.11: View of staff accommodation in the northern section.



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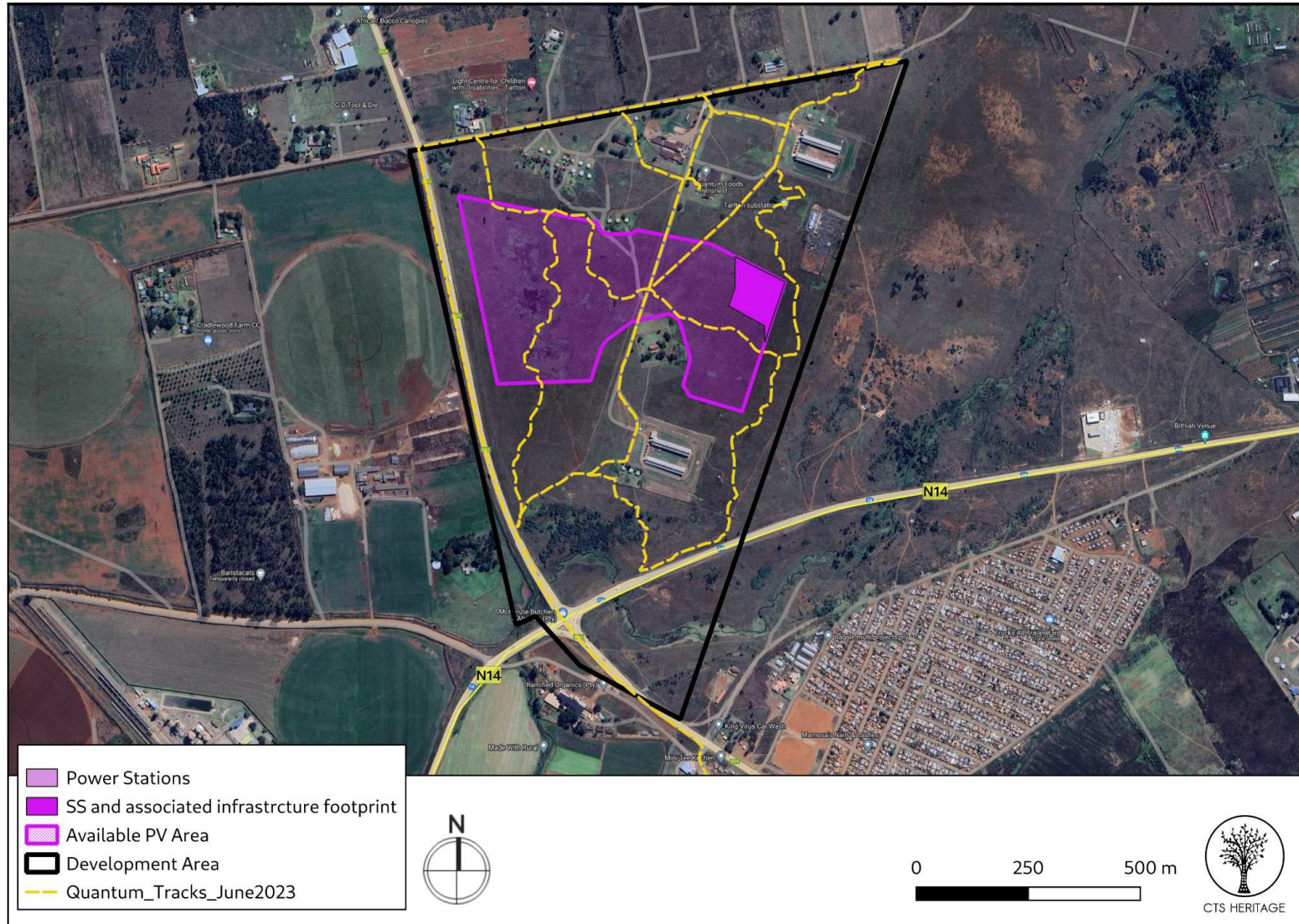


Figure 5.1: Overall track paths of foot survey for the proposed development

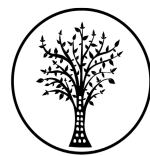




## 4.2 Archaeological Resources identified

**Table 2: Observations noted during the field assessment**

Obs#	Description	Type	Period	Density	Latitude	Longitude	Grade	Mitigation
001	Wolfelea staff accommodation, modern	Structure	Modern	n/a	-26.067507	27.648648	NCW	NA
001	Wolfelea staff accommodation, modern	Structure	Modern	n/a	-26.066482	27.647328	NCW	NA
002	Quantum Foods offices, latter 20th century buildings	Structure	Modern	n/a	-26.06626	27.649631	NCW	NA
003	Another Wolfelea residence, larger, modern	Structure	Modern	n/a	-26.070183	27.649346	NCW	NA
004	Tarlton substation	Structure	Modern	n/a	-26.067588	27.652862	NCW	NA
005	Feed lots	Structure	Modern	n/a	-26.066379	27.652951	NCW	NA
006	In burnt area on western side, underground water works/sewerage infrastructure, ground appears to have been cultivated before as it is entirely levelled. Some bricks also seen, appears that some structures have been demolished and cleared.	Ruin	Modern, Historic	n/a	-26.06865	27.646965	NCW	NA
007	Quartz flakes in little rocky patch	Artefacts	LSA	0 to 5	-26.068612	27.647881	NCW	NA
008	Feed lots	Structure	Modern	n/a	-26.072168	27.649598	NCW	NA
009	Some more quartz material, some flaked	Artefacts	LSA	0 to 5	-26.073811	27.649164	NCW	NA



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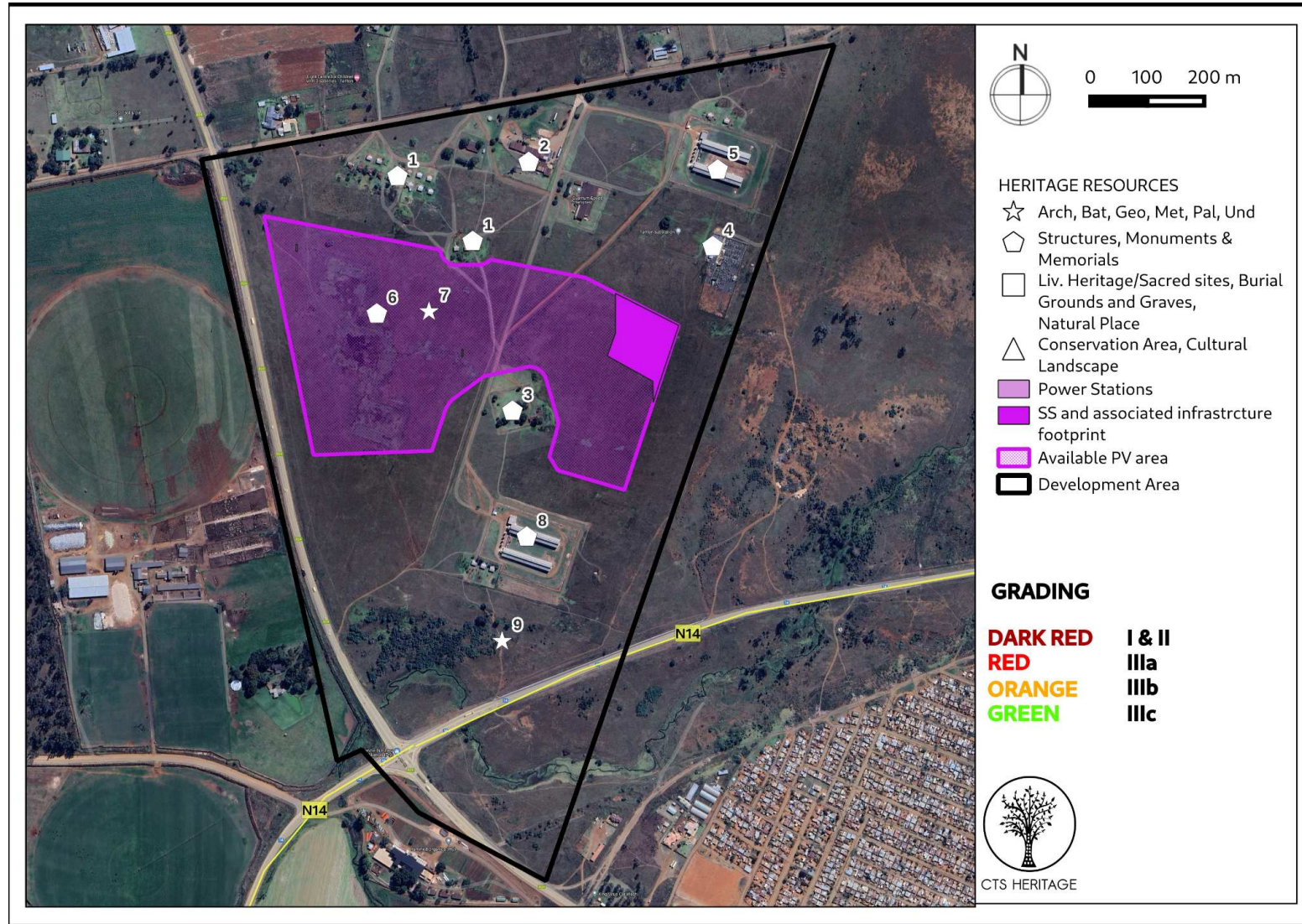


Figure 6: Map of all sites and observations noted within the development area



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### 4.3 Selected photographic record

(a full photographic record is available upon request)



Figure 6.1: Observation 001 - Staff Accommodation



Figure 6.2: Observation 002 - Quantum Offices



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Figure 6.3: Observation 003 - Wolfelea Residence



Figure 6.4: Observation 004 - Tarlton Substation



Figure 6.5: Observation 005 - Feedlots



Figure 6.6: Observation 006 - Demolished Infrastructure in burnt area



Figure 6.7: Observation 007 - Quartz Flakes



Figure 6.8: Observation 008 - Feedlots



Figure 6.9: Observation 009 - Quartz material and flakes



Figure 6.10: Observation 009 - Quartz material and flakes



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## **5. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT**

### **5.1 Assessment of impact to Archaeological Resources**

No significant archaeological heritage resources were identified within the area proposed for development. This is likely a result of the extensive and intensive agricultural activities that have taken place here in the past. As a result, the development area is not considered to be a sensitive archaeological landscape.

Two examples of quartz flakes were identified during the assessment, these are isolated artefacts with no stratigraphic association. As such, these artefacts have limited scientific value and their recording herein is considered sufficient. These artefacts are determined to be not conservation-worthy. It is likely that these artefacts were visible due to the recent burning in the vicinity and as such, similar artefacts may be present within the development area where burning has not recently occurred. However, it is very likely that any artefacts that are present will also be of limited scientific value and will be considered to be not conservation-worthy.

## **6. CONCLUSION AND RECOMMENDATIONS**

Even though the broader area is rich in history, no significant archaeological heritage resources were identified during the field assessment. No Stone Age or Iron Age heritage resources of significance were identified during the survey. In addition, no structures of cultural value or graves were identified. As such, this development is not considered to be a sensitive archaeological landscape.

It is unlikely that the proposed development will impact significant archaeological heritage.

### ***Recommendations***

Based on the outcomes of this report, it is not anticipated that the proposed development of the solar energy facility will negatively impact on significant archaeological heritage on condition that:

- Although all possible care has been taken to identify sites of cultural importance during the investigation of the study area, it is always possible that hidden or subsurface sites could be overlooked during the assessment. If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils, burials or other categories of heritage resources are found during the proposed development, work must cease in the vicinity of the find and SAHRA must be alerted immediately to determine an appropriate way forward.



**7. REFERENCES**

Heritage Impact Assessments				
Nid	Report Type	Author/s	Date	Title
5106	AIA Phase 1	Johnny Van Schalkwyk	01/11/2003	Heritage Impact Assessment for the Waterval West 510 JQ Development, Krugersdorp District, Gauteng Province
5114	AIA Phase 1	Anton van Vollenhoven, Anton Pelser	01/09/2007	A Report on a Cultural Heritage Impact Assessment on Erf 85, Chamdor, Krugersdorp for the William Tell Particle Boards and Medium Density Manufacturing Plant
5118	AIA Phase 1	Johnny Van Schalkwyk	01/02/2008	Heritage Survey Report for the Development of Water Pipelines for the Droogeheuvel and Middelvlei Townships, Randfontein, Gauteng Province
6271	AIA Phase 1	Wouter Fourie, M Ramsden	01/08/2002	Blaauwbank Historic Gold Mine, Magaliesberg: Cultural Heritage Scoping
6340	AIA Phase 1	Wouter Fourie, Jaco van der Walt	08/12/2005	Portion of the Proposed Pipeline from Brandvlei to Krugersdorp on the Farm Brandvlei 261 IQ, District Mogale City, Gauteng Province
6402	AIA Phase 1	Wouter Fourie	03/09/2007	Archaeological Impact Assessment: Proposed Township - Chancliff Ridge Extension 34, Mogale City
7795	AIA Phase 1	Johnny Van Schalkwyk, Frank Teichert	04/06/2007	Heritage Impact Assessment for the Planned Rietvallei 180 IQ Development, Krugersdorp Municipal District, Gauteng Province
8056	AIA Phase 1	Polke Birkholtz	23/06/2008	Heritage Scoping: Proposed Second Dwelling, Thorny Valley Estate 240 (Portion 240 a Portion of 264) of the Farm Honingklip 178 IQ, Mogale City, Gauteng Province
8251	AIA Phase 1	Johnny Van Schalkwyk	01/11/2007	Heritage Survey Report for the Proposed West Village Outfall Sewer, Mogale City Local Municipality, Gauteng
110292	AIA Phase 1		13/02/2013	Ntshona Heritage Reports
195364	HIA Phase 1	Wouter Fourie	26/01/2015	THE RAND EN DAL EXT13 PROPOSED DEVELOPMENT ON PORTION 29 OF THE FARM PAARDEPLAATS 177 IQ, KRUGERSDORP, MOGALE CITY DISTRICT, GAUTENG PROVINCE
195364	HIA Phase 1	Wouter Fourie	26/01/2015	THE RAND EN DAL EXT13 PROPOSED DEVELOPMENT ON PORTION 29 OF THE FARM PAARDEPLAATS 177 IQ, KRUGERSDORP, MOGALE CITY DISTRICT, GAUTENG PROVINCE
269462	Heritage Impact Assessment Specialist Reports	Dominic Stratford	20/11/2014	Basic Heritage Impact Assessment for the proposed upgrades to the Maropeng Interpretive Centre
364744	AIA Phase 1	Jaco van der	17/05/2016	ARCHAEOLOGICAL IMPACT ASSESSMENT FOR THE PROPOSED PROTEA





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		Walt		RIDGE DEVELOPMENT, GAUTENG PROVINCE
375227	AIA Phase 1	Jaco van der Walt	04/10/2016	ARCHAEOLOGICAL IMPACT ASSESSMENT For the Proteadal Mixed Use Township, Proteadal Extension 1, Portion 216 (a Portion of Portion 214) , Paardeplaats 177 IQ, Gauteng Province
375715	HIA Phase 2	Jaco van der Walt, Sidney Miller	04/10/2016	2nd Phase documentation report of the Farmyard On Portion 216 Of Paardekraal 177 IQ, Proteadal Extension 1. Mogale City/Krugersdorp, Gauteng Province.



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## APPENDIX 2: Palaeontological Assessment (2022)

# **Palaeontological Impact Assessment for the proposed Quantum 1 Solar Energy Facility (SEF) near Krugersdorp, Gauteng Province**

**CTS23\_071\_Savannah\_Quantum 1 SEF**

**Site Visit Report (Phase 2)**

**For**

**CTS Heritage**

**25 June 2023**

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## **Expertise of Specialist**

The Palaeontologist Consultant: Prof Marion Bamford  
Qualifications: PhD (Wits Univ, 1990); FRSSAf, ASSAf, PSSA  
Experience: 34 years research; 26 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, Simons 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

A handwritten signature in blue ink, appearing to read 'M Bamford', with a horizontal line underneath.

Signature:

## Executive Summary

A Palaeontological Impact Assessment was requested for the proposed development of the Quantum 1 Solar Energy Facility (SEF) near Krugersdorp, Gauteng Province.

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 site lies on the potentially fossiliferous Malmani Subgroup (Transvaal Supergroup) that could preserve trace fossils such as stromatolites or microbialites in the dolomites. The site visit and walk through on 20<sup>th</sup> June 2023 confirmed that there were NO FOSSILS in the area for the proposed Solar collectors. The area is covered by soils and no dolomites were present. Nonetheless, a Fossil Chance Find Protocol should be added to the EMP. Based on this information it is recommended that no further palaeontological impact assessment is required unless fossils are found by the contractor, developer, environmental officer or other designated responsible person once excavations for pole foundations or solar collectors and infrastructure have commenced. Since the impact will be low, as far as the palaeontology is concerned, the project should be authorised.

ASPECT	SCREENING TOOL SENSITIVITY	VERIFIED SENSITIVITY	OUTCOME STATEMENT/PLAN OF STUDY	RELEVANT SECTION MOTIVATING VERIFICATION
Palaeontology	High	Low	Paleontological Impact Assessment	Section 7.2. SAHRA Requirements

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# 1. Background

South Africa Mainstream Renewable Power Developments (Pty) Ltd is proposing the construction and operation of a solar photovoltaic (PV) facility and associated infrastructure on Portion 285 (a portion of portion 19) of the Farm Vlakplaats 160, located approximately 7.2km west of Krugersdorp, within the Mogale City Local Municipality in the West Rand District Municipality in the Gauteng Province. The facility will have a contracted capacity of up to 10MW and will be known as Quantum 1 Solar Energy Facility.

A preferred development area with an extent of ~94.1479ha has been identified by South Africa Mainstream Renewable Power Developments (Pty) Ltd as technically suitable for the development of the Quantum 1 Solar Energy Facility. The facility will comprise the following infrastructure:

- Solar PV array comprising solar modules.
- Mounting System Technology
- Inverters and transformers.
- Low voltage cabling between the PV modules to the inverters.
- Overhead power lines
- Onsite substation, switching substation and laydown areas.
- Battery Energy Storage System (BESS) and associated infrastructure.
- Internal access roads.
- Fence around the project development areas.

A summary of the details and dimensions of the planned infrastructure associated with the project is provided in Table 1.

**Table 1: Details of typical infrastructure required for the 10MW Quantum 1 SEF.**

Component	Description / Dimensions
District Municipality	West Rand District Municipality
Local Municipality	Mogale City Local Municipality
Ward Number (s)	Ward 30
Nearest town(s)	Krugersdorp (7.2km east)
Farm name(s) and number(s) of properties affected by the PV Facility, incl SG 21 Digit Code (s)	Portion 265 (a portion of portion 19) of the Farm Vlakplaats 160 (T0IQ0000000016000265)
Current zoning	Agriculture
Site Coordinates (centre of development area)	26° 4'8.17"S, 27°38'55.89"E
Total extent of the Affected Properties, also referred to as the project site <sup>1</sup>	~94.1479ha

<sup>1</sup> The project site is that identified area within which the development area and development footprint are located. The project site is ~93ha in extent and only consist of one affected property.



Total extent of the Development area <sup>2</sup>	~94.1479ha
Total extent of the Development footprint <sup>3</sup>	To be confirmed following specialist input during the scoping phase
Contracted capacity of the PV facility	10MW
PV panels	Height: up to 5m from ground level (installed)
Power line capacity	11kV
Power line servitude width	Up to 18m
Grid connection	To be evacuated from the onsite substation via 11kV Monopole or lattice structure pylons to the Eskom Tarlton 132/44/11kV substation located on the same land parcel as the proposed PV facility. This will form part of a separate EA process.
On-site Facility Substation, and O&M buildings	Located within the development area. Approximately 1.5ha in extent.
Battery Energy Storage System (BESS)	The BESS area will form part of the 1.5ha allocated for other infrastructure.
Access roads and internal roads	Existing roads will be used as far as possible. There are existing gravel roads that can be utilized for site access (width of up to 6m). Upgrading of existing roads or new roads may be required.

The Quantum 1 SEF is proposed in response to the identified objectives of the national and provincial government and local and district municipalities to develop renewable energy facilities for power generation purposes. It is the developer's intention to submit a bid in terms of a regulated power purchase procurement process (e.g., REIPPPP) with the aim of evacuating the generated power into the national grid or obtaining a commercial PPA (Power Purchase Agreement). This will aid in the diversification and stabilisation of the country's electricity supply, in line with the objectives of the Integrated Resource Plan (IRP) with the Quantum 1 SEF set to inject up to 10MW (peak AC power) into the national grid.

From a regional perspective, the area within the West Rand District Municipality identified for the project is considered favourable for the development of a commercial PV facility due to the low environmental sensitivity of the identified site, excellent solar resource, and availability of land on which the development can take place. There is also potential for evacuating the power to the national grid via a direct grid connection at the Eskom Tarlton 132/44/11kV substation which is adjacent to the proposed site. The site is also in proximity to large electricity users which opens opportunities for commercial PPAs (Behind the meter connection Or Wheeling to a 3<sup>rd</sup> party off-taker).

For the purposes of the BA process, the following terms will be used:

**Project:** Project includes the PV facility and all of the associated infrastructures.

<sup>2</sup> The development area is that identified area where the 10MW PV facility is planned to be located. This area has been selected as a practicable option for the facility, considering technical preference and constraints. The development area is ~94.1479ha in extent.

<sup>3</sup> The development footprint is the defined area (located within the development area) where the PV panel array and other associated infrastructure for the Quantum 1 Solar Energy Facility is planned to be constructed. This is the actual footprint of the facility, and the area which would be disturbed.

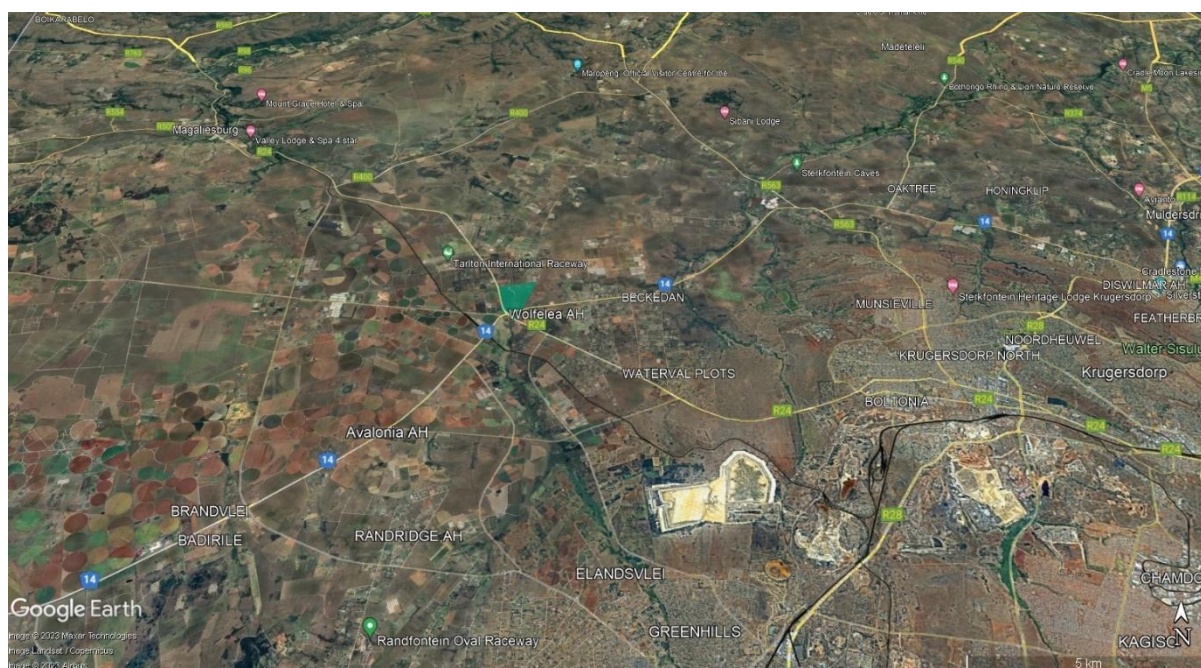
**Project Site/Area:** The Project Site/Area is the area with an extent of approx. 94.1479ha, within which the Quantum 1 Solar PV Facility development footprint will be located.

A Palaeontological Impact Assessment was requested for the Quantum 1 Solar Energy Facility. 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 and is reported herein.

**Table 2: National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and Environmental Impact Assessment (EIA) Regulations, 2014 (as amended) - Requirements for Specialist Reports (Appendix 6).**

	<b>A specialist report prepared in terms of the Environmental Impact Regulations of 2017 must contain:</b>	<b>Relevant section in report</b>
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
c	An indication of the scope of, and the purpose for which, the report was prepared	Section 1
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
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 2
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 5

	<b>A specialist report prepared in terms of the Environmental Impact Regulations of 2017 must contain:</b>	<b>Relevant section in report</b>
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 4
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 of any comments that were received during any consultation process	N/A
q	Any other information requested by the competent authority.	N/A
2	Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	N/A



**Figure 1: Google Earth map of the proposed development showing the relevant landmarks.**



**Figure 2: Google Earth map for the proposed Quantum 1 SEF on Farm Vlakplaats 160.**

## 2. Methods and Terms of Reference

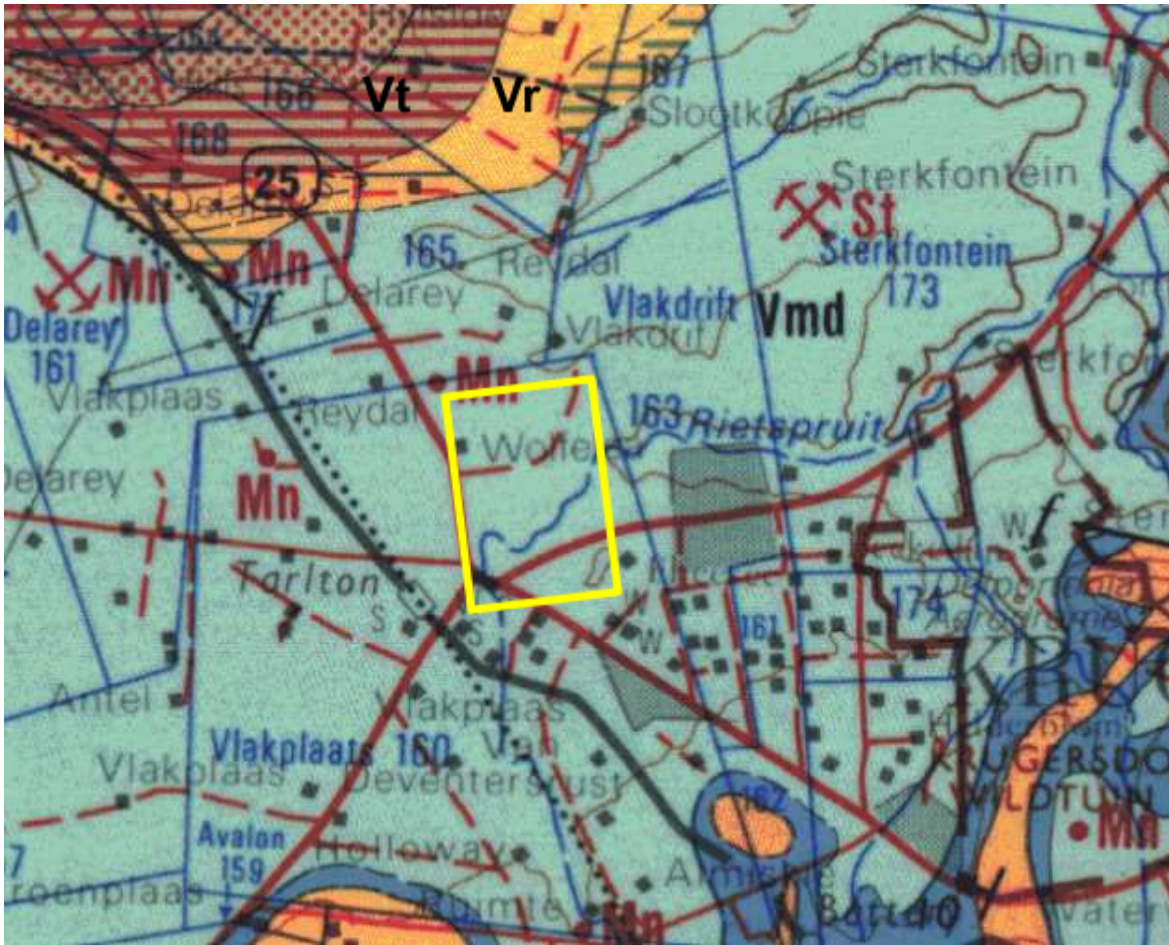
The Terms of Reference (ToR) for this study were to undertake a PIA and provide feasible management measures to comply with the requirements of SAHRA.

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*).

## 3. Geology and Palaeontology

### i. Project location and geological context



**Figure 3: Geological map of the area around the Farm Vlakplaats 160 with the Quantum SEF site within the yellow polygon. Abbreviations of the rock types are explained in Table 2. Map enlarged from the Geological Survey 1: 250 000 map 2626 West Rand.**

Table 2: Explanation of symbols for the geological map and approximate ages (Johnson et al., 2006; Eriksson et al., 2006; Zeh et al., 2020). SG = Supergroup; Fm = Formation; Ma = million years; grey shading = formations impacted by the project.

Symbol	Group/Formation	Lithology	Approximate Age
Qs	Quaternary	Alluvium, sand, calcrete	Neogene, ca 2.5 Ma to present
Vdi	diabase	Diabase	Post-Transvaal SG
Vr	Rooihogte Fm, Pretoria Group, Transvaal SG	Andesite, agglomerate, tuff	Palaeoproterozoic
Vt	Timeball Hill Fm, Pretoria Group, Transvaal SG	Quartzite	Palaeoproterozoic < 2420 Ma
Vmd	Malmani Subgroup, Chuniespoort Group, Transvaal SG	Dolomite, chert	Palaeoproterozoic Ca 2650 – 2640 Ma
Vbr	Black Reef Fm, Transvaal SG	Quartzite, conglomerate, shale, basalt	Palaeoproterozoic Ca 2750 – 2650 Ma

Symbol	Group/Formation	Lithology	Approximate Age
Rh	Hospital Subgroup, West Rand Group, Witwatersrand SG	Quartzite, shale, greywacke, conglomerate	Mesoarchaeon Ca 2890 Ma
Rg	Government Subgroup, West Rand Group, Witwatersrand SG	Quartzite, shale, greywacke, conglomerate	Mesoarchaeon Ca 2890 Ma

The project lies in the south western part of the Transvaal Basin where the lower rocks of the Transvaal Supergroup are exposed, in particular the dolomites of the Malmani Subgroup (Chuniespoort Group, Transvaal Supergroup; ca 2585-2480 Ma), Figure 3. These rocks unconformably overlies the ancient rocks of the Witwatersrand Supergroup.

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

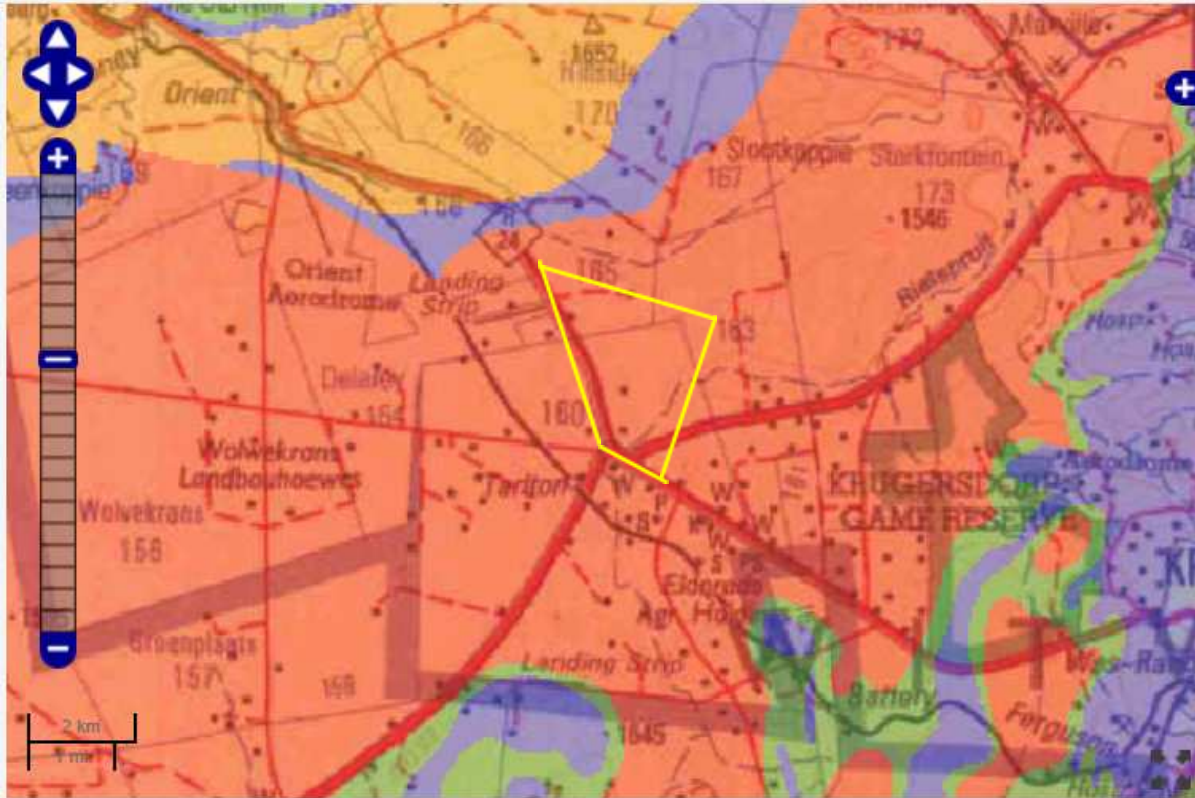
In the Transvaal Basin the Transvaal Supergroup is divided into two Groups, the lower Chuniespoort Group and the upper Pretoria Group (with ten formations; Eriksson et al., 2006). The Chuniespoort Group is divided into the basal **Malmani Subgroup** that comprises dolomites and limestones and is divided into five formations based on chert content, stromatolitic morphology, intercalated shales and erosion surfaces. The top of the Chuniespoort Group has the Penge Formation and the Deutschland Formation.

Making up the lower Pretoria Group are the Timeball Hill Formation and the Boshhoek Formation. The Hekpoort, Dwaalheuwel, Strubenkop and Daspoort Formations form a sequence as the middle part of the Pretoria Group, Transvaal Supergroup, and represent rocks that are over 2060 million years old. The Hekpoort Formation is a massive lava deposit and is overlain by the rest of the Transvaal Supergroup.

The Transvaal sequence has been interpreted as three major cycles of basin infill and tectonic activity with the first deep basin sediments forming the Chuniespoort Group, the second cycle deposited the lower Pretoria Group, and the sediments in this area are from the interim lowstand that preceded the third cycle. These sediments were deposited in shallow lacustrine, alluvial fan and braided stream environments (Eriksson et al., 2012).

## ii. Palaeontological context

The palaeontological sensitivity of the area under consideration is presented in Figure 4. The site for development is in the very highly sensitive Malmani Subgroup (Transvaal Supergroup).



**Figure 4: SAHRIS palaeosensitivity map for the site for the proposed Quantum 1 SEF (yellow polygon). Background colours indicate the following degrees of sensitivity: red = very highly sensitive; orange/yellow = high; green = moderate; blue = low; grey = insignificant/zero.**

The Transvaal Supergroup 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 photosynthesis, the so-called Great Oxygen Event (ca 2.40 – 2.32 Ga) and precursor to an environment where diverse life forms could evolve. The Neoproterozoic 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).

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 and deposited layer upon layer of minerals, often in domes or columns. The minerals are predominantly calcium carbonate, calcium sulphate, magnesium carbonate and magnesium sulphate. Only very rarely are the bacteria and algae preserved but the stromatolites are traces of their activity, hence call trace fossils. These fossils are protected by legislation, therefore the Malmani Subgroup palaeosensitivity is very high (Figure SAHRIS).

### iii. Site visit observations



**Figure 5: Quantum Solar 1 site visit route map (red line). Site photographs are given in figures .... And the captions provide the observations.**

In summary, the area is generally flat and open with low secondary grassland, and in some places, burned, grassland. Visibility was very good. Exotic trees are scattered around. It is very disturbed from previous urban or agricultural activities and the soils appear to be fairly deep.

There were no rocky outcrops of any kind. There were no outcrops of dolomites and hence no trace fossils such as stromatolites or microbialites (Figures 6-8).





**Figure 6: Quantum site visit photographs. Northern section with housing along the margin (A) and a powerline (B). Open field with burned grass showing the lack of any rocky outcrops.**



**Figure 7: Central part of the Quantum SEF area. Open flat areas with no rocks, no dolomites and no fossils.**



**Figure 8: Quantum site visit photographs. A - gum trees in the distance and evidence of demolished structures. B - Power lines and substation. No rocks, no dolomites and no fossils.**

## 4. Impact assessment

An assessment of the potential impacts to possible palaeontological resources considers the criteria encapsulated in Table 4:

**Table 4a: Criteria for assessing impacts**

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

**Table 4b: Impact Assessment**

<b>PART B: Assessment</b>		
<b>SEVERITY/NATURE</b>	<b>H</b>	-
	<b>M</b>	-
	<b>L</b>	Soils do not preserve plant fossils; so far there are no records from the Malmani Subgroup of trace fossils of stromatolites in this region so it is very unlikely that fossils occur on the site. The impact would be very unlikely.
	<b>L+</b>	-

<b>PART B: Assessment</b>		
	<b>M+</b>	-
	<b>H+</b>	-
<b>DURATION</b>	<b>L</b>	-
	<b>M</b>	-
	<b>H</b>	Where manifest, the impact will be permanent.
<b>SPATIAL SCALE</b>	<b>L</b>	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.
	<b>M</b>	-
	<b>H</b>	-
<b>PROBABILITY</b>	<b>H</b>	-
	<b>M</b>	-
	<b>L</b>	It is extremely unlikely that any fossils would be found in the loose sand that will be excavated but there might be stromatolites in the dolomites. Therefore, 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 development 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. Since there is an extremely small chance that trace fossils from the Malmani Subgroup 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.

## 5. 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 some do contain trace fossils, fossil plant, insect, invertebrate and vertebrate material. The site visit and walk through on 20<sup>th</sup> June 2023 by palaeontologists Rick Tolchard and Brandon Stuart confirmed that there are NO FOSSILS in the proposed area for the solar collectors. The overlying sands and soils of the Quaternary period would not preserve fossils.

## 6. Recommendation

Based on the fossil record but confirmed by the site visit and walk through there are NO FOSSILS of the project footprint. Although stromatolites have been recorded from some exposures of the Malmani Subgroup, enabling the recognition of the Formations within this group, stromatolites, oolitic and algal dolomite are absent from this region. 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 trace fossils may occur below the ground surface in the dolomites of the Malmani Subgroup 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.

Since there is an extremely small chance of fossils being impacted by this project, as far as the palaeontology is concerned, the project should be authorised.

## 7. References

Beukes, N.J., 1987. Facies relations, depositional environments and diagenesis in a major early Proterozoic stromatolitic carbonate platform to basinal sequence, Campbellrand Subgroup, Transvaal Supergroup, southern Africa. *Sedimentary Geology* 54, 1-46.

Eriksson, P.G., Altermann, W., Hartzler, 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.

Plumstead, E.P., 1969. Three thousand million years of plant life in Africa. *Geological Society of southern Africa, Annexure to Volume LXXII*. 72pp + 25 plates.

Zeh, A., Wilson, A.H., Gerdes, A., 2020. Zircon U-Pb-Hf isotope systematics of Transvaal Supergroup – Constraints for the geodynamic evolution of the Kaapvaal Craton and its hinterland between 2.65 and 2.06 Ga. *Precambrian Research* 345, 105760.

<https://doi.org/10.1016/j.precamres.2020.105760>

## 8. Chance Find Protocol

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

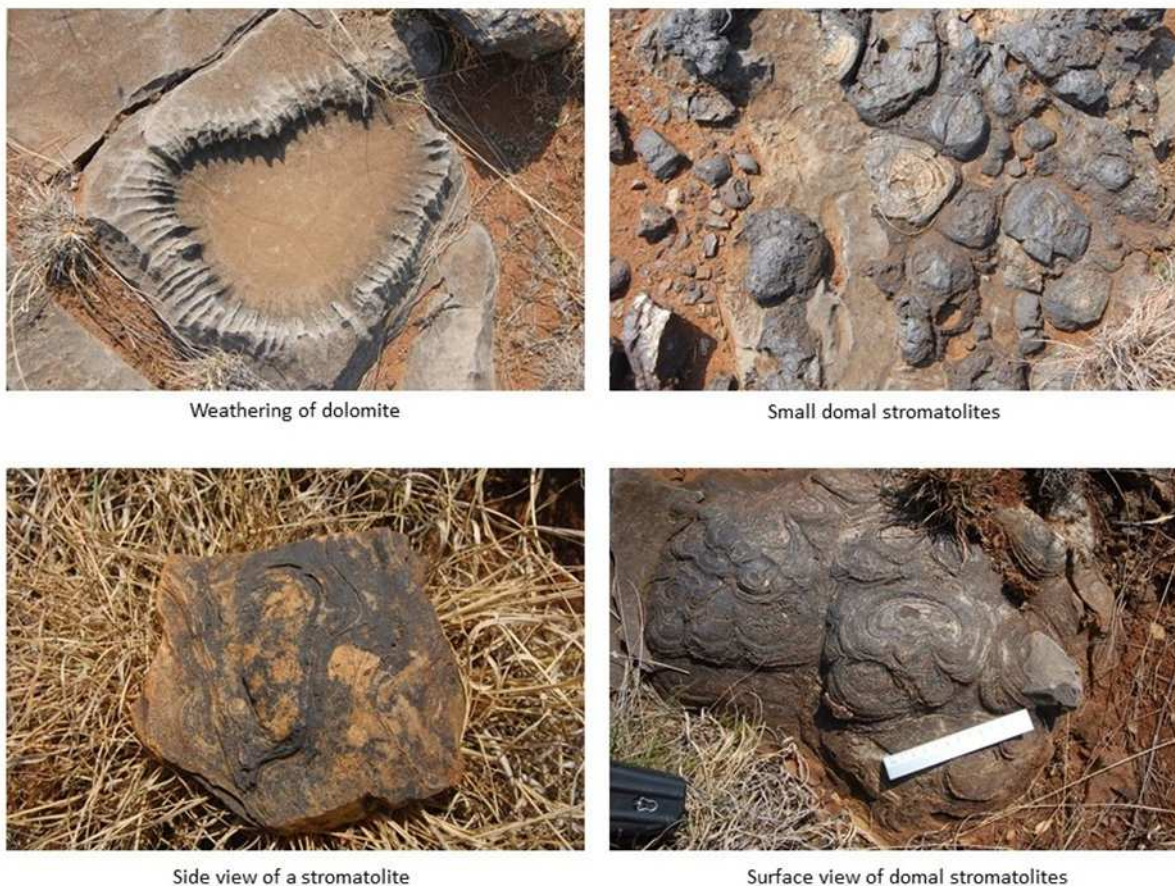
1. The following procedure is only required if fossils are seen on the surface and when drilling/excavations commence.
2. When excavations begin the rocks and discard must be given a cursory inspection by the environmental officer or designated person. Any fossiliferous material (trace fossils, fossils 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 9). 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.



## Appendix A – Examples of fossils from the Malmani Subgroup



**Figure 9: Photographs of dolomite and stromatolites as seen in the field.**

## 9. Appendix B – Details of specialists

**Marion Bamford (PhD)**

**Short CV for PIAs – June 2023**

### 1) **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

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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	14	1
PhD	11	6
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
- Lielifontein 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 July 2022 peer-reviewed journals or scholarly books: over 170 articles published; 5 submitted/in press; 10 book chapters.

Scopus h-index = 31; Google Scholar h-index = 39; i10-index = 116

Conferences: numerous presentations at local and international conferences.

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**Mr Frederick Tolchard**

## Brief Curriculum Vitae – June 2023

### 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 – SARA0 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  
2022 March – Taaibosch Puts PVs – CTS Heritage  
2022 March – Modder East Operations – Prime Resources  
2022 March – Driefontein mine revised infrastructure – Amber Earth  
2022 March – Transnet MPP Access routes, inland and coastal - ENVASS  
2022 June – Roodepoort MRA, Rietspruit – Eco-Elementum  
2022 July – Highveld Colliery for Eco-Elementum  
2022 July – Doornrug and Kleinwater Collieries for Eco-Elementum  
2022 November – Kendal Plots, Ogies, for Amber Earth  
2022 November – Boschmanspoort, Hendrina for Eco-Elementum  
2022 December – Newcastle Coal for Cabanga Environmental  
2023 January – Virginia SEFs x 4 for AGES Limpopo (Pty) Ltd  
2023 June – Blyvoor Gold Solar for Digby Wells

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## **Brandon Stuart CV**

### **June 2023**

After completing my BSc degree majoring in Zoology and Genetics in 2019, in 2020 I enrolled and completed a BSc Honours degree majoring in Zoology and specializing in Paleontology. My Honours research project was focused on describing the postcranial anatomy of the therocephalian *Moschorhinus kitchingi*, supervised by Dr. Jennifer Botha at the National Museum, Bloemfontein.

I have completed my Masters degree at the University of the Free State in Palaeobiology (graduated April 2023). I carried out my research through the National Museum, Bloemfontein supervised by Dr. Jennifer Botha. My research is focused on studying the postcranial morphology of therocephalian therapsids from the Karoo Basin of South Africa. In March 2023, I registered for a doctoral degree at the University of the Witwatersrand, in the Evolutionary Studies Institute and will be supervised by Prof Botha and Prof Jonah Choiniere.

### **Qualifications**

BSc – Majors: Genetics and Geology - University of the Free State – 2019

BSc Honours – Palaeontology – University of the Free State – 2020

MSc – Palaeontology – University of the Free State – graduated April 2023.

PhD – Palaeontology – University of the Witwatersrand – March 2023 onwards.

### **PIA Fieldwork Experience**

July 2021 – Sannaspos SEF, Free State, for CTS Heritage  
October 2021 – Beatrix Mine-Theunissen Eskom Powerline for 1World  
January 2022 – Fouriesburg residential development for Mang Geoenviron-mental  
February 2022 – Balkfontein-Doornhoek 11 kV powerline for 1World  
March 2022 – Transnet MPP Access routes, inland and coastal for ENVASS  
June 2022 – Koria-Boesmanshoek 22 kV powerline for 1World  
January 2023 – Virginia SEFs x 4 Phase 2 for AGES Limpopo (Pty) Ltd.  
February 2023 – Tournee SEFs for CTS Heritage  
February 2023 – Ujekamanzi SEFs for CTS Heritage  
March 2023 – Nala Concrete Batch Plant, Bethal, for CTS Heritage  
March 2023 – Roos Solar PV Facility, Belfast, for CTS Heritage  
April 2023 – Riverplaats SEF, Sasolburg, for CTS Heritage  
May 2023 – Ext 69 Witfontein residential for EP3 Environmental  
May 2023 – Dalpark and Struisbult Pumpstation upgrades for AquaStrat Solutions  
May 2023 – Kopermyn expansion for Eco-Elementum  
June 2023 – Blyvoor Gold Solar for Digby Wells

### **References:**

Dr Jennifer Botha, Head of Palaeontology, National Museum, Bloemfontein  
[jbotha@nasmus.ac.za](mailto:jbotha@nasmus.ac.za)

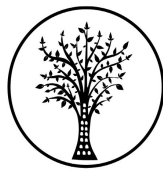
Prof Jonah Choiniere, Evolutionary Studies Institute, University of the Witwatersrand,  
Johannesburg  
[Jonah.choiniere@wits.ac.za](mailto:Jonah.choiniere@wits.ac.za)

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### APPENDIX 3: Chance Fossil Finds Procedure



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## **CHANCE FINDS OF PALAEOLOGICAL 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.

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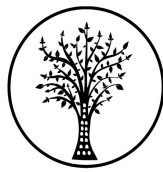
### **Actions to be taken**

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.



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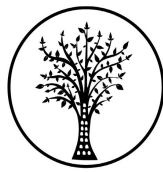
- Exposed finds must be stabilised where they are unstable and the site capped, e.g. with a plastic sheet or sand bags. This protection should allow for the later excavation of the finds with due scientific care and diligence. SAHRA can advise on the most appropriate method for stabilisation.
- If the 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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<b>FOSSIL DISCOVERIES: PRELIMINARY RECORDING FORM</b>		
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:	<i>Lat:</i>	<i>Long:</i>
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)	<i>Digital image of vertical section (side)</i>	
	<i>Fossil from different angles</i>	
	<i>Wider context of the find</i>	
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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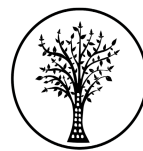
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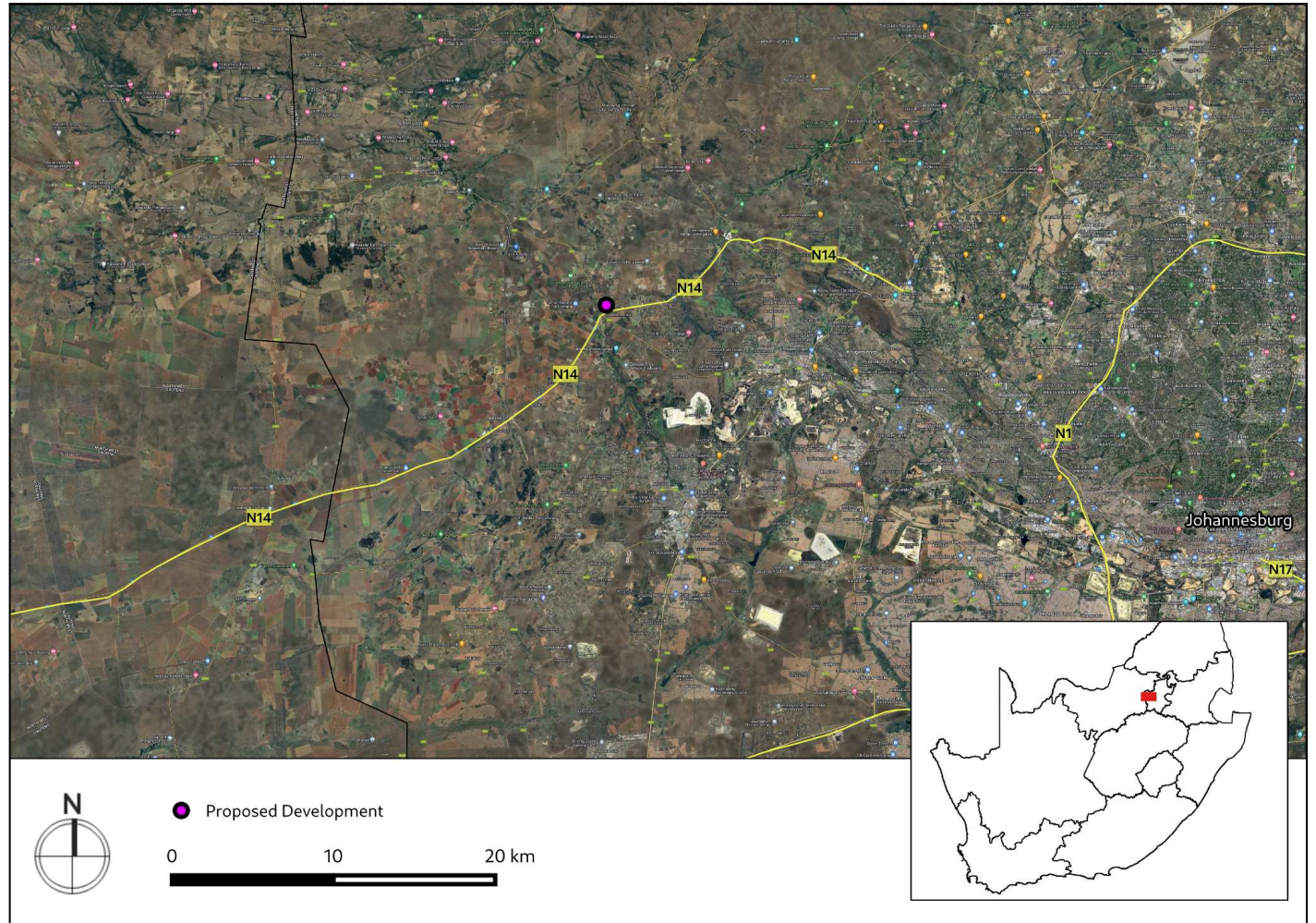
## APPENDIX 4: Heritage Screening Assessment



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# HERITAGE SCREENER

CTS Reference Number:	<b>CTS23_071</b>
SAHRIS Ref	
Client:	<b>Savannah</b>
Date:	<b>June 2023</b>
Title:	<b>Proposed development of the Quantum 1 Solar Energy Facility (SEF) near Krugersdorp, Gauteng Province</b>



**Figure 1a.** Satellite map indicating the location of Quantum Solar PV Energy Facility in the Gauteng Province

Recommendation:	<b>RECOMMENDATION</b> The area proposed for development is located in an area of high archaeological and palaeontological sensitivity. It is recommended that a full HIA be undertaken to assess the impacts likely to result from the proposed development of the PV facility and associated grid connections.
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## 1. Proposed Development Summary

South Africa Mainstream Renewable Power Developments (Pty) Ltd is proposing the construction and operation of a solar photovoltaic (PV) facility and associated infrastructure on Portion 285 (a portion of portion 19) of the Farm Vlakplaats 160, located approximately 7.2km west of Krugersdorp, within the Mogale City Local Municipality in the West Rand District Municipality in the Gauteng Province. The facility will have a contracted capacity of up to 10MW and will be known as Quantum 1 Solar Energy Facility.

A preferred development area with an extent of ~94.1479ha has been identified by South Africa Mainstream Renewable Power Developments (Pty) Ltd as technically suitable for the development of the Quantum 1 Solar Energy Facility. The facility will comprise the following infrastructure:

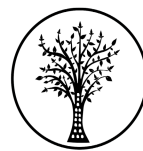
- » Solar PV array comprising solar modules.
- » Mounting System Technology
- » Inverters and transformers.
- » Low voltage cabling between the PV modules to the inverters.
- » Overhead power lines
- » Onsite substation, switching substation and laydown areas.
- » Battery Energy Storage System (BESS) and associated infrastructure.
- » Internal access roads.
- » Fence around the project development areas.

A summary of the details and dimensions of the planned infrastructure associated with the project is provided in Table 1.

**Table 1: Details of typical infrastructure required for the 10MW Quantum 1 SEF.**

Component	Description / Dimensions
District Municipality	West Rand District Municipality
Local Municipality	Mogale City Local Municipality
Ward Number (s)	Ward 30
Nearest town(s)	Krugersdorp (7.2km east)
Farm name(s) and number(s) of properties affected by the PV Facility, incl SG 21 Digit Code (s)	Portion 265 (a portion of portion 19) of the Farm Vlakplaats 160 (T01Q0000000016000265)
Current zoning	Agriculture
Site Coordinates (centre of development area)	26° 4'8.17"S, 27°38'55.89"E
Total extent of the Affected Properties, also referred to as the project site <sup>1</sup>	~94.1479ha

<sup>1</sup> The project site is that identified area within which the development area and development footprint are located. The project site is ~93ha in extent and only consist of one affected property.



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Total extent of the Development area <sup>2</sup>	~94.1479ha
Total extent of the Development footprint <sup>3</sup>	To be confirmed following specialist input during the scoping phase
Contracted capacity of the PV facility	10MW
PV panels	Height: up to 5m from ground level (installed)
Power line capacity	11kV
Power line servitude width	Up to 18m
Grid connection	» To be evacuated from the onsite substation via 11kV Monopole or lattice structure pylons to the Eskom Tarlton 132/44/11kV substation located on the same land parcel as the proposed PV facility. This will form part of a separate EA process.
On-site Facility Substation, and O&M buildings	» Located within the development area. » Approximately 1.5ha in extent.
Battery Energy Storage System (BESS)	» The BESS area will form part of the 1.5ha allocated for other infrastructure.
Access roads and internal roads	» Existing roads will be used as far as possible. There are existing gravel roads that can be utilized for site access (width of up to 6m). Upgrading of existing roads or new roads may be required.

The Quantum 1 SEF is proposed in response to the identified objectives of the national and provincial government and local and district municipalities to develop renewable energy facilities for power generation purposes. It is the developer's intention to submit a bid in terms of a regulated power purchase procurement process (e.g., REIPPPP) with the aim of evacuating the generated power into the national grid or obtaining a commercial PPA (Power Purchase Agreement). This will aid in the diversification and stabilisation of the country's electricity supply, in line with the objectives of the Integrated Resource Plan (IRP) with the Quantum 1 SEF set to inject up to 10MW (peak AC power) into the national grid.

From a regional perspective, the area within the West Rand District Municipality identified for the project is considered favourable for the development of a commercial PV facility due to the low environmental sensitivity of the identified site, excellent solar resource, and availability of land on which the development can take place. There is also potential for evacuating the power to the national grid via a direct grid connection at the Eskom Tarlton 132/44/11kV substation which is adjacent to the proposed site. The site is also in proximity to large electricity users which opens opportunities for commercial PPAs (Behind the meter connection Or Wheeling to a 3<sup>rd</sup> party off-taker).

## 2. Application References

<b>Name of relevant heritage authority(s)</b>	SAHRA
<b>Name of decision making authority(s)</b>	

<sup>2</sup> The development area is that identified area where the 10MW PV facility is planned to be located. This area has been selected as a practicable option for the facility, considering technical preference and constraints. The development area is ~94.1479ha in extent.

<sup>3</sup> The development footprint is the defined area (located within the development area) where the PV panel array and other associated infrastructure for the Quantum 1 Solar Energy Facility is planned to be constructed. This is the actual footprint of the facility, and the area which would be disturbed.



### 3. Property Information

<b>Latitude / Longitude</b>	26° 4'8.17"S, 27°38'55.89"E
<b>Erf number / Farm number</b>	Portion 285 (a portion of portion 19) of the Farm Vlakplaats 160
<b>Local Municipality</b>	Mogale City Local Municipality
<b>District Municipality</b>	West Rand District Municipality
<b>Province</b>	Gauteng
<b>Current Use</b>	Agriculture
<b>Current Zoning</b>	Agriculture

### 4. Nature of the Proposed Development

<b>Total Surface Area</b>	~94.1479ha
<b>Depth of excavation (m)</b>	TBA
<b>Height of development (m)</b>	TBA

### 5. Category of Development

x	<b>Triggers: Section 38(8) of the National Heritage Resources Act</b>
	<b>Triggers: Section 38(1) of the National Heritage Resources Act</b>
	1. Construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier over 300m in length.
	2. Construction of a bridge or similar structure exceeding 50m in length.
	3. Any development or activity that will change the character of a site-
x	a) exceeding 5 000m <sup>2</sup> in extent
	b) involving three or more existing erven or subdivisions thereof
	c) involving three or more erven or divisions thereof which have been consolidated within the past five years





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	4. Rezoning of a site exceeding 10 000m <sup>2</sup>
	5. Other (state):

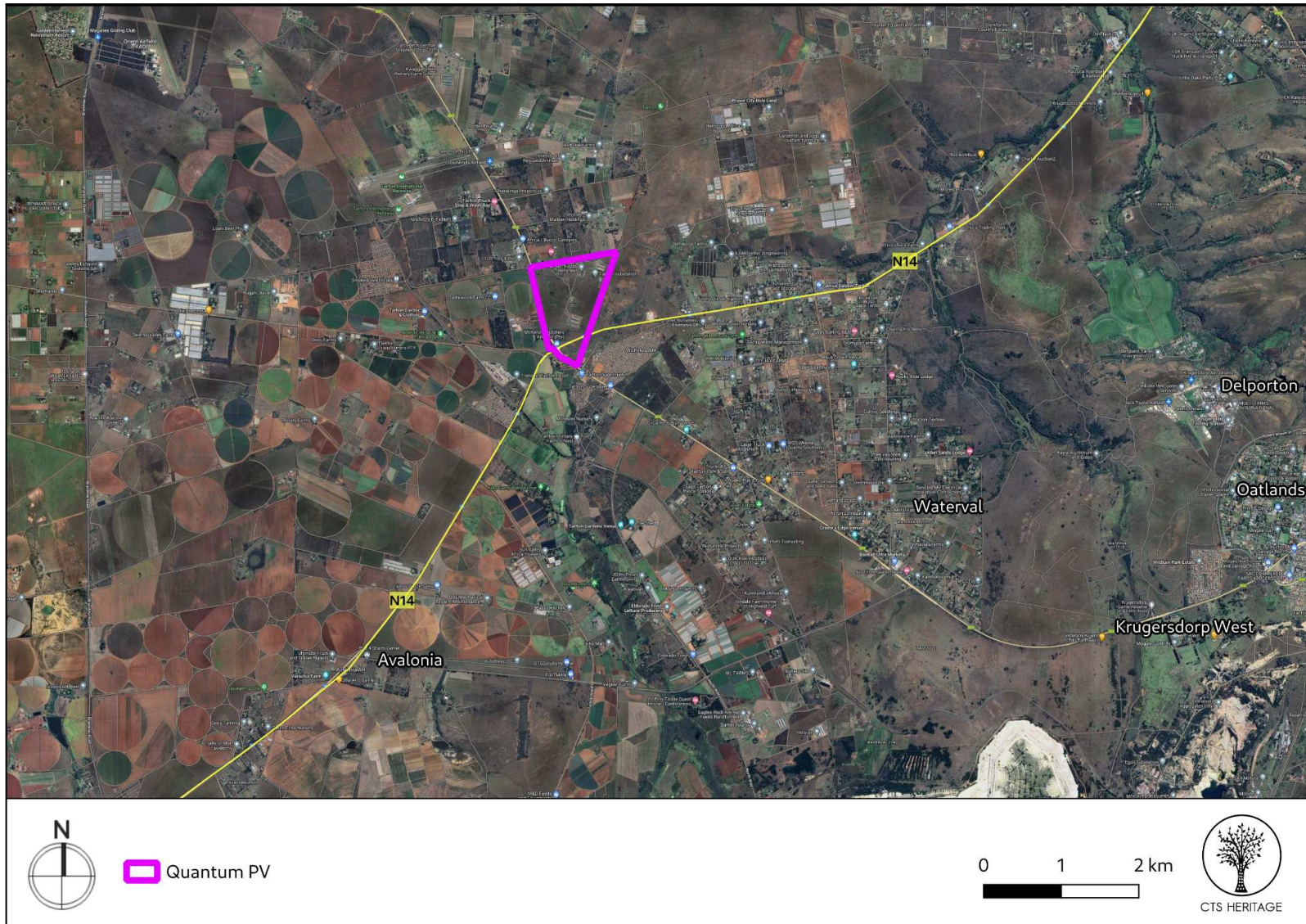
## 6. Additional Infrastructure Required for this Development

TBA
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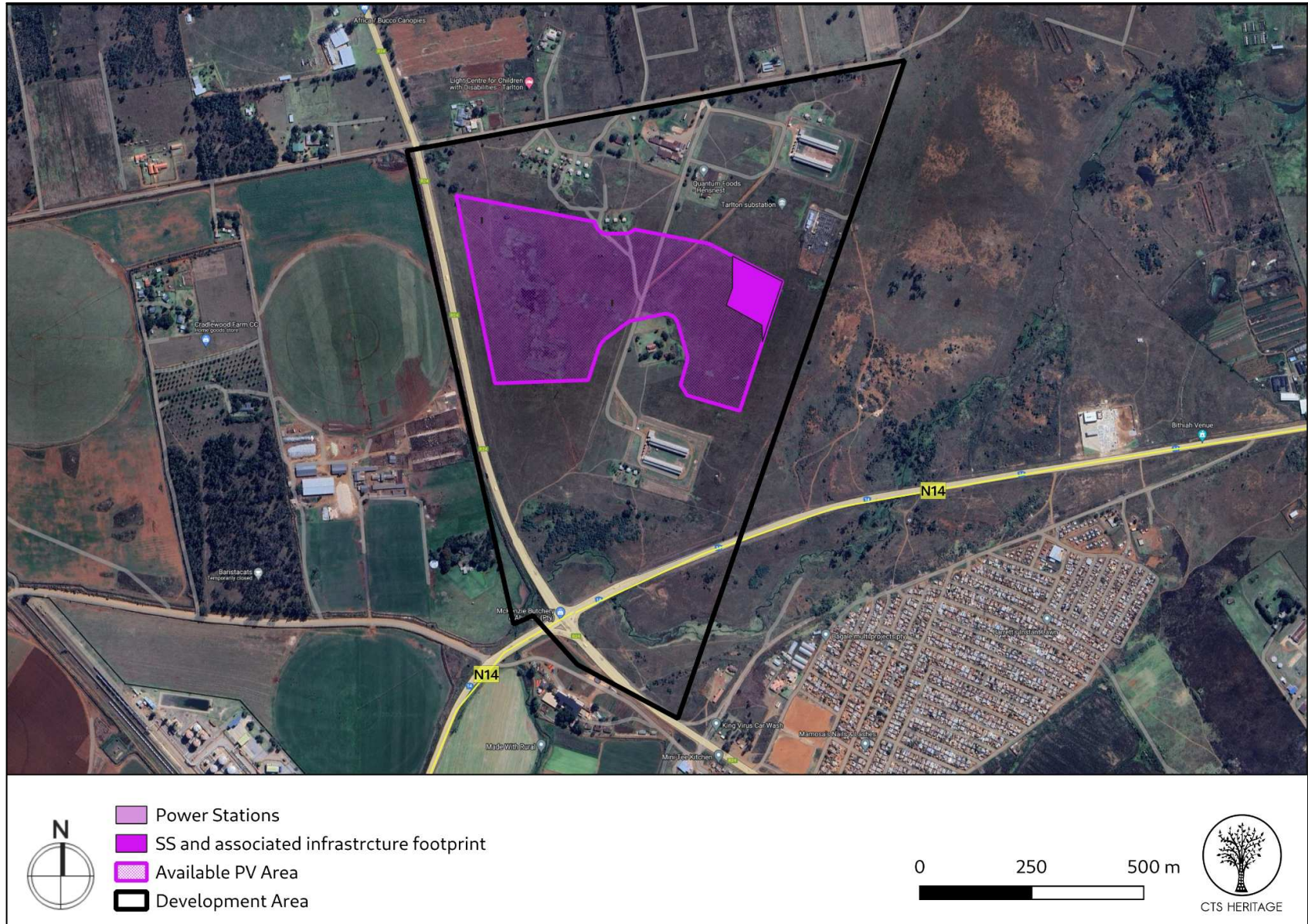
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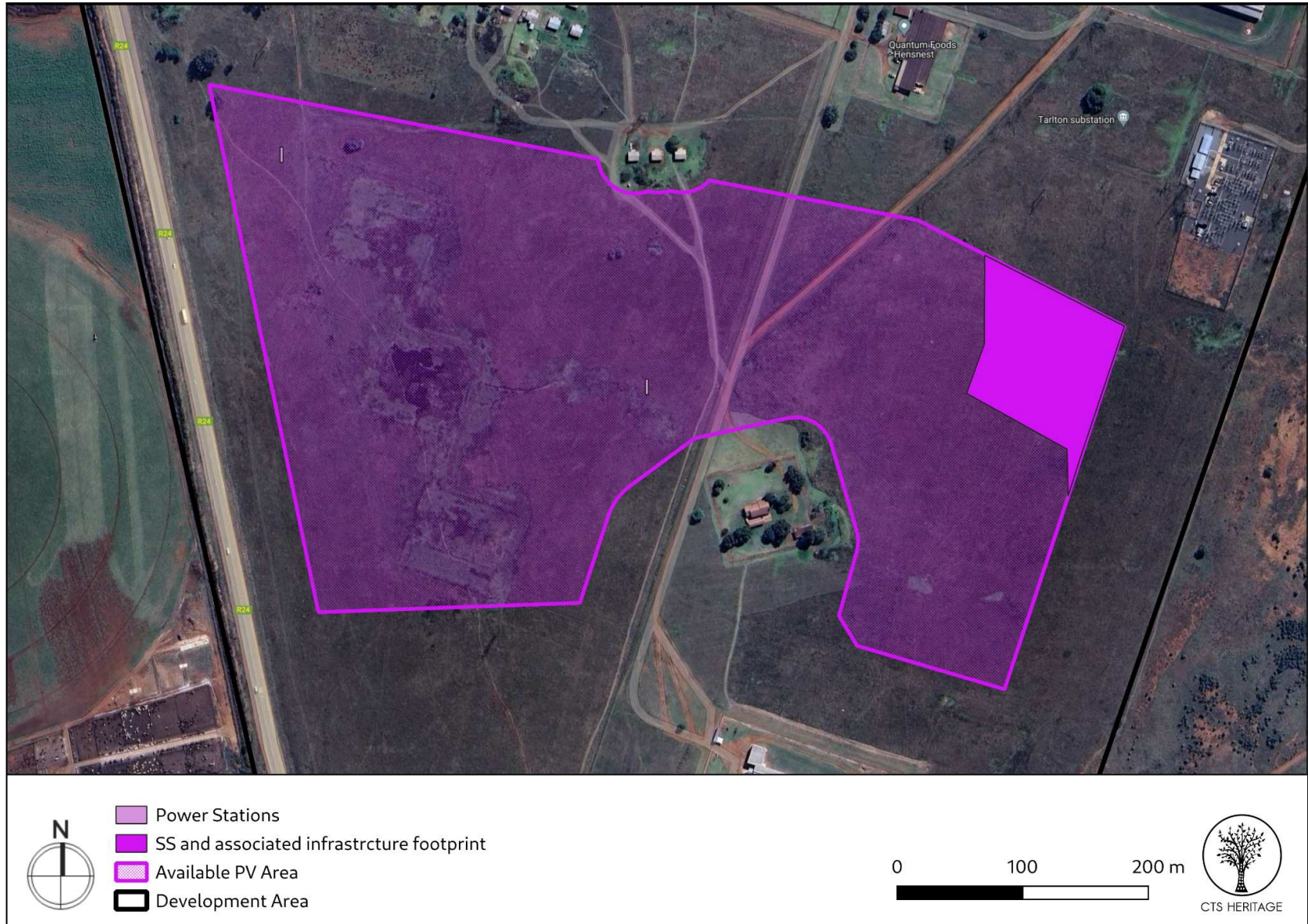
## 7. Mapping (please see Appendix 3 and 4 for a full description of our methodology and map legends)



**Figure 1b Overview Map.** Satellite image (2023) indicating the proposed development area.



**Figure 1c Overview Map.** Satellite image (2023) indicating the proposed development area, close up.



**Figure 1d Overview Map.** Satellite image (2023) indicating the proposed development area, close up.



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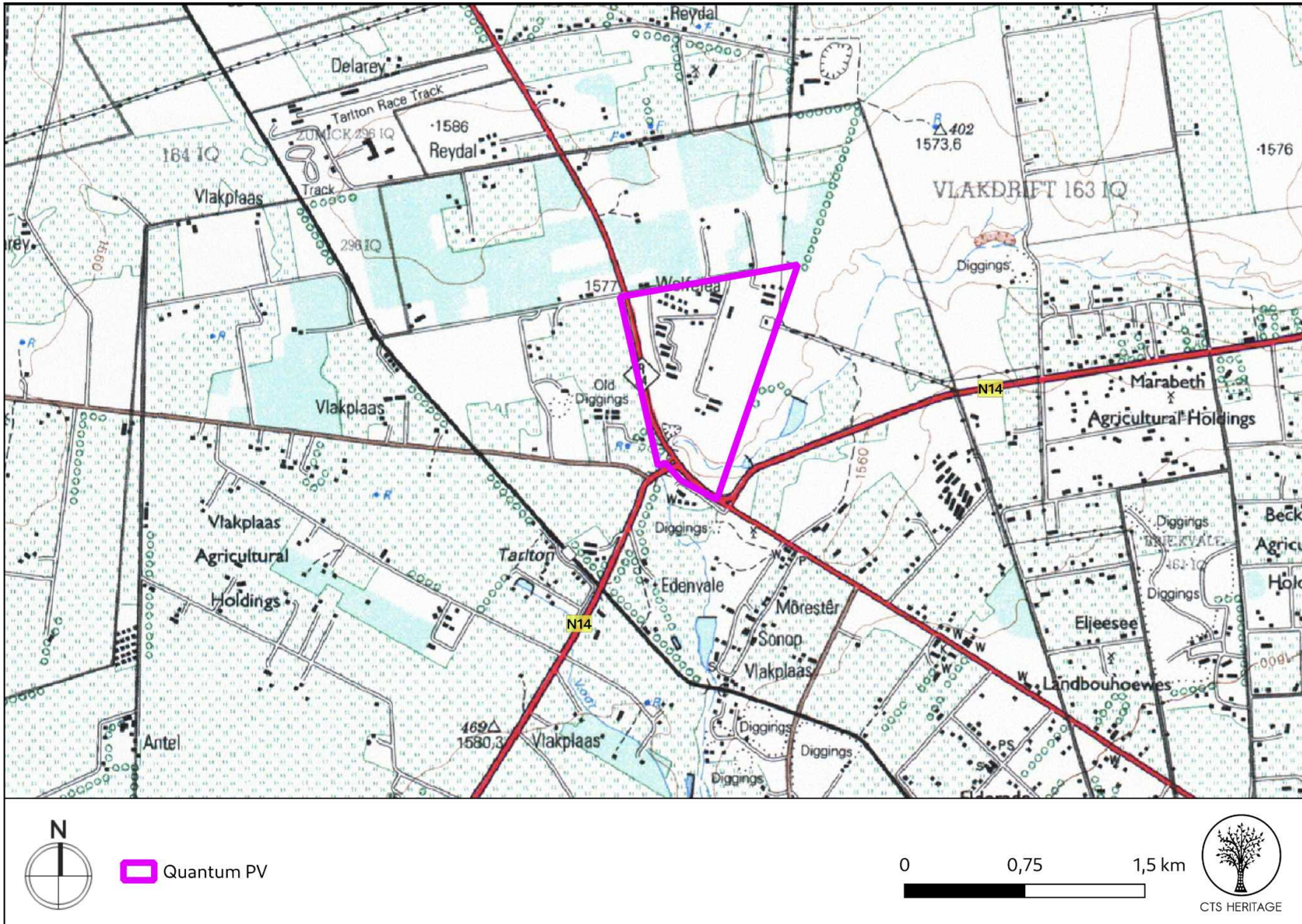
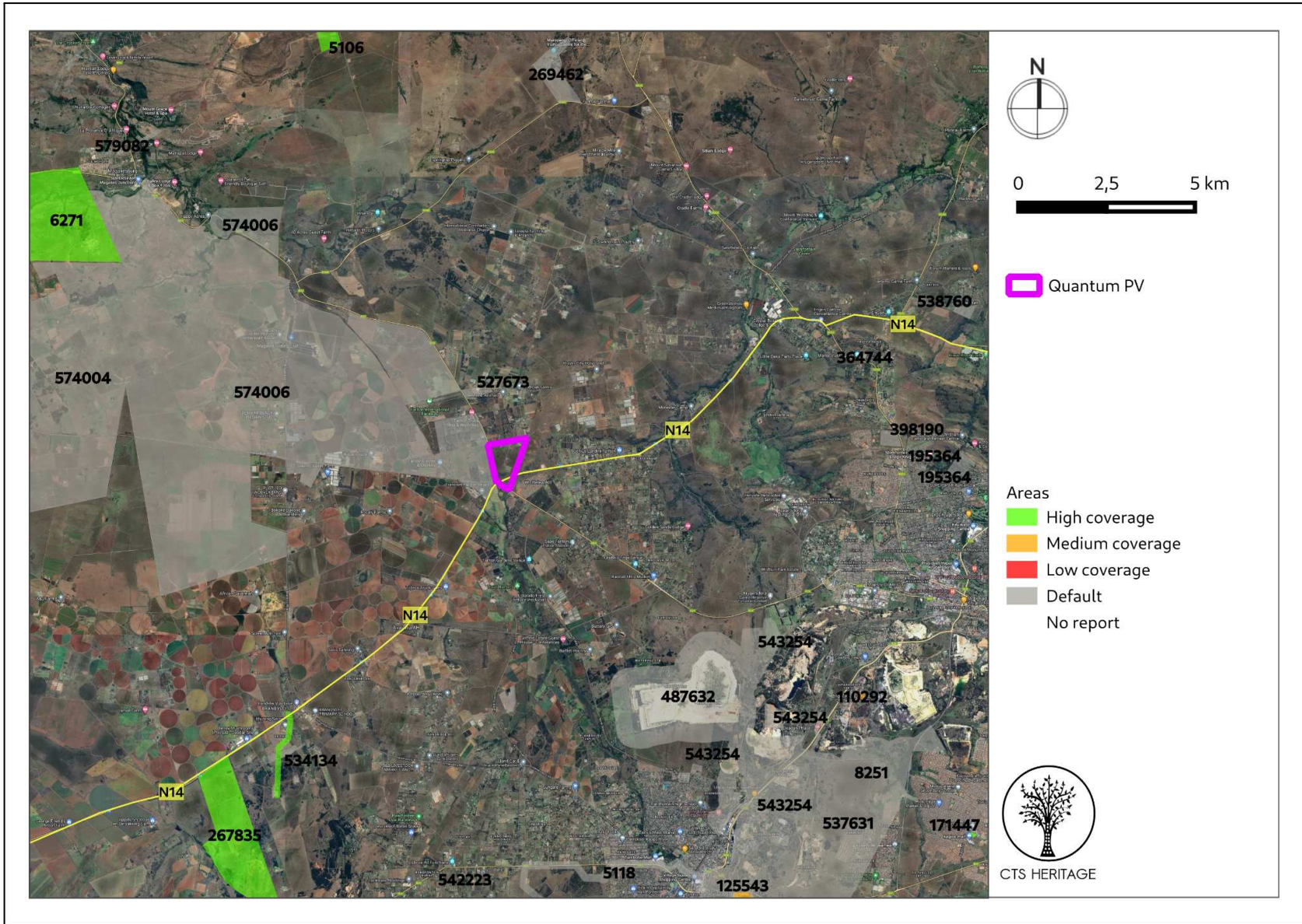


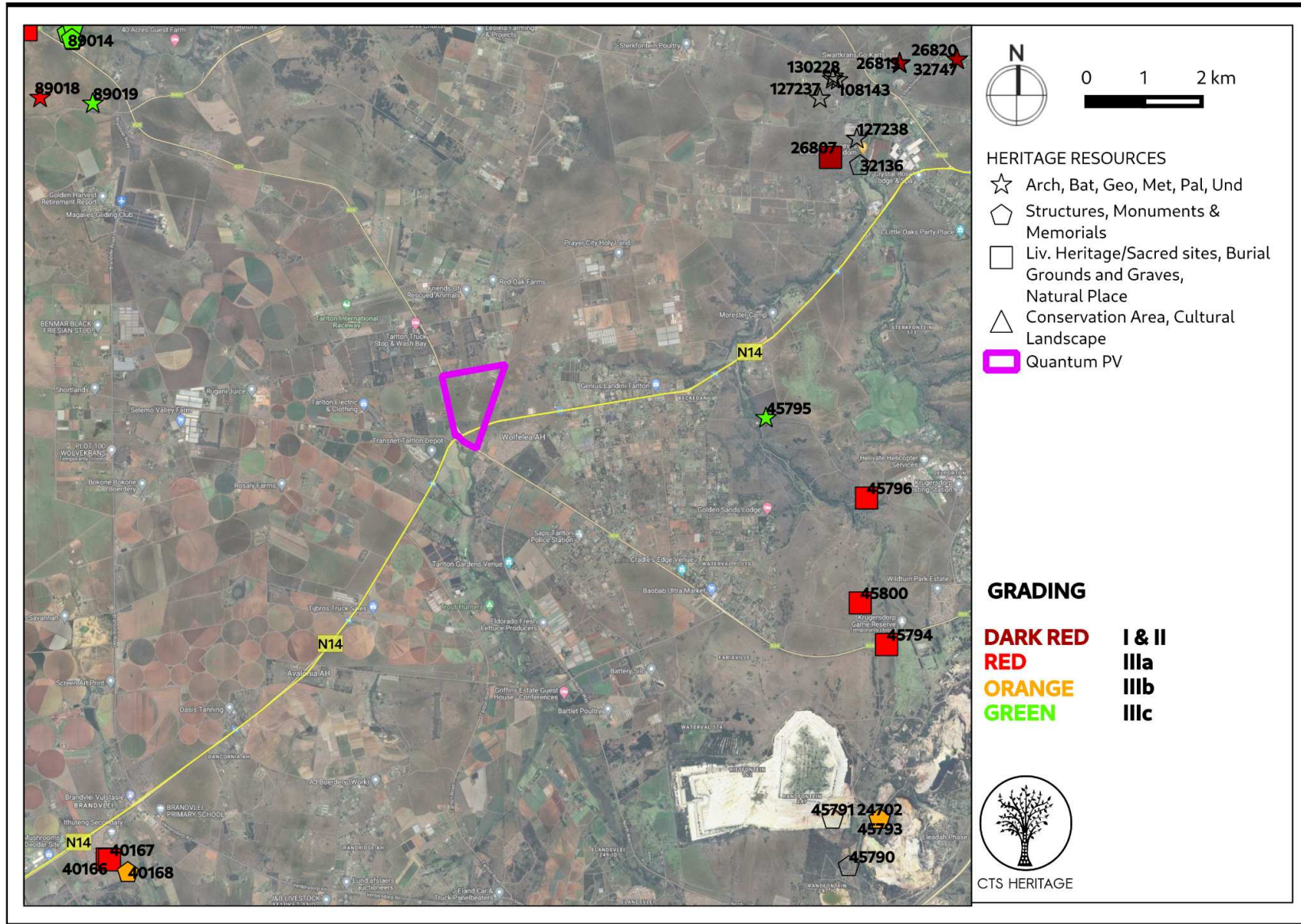
Figure 1d Overview Map. Extract from the 1:50 000 Topo map for the development area.

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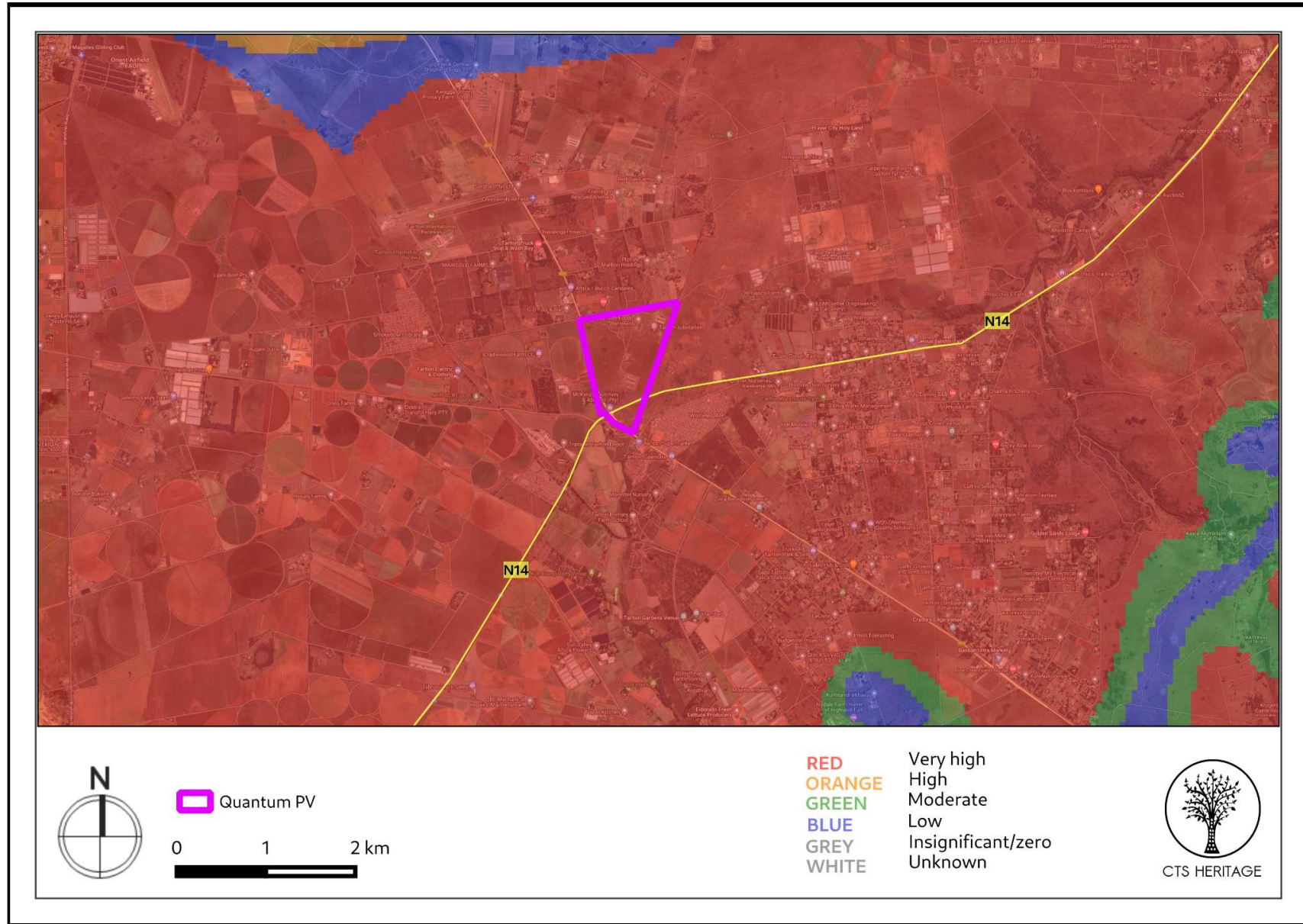
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**Figure 2. Previous HIAs Map.** Previous Heritage Impact Assessments surrounding the proposed development area within 15km, with SAHRIS NIDS indicated. Please see Appendix 2 for a full reference list.

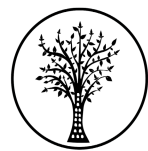


**Figure 3. Heritage Resources Map.** Heritage Resources previously identified in and near the study area, with SAHRIS Site IDs indicated within 10km. Please See Appendix 4 for full description of heritage resource types.



**Figure 4.1. Palaeosensitivity Map.** Indicating very high fossil sensitivity underlying the study area. Please See Appendix 3 for a full guide to the legend.





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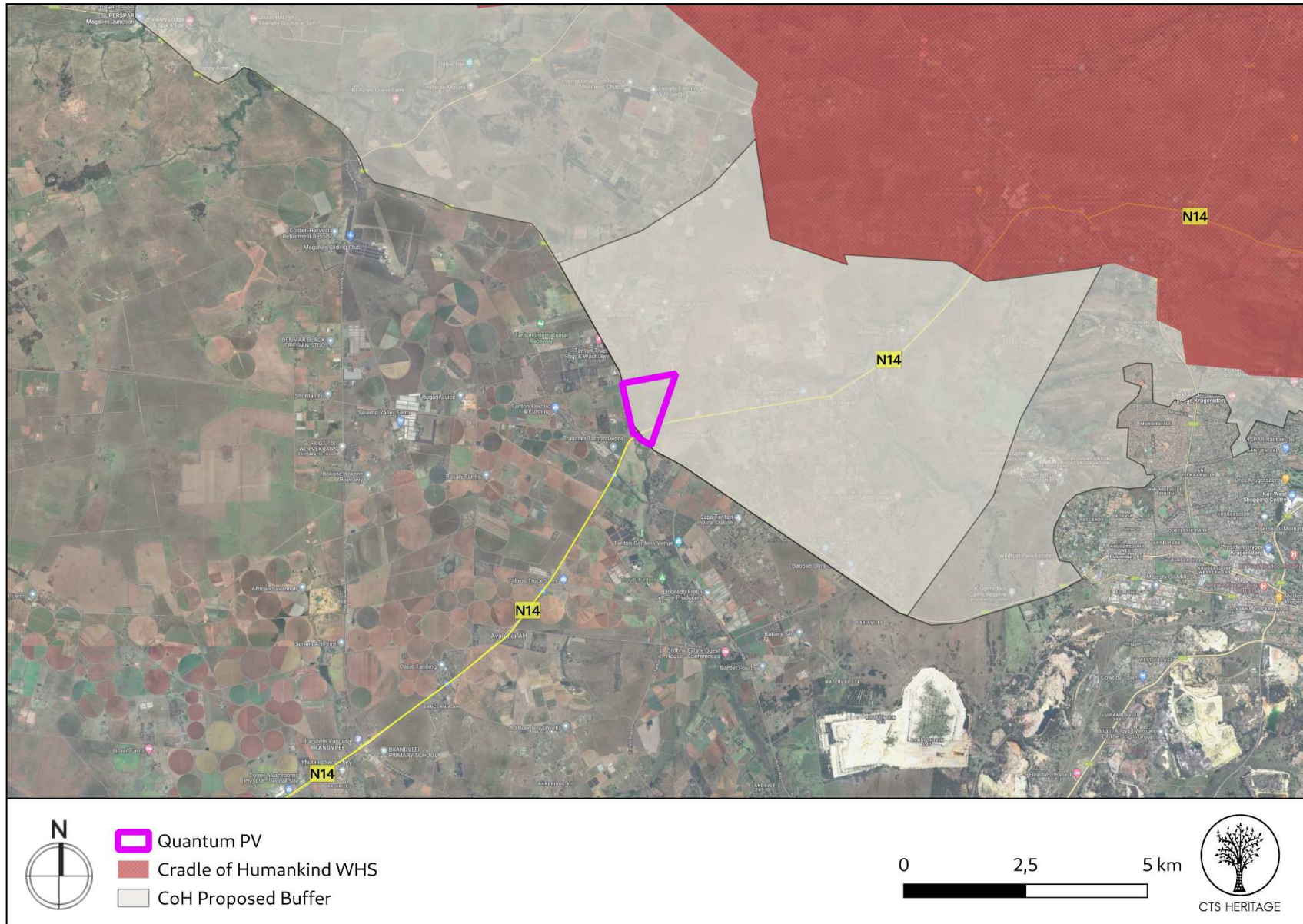
**Figure 4.2. Geology Map.** Extract from the CGS Map 2626 for West Rand indicating that the development area is underlain by Vmd: Malmani Subgroup sediments of the Chuniespoort Group

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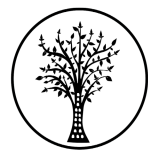
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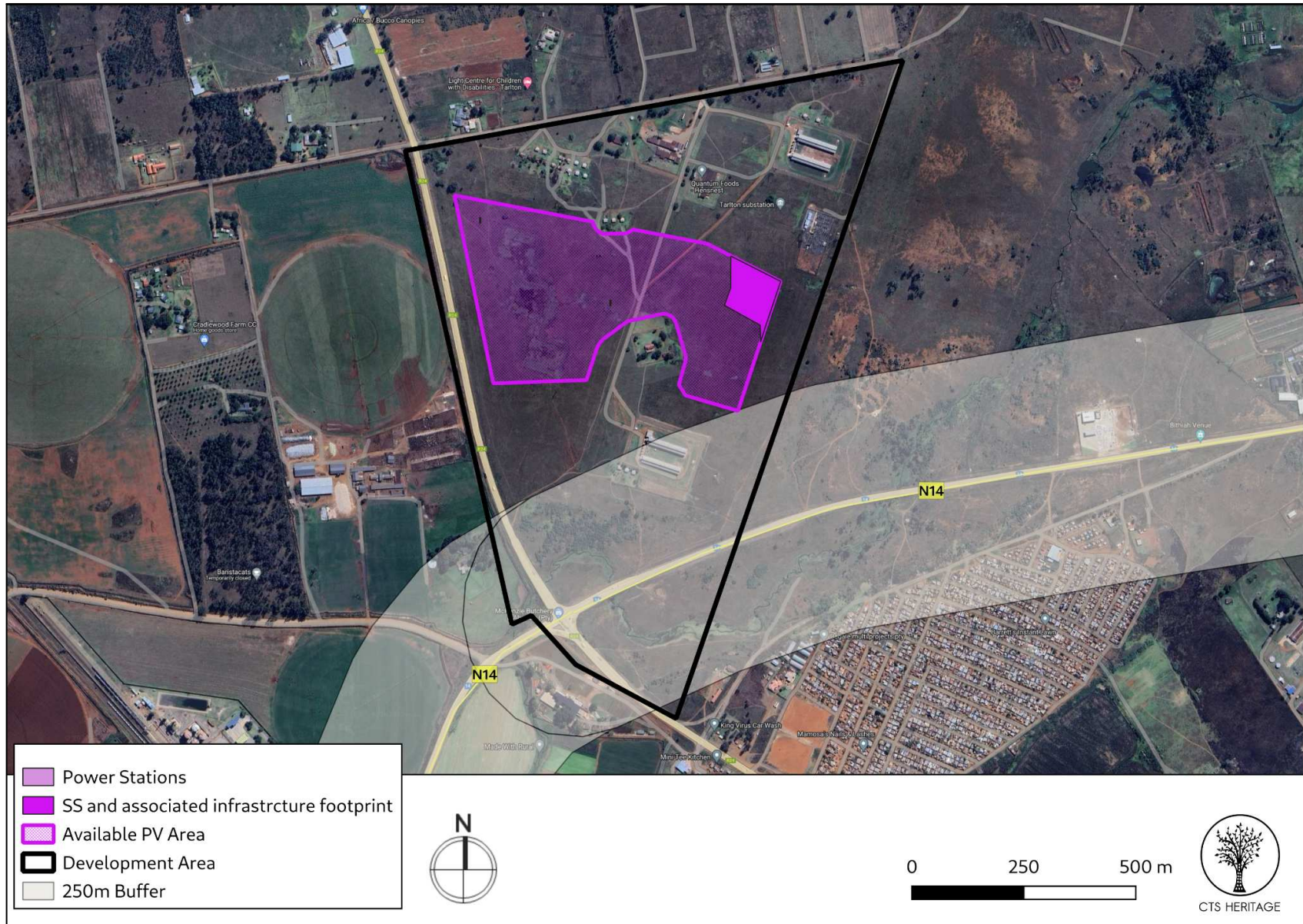
**Figure 5. Cradle of Humankind WHS Map. Relative to development area**

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**Figure 6. Recommended Buffer.** Relative to the historic N14 access route

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## 8. Heritage Assessment

### Background

The study area borders Magaliesburg to the south, while Krugersdorp is located 15 km to the east and Carletonville 32 km to the southwest. Krugersdorp was established on the farm Paardekraal in 1887 after the discovery of gold in the area. The discovery of gold and the mining boom had an impact on the establishment of all the towns in the area and on the evolution and development of South Africa more generally. Krugersdorp also played a significant role in the Transvaal War of Independence and the Second Boer War, during which the British established a concentration camp on the then outskirts of the city. The exact location of the site of the concentration camp is unknown however it is expected that the camp was located at the site of the present Coronation Park, located far from the area proposed for development here.

The area proposed for development is located approximately 32km northeast of Carletonville within the Merafong Municipality. Carletonville was developed by various mining companies from 1937 onwards, but was not officially incorporated until 1959, and was subsequently recognised as a provincial town in 1967. Surrounding Carletonville are a number of privately owned gold-mining township villages and contractor labour quarters established by the mining companies on land owned by the mines. The area surrounding Carletonville is dominated by a cultural landscape that is shaped and defined by the historic and on-going mining activities associated with the Witwatersrand. A detailed archaeological background of the area is provided by Du Pisanie and Nel (2012, SAHRIS NID 104305) and is therefore not repeated here. It is sufficient to note that no significant Early, Middle or Later Stone Age sites are known from this broader area, however sites representing the Iron Age occupation of the region are present in the broader context.

### Archaeology and Cultural Heritage

Tobais (2021) notes that “the general region is significant from a heritage perspective. Heritage sites are likely to include cemeteries/graves, Stone Age Sites, Iron Age and historical sites. Since gold mining can be dated to at least 1874 on the Farm Blaauwbank that is located directly north of the study area, it can be assumed that similar mining activities took place in the general area during the same time. Remnants of the South African War of 1899 – 1902 are also likely to be encountered within the study area.”

Birkholtz and Groenewald (2016, SAHRIS NID 369805) describe the broader areas as “generally undulating with a number of extensive pans located within this area... While the overall study area is mostly utilised for agricultural activities, the proposed development bulk sample area that was assessed in the field is characterised by agricultural fields (maize), a large number of small livestock camps associated with stud farming (cattle) as well as Eskom power lines.” The N14 is an historic scenic route that runs between Ventersdorp and Pretoria and is likely based on the original wagon route used for this journey. This route is located immediately adjacent to the proposed development area. In general, for the development of PV infrastructure and its associated grid connection infrastructure, it is preferred for such development to be clustered with existing development, such as mining or residential development, in order to reduce the perception of urban and infrastructure sprawl across an otherwise agricultural landscape and a no-development buffer of 500m for PV infrastructure is recommended along significant access routes such as the N14. However, in this instance, due to the already transformed nature of the broader area, a 250m buffer is appropriate (Figure 6).

Birkholtz and Groenewald (2016) go on to note that examples of published excavated archaeological sites from the general surroundings of the study area include the Later Stone Age and Iron Age sites located along the Magaliesberg Mountains and sites of international palaeoanthropological significance such as Sterkfontein and Kromdraai, both located within the Cradle of Humankind World Heritage Site. The area proposed for the PV development is located within the buffer area of the COHWHS (Figure 5). The COHWHS site is managed by a Management Authority on behalf of the State Party represented by the South African Minister of Environmental Affairs. The Management Authority is responsible for day to day management and falls under the MEC for Economic Development in Gauteng Province. To achieve long term sustainability and effectiveness, a Master Plan was developed in 2000 and has since then guided all conservation, development and research work at the site. According to the COHWHS Management Plan (2014-2017), the primary aim of the Management Authority is to protect and preserve the site, promote further scientific research, encourage community participation and stimulate tourism development that will benefit local communities and ultimately contribute to Local Economic Development (LED). Specific engagement with the MA for the COHWHS should take place regarding development within the identified WHS buffer.

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### **Palaeontology**

According to the SAHRIS Palaeosensitivity Map, the Proposed Development Areas are located within areas that have variable palaeontological sensitivity but all areas have sediments that have high and very high palaeontological sensitivity. According to the extract from the Council of GeoScience Map for West Rand 2626, the very highly sensitive formations that may be impacted include the Malmani Subgroup. The Malmani Subgroup is known to preserve a range of shallow marine to intertidal stromatolites (domes, columns *etc*), organic-walled microfossils and includes FOSSILIFEROUS LATE CAENOZOIC CAVE BRECCIAS such as in the Cradle of Humankind.

### **RECOMMENDATION**

**The area proposed for development is located in an area of high archaeological and palaeontological sensitivity. It is recommended that a full HIA be undertaken to assess the impacts likely to result from the proposed development of the PV facility and associated grid connections.**

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## 9. Impact Assessment

### Impact

- Impact to archaeological resources
- Impact to palaeontological resources
- Impact to Cultural Landscape
- Cumulative Impact

### Desktop Sensitivity Analysis of the Site

- Impact to significant archaeological resources such as Stone Age artefact scatters, burial grounds and graves, Iron age sites and historical artefacts through destruction during the development phase is likely.
- Impacts to palaeontological resources are likely.
- Due to the nature of the development and its context, cumulative impact and negative impact to the cultural landscape is likely

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Impact to significant heritage resources through destruction during the development phase.	Destruction of significant heritage resources	Local scale with broader impacts to scientific knowledge	None known at present

### Gaps in knowledge & recommendations for further study

- It is likely that the proposed development will impact significant cultural landscape, archaeological and palaeontological heritage and as such, it is recommended that a heritage impact assessment be completed that assesses these impacts as per section 38(3) of the NHRA.

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### APPENDIX 1: List of heritage resources in proximity to the development area

Site ID	Site no	Full Site Name	Site Type	Grading
26807	9/2/233/0032-1	Bolts Farm, Sterkfontein 173 IQ (portion 32), Gauteng	Archaeological, Palaeontological, Place	Grade I
26820	9/2/233/0004	Sterkfontein Caves, Zwartkrans, Krugersdorp District	Archaeological	Grade I
26813	9/2/233/0012	Swartkrans Palaeontological Site, Zwartkrans 172, Krugersdorp District	Archaeological	Grade I
32747	Jacovec Cavern	Jacovec Cavern, Sterkfontein Caves, Gauteng	Archaeological, Palaeontological	Grade IIIb
24702	BKS1310/2627BA/BE016	No. 8 Shaft Randfontein Estates Gold Mine	Structures	Grade IIIb
45790	DWE001	DWE_BKS1310/001	Building	Ungraded
45791	DWE002	DWE_BKS1310/002	Building	Ungraded
45793	DWE004	DWE_BKS1310/004	Structures	Ungraded
45794	DWE005	DWE_BKS1310/005	Burial Grounds & Graves	Grade IIIa
45795	DWE006	DWE_BKS1310/006	Archaeological	Grade IIIc
45796	DWE007	DWE_BKS1310/007	Burial Grounds & Graves	Grade IIIa
45800	DWE011	DWE_BKS1310/011	Burial Grounds & Graves	Grade IIIa
32136	GSF-001	Goldsmith's Farm	Structures	
89014	MES010	Maloney's Eye 169 IQ & Steenkoppie 153 IQ/ 010	Structures	Grade IIIc

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89016	MES012	Maloney's Eye 169 IQ & Steenkoppie 153 IQ/ 012	Structures	Grade IIIc
89017	MES013	Maloney's Eye 169 IQ & Steenkoppie 153 IQ/ 013	Structures	Grade IIIc
89018	MES014	Maloney's Eye 169 IQ & Steenkoppie 153 IQ/ 014	Battlefield	Grade IIIa
89019	MES015	Maloney's Eye 169 IQ & Steenkoppie 153 IQ/ 015	Archaeological	Grade IIIc
40166	BRAND01	Brandvlei 01	Burial Grounds & Graves	Grade IIIa
40167	BRAND02	Brandvlei 02	Burial Grounds & Graves	Grade IIIa
40168	BRAND03	Brandvlei 03	Building	Grade IIIb
104986	U.W 101 - 104	Rising Star Cave	Palaeontological, Archaeological	
108143	Rising Star Cave	Rising Star Cave	Palaeontological	
128300	SWT	Swartkrans Cave	Archaeological	
130228	UW105	UW 105 Rising Star	Archaeological	
127238	9/2/233/0032-2	Bolt's Farm, Greensleeves portion, Sterkfontein 173 IQ (portion 12)	Palaeontological	
127237	9/2/233/0032-3	Bolts Farm, Sterkfontein 173 IQ (portion 38), Gauteng	Palaeontological	

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## APPENDIX 2: Reference List

Heritage Impact Assessments				
Nid	Report Type	Author/s	Date	Title
5106	AIA Phase 1	Johnny Van Schalkwyk	01/11/2003	Heritage Impact Assessment for the Waterval West 510 JQ Development, Krugersdorp District, Gauteng Province
5114	AIA Phase 1	Anton van Vollenhoven, Anton Pelsler	01/09/2007	A Report on a Cultural Heritage Impact Assessment on Erf 85, Chamdor, Krugersdorp for the William Tell Particle Boards and Medium Density Manufacturing Plant
5118	AIA Phase 1	Johnny Van Schalkwyk	01/02/2008	Heritage Survey Report for the Development of Water Pipelines for the Droogeheuvel and Middelvlei Townships, Randfontein, Gauteng Province
6271	AIA Phase 1	Wouter Fourie, M Ramsden	01/08/2002	Blaauwbank Historic Gold Mine, Magaliesberg: Cultural Heritage Scoping
6340	AIA Phase 1	Wouter Fourie, Jaco van der Walt	08/12/2005	Portion of the Proposed Pipeline from Brandvlei to Krugersdorp on the Farm Brandvlei 261 IQ, District Mogale City, Gauteng Province
6402	AIA Phase 1	Wouter Fourie	03/09/2007	Archaeological Impact Assessment: Proposed Township - Chancliff Ridge Extension 34, Mogale City
7795	AIA Phase 1	Johnny Van Schalkwyk, Frank Teichert	04/06/2007	Heritage Impact Assessment for the Planned Rietvallei 180 IQ Development, Krugersdorp Municipal District, Gauteng Province
8056	AIA Phase 1	Polke Birkholtz	23/06/2008	Heritage Scoping: Proposed Second Dwelling, Thorny Valley Estate 240 (Portion 240 a Portion of 264) of the Farm Honingklip 178 IQ, Mogale City, Gauteng Province
8251	AIA Phase 1	Johnny Van Schalkwyk	01/11/2007	Heritage Survey Report for the Proposed West Village Outfall Sewer, Mogale City Local Municipality, Gauteng
110292	AIA Phase 1		13/02/2013	Ntshona Heritage Reports
195364	HIA Phase 1	Wouter Fourie	26/01/2015	THE RAND EN DAL EXT13 PROPOSED DEVELOPMENT ON PORTION 29 OF THE FARM PAARDEPLAATS

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				177 IQ, KRUGERSDORP, MOGALE CITY DISTRICT, GAUTENG PROVINCE
195364	HIA Phase 1	Wouter Fourie	26/01/2015	THE RAND EN DAL EXT13 PROPOSED DEVELOPMENT ON PORTION 29 OF THE FARM PAARDEPLAATS 177 IQ, KRUGERSDORP, MOGALE CITY DISTRICT, GAUTENG PROVINCE
269462	Heritage Impact Assessment Specialist Reports	Dominic Stratford	20/11/2014	Basic Heritage Impact Assessment for the proposed upgrades to the Maropeng Interpretive Centre
364744	AIA Phase 1	Jaco van der Walt	17/05/2016	ARCHAEOLOGICAL IMPACT ASSESSMENT FOR THE PROPOSED PROTEA RIDGE DEVELOPMENT, GAUTENG PROVINCE
375227	AIA Phase 1	Jaco van der Walt	04/10/2016	ARCHAEOLOGICAL IMPACT ASSESSMENT For the Proteadal Mixed Use Township, Proteadal Extension 1, Portion 216 (a Portion of Portion 214) , Paardeplaats 177 IQ, Gauteng Province
375715	HIA Phase 2	Jaco van der Walt, Sidney Miller	04/10/2016	2nd Phase documentation report of the Farmyard On Portion 216 Of Paardekraal 177 IQ, Proteadal Extension 1. Mogale City/Krugersdorp, Gauteng Province.

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## APPENDIX 3 - Keys/Guides

### Key/Guide to Acronyms

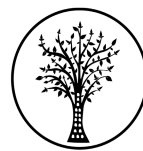
<b>AIA</b>	Archaeological Impact Assessment
<b>DARD</b>	Department of Agriculture and Rural Development (KwaZulu-Natal)
<b>DEFF</b>	Department of Environment, Forest and Fisheries (National)
<b>DEADP</b>	Department of Environmental Affairs and Development Planning (Western Cape)
<b>DEDEAT</b>	Department of Economic Development, Environmental Affairs and Tourism (Eastern Cape)
<b>DEDECT</b>	Department of Economic Development, Environment, Conservation and Tourism (North West)
<b>DEDT</b>	Department of Economic Development and Tourism (Mpumalanga)
<b>DEDTEA</b>	Department of economic Development, Tourism and Environmental Affairs (Free State)
<b>DENC</b>	Department of Environment and Nature Conservation (Northern Cape)
<b>DMR</b>	Department of Mineral Resources (National)
<b>GDARD</b>	Gauteng Department of Agriculture and Rural Development (Gauteng)
<b>HIA</b>	Heritage Impact Assessment
<b>LEDET</b>	Department of Economic Development, Environment and Tourism (Limpopo)
<b>MPRDA</b>	Mineral and Petroleum Resources Development Act, no 28 of 2002
<b>NEMA</b>	National Environmental Management Act, no 107 of 1998
<b>NHRA</b>	National Heritage Resources Act, no 25 of 1999
<b>PIA</b>	Palaeontological Impact Assessment
<b>SAHRA</b>	South African Heritage Resources Agency
<b>SAHRIS</b>	South African Heritage Resources Information System
<b>VIA</b>	Visual Impact Assessment

### Full guide to Palaeosensitivity Map legend

	<b>RED:</b>	VERY HIGH - field assessment and protocol for finds is required
	<b>ORANGE/YELLOW:</b>	HIGH - desktop study is required and based on the outcome of the desktop study, a field assessment is likely
	<b>GREEN:</b>	MODERATE - desktop study is required
	<b>BLUE/PURPLE:</b>	LOW - no palaeontological studies are required however a protocol for chance finds is required
	<b>GREY:</b>	INSIGNIFICANT/ZERO - no palaeontological studies are required
	<b>WHITE/CLEAR:</b>	UNKNOWN - these areas will require a minimum of a desktop study.

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## APPENDIX 4 - Methodology

The Heritage Screener summarises the heritage impact assessments and studies previously undertaken within the area of the proposed development and its surroundings. Heritage resources identified in these reports are assessed by our team during the screening process.

The heritage resources will be described both in terms of **type**:

- Group 1: Archaeological, Underwater, Palaeontological and Geological sites, Meteorites, and Battlefields
- Group 2: Structures, Monuments and Memorials
- Group 3: Burial Grounds and Graves, Living Heritage, Sacred and Natural sites
- Group 4: Cultural Landscapes, Conservation Areas and Scenic routes

and **significance** (Grade I, II, IIIa, b or c, ungraded), as determined by the author of the original heritage impact assessment report or by formal grading and/or protection by the heritage authorities.

Sites identified and mapped during research projects will also be considered.

### DETERMINATION OF THE EXTENT OF THE INCLUSION ZONE TO BE TAKEN INTO CONSIDERATION

The extent of the inclusion zone to be considered for the Heritage Screener will be determined by CTS based on:

- the size of the development,
- the number and outcome of previous surveys existing in the area
- the potential cumulative impact of the application.

The inclusion zone will be considered as the region within a maximum distance of 50 km from the boundary of the proposed development.

### DETERMINATION OF THE PALAEOLOGICAL SENSITIVITY

The possible impact of the proposed development on palaeontological resources is gauged by:

- reviewing the fossil sensitivity maps available on the South African Heritage Resources Information System (SAHRIS)
- considering the nature of the proposed development
- when available, taking information provided by the applicant related to the geological background of the area into account

### DETERMINATION OF THE COVERAGE RATING ASCRIBED TO A REPORT POLYGON

Each report assessed for the compilation of the Heritage Screener is colour-coded according to the level of coverage accomplished. The extent of the surveyed coverage is labeled in three categories, namely low, medium and high. In most instances the extent of the map corresponds to the extent of the development for which the specific report was undertaken.

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**Low coverage** will be used for:

- desktop studies where no field assessment of the area was undertaken;
- reports where the sites are listed and described but no GPS coordinates were provided.
- older reports with GPS coordinates with low accuracy ratings;
- reports where the entire property was mapped, but only a small/limited area was surveyed.
- uploads on the National Inventory which are not properly mapped.

**Medium coverage** will be used for

- reports for which a field survey was undertaken but the area was not extensively covered. This may apply to instances where some impediments did not allow for full coverage such as thick vegetation, etc.
- reports for which the entire property was mapped, but only a specific area was surveyed thoroughly. This is differentiated from low ratings listed above when these surveys cover up to around 50% of the property.

**High coverage** will be used for

- reports where the area highlighted in the map was extensively surveyed as shown by the GPS track coordinates. This category will also apply to permit reports.

## RECOMMENDATION GUIDE

The Heritage Screener includes a set of recommendations to the applicant based on whether an impact on heritage resources is anticipated. One of three possible recommendations is formulated:

**(1) The heritage resources in the area proposed for development are sufficiently recorded** - The surveys undertaken in the area adequately captured the heritage resources. There are no known sites which require mitigation or management plans. No further heritage work is recommended for the proposed development.

This recommendation is made when:

- enough work has been undertaken in the area
- it is the professional opinion of CTS that the area has already been assessed adequately from a heritage perspective for the type of development proposed

**(2) The heritage resources and the area proposed for development are only partially recorded** - The surveys undertaken in the area have not adequately captured the heritage resources and/or there are sites which require mitigation or management plans. Further specific heritage work is recommended for the proposed development.

This recommendation is made in instances in which there are already some studies undertaken in the area and/or in the adjacent area for the proposed development. Further studies in a limited HIA may include:

- improvement on some components of the heritage assessments already undertaken, for instance with a renewed field survey and/or with a specific specialist for the type of heritage resources expected in the area
- compilation of a report for a component of a heritage impact assessment not already undertaken in the area

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- undertaking mitigation measures requested in previous assessments/records of decision.

**(3) The heritage resources within the area proposed for the development have not been adequately surveyed yet - Few or no surveys have been undertaken in the area proposed for development. A full Heritage Impact Assessment with a detailed field component is recommended for the proposed development.**

**Note:**

The responsibility for generating a response detailing the requirements for the development lies with the heritage authority. However, since the methodology utilised for the compilation of the Heritage Screeners is thorough and consistent, contradictory outcomes to the recommendations made by CTS should rarely occur. Should a discrepancy arise, CTS will immediately take up the matter with the heritage authority to clarify the dispute.

## **APPENDIX 5 -Summary of Specialist Expertise**

**Jenna Lavin**, an archaeologist with an MSc in Archaeology and Palaeoenvironments, and currently completing an MPhil in Conservation Management, 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 a member 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. Recently, Jenna has been responsible for conducting training in how to write Wikipedia articles for the Africa Centre's WikiAfrica project.

Since 2016, Jenna has drafted over 70 Heritage Impact Assessments throughout South Africa.

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