

# HERITAGE IMPACT ASSESSMENT

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

## **Proposed development of the 30MW Harmony Target Solar PV, Allanridge, Free State Province**

SAHRIS Ref:

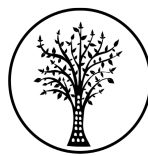
**Prepared by CTS Heritage**



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**For  
Savannah Environmental**

**January 2023**



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## EXECUTIVE SUMMARY

1. Site Name:

30MW Harmony Target Solar PV, Allanridge, Free State Province

2. Location:

Farm Name	Portion Number
Kromdraai 386	0

3. Locality Plan:

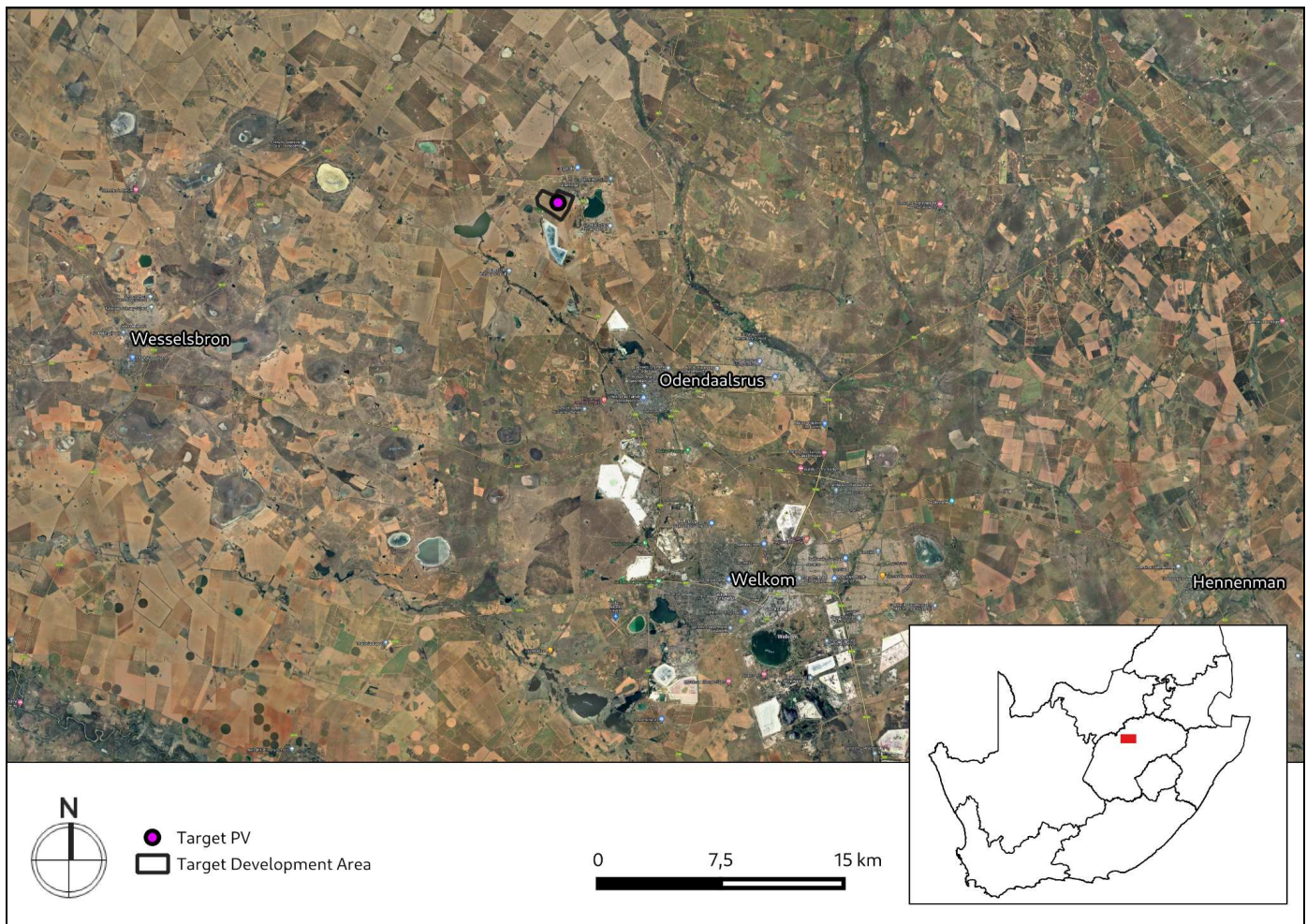
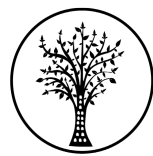


Figure 1: Location of the proposed study area



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#### 4. Description of Proposed Development:

Avgold (Pty) Ltd (a subsidiary of Harmony Gold Mining Company Ltd) is looking to supplement its energy supply by implementing Photovoltaic (PV) generation, aiding their transition to a more sustainable and environmentally friendly energy mix.

The development of a solar photovoltaic (PV) facility with a generating capacity of up to 30MW is proposed 550m south of the Harmony Target operations, approximately ~14km south of the town of Allanridge within the Matjhabeng Local Municipality and within the Lejweleputswa District Municipality, Free State Province. The PV facility is located on Portion 0 of the Farm Kromdraai 386 and Portion 0 of the Farm Aandenk 227. The solar PV development will be known as Harmony Target Solar PV Facility.

#### 5. Heritage Resources Identified in and near the study area:

Site No.	Site Name	Description	Period	Co-ordinates		Grading	Mitigation
TG1	Target 1	Isolated artefacts: two miniature cores associated with microlithic flake production	LSA	-27.7608890 4	26.6334529 9	NCW	NA

#### 6. Anticipated Impacts on Heritage Resources:

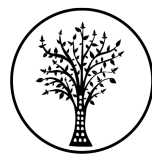
All of the areas surveyed as part of this assessment have been transformed through agricultural interventions and/or mining activity. No archaeological resources of scientific cultural value were identified within the area proposed for the Target PV Facility and its grid connection and as such, no impact to significant archaeological heritage resources is anticipated.

Furthermore, no impacts to significant palaeontological heritage is anticipated on condition that the attached Chance Fossil Finds Process is implemented and no impacts to the cultural landscape are anticipated.

#### 7. Recommendations:

There is no objection to the proposed development in terms of impacts to heritage resources on condition that:

- The attached Chance Fossil Finds Procedure is implemented for the duration of construction activities
- Should any buried archaeological resources or human remains or burials be uncovered during the course of development activities, work must cease in the vicinity of these finds. The South African Heritage Resources Agency (SAHRA) must be contacted immediately in order to determine an appropriate way forward.



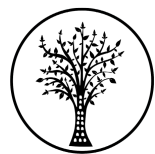
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### **Details of Specialist who prepared the HIA**

**Jenna Lavin**, an archaeologist with an MSc in Archaeology and Palaeoenvironments, 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.

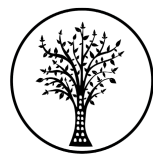
Jenna is a member of the Association of Professional Heritage Practitioners (APHP), and is also an active member of the International Committee on Monuments and Sites (ICOMOS) as well as the International Committee on Archaeological Heritage Management (ICAHM). In addition, Jenna has been a member of 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 100 Heritage Impact Assessments throughout South Africa.



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## 1. INTRODUCTION

### 1.1 Background Information on Project

Avgold (Pty) Ltd (a subsidiary of Harmony Gold Mining Company Ltd) is looking to supplement its energy supply by implementing Photovoltaic (PV) generation, aiding their transition to a more sustainable and environmentally friendly energy mix.

The development of a solar photovoltaic (PV) facility with a generating capacity of up to 30MW is proposed 550m south of the Harmony Target operations, approximately ~14km south of the town of Allanridge within the Matjhabeng Local Municipality and within the Lejweleputswa District Municipality, Free State Province. The PV facility is located on Portion 0 of the Farm Kromdraai 386 and Portion 0 of the Farm Aandenk 227. The solar PV development will be known as Harmony Target Solar PV Facility.

The preferred site for the project is on properties which are privately owned by the Mine and are available for the proposed project, and is therefore deemed technically feasible by the project developer for such development to take place.

A project site<sup>1</sup> considered to be technically suitable for the development of the solar PV facility, with an extent of approximately 500ha, was identified. A development area<sup>2</sup> of ~245ha was demarcated within this project site and allows an adequate footprint (~105ha)<sup>3</sup> for the installation of a solar PV facility with a contracted capacity of up to 30MW, while allowing for the avoidance of environmental site sensitivities.

The infrastructure associated with the 30MW solar PV facility will include:

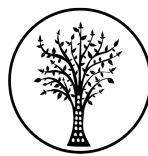
- » PV modules and mounting structures
- » Inverters and transformers a SCADA room, and maintenance room
- » Cabling between the project components, to be laid underground where practical
- » Access roads, internal roads and fencing around the development area.
- » Temporary and permanent laydown areas and O&M buildings.
- » Grid connection solution including an on-site facility substation, switching station, to be connected to the Avgold Substation via an overhead power line (located ~400m north east of the site).

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<sup>1</sup> The project site comprises the affected properties for that identified area within which the development area and development footprint are located. It is the broader geographic area assessed as part of the BA process, within which direct effects of the proposed project may occur. The project site is ~500ha in extent.

<sup>2</sup> The development area is that identified area where the 30MW 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 ~245ha in extent.

<sup>3</sup> The development footprint is the defined area (105ha) located within the development area) where the PV panel array and other associated infrastructure for the Harmony Target Solar PV facility is planned to be constructed. This includes the actual footprint of the facility, and the area which would be disturbed.



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Three alternative grid corridors (300m in width) have been assessed. These are described as follows:

**Alternative 1:** A 300m wide corridor between the switching substation located on the Harmony Target Solar PV Facility and the Avgold Substation via an overhead power line (~750m in length). The corridor exits the facility from the north east corner of the development footprint, and follows existing Eskom power lines to the east of the development area as well as an unnamed mine access road. The route skirts around the Loraine One Substation to access the south side of the Avgold Substation (located directly south west of the Loraine One Substation).

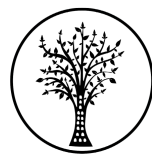
**Alternative 2:** A 300m wide corridor between the switching substation located on the Harmony Target Solar PV Facility and the Avgold Substation via an overhead power line (~440m in length). The corridor exits the facility from the north east corner of the development footprint, and follows a secondary mine access road to access the south side of the Avgold Substation (located 400m north east of the site).

**Alternative 3:** A 300m wide corridor between the switching substation located on the Harmony Target Solar PV Facility and the Avgold Substation via an overhead power line (~1.5km in length). The corridor exits the facility from the north west corner of the development footprint, and follows the farm boundary for approximately 200m west before turning north and then east to follow an unnamed mine access road for approximately 570m. at the junction with the secondary road, the route turns south to access the south side of the Avgold Substation.

The site is accessible via the R30 and an unnamed secondary road/mine access road.

As of 2019, the Industrial sector was the leading electricity consumer in South Africa, with up to 56 percent of the total consumption (Ratshomo 2019). Mining and quarrying accounted for 10% of the industrial consumption while non-ferrous metals and non-metallic both accounted for 8% and 5%, respectively (*Chamber of Mines of South Africa, 2017*).

The successful development of the renewable energy projects will enable Harmony Gold to make a valuable and meaningful contribution towards growing the green economy within the province and South Africa. This will assist the Free State in creating green jobs and reducing Green House Gas emissions, whilst reducing the energy demand on the National Grid.



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## 1.2 Description of Property and Affected Environment

The potentially affected area associated with the proposed PV facility is located in the Target mining area, approximately 12 km north-east of the town of Odendaalsrus in the goldfields region of the Lejweleputswa district of the Free State province of South Africa. The footprint for potential development is largely flat, and characterised - over substantial portions - by ploughed agricultural camps in the western most two-thirds. The upper sediments in the agriculturally affected regions (western portion) have thus been extensively disturbed through agricultural processes, and the original quaternary deposits have been reworked or removed to depths in excess of ~0.5m in several places, as a consequence of agriculture and/or mining related clearing (CTG1 - CTG6).

Local bedrock outcrops ephemerally at several points east of the affected area. This bedrock is comprised largely of shales and indurated siltstones (Ecca Group), whereas the upper sediments covering these host rocks, and the footprint itself, likely derive from the in-situ weathering of local parent formations. The upper sediments were fluviially deposited across much of the area (as evidenced by sub-angular edges and rounding of lithic inclusions), and potentially relate in depositional origin to summer flooding of the drainages to the south and west.

In the eastern portion of the affected property, where natural landscape is primarily retained (i.e. unaffected by modern activity), grassland and semi-arid shrubland is evident with shale and some evidence for sub-volcanic rock in the form of small secondary colluvial nodules (<5cm in maximum diameter) in several locations.

The western portion of the affected property is interspersed with vehicle tracks where grass has been trampled and/or removed, probably to facilitate vehicle manoeuvrability between agricultural infrastructure and to facilitate movement associated with prospecting. Indigenous fowl including francolin and guineafowl were observed on the affected property, in addition to abundant traces of burrowing rodents (predominantly hares), which may well affect any potential sub-surface archaeology (though no sub-surface remains were documented).



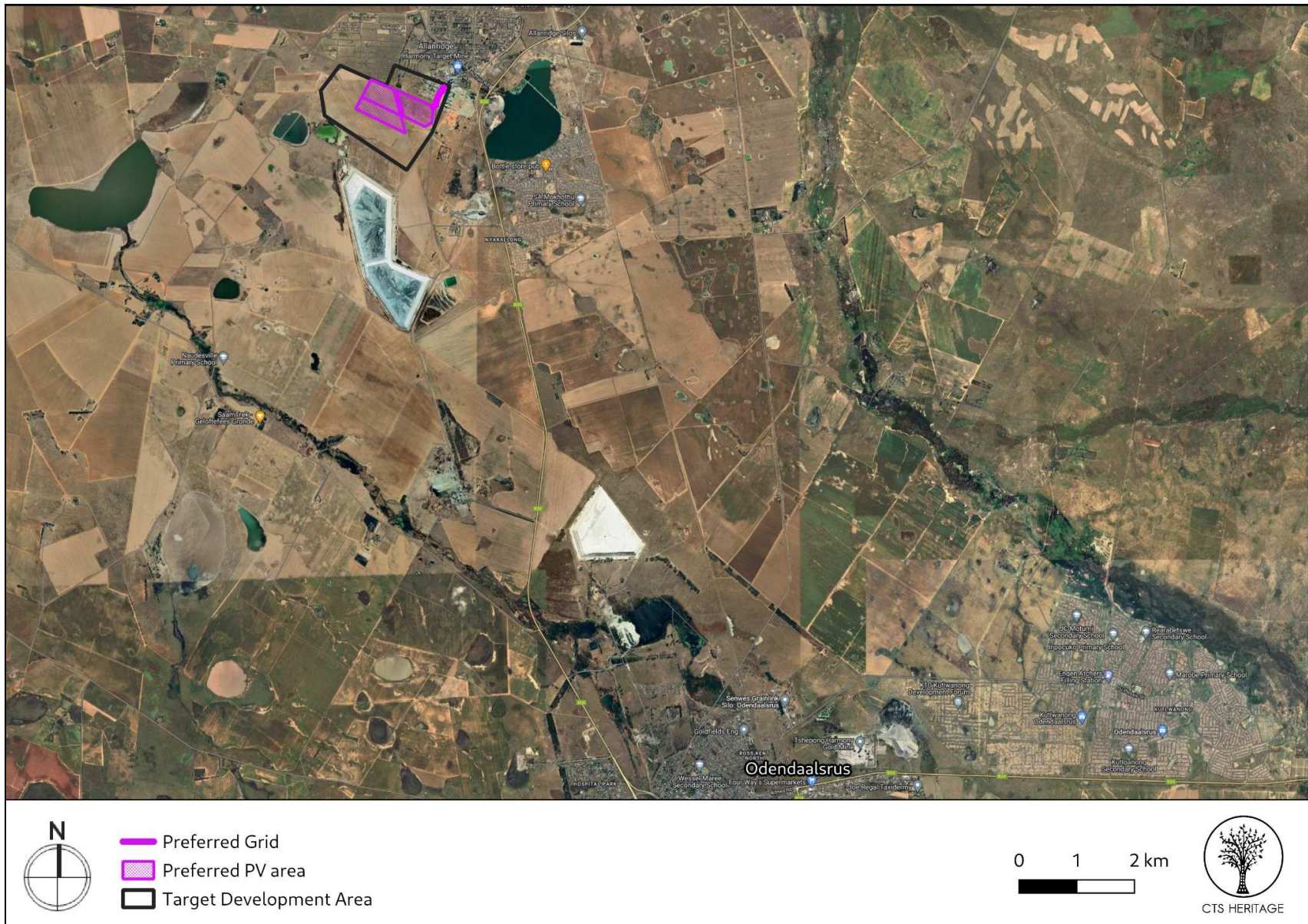
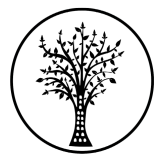
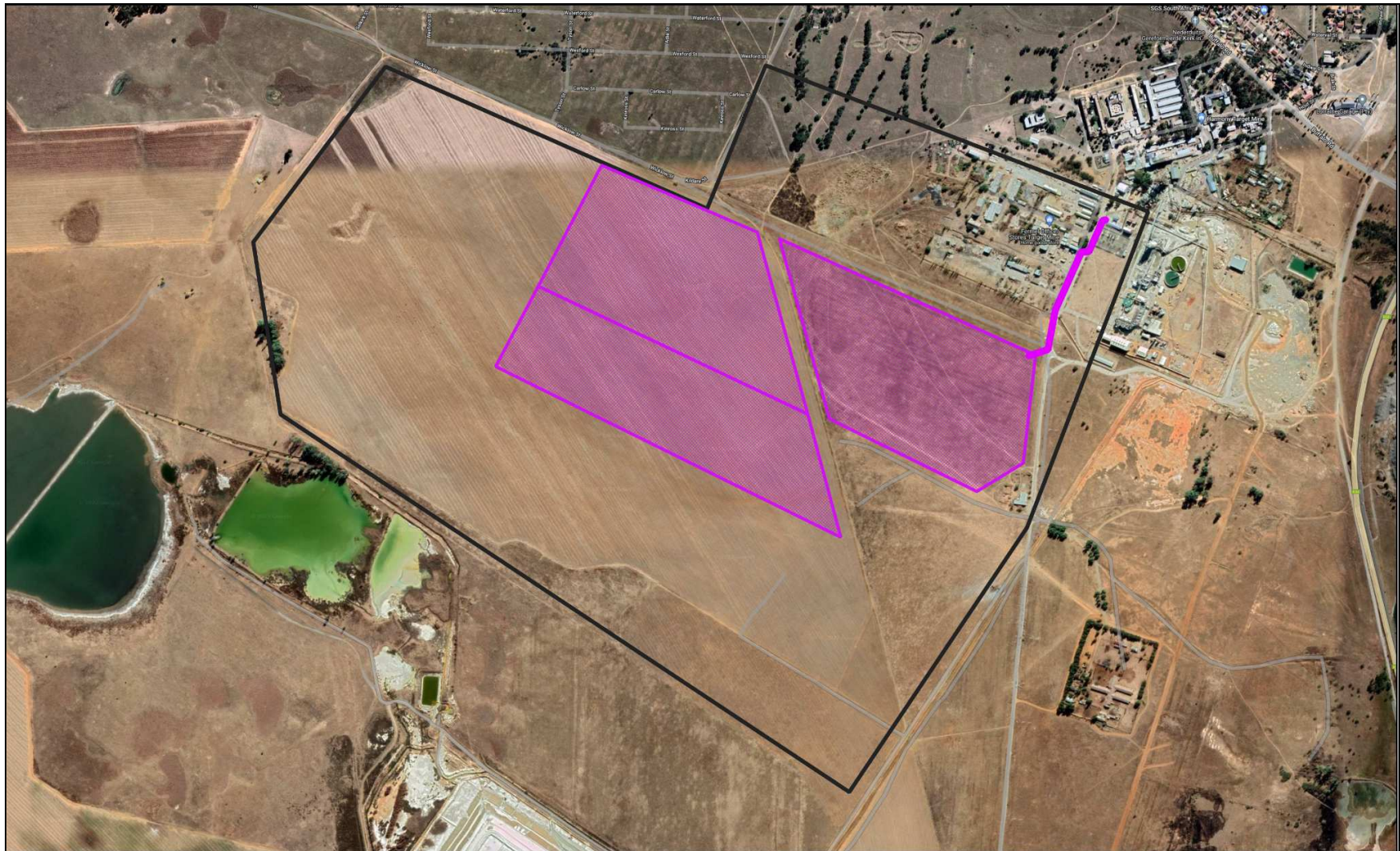


Figure 1.1: The proposed development area



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-  Preferred Grid
-  Preferred PV area
-  Target Development Area

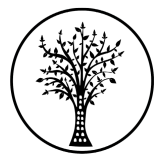
0 250 500 m



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Figure 1.2: The proposed development area

Cedar Tower Services (Pty) Ltd t/a CTS Heritage  
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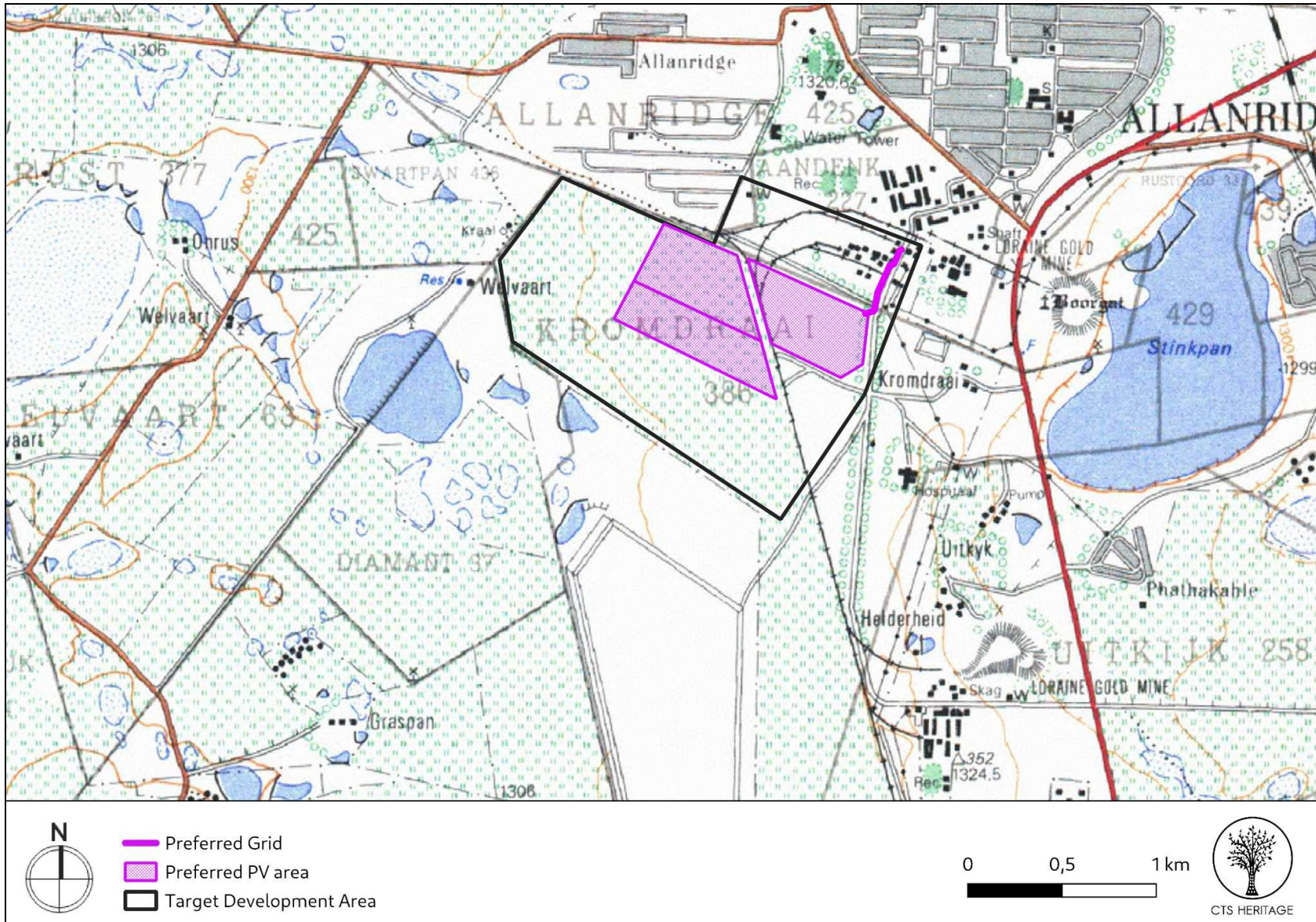
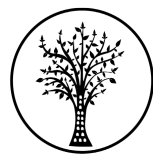


Figure 1.3: Study Area reflected on the 1:50 000 Topo Map



## 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) (Appendix 1)
- An archaeologist conducted an assessment of the broader study area in order to determine the archaeological resources likely to be disturbed by the proposed development. The archaeologist conducted her site visit on 30 June 2022 (Appendix 2)
- A Desktop Palaeontology Assessment was completed 6 July 2022, Appendix 3)
- The identified resources were assessed to evaluate their heritage significance and potential impacts to these resources were interrogated
- Alternatives and mitigation options were discussed with the Environmental Assessment Practitioner

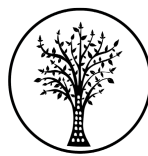
### 2.3 Assumptions and uncertainties

- 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

Ploughed agricultural camps encompass the western most two-thirds of the affected area. Consequently, the upper sediments are substantially disturbed where crops are actively growing and cattle grazing and resulting trampling is evident.



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Dense grasses and occasional shrubland cover portions of the project area. This coverage significantly inhibited the visibility of surface archaeology. However, this is not regarded as a substantial problem in relation to the Stone Age archaeological remains, which in most cases look to have generally limited scientific importance due to the disturbed and deflated contexts they occur in. Additionally, even in the places that had optimal visibility, evidence of archaeology was extremely sparse. It is clear that the Stone Age sensitivity and scientific potential of the project area has been comprehensively assessed.

The inability to assess some of the footprint area at ground surface level in some portions (due to modern vegetation cover), should be regarded as a constraint to the documentation of potential graves.

Previous vegetation clearing activities through prospection, and by farmers, may have affected evidence of surface archaeology including the possible above-surface presence of material evidence of graves (i.e. the removal of surface stone structures).

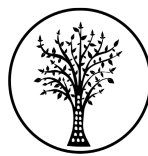
Access was not possible in areas actively mined; however, any archaeology occurring in these areas would be *ex situ* in any case, and of limited scientific importance.

The team is confident that, despite these challenges, the work completed has provided a sufficient assessment of the heritage sensitivity of the area proposed for development.

## 2.5 Savannah Impact Assessment Methodology

Direct, indirect and cumulative impacts of the issues identified through the Basic Assessment process 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



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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.
- 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

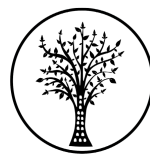
D = Duration

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**

##### **Background**

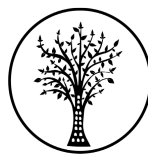
This application is for the proposed development of a PV facility and associated grid infrastructure located immediately adjacent to the town of Allanridge and approximately 15km from the town of Odendaalsrus in the Free State Province. Odendaalsrus started out in 1912 as a ramshackle collection of farms and a central church that became a town. In April 1946 gold was struck on the farm *Geduld* near the town. Allanridge is the main centre of the Loraine Gold Mining Company and is dominated by the tall headgear and complex reduction works that processes thousands of tons of gold-bearing ore every month. Allanridge was established as a settlement in the Free State goldfields in 1947 and was named after Allan Roberts whose borehole's proximity to the gold bearing reef was the precursor to the mining in the area. The town layout was designed by town planner William Backhouse, who also planned Welkom. It became a municipality on 21 December 1956.

The study area falls within the bioregion described by Mucina et al (2006) as the Dry Highveld Grassland Bioregion with the vegetation described as Vaal-Vet Sandy Grassland within a Grassland Biome. Land use in the general area is characterised by mining and agriculture, dominated by crops and cattle farming. The study area is characterised by deep sandy to loamy soils based on the extensive agricultural activities." According to Fourie (2021), "Existing surrounding land uses associated with the project area include a combination of mining related infrastructure and developments, powerlines, refuse dumps and dirt roads." As the area proposed for development is located within an existing mining area, it is very unlikely that significant built environment heritage will be impacted by the proposed development.

The proposed development area is located immediately adjacent to an old National Monument declared in 1960. This site has the shape of a keyhole and marks the place where the first gold prospecting borehole in this area of vast plains was drilled. Although the first payable gold deposits to be discovered in the Orange Free State were not found in this borehole, it was the first prospecting borehole in the area and the results obtained from it undoubtedly gave rise to other prospecting and the discovery of the Orange Free State goldfields. The monument erected round the borehole through the generosity of Lorraine Gold Mines Limited, is fittingly designed in the form of a keyhole to symbolise the unlocking of the goldfields of the Orange Free State. A detailed history of this monument is recorded on SAHRIS. The history of Allanridge is intimately linked with the gold mining industry and as such, it is unlikely that the proposed PV development will negatively impact on this unique cultural landscape as it is proposed to support the gold mining industry.

##### **Archaeology**

According to Fourie (2021), "The Free State has a rich archaeological and historical history going back millions of



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years and includes significant aspects such as Later Stone Age rock art, Battlefields and Iron Age stonewalled enclosures. The general surroundings of the study area became a melting pot of contact and conflict as it represents one of many frontiers where San hunter-gatherers, Nguni and Sotho-Tswana agro-pastoralists, Dutch Voortrekkers and British Colonists all came together. The ravages of war also swept across these plains, and in particular the South African War (1899-1902) as well as the Boer Rebellion (1914-1915).” No heritage resources of significance were identified by Van der Walt (2013) in his assessment of a nearby farm. Van der Walt (2013) notes that “some MSA finds might be possible around pans on the farm. It is important to note that the lack of sites can be attributed to a lack of sustainable water sources (no pans exist in the development footprint) in the development area as well as the lack of raw material for the manufacturing of stone tools. No Sites dating to the Early or Middle Iron Age have been recorded or are expected for the study area. The same goes for the Later Iron Age period where the study area is situated outside the western periphery of the distribution of Late Iron Age settlements in the Free State. However to the north of the study area, ceramics from the Thabeng facies belonging to the Moloko branch of the Urewe tradition were recorded at Oxf 1 and Platberg 32/71 (Maggs 1976, Mason 1986)”.

In his field assessment conducted close to the area proposed for development, Rossouw (2012) noted that “The Stone Age archaeological footprint in the region is largely represented by the occurrence of open-site, Middle Stone Age (MSA) and Later Stone Age (LSA) assemblages that are mainly located near river drainages. Interestingly, a large number of MSA artifacts were found 2m below the surface at the Allanridge railway siding in 1953. The material is stored at the National Museum in Bloemfontein. Unfortunately, the context of the assemblage is unknown. MSA as well as LSA artefacts, in association with mammal fossil remains, are also found in a series of erosional gullies along the Sand and Doring Rivers between Virginia and Theunisen. There are no records of rock engravings known from the area. The ruins of a large complex of Late Iron Age settlements (OXF 1, Maggs 1976) are found at Strydfontein between Hennenman and Ventersburg. However, it is noted that the affected area is situated outside the western periphery of distribution of Late Iron Age settlements below the Vals River in the Free State (Maggs 1976).” In Rossouw’s assessment, he found no evidence of *in situ* Stone Age or Iron Age archaeological material. He noted no indications of prehistoric structures or rock engravings, historical buildings or structures older than 60 years. Two small graveyards were also recorded during the survey.



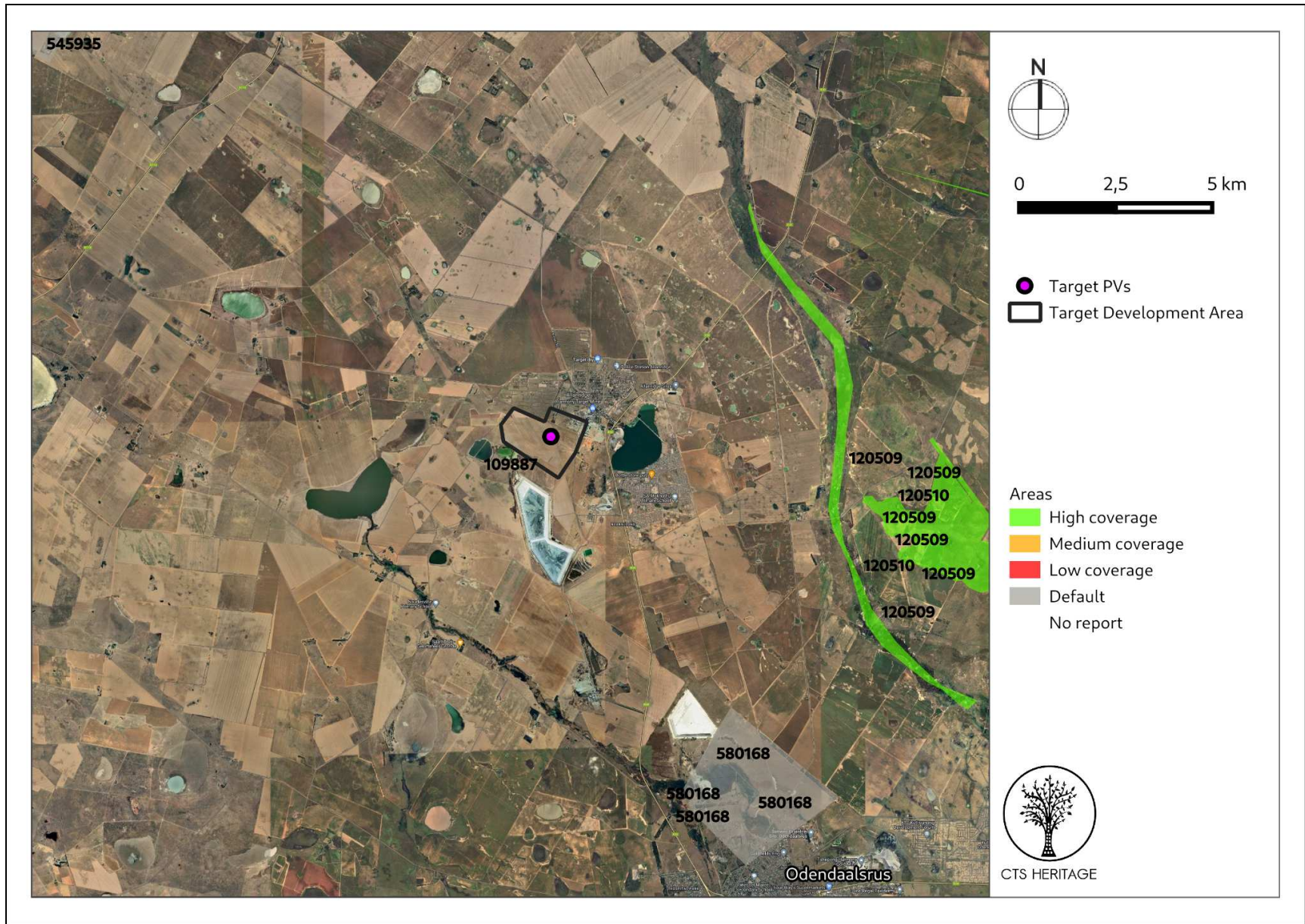


Figure 2.1: Spatialisation of heritage assessments conducted in proximity to the broader study area

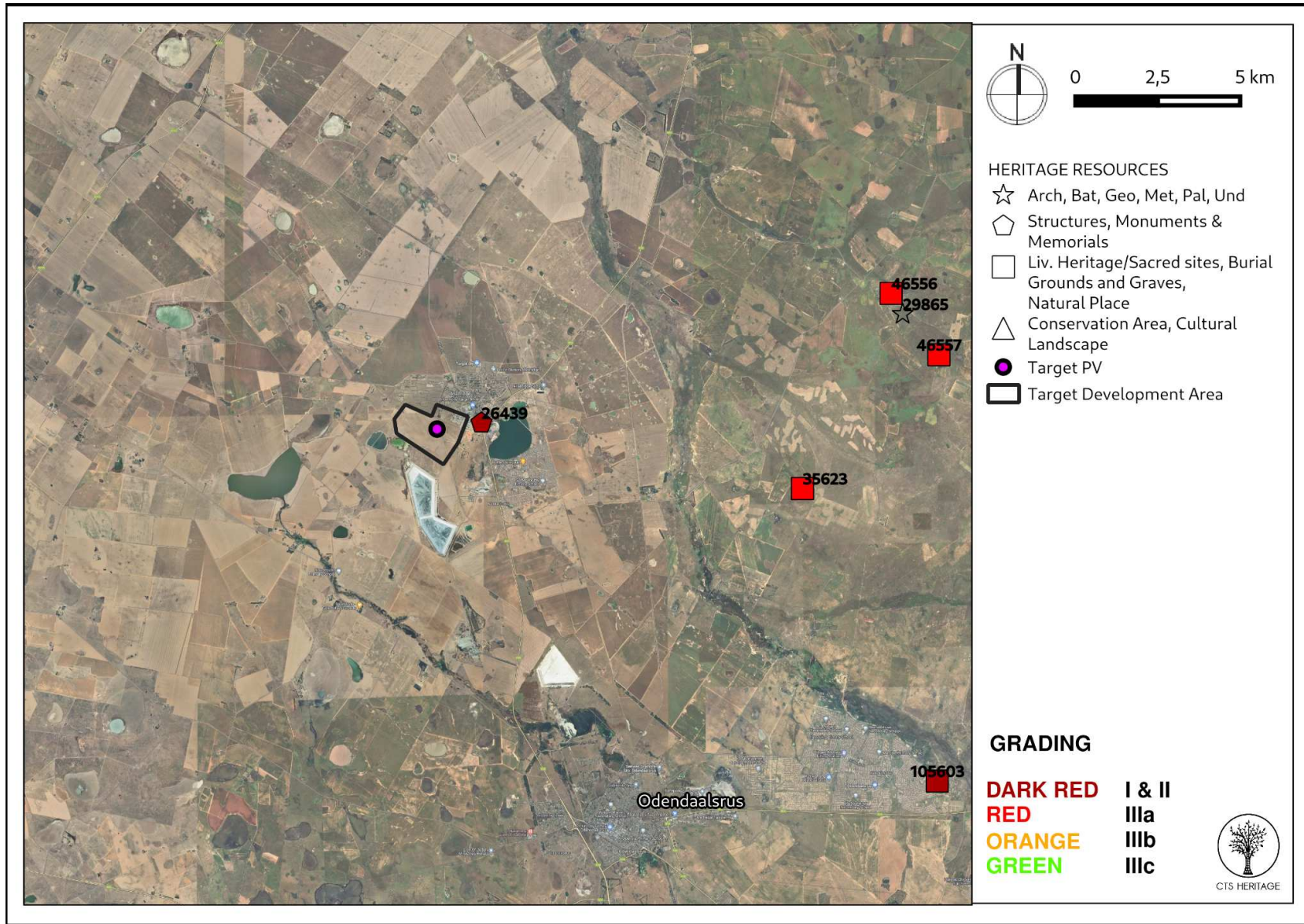


Figure 2.2: Spatialisation of heritage resources known in proximity to the broader study area

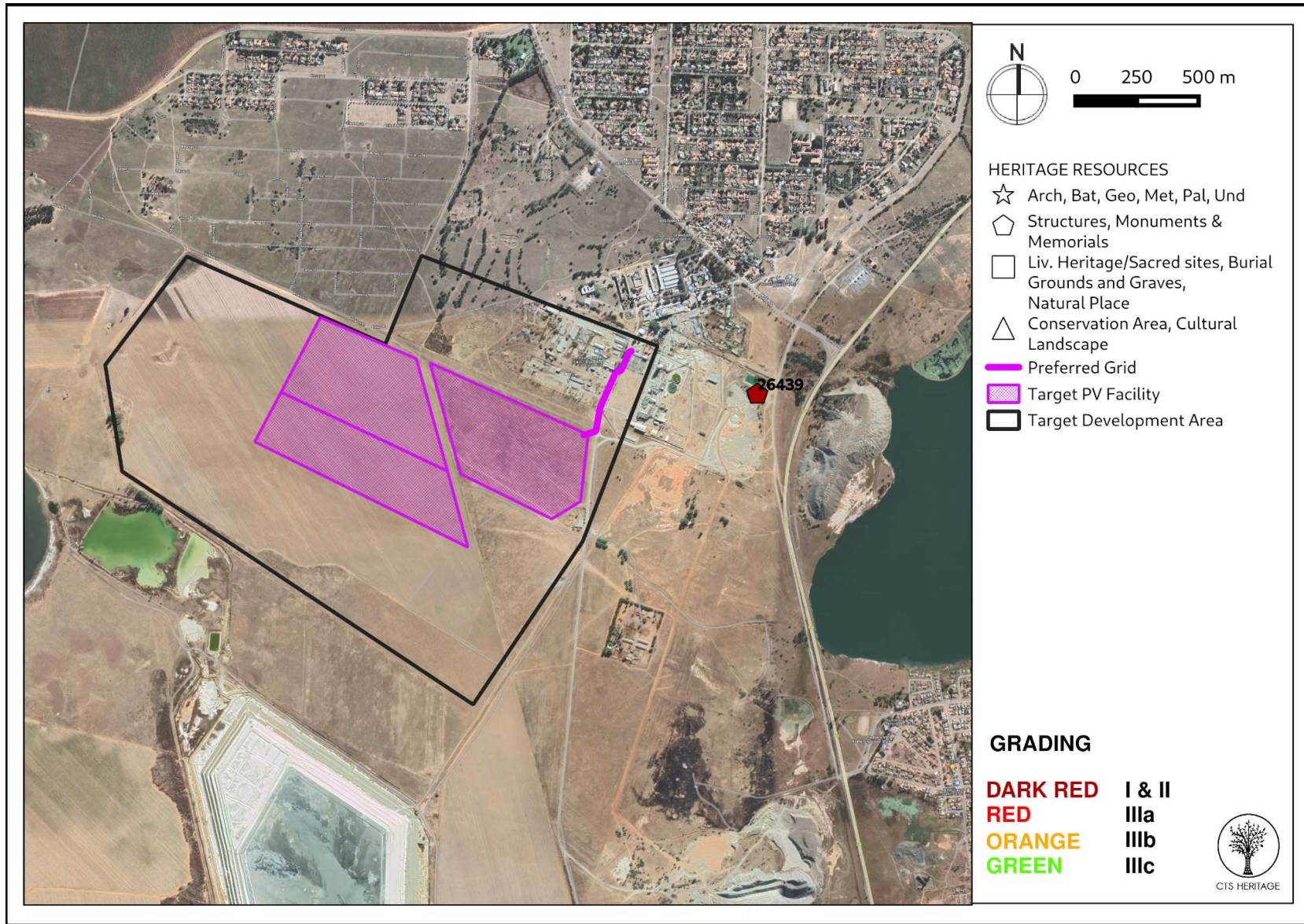


Figure 2.3: Spatialisation of heritage resources known in proximity to the broader study area



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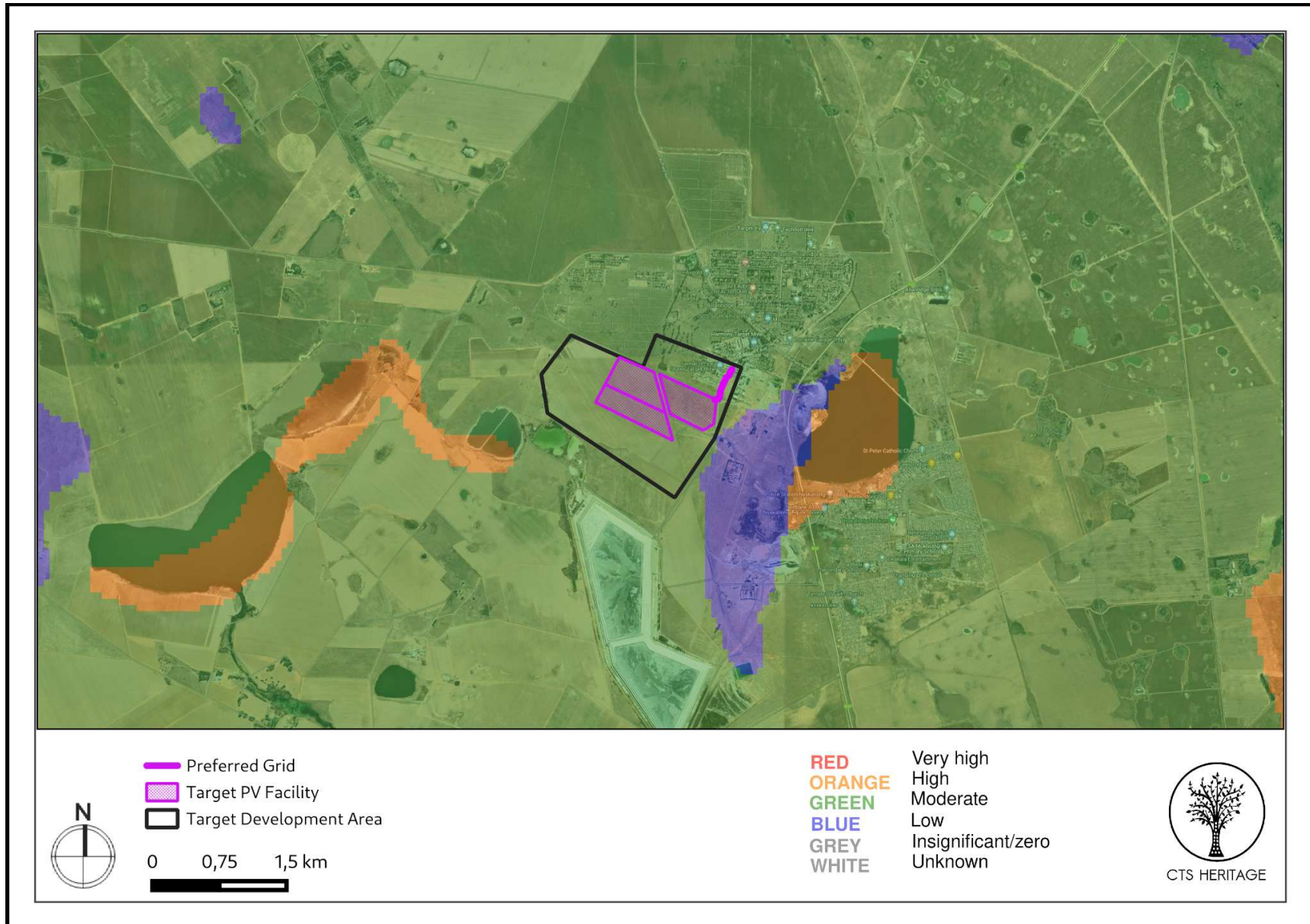
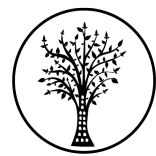


Figure 3.1: Palaeontological sensitivity of the area surrounding the broader study area



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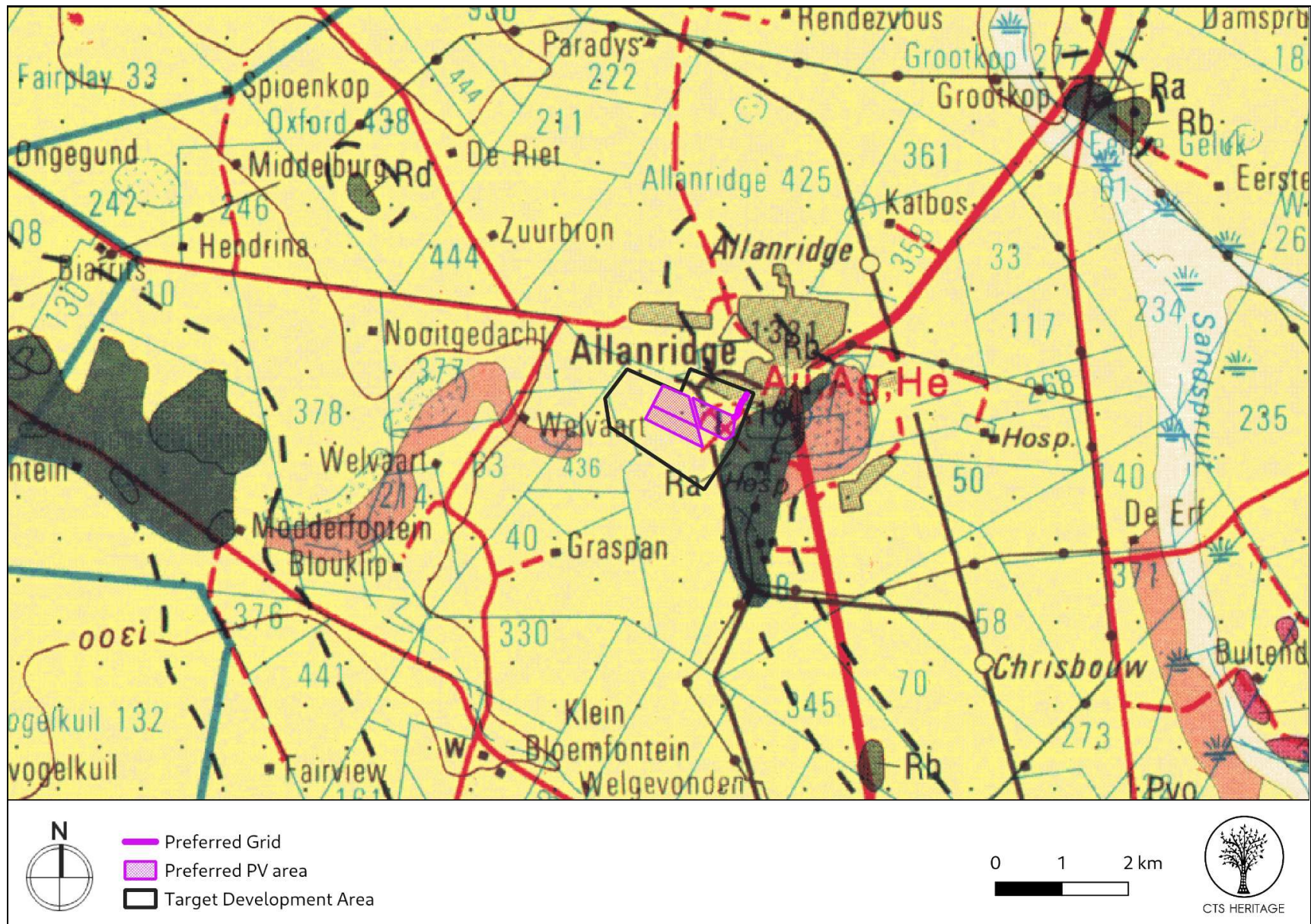
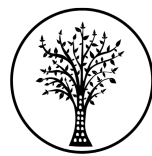


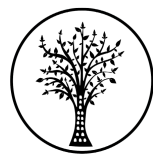
Figure 3.2: Geology Map. Extract from the CGS 2726 Kroonstad Geology Map indicating that the development area is underlain by Quaternary Sands (Qs)



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### 3.2 Palaeontology

According to the SAHRIS Palaeosensitivity Map the development sites are underlain by sediments of moderate fossil sensitivity (Figure 4) consisting of caenozoic regolith according to the extract from the CGS 2726 Kroonstad Geology Map (Figure 4b). According to a Palaeontological assessment completed by Groenewald (2013) for a development located nearby in similar sediments, “No fossils have been described from the quaternary aeolian deposits in the study area, although fossil finds have been recorded from similar aged sediments, for example: the Cornelia Formation in the north-eastern Free State (Johnson et al, 2006).” It is possible that sensitive sediments of the Adelaide Subgroup underly the Quaternary Sands. According to Groenewald (2013), “The Permian Adelaide Subgroup is interpreted as a meandering river deposit grading upwards into a lacustrine environment and is well known for containing fossils (Johnson et al, 2006). Although difficult to correlate the study area directly with more well-known outcrops of the lower part of the Adelaide Subgroup to the east, the subgroup is known to contain very good examples of Glossopteris flora as well as numerous remains of vertebrate fossils associated with the Dicynodon Assemblage Zone in the north-eastern part of the Karoo Basin (Groenewald, 1989 and 1996).” Groenewald (2013) concludes that “There is a possibility that fossils could be encountered during excavation into both the quaternary sand deposits and the Adelaide Subgroup sediments within the development footprint. The study area has been extensively modified through agricultural development and it is unlikely that fossils will be exposed in these developed areas.”



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## **4. IDENTIFICATION OF HERITAGE RESOURCES**

### **4.1 Summary of findings of Specialist Reports**

#### **4.1.1 Archaeology**

The survey was conducted primarily on foot but also involved driving between key targeted areas, and sought to assess the presence and significance of archaeological occurrences within the project area. Overall field assessment documented a sparse number of isolated stone artefacts in secondary and surface contexts, suggesting the area may have been traversed intermittently by Stone Age groups through periods in both the Middle Stone Age (MSA – ~300ka:~40ka), the Later Stone Age (LSA: ~40ka: ~2ka) in addition to individual bifacial tools potentially associated with the later ESA (~400~200ka), although artefacts that could be clearly linked with chrono-cultural periods were scarce.

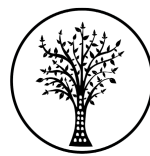
The presence of small nodules of artefact-quality chert rocks, homogenous quartzites as well as high-quality riverine Hornfels and Quartz in the project areas in addition to relatively abundant standing water, were likely the resources that attracted groups to the broader region, and resulted in them leaving behavioural traces in the form of stone artefacts. Indeed the majority of the stone artefacts identified look to be the result of expedient ‘testing’ of rocks for quality, although several cores and tools associated with more extensive investment in production were identified. In this sense no evidence of substantial densities of finds or occupational debris were identified, and the stone artefacts present look to have been produced by mobile forager groups moving through the area.

No primary or secondary sources of artefact quality stone were documented on the affected property, and only two stone artefacts (on exotic fine-grained quartzite) were documented in the vicinity of the affected property. The isolated archaeological finds were documented in the eastern portion, in broad association with the original quaternary upper sediments. However these archaeological finds occurred in secondary contexts on a deflated land surface, so therefore have limited potential for modern scientific analyses (due to the *ex situ* spatial contexts of the finds and limited possibility of radiometric dating or directly associating them with dateable sediments).

Apart from the ephemeral Stone Age remains documented, evidence for archaeology was minimal. No graves were identified within the survey and visibility was reasonably good for stone structures, so the latter finding could be considered comprehensive. However, the substantial grass cover and soil formation across the eastern part of the footprint was a relevant constraint to documenting stone artefacts and other smaller potential surface remains such as pottery etc.

#### **4.1.2 Palaeontology**

The site for development is on Quaternary sands. Six formations are recognised in the Kalahari Group but they are not often indicated on the geological maps. A more recent review by Botha (2021) attempts to correlate the Quaternary sediments but they are difficult to date or to determine their source. In this part of the Free State the



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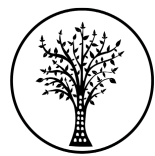
Hoopstad Aeolian sands are present. According to Harmse (1963, in Botha, 2021) this extensive red and grey sandy soil cover is associated with three generations of aeolian sand sheets. Moreover, these generations of aeolian sand form the soil substrate in the heart of the nation's maize cultivation region, yet their geological origin and age remains understudied (Botha, 2021, p. 825).

Quaternary sands and alluvium do not preserve fossils because they are transported and porous. For preservation of fossils, a low energy deposit with sedimentation of fine grained silts or muds that exclude decomposing organisms such as bacteria, fungi and invertebrates is required to maintain a highly reducing environment (Cowan, 1995). Only if there are traps such as palaeo-pans or palaeo-springs that provide traps for water and fine sediments, would plants or bones be preserved and fossilised. No such features are visible in the satellite imagery in the project footprint.



Figure 4.1: . Dense grasses cover portions of the project area inhibiting the visibility of surface archaeology at Target: CTG9.





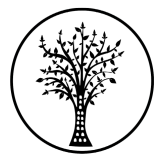
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Figure 4.2: Areas of Target affected by mining activities



Figure 4.3: Areas of Target affected by mining activities



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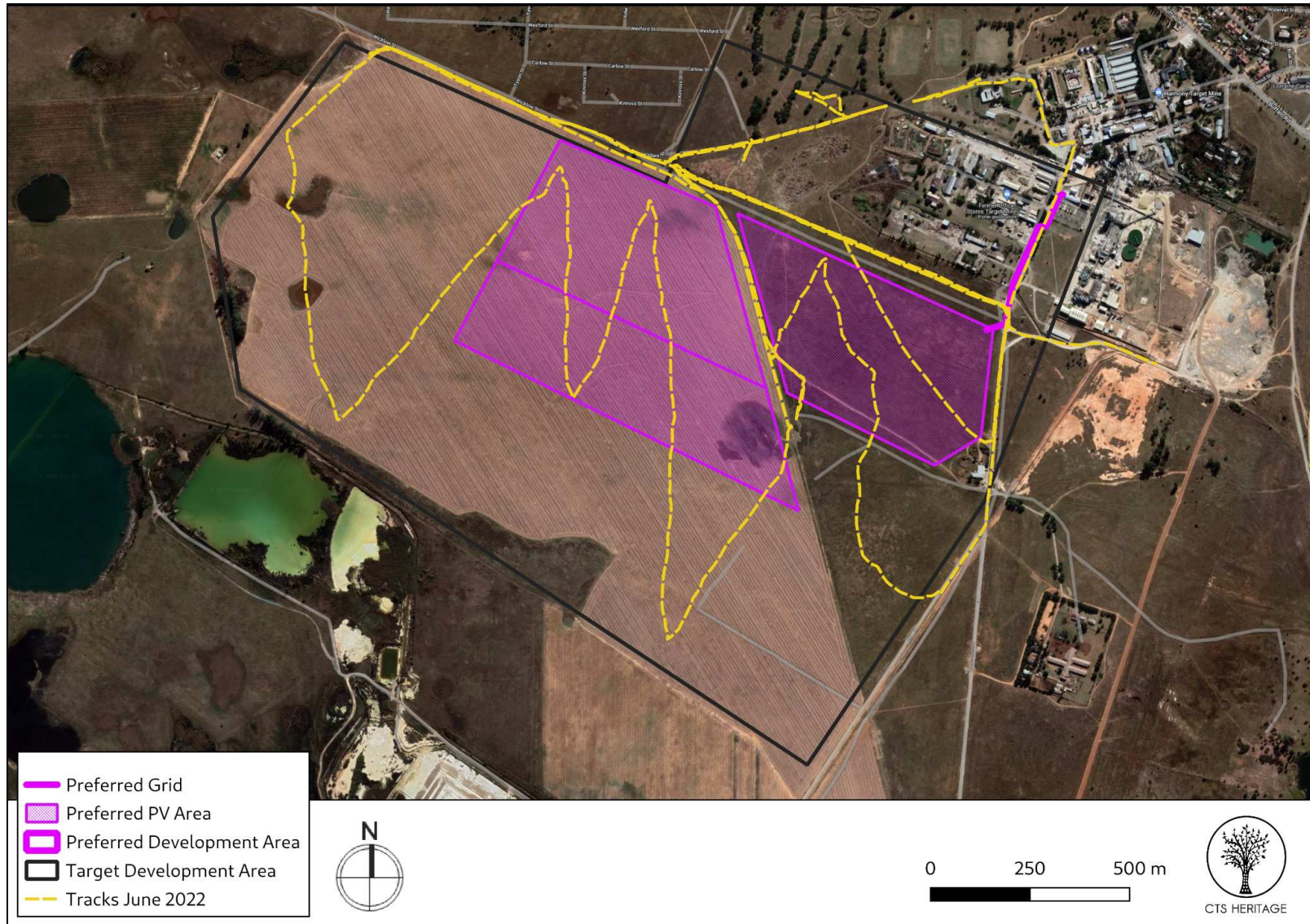
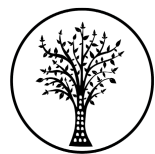


Figure 5: Overall track paths of foot survey - Target PV Facility



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#### 4.2 Heritage Resources identified

No significant archaeology was documented within the footprint at Target. The only isolated finds were two small probably Later Stone age cores (TG1). These cores were documented in the area of the footprint that is not currently earmarked for development.

Table 1: Heritage resources identified from fieldwork 2022

Site No.	Site Name	Description	Period	Co-ordinates		Grading	Mitigation
TG1	Target 1	Isolated artefacts: two miniature cores associated with microlithic flake production	LSA	-27.76088904	26.63345299	NCW	NA



Figure 6: Ex situ archaeological remains from Target: TG1: two miniature cores associated with microlithic flake production

### 4.3 Mapping and spatialisation of heritage resources

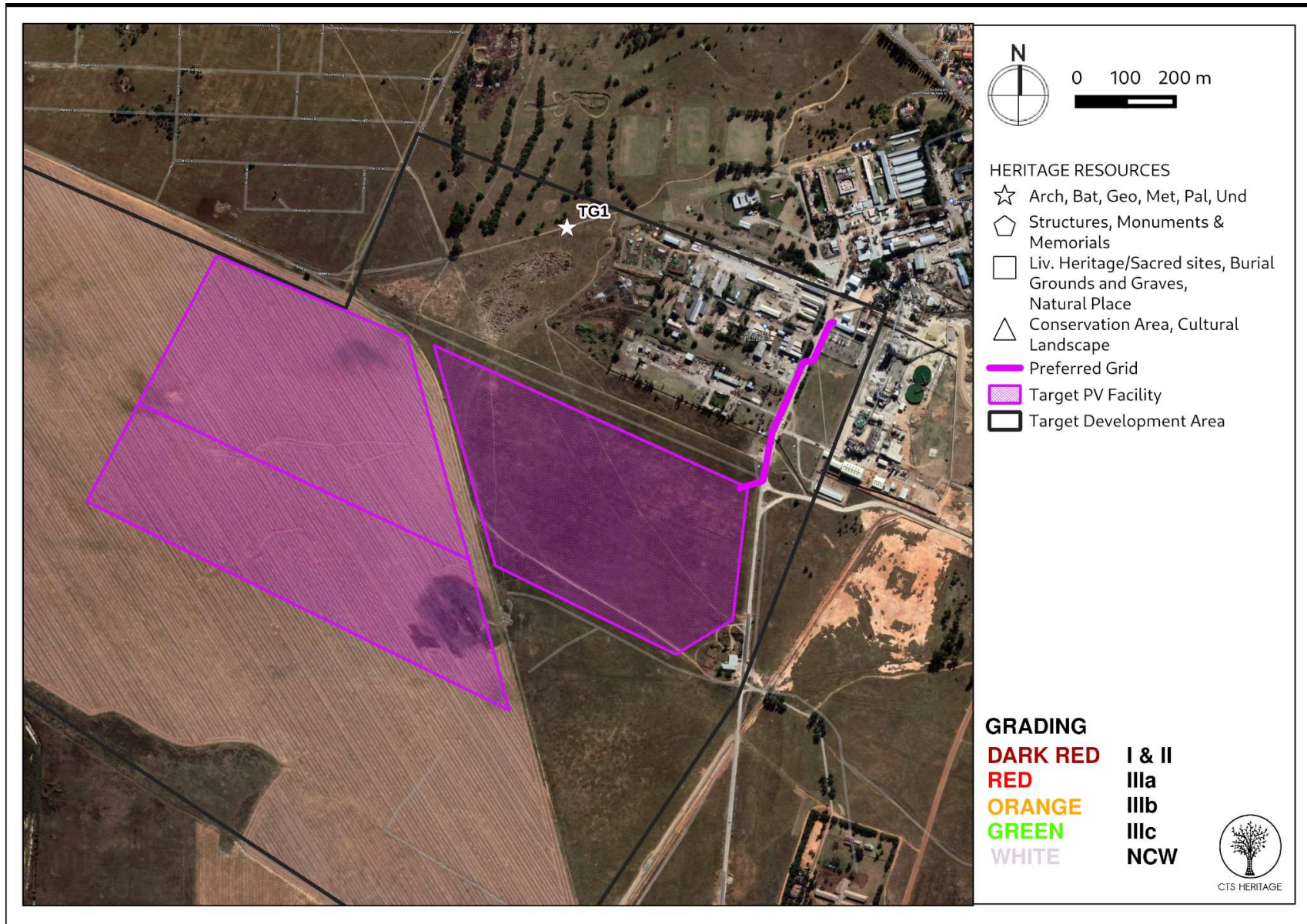
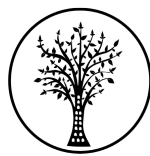


Figure 7: Map of significant heritage resources identified during the field assessment, relative to the proposed development.



## 5. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT

### 5.1 Assessment of impact to Heritage Resources

#### 5.1.1 Archaeology

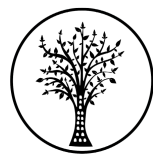
The potential for finding a dateable *in-situ* archaeological horizon at Target based on current surface observations outlined above appears to be low. The documented archaeology at Target is therefore classified as scientifically LOW SIGNIFICANCE.

Concerning the archaeology observed during the survey of the potentially affected area at Target, there are no objections to the authorization of the proposed development, provided that if any evidence of buried human remains are exposed during excavation, that development activities cease in the area of the identified remains.

No impacts to significant heritage resources are anticipated.

**Table 4.1: Impacts of the proposed development on archaeological resources**

<b>NATURE:</b> It is possible that buried archaeological resources may be impacted by the proposed development in the preferred location			
		<b>Without Mitigation</b>	<b>With Mitigation</b>
<b>MAGNITUDE</b>	<b>L (2)</b>	No archaeological resources of significance were identified within the development area	<b>L (2)</b> No archaeological resources of significance were identified within the development area however
<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>	Limited to the development footprint	<b>L (1)</b> Limited to the development footprint
<b>PROBABILITY</b>	<b>L (2)</b>	It is unlikely that significant heritage will be impacted	<b>L (1)</b> It is unlikely that significant heritage will be impacted
<b>SIGNIFICANCE</b>	<b>L</b>	$(2+5+1) \times 2 = 16$	<b>L</b> $(2+5+1) \times 1 = 8$
<b>STATUS</b>		Negative	Negative
<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>	Not Likely	<b>L</b> Not Likely
<b>CAN IMPACTS BE MITIGATED</b>		NA	
<b>MITIGATION:</b>			
<ul style="list-style-type: none"> <li>Should any previously unrecorded archaeological resources or possible burials be identified during the course of construction activities, work must cease in the immediate vicinity of the find, and SAHRA must be contacted regarding an appropriate way forward.</li> </ul>			
<b>RESIDUAL RISK:</b>			
None			



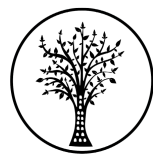
### 5.1.2 Palaeontology

According to the Desktop Palaeontology Assessment, “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 sandstones, shales and sands are typical for the country and might contain trapped fossils. The sands of the Quaternary period would not preserve fossils. The area has been disturbed from farming and mining so no fossils would be present on the surface.”

“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 right age to contain fossils but are covered by soils. Furthermore, the material to be excavated are soils and this does not preserve fossils. Since there is a small chance that fossils were trapped in pans that might occur below the soils and 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 low.” “Based on experience and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the overlying sands and soils of the Quaternary. There is a very small chance that fossils may occur in pans or springs but no such feature is visible in the satellite imagery. Nonetheless, a Fossil Chance Find Protocol should be added to the EMPr.”

**Table 4.2: Impacts of the proposed development to palaeontological resources**

<b>NATURE:</b> It is possible that buried palaeontological resources may be impacted by the proposed development in the preferred location					
		<b>Without Mitigation</b>		<b>With Mitigation</b>	
<b>MAGNITUDE</b>	<b>M (5)</b>	According to the SAHRIS Palaeosensitivity Map (Figure 3.1), the area proposed for development of the PV facilities is underlain by sediments that have moderate palaeontological sensitivity.	<b>M (5)</b>	According to the SAHRIS Palaeosensitivity Map (Figure 3.1), the area proposed for development of the PV facilities is underlain by sediments that have moderate palaeontological sensitivity.	
<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>	Limited to the development footprint	<b>L (1)</b>	Limited to the development footprint	
<b>PROBABILITY</b>	<b>L (1)</b>	It is unlikely that significant fossils will be impacted	<b>L (1)</b>	It is unlikely that significant fossils will be impacted	
<b>SIGNIFICANCE</b>	<b>L</b>	(5+5+1)x1=11	<b>L</b>	(5+5+1)x1=11	
<b>STATUS</b>		Negative		Negative	
<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>	Not Likely	
<b>CAN IMPACTS BE MITIGATED</b>		Yes			
<b>MITIGATION:</b>					
The attached Chance Fossil Finds Procedure must be implemented for the duration of construction activities Should any previously unrecorded palaeontological resources be identified during the course of construction activities, work must cease in the immediate vicinity of the find, and SAHRA must be contacted regarding an appropriate way forward.					
<b>RESIDUAL RISK:</b> None					



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## 5.2 Sustainable Social and Economic Benefit

According to the Social Impact Assessment completed for this project, Harmony Gold currently has social labour plans in place which meet the requirements of employment in terms of local employment and skills development. As per the SLP, the Harmony Target Plant Human Resources Development (HRD) Strategy supports the company's business strategy and objectives, as well as the South African legislative and regulatory framework that seeks to address the general skills shortage within the country, as well as ensuring equitable representation in the workplace. Part of these strategies include:

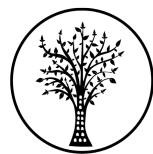
- Adult Basic Education Training
- Portable Skills Training plans
- Trainee Programmes and Learnerships for Employees
- Management Development Programs
- Talent Pool Development
- Community Human Resource Development Programme
- Learnerships for the Community

It is the mine's intention to incorporate the development of the Harmony One Plant Solar PV facility under the same principles as followed in the SLP, albeit on a smaller scale, relative to the size of the development of a 30MW solar PV facility.

The establishment of the facility will be a game-changing event for the community and local municipality. It'll result in the following impacts, in varying degrees:

- People
  - Skills development
  - Employment
  - Renewed sense of hope
  - Improved social outcomes owing to SED investments: Health, Education
- Economic participation
- Increased sense of prestige for the community and town
- Planet: Increased power supply for the country, with less damage to the planet as a consequence.
- Profit
  - Increased revenue for local municipality
  - Increased economic activity in local community and broader municipality
  - Investment in social and commercial infrastructure to increase economic activity.

Based on the findings of the SIA, the anticipated socio-economic benefits to be derived from this project outweigh the potential negative impacts to heritage resources, especially if the Final Layout (Figure 8) is implemented.



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### 5.3 Proposed development alternatives

Based on the outcomes of this analysis, and other environmental constraints, a Final Layout has been developed that fits within the various environmental constraints identified. This Final Layout is mapped in Figure 8 relative to the identified heritage resources and is the preferred development layout from a heritage perspective.

Three alternative grid corridors (300m in width) have been assessed. These are described as follows:

**Alternative 1:** A 300m wide corridor between the switching substation located on the Harmony Target Solar PV Facility and the Avgold Substation via an overhead power line (~750m in length). The corridor exits the facility from the north east corner of the development footprint, and follows existing Eskom power lines to the east of the development area as well as an unnamed mine access road. The route skirts around the Loraine One Substation to access the south side of the Avgold Substation (located directly south west of the Loraine One Substation).

**Alternative 2:** A 300m wide corridor between the switching substation located on the Harmony Target Solar PV Facility and the Avgold Substation via an overhead power line (~440m in length). The corridor exits the facility from the north east corner of the development footprint, and follows a secondary mine access road to access the south side of the Avgold Substation (located 400m north east of the site).

**Alternative 3:** A 300m wide corridor between the switching substation located on the Harmony Target Solar PV Facility and the Avgold Substation via an overhead power line (~1.5km in length). The corridor exits the facility from the north west corner of the development footprint, and follows the farm boundary for approximately 200m west before turning north and then east to follow an unnamed mine access road for approximately 570m. at the junction with the secondary road, the route turns south to access the south side of the Avgold Substation.

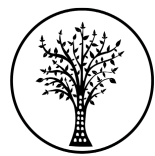
Observation TG1 falls within the proposed grid alignment alternative 3, however this observation is determined to be Not Conservation-Worthy and as such, no impact to heritage resources is anticipated from this final layout.

### 5.4 Cumulative Impacts

This application is for the proposed development of a solar energy facility and associated grid connection to facilitate activities at the Target Harmony Mine. The location of the proposed PV facility within an area with existing mining activities may lend itself to cumulative impacts. However, in terms of cumulative impacts to heritage resources, it is preferable that industrial-type infrastructure is clustered within an area in order to prevent the sprawl of industrial development across otherwise sensitive cultural landscapes.

As such, it is not anticipated that the proposed development will have a negative cumulative impact on significant heritage resources.





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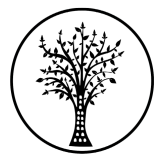
## **6. RESULTS OF PUBLIC CONSULTATION**

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

## **7. CONCLUSION**

The areas surveyed as part of this assessment have been transformed through agricultural interventions and/or mining activity. No archaeological resources of scientific cultural value were identified within the area proposed for the Target PV Facility and its grid connection and as such, no impact to significant archaeological heritage resources is anticipated.

Furthermore, no impacts to significant palaeontological heritage is anticipated on condition that the attached Chance Fossil Finds Process is implemented and no impacts to the cultural landscape are anticipated.



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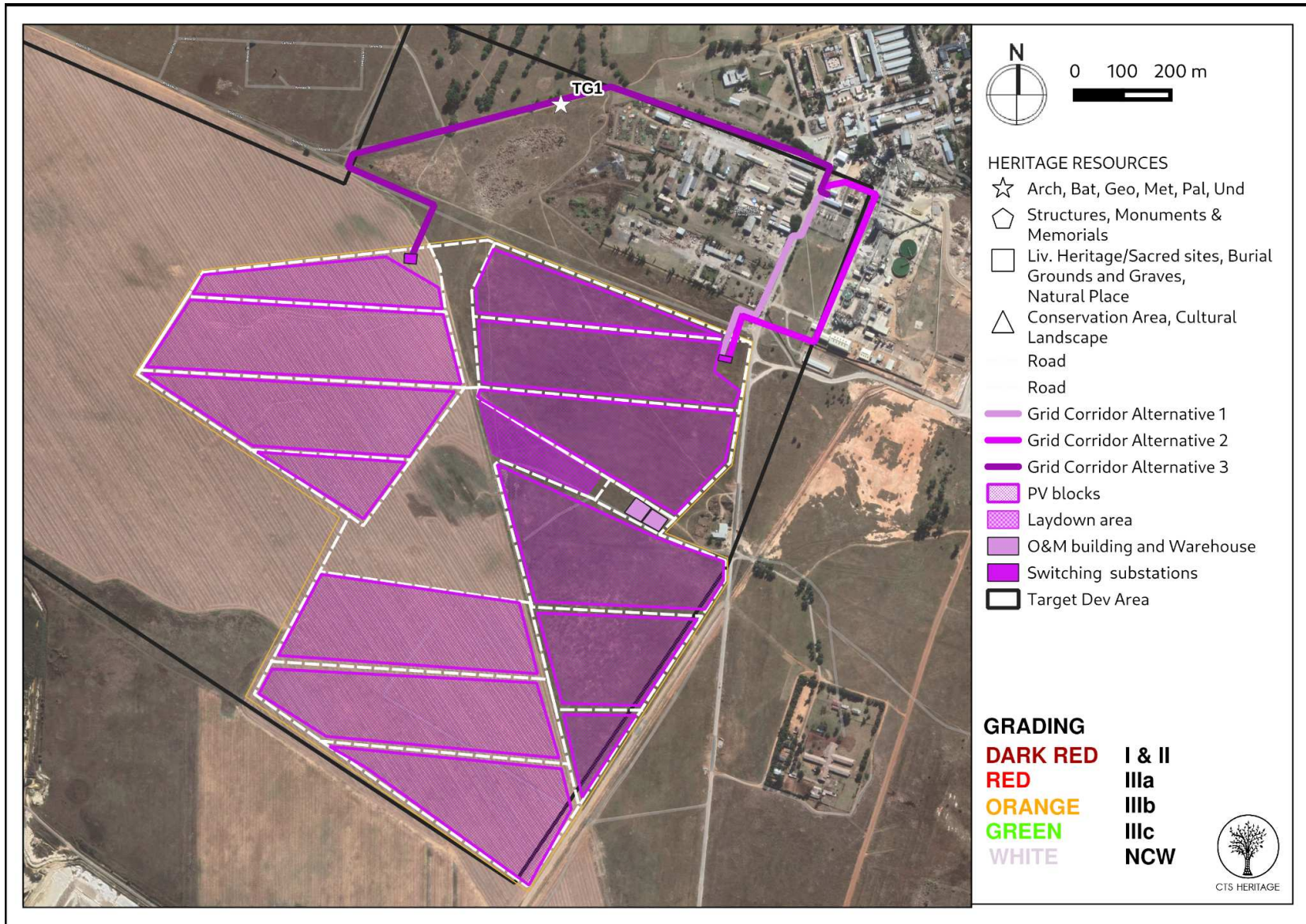
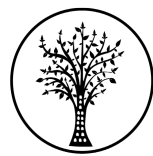


Figure 8: Map of significant heritage resources identified during the field assessment, relative to the proposed Final Layout

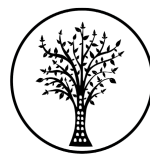


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## 8. RECOMMENDATIONS

There is no objection to the proposed development in terms of impacts to heritage resources on condition that:

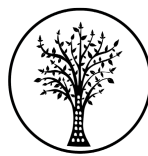
- The attached Chance Fossil Finds Procedure is implemented for the duration of construction activities
- Should any buried archaeological resources or human remains or burials be uncovered during the course of development activities, work must cease in the vicinity of these finds. The South African Heritage Resources Agency (SAHRA) must be contacted immediately in order to determine an appropriate way forward.



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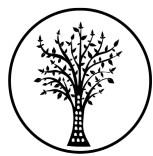
## 9. REFERENCES

Heritage Impact Assessments				
NID	Author(s)	Date	Type	Title
109887	HIA Phase 1	Lloyd Rossouw	10/09/2012	Phase 1 Heritage Impact Assessment of a Proposed New Solar Facility at Grootspruit 252 near Allanridge, FS
120509	Archaeological Specialist Reports	Jaco van der Walt	06/05/2013	Archaeological Scoping Report for the Proposed Grootkop Solar Energy Facility
120510	PIA Desktop	Barry Millstead		Desktop Palaeontology Heritage Impact Assessment Report for the Grootkop Solar Energy Facility
164270	AIA Phase 1	Jaco van der Walt	30/08/2013	Archaeological Impact Assessment for the proposed Grootkop Solar Energy Facility, Free State Province



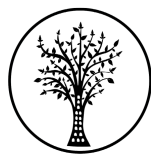
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## APPENDICES



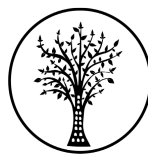
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## APPENDIX 1: Heritage Screening Assessment (2022)



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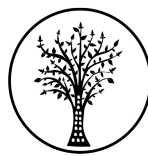
## APPENDIX 2: Archaeological Assessment (2022)



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### APPENDIX 3: Palaeontological Assessment (2022)





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## APPENDIX 4: Chance Fossil Finds Procedure