HERITAGE IMPACT ASSESSMENT

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

Development of the Fountain Solar PV1 Facility near De Aar, Northern Cape Province

SAHRIS Ref:

Prepared by CTS Heritage

CTS HERITAGE

Jenna Lavin

For

Savannah Environmental

July 2022

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EXECUTIVE SUMMARY

1. Site Name:

Fountain Solar PV Facility

2. Location:

Farm Wag 'n Bietjie 5, Portion 1 of Farm Riet Fountain 6, Portion 3 and 4 of Farm Carolus Poort 3

3. Locality Plan:

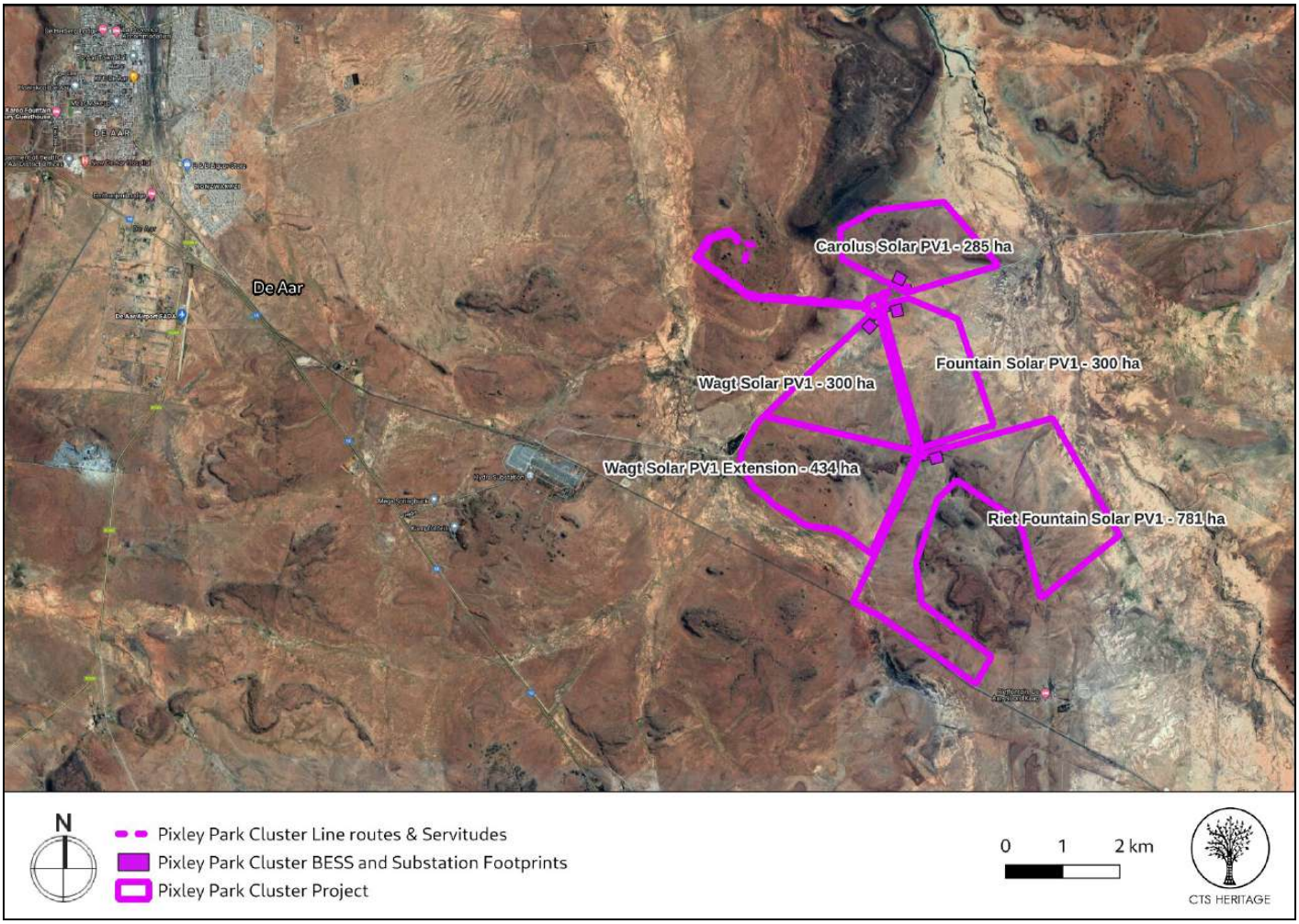

Figure A: Location of the proposed study area

4. Description of Proposed Development:

Fountain Solar PV1 (Pty) Ltd is proposing the development of a Photovoltaic (PV) Solar Energy Facility and associated infrastructure on Portion 1 of the Farm Riet Fountain No.6, located approximately 10km east of De Aar within the Emthanjeni Local Municipality in the Northern Cape Province. The facility will have a contracted capacity of up to 100MW and will be known as Fountain Solar PV1. The project is planned as part of a cluster of

renewable energy facilities known as Pixley Park, which includes three (3) additional 100MW Solar PV Facilities (Wagt Solar PV1, Carolus PV1, and Rietfontien Solar PV), and grid connection infrastructure connecting the facilities to the existing Hydra Substation. The projects will all connect to the new Vetlaagte Main Transmission Substation (MTS) via the Wag 'n Bietjie MTS.

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

Site No.	Site Name	Description	Density m2	Period	Co-ordinates		Grading	Mitigation
020	Fountain	Two patinated hornfels flakes	0 to 5	MSA	-30.70753	24.15583	NCW	NA
021	Fountain	Patinated hornfels flake	0 to 5	MSA	-30.70754	24.15995	NCW	NA
022	Fountain	Early MSA patinated hornfels flake	0 to 5	MSA	-30.70754	24.16425	NCW	NA
023	Fountain	Various patinated hornfels flakes and cores	5 to 10	MSA	-30.70621	24.16527	NCW	NA
024	Fountain	Patinated hornfels flake	0 to 5	MSA	-30.70543	24.16088	NCW	NA
025	Fountain	Chert core and hornfels flake	0 to 5	MSA	-30.70473	24.15455	NCW	NA
030	Fountain	Patinated hornfels flake	0 to 5	MSA	-30.69968	24.15232	NCW	NA
031	Fountain	Various hornfels flakes	5 to 10	MSA	-30.69845	24.15833	NCW	NA
032	Fountain	Kraal, dam windmill	n/a	Modern	-30.69642	24.16576	NCW	NA
033	Fountain	Patinated hornfels flakes	0 to 5	MSA	-30.69665	24.16344	NCW	NA
034	Fountain	Patinated hornfels flakes	0 to 5	MSA	-30.69634	24.15944	NCW	NA
035	Fountain	Hornfels blade and point	0 to 5	LSA	-30.69602	24.15521	NCW	NA
036	Fountain	Very patinated hornfels flakes	0 to 5	MSA	-30.69598	24.15159	NCW	NA
037	Fountain	Hornfels core and flakes	0 to 5	MSA	-30.69342	24.14989	NCW	NA
038	Fountain	Various hornfels flakes	5 to 10	MSA	-30.69189	24.15262	NCW	NA
039	Fountain	Various hornfels flakes	5 to 10	MSA	-30.69127	24.15398	NCW	NA
040	Fountain	Very patinated hornfels flakes	0 to 5	MSA	-30.69006	24.15548	NCW	NA

6. Anticipated Impacts on Heritage Resources:

The overall archaeological sensitivity of the development area with regard to the preservation of Early, Middle and Later Stone Age archaeology as well as Khoe and San heritage, early colonial settlement is regarded as very high. Despite this, the field assessment conducted for this project has demonstrated that the specific area proposed for development has low sensitivity for impacts to significant archaeological heritage.

As indicated above, the results of this assessment align with the findings of other specialists such as Morris (2011) who notes that ephemeral MSA and LSA scatters are the dominant archaeological signature of the area and the majority of these are therefore not archaeologically significant. Furthermore, it is noted that pre-colonial occupation tended to be concentrated around the natural shelters created by dolerite outcrops in this area and as such, we highly recommend that careful consideration is made to placing the solar PV infrastructure away from these outcrops. These areas are mapped in Figure 4.

Based on experience, other reports and the lack of any significant previously recorded fossils from the area, it is unlikely that any fossils would be preserved in the Tierberg Formation or Adelaide Subgroup. Nonetheless, a Fossil Chance Find Protocol should be added to the EMPr.

7. Recommendations:

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

- The dolerite outcrops spanning west-east along portions of Wag ‘n Bietjie 5 as well as the outcrops in the far northern end near Carolus Poort should ideally be avoided for the location of the solar PV laydown area and access roads carefully planned to minimise the impact on any other dolerite outcrops. Site 062 lies on a small ridge on Riet Fountain 6 and roads or PV laydown areas should be placed on the level grassy plains and not on the ridges where archaeological material is concentrated.
- 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.

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 80 Heritage Impact Assessments throughout South Africa.

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APPENDICES

1. INTRODUCTION

1.1 Background Information on Project

Fountain Solar PV1 (Pty) Ltd is proposing the development of a Photovoltaic (PV) Solar Energy Facility and associated infrastructure on Portion 1 of the Farm Riet Fountain No.6, located approximately 10km east of De Aar within the Emthanjeni Local Municipality in the Northern Cape Province. The facility will have a contracted capacity of up to 120MW and will be known as Fountain Solar PV1. The project is planned as part of a cluster of renewable energy facilities known as Pixley Park, which includes three (3) additional Solar PV Facilities (Wagt Solar PV1, Carolus PV1, and Rietfontien Solar PV), and grid connection infrastructure connecting the facilities to the existing Hydra Substation. The projects will all connect to the new Vetlaagte Main Transmission Substation (MTS) via the Wag 'n Bietjie MTS.

Infrastructure associated with the Solar PV Facility will include the following:

- Solar PV array comprising bifacial PV modules and mounting structures, using single axis tracking technology
- Inverters and transformers
- Cabling between the panels
- Battery Energy Storage System (BESS)
- Laydown areas, construction camps, site offices
- 12m wide Access Road and entrance gate from the [xx rod] to project site and switching station
- 6m wide internal distribution roads
- Operations and Maintenance Building, Site Offices, Ablutions with conservancy tanks, Storage Warehouse, workshop, Guard House
- Onsite 132kV IPP Substation, including the HV Step-up transformer, and MV Interconnection building 132kV Overhead Power Line (OHPL) – 30m height from the switching station to the Main Transmission Substation (MTS) located on farms Vetlaagte and Wagt, which is to be handed back to Eskom (a separate EA is being applied for in this regard)
- Extension of the 132kV Busbar at the MTS
- 132kV Feeder Bay at the MTS
- Extension of the 400kV Busbar at the MTS
- Installation of a new 400/132kV Transformer and bay at the MTS

A development footprint of approximately 300ha has been identified within the broader project site (approximately 8200ha in extent), by the developer for the development of the Fountain Solar PV1 Facility, which 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 bid the proposed project under the Department of Mineral Resources and Energy's (DMRE's) Renewable Energy Independent Power Producer Procurement (REIPPP) Programme (or similar programme), with the aim of evacuating the generated power into the national grid. 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 Fountain Solar PV1 set to inject up to 120MW into the national grid.

1.2 Description of Property and Affected Environment

The four Pixley Park solar PV projects lie on three farms, Wag 'n Bietjie 5, Riet Fountain 6 and Carolus Poort 3. These properties are to the east and north east of the Hydra substation which is roughly 10km south of De Aar in the Northern Cape. A number of renewable energy projects, particularly solar PV farms, have been proposed immediately surrounding this substation and three completed solar farms lie north and northwest such as De Aar Solar and Paarde Valley. A completed 144MW wind farm lies on the plateau north east of the development. Large 765kV powerlines traverse the area connecting the grid to and from the Hydra substation. The northern boundary at Carolus Poort holds a prominent koppie while smaller dolerite outcrops run in a west to east line on Wag 'n Bietjie 5. Another dolerite ridge lies on Riet Fountain 6 but much of the development footprint has been planned to avoid this rocky topography.

The designated areas for the solar PV farms mostly fall on flat grassland dotted with typical Karoo windmills, kraals and tanks for sheep and cattle farming.The vegetation is typical of the Karoo and the grassland was dense enough over much of the site to hamper visibility of archaeological material lying on the surface, especially due to the recent high rainfall this year.

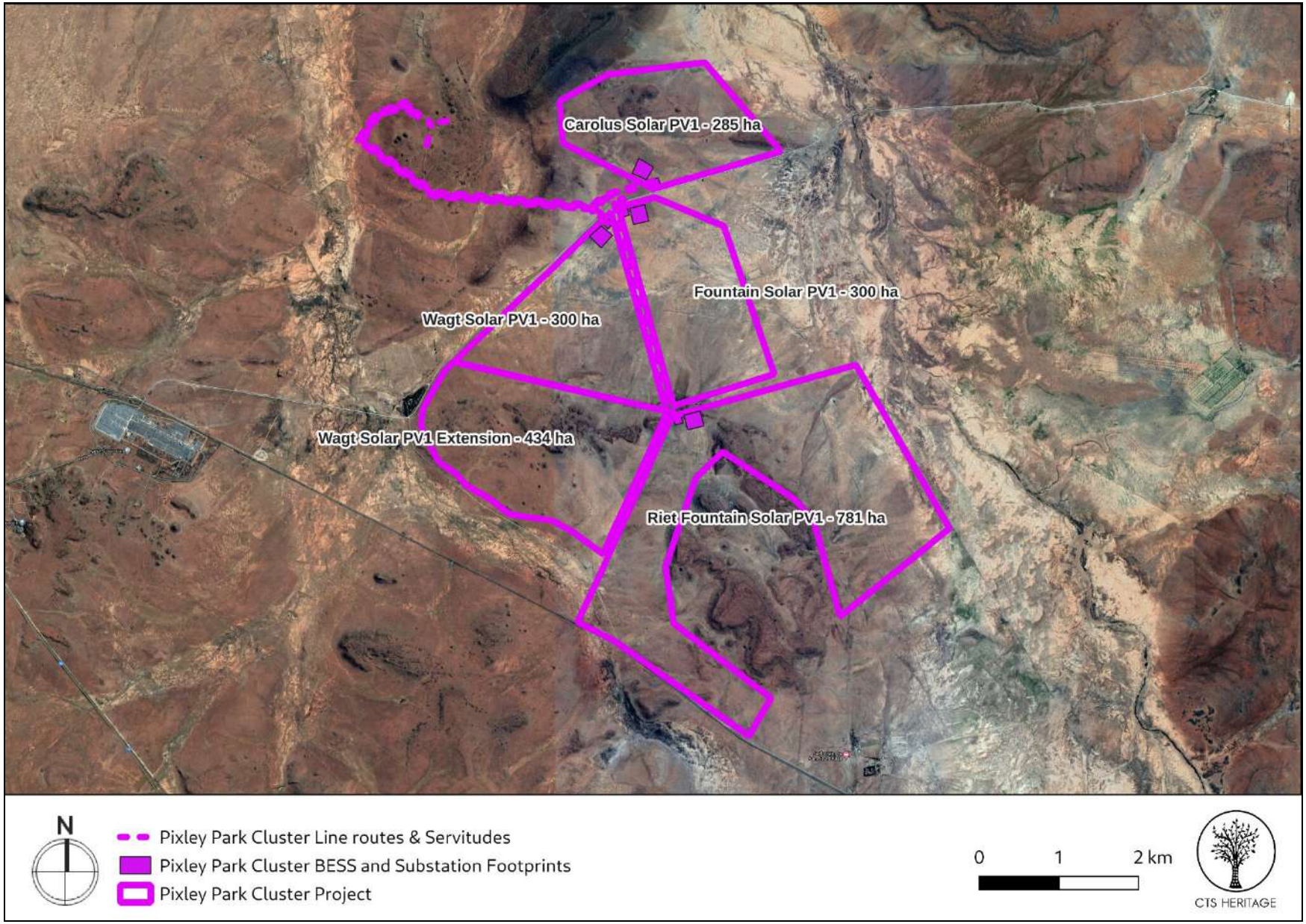

Figure 1.1: The proposed development area

Figure 1.2: The proposed development area

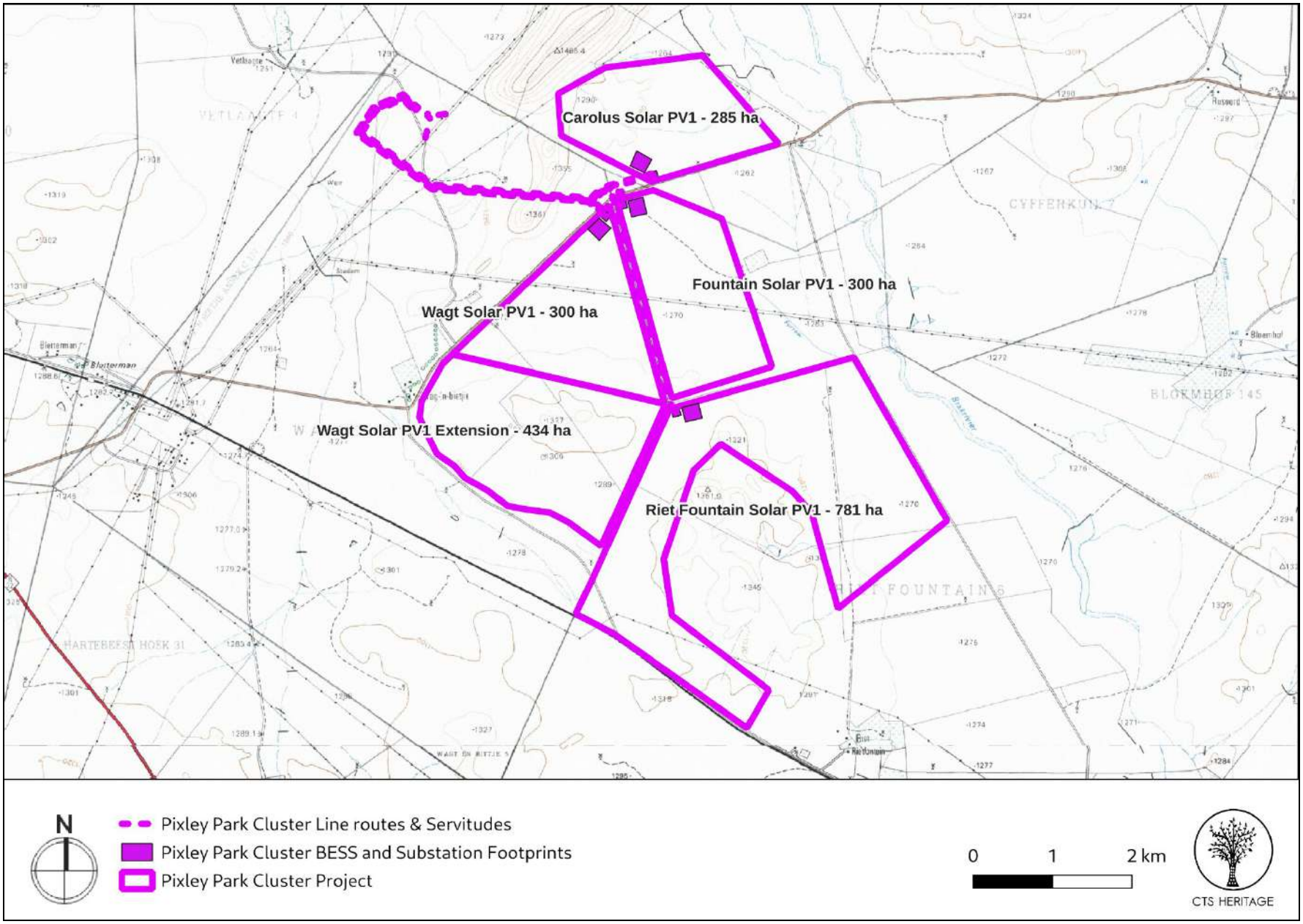

Figure 1.3: Study Area reflected on the 1:50 000 Topo Map

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 his site visit on 7-11 February and 23-24 May 2022 (Appendix 2)
- A Desktop Palaeontology Assessment was completed (June 2022)
- 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

Recent good rains in the area had significantly elevated the vegetation density (mostly grassland) for the survey but sufficient open ground was found throughout the study area to properly document the archaeological material. Much of the project area is relatively flat and easily traversed, which enabled very high survey coverage

to be achieved. Archaeological visibility was very high in the areas on and immediately adjacent to the dolerite outcrops where most of the archaeological material is concentrated.

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 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) x 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).

3. HISTORY AND EVOLUTION OF THE SITE AND CONTEXT

3.1 Desktop Assessment

De Aar was originally established on the Farm "De Aar." The name means "the artery," a reference to its underground water supply. The Cape Government Railways were founded in 1872, and the route that the government chose for the line to connect the Kimberley diamond fields to Cape Town on the coast, ran directly through De Aar. Because of its central location, the government also selected the location for a junction between this first railway line, and the other Cape railway networks further east, in 1881. In 1899 two brothers who ran a trading store and hotel at the junction, Isaac and Wulf Friedlander, purchased the farm of De Aar. Following the Anglo Boer War, the Friedlander brothers surveyed the land for the establishment of a town. The municipality was created a year later in 1900.

Orton (2012) writes that “The colonial period history of the area is not that old. While the town of De Aar only dates back to 1903, just after the cessation of the 1899-1902 Anglo-Boer War, farms were given out and surveyed in the 1800s.” He goes on to note that “ The railway junction dates to 1881 when Cape Town and Kimberley were linked by rail after diamonds were discovered at the latter town. It was very important to the British during the Anglo-Boer War since railway lines from Cape Town and Port Elizabeth joined here and extended on through Kimberly to Mafikeng (AngloBoerWar.com 2011). De Aar was also the site of the first use of wireless telegraphy in South Africa where the British employed it to maintain communications between their various columns operating in the area. However, owing to the climatic conditions in the Karoo, the wireless sets, which were designed for shipboard use, could not perform properly and were soon withdrawn from inland service (Baker 1998). The town was laid out around the railway junction on the farm De Aar which was purchased in 1889 by Isaac and Wolf Friedlander, who ran a trading store and hotel at the railway junction. After the war, the brothers established the town.” Orton (2012) also notes that “Two Provincial Heritage Sites occur in De Aar. These are the “Olive Schreiner house” and the “St Paul’s Church”. At least one other building is listed (SAHRA, n.d.). Many of the older buildings in the town are early 20th century, including some art deco, but the majority of structures date to the mid- to late 20th century. De Aar is well known as one of the places where Olive Schreiner lived. She and her husband were there from 1907 to 1914.”

Kruger (2012) describes the development area as “characterised by flat undulating Karoo vegetation comprised of relatively sparse scrub and grasses, with dolerite hills in the surrounding landscape. Large portions of the land is currently devoted to livestock farming but a number of solar energy facilities are to be constructed on farms around De Aar. Shallow soils covers a combination of calcrete, shale and dolerite substrates, and large sections in the landscape are exposed to sheet erosion, specifically along low lying areas and drainage lines. Dolerite and sandstone is present, while exotic rocks occur in the gravel of the Orange River bed and terraces. These provided suitable material for stone tool production during the Earlier, Middle and Later Stone Ages.“

Archaeology

As part of the 2012 process for approval of the Vetlaagte Solar Energy Facility located immediately adjacent to the proposed development area, Kruger conducted a detailed Heritage Impact Assessment of the area. According to Kruger (2012), "During the survey, widespread Middle Stone Age (MSA) material, including characteristic formal MSA stone tools such as points, blades and scrapers were documented in the survey area along a north-south oriented drainage on the (western) periphery of the property. The lithic remains occur in three large scatters and, almost without exception, in low lying areas along non-perennial drainage lines and wetland areas where precipitation and groundwater have exposed the stone tools, originally deposited on a decomposed calcrete rock layer approximately 30cm sub surface. Preliminary examinations of some of the lithics indicated that a number of flakes displayed facetted platforms, characteristic of the MSA." Part of the study area for the Wag 'n Bietjie development assessed in this report is located within the drainage described above. It is therefore likely that the proposed development will impact on significant MSA archaeology.

Kruger (2012) also documented historical period remains, "specifically the old Vetlaagte homestead with restored farmhouse, outbuildings, midden and labourers quarters, as well as a dilapidated dam wall constructed in the drainage line east of the farmstead are present on the property. The date of construction of the farm house is denoted by a year count ("1930") on the front gable of the structure. The entire farmstead is situated in an area excluded from the solar farm development. A small family graveyard, associated with the farmstead at Vetlaagte, also occurs in the exclusion zone about 100m north of the farm house."

In his assessment of areas adjacent to this proposed development, Orton (2012) found that "All the archaeological finds on Badenhorst Dam Farm were pre-colonial, but nevertheless, different types were present. This farm also had areas with artefacts best described as being 'background scatter'. The grass cover, however, meant that fewer such areas were identified. Most were in open, silty patches that clearly hold water in the rainy season…" Orton (2012) found LSA artefacts associated with the ridge running through the property that he assessed, and MSA artefacts from a pan-like area. He noted that "the artefacts in the flatter areas here appeared to be of much lower density and far fewer occurrences were recorded. However, stone artefact scatters with spatial integrity were more common. These were predominantly LSA and very much focused on the rocky ridges crossing the farm."

Orton (2012) noted that the spatially constrained scatters of artefacts that he identified "are almost certain to indicate places where people camped and the durable stone artefacts are now all that remains as evidence. It is also notable that their locations are not random – they are placed on level areas and saddles along the ridges. One of these LSA scatters, DAR2011/019 (#026) included a thumbnail scraper indicative of a mid- to late Holocene age. Some of the artefacts here were very black and shiny indicating recent flaking and deposition." Orton (2012)

also identified a number of piled stone structures. These appeared to be concentrated on one particular dolerite ridge and, unlike those from elsewhere in the Karoo, only one may have been a kraal. He determined that these structures are likely to be pre-colonial in age as similar piles have been recorded in an almost certain pre-colonial context in the Seacow River valley (Hart 1989). Orton (2012) also identified a number of engraved rocks that date to the LSA and historical times. All of Orton's findings (2012) are mapped in Figure 3 and 3b. While these resources fall outside of this development area, they give an indication of the likely archaeological sensitivity of the development area under consideration in this assessment.

A recent field assessment on an adjacent farm conducted by CTS Heritage found that "The overall archaeological sensitivity of the development area with regard to the preservation of Early, Middle and Later Stone Age archaeology as well as Khoe and San heritage, early colonial settlement is regarded as very high. Despite this, the field assessment conducted for this project has demonstrated that the specific area proposed for development has low sensitivity for impacts to significant archaeological heritage." The report goes on to note that "Two sites warranted protection with an interesting scatter of Still Bay tools on top of a dolerite outcrop with excellent views of the surrounding area. It is highly unlikely this area will be developed and it is recommended that infrastructure is not placed on this outcrop. Another site was found warranting a IIIB rating with pottery, bone and an extensive stone tool assemblage amongst the dolerite outcrops on the eastern end of the property. Again, this site has been demarcated as sensitive and the project team has been advised to avoid this area when finalising the layouts. A minimum buffer of 100m is recommended from this site (Wag n Bietjie 014). The rest of the observations are typical of the area and are ubiquitously distributed in low densities of less than 5 artefacts per observation." Similar heritage resources are likely to be located within the area proposed for development.

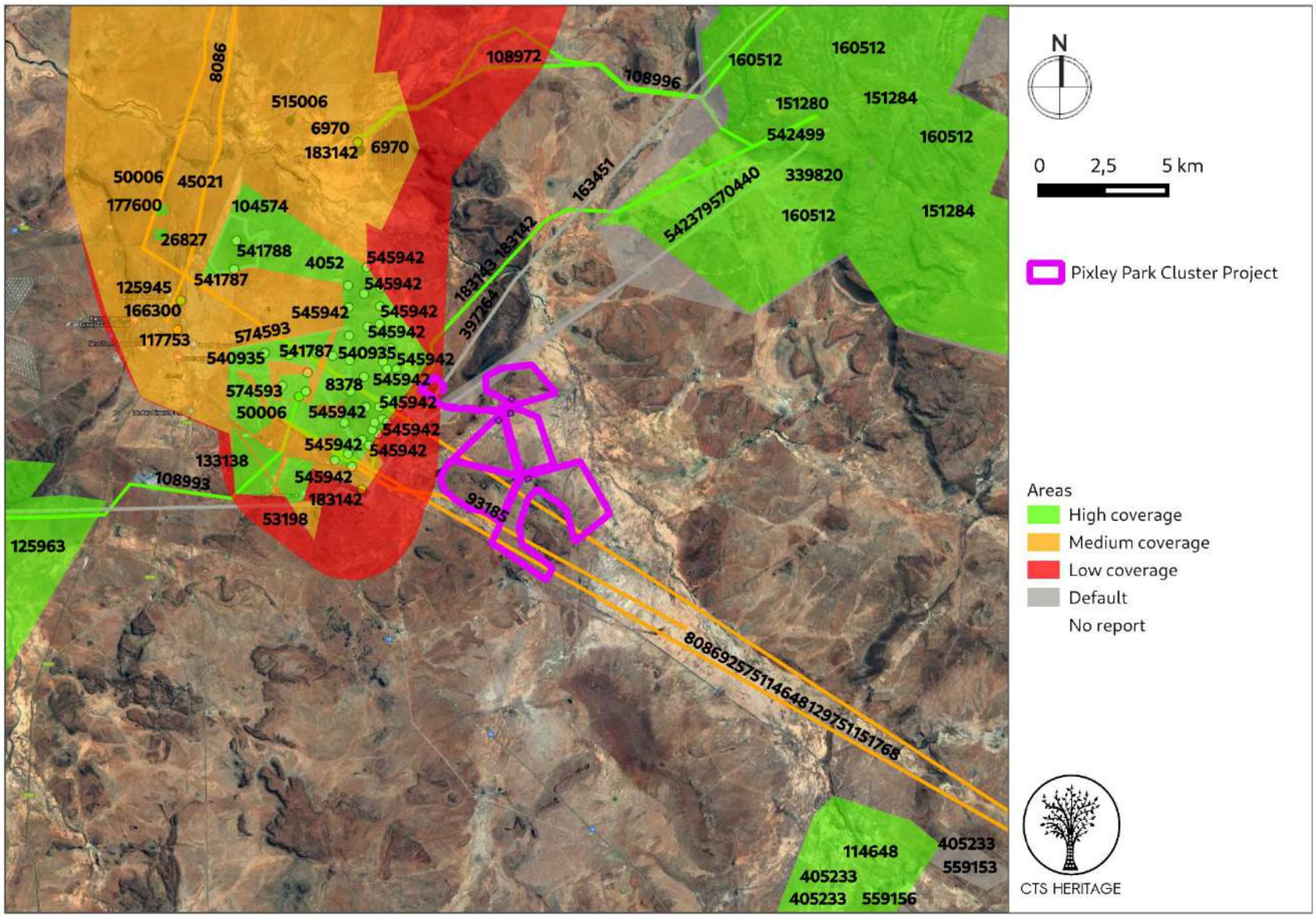

Figure 2.1: Spatialisation of heritage assessments conducted in proximity to the broader study area

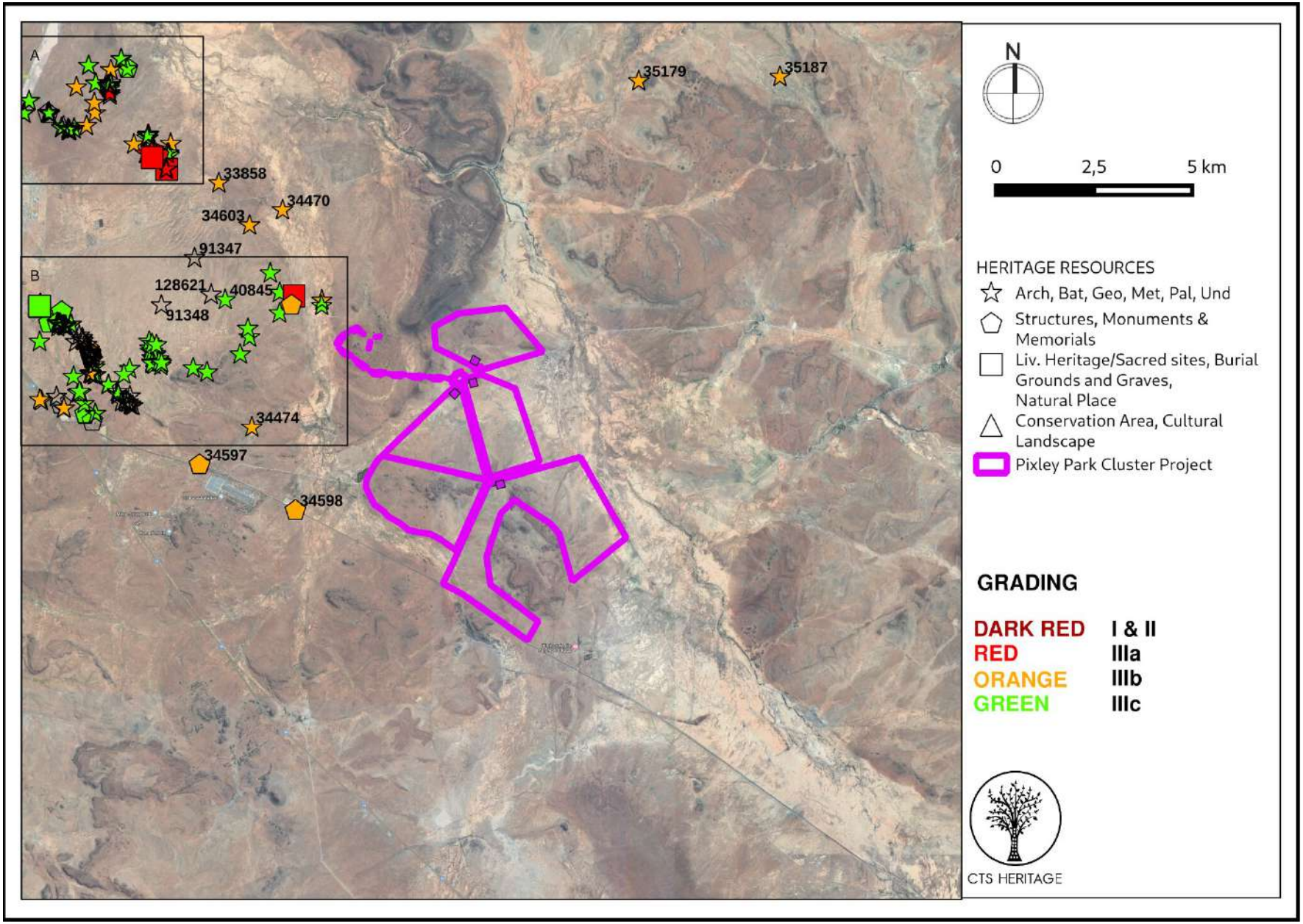

Figure 2.2: Spatialisation of heritage resources known in proximity to the broader study area

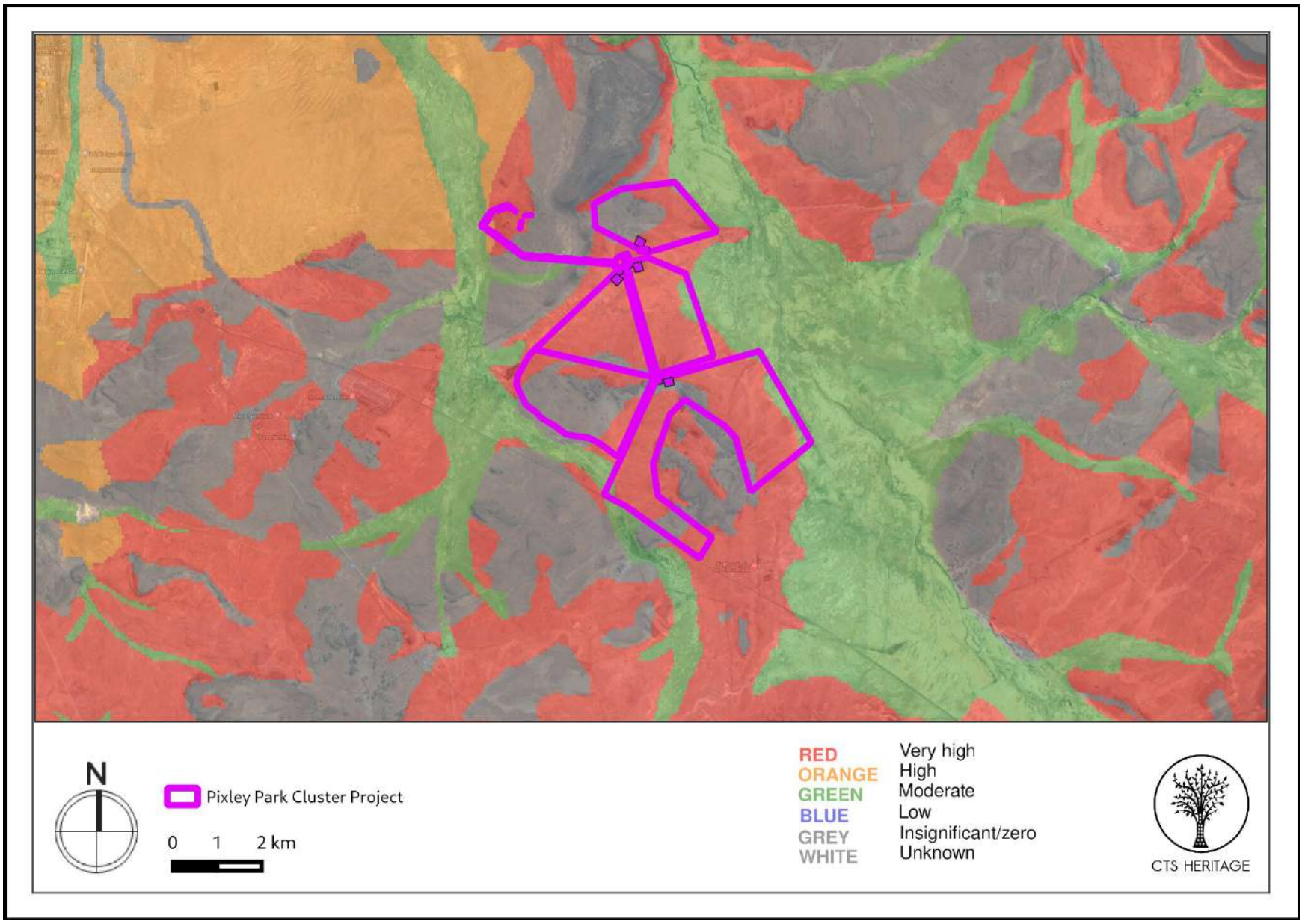

Figure 3.1: Palaeontological sensitivity of the area surrounding the broader study area

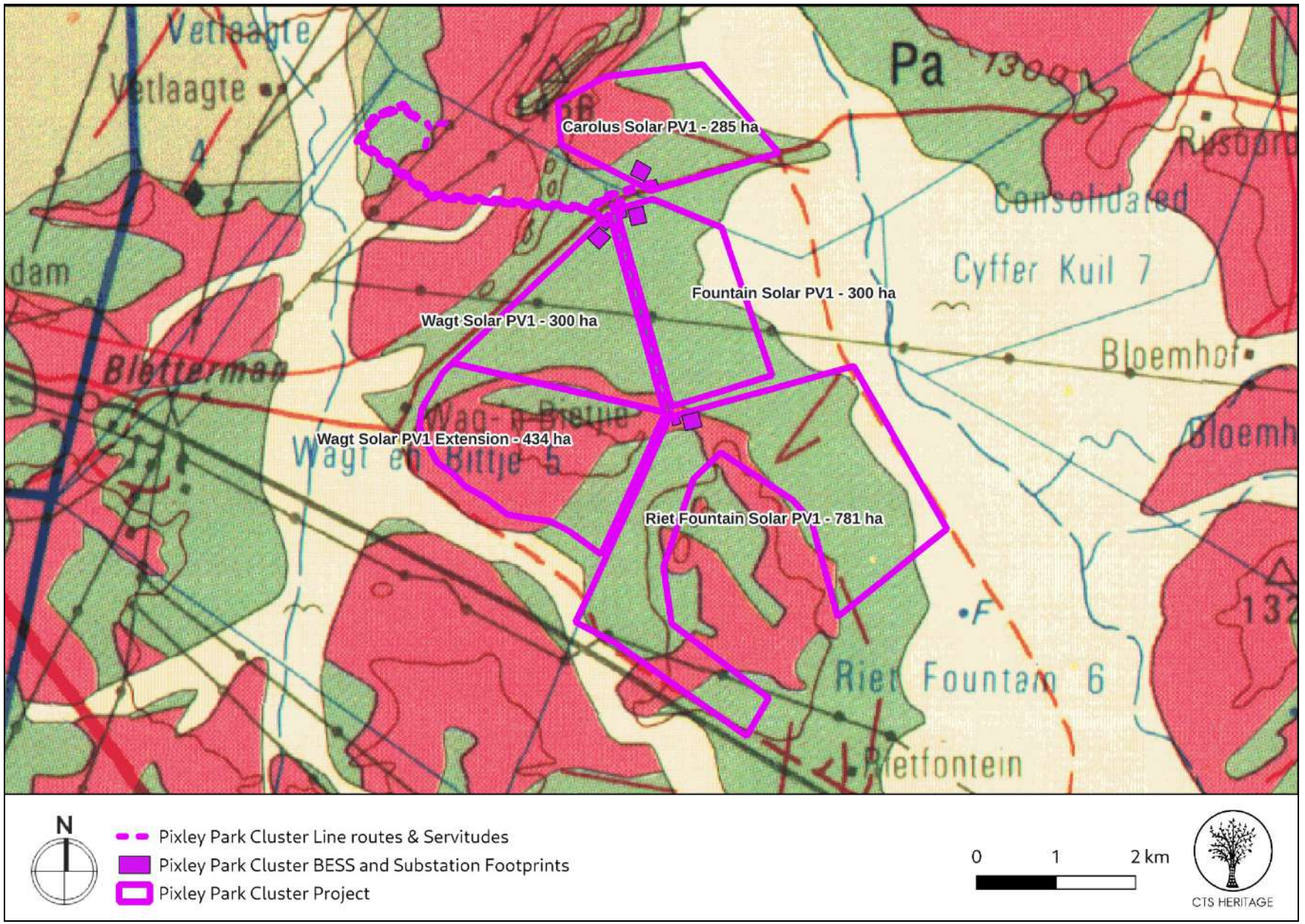

Figure 3.2: Geology Map. Extracted from the Council for GeoSciences Map 3024 for Colesburg indicating that the development area is underlain by Jd: Jurassic Dolerite, Pt (lighter green): Tierberg Formation of the Ecca Group and Pa (darker green): Adelaide Subgroup of the Beaufort Group

3.2 Palaeontology

According to the SAHRIS Palaeosensitivity Map (Figure 3.2), the area proposed for development is underlain by sediments of moderate, high and very high paleontological sensitivity. According to the extract from the Council for GeoSciences Map 3024 for Colesburg, the development area is underlain by Jurassic Dolerite, the Tierberg Formation of the Ecca Group and the Adelaide Subgroup of the Beaufort Group as well as Quaternary sands associated with the drainage lines.

As part of the process completed in 2012 for the approved neighbouring Vetlaagte Solar Energy Facility, Almond completed a field-based palaeontological assessment. Almond (2012) found that "The potentially fossiliferous sediments of the Late Palaeozoic Karoo Supergroup (Ecca and Lower Beaufort Groups) that underlie the study area are almost entirely mantled in a thick layer of superficial deposits of probable Pleistocene to Recent age. These include various soils, gravels and – at least in some areas - a well-developed calcrete hardpan. The upper Ecca Group bedrocks in the northern portion of the study area contain locally abundant fossil wood (of palaeontological interest for dating and palaeoenvironmental studies), as well as low diversity non-marine trace fossil assemblages typical of the Waterford Formation, rather than the Tierberg Formation as mapped. No vertebrate fossils and only scattered woody plant impressions of the Permian Glossopteris Flora were observed within the Lower Beaufort Group rocks that are very poorly exposed in the southern portion of the Vetlaagte study area. Trace fossils, silicified wood and rare vertebrate remains (therapsids, parareptiles) of the Middle Permian Pristerognathus Assemblage Zone have recently been recorded from this succession in the De Aar region (Almond 2010b). Extensive dolerite sills and dykes of the Early Jurassic Karoo Dolerite Suite intruding the Karoo Supergroup sediments are entirely unfossiliferous, as are rare intrusive kimberlite pipe rocks of the Cretaceous age. The diverse superficial deposits within the three study areas (e.g. soils, gravels, alluvium, calcrete hardpans) are of low palaeontological sensitivity as a whole . Abundant fragments of reworked fossil wood material of Ecca provenance occur widely within subsurface and surface gravels overlying the Ecca Group outcrop area."

Almond (2012) concludes that "The construction of new access roads and transmission lines in this region are likewise considered to be of low significance as far as fossil heritage is concerned… In view of the overall low significance of the proposed development on palaeontological heritage resources, it is concluded that no further palaeontological heritage studies or specialist mitigation are required for these small PV projects, pending the exposure of any substantial fossil remains (e.g. vertebrate bones and teeth, large blocks of petrified wood) during the construction phase."

4. IDENTIFICATION OF HERITAGE RESOURCES

4.1 Summary of findings of Specialist Reports

Archaeology

Over 79 archaeological observations were made during the survey of the broader area and only 17 observations were made within the area proposed for the Fountain PV development. Hornfels dominated the assemblages with smaller numbers of flakes struck from siltstones. It is very likely that the main dolerite outcrop at Riet Fountain 6 surrounded by this development footprint will contain more sites with a wider range of imported stone such as CCS observed during surveys of the adjacent Vetlaagte PV and the Castle WEF. While the vast majority of the scatters were made during the Middle Stone Age, there was also a relatively clear Later Stone Age presence in the study area. Many examples of blade forms were found which are typical of the Still Bay period (>70 000 years BP). Relatively dense Later Stone Age sites were found on the far eastern end of Wag 'n Bietjie and these date within the last 2000 years due to the presence of pottery in these sites.

Five archaeological sites across the survey area are significant enough to require buffer zones around them to avoid negative impacts from solar PV panels, roads and other related infrastructure. Three of these are rock art sites with engravings on dolerite boulders that were graded with local medium significance (IIIB) and two LSA sites were identified with relatively dense scatters of stone tools.

None of these archaeologically significant observations are located within the Fountain PV development area. These observations do not warrant further study as they are typical of the area and are ubiquitously distributed in low densities of less than 5 artefacts per observation. Much of the archaeological material will be well conserved within a series of areas that can't be developed for the solar PV arrays while the flat, grassy vlaktes that are ideal for the solar PV farms are also the areas with the lowest archaeological sensitivity.

Palaeontology

- The Palaeontological Sensitivity of the **Tierberg Formation** is classified as **High Risk** by SAHRIS. The most abundant fossils from the formation are trace fossils. These include approximately ten ichnogenera including invertebrate burrows (e.g. *Planolites, Palaeophycus*), arthropod trackways (e.g. *Umfolozia*), and fish swimming trails (e.g. *Undichna*). Rare microvertebrate remains (fish scales and teeth) in calcareous concretions as well as plant fossils (leaves and petrified wood) have also been recovered (Van Dijk, Channing & Van Den Heever, 2002; Almond, 2008; Almond, 2013). If the Tierberg Formation exposures in the area are instead Waterford Formation deposits, these sediments have yielded poorly preserved tetrapod remains (possibly temnospondyl), microvertebrates (fish scales), fish coprolites, non-marine bivalves, trace fossils (e.g. invertebrate burrows *Scoyenia*,), and plant fossils (e.g. petrified wood and *Glossopteris*) (Rubidge, Hancox & Catuneanu, 2000; Johnson, Anhauesser & Thomas, 2006; Almond, 2013).

- The Palaeontological Sensitivity of the **Adelaide Subgroup** is classified as **Very High Risk** by SAHRIS. The unit contains a highly diverse tetrapod assemblage and three Assemblage Zones: the *Tapinocephalus*, *Endothiodon*, and *Cistecephalus* Assemblage Zones (Day & Rubidge, 2020; Day & Smith, 2020; Rubidge & Day, 2020). These have yielded amphibian fossils (including temnospondyls like *Rhinesuchus*), Pan-testudines (e.e. *Eunotososaurus*), therapsids (including biarmosuchians, anomodonts, gorgonopsians and therocephalians) as well as fish (e.g. *Namaichthys*). Plant fossils (including petrified wood, plant remains, leaf & stem impressions), non-marine molluscs, and trace fossils (trackways, invertebrate burrows, coprolites) have also been recovered in the Adelaide Subgroup (Johnson, Anhauesser & Thomas, 2006; Bordy & Prevec, 2008; Bordy, Linkermann & Prevec, 2011; Bamford, Cairncross & Lombard, 2020; Almond, 2021). Previous surveys in the area (22 km South-East of current proposed area) have reported that "Due to the generally very poor exposure of Lower Beaufort Group (Adelaide Subgroup) bedrocks in the region between De Aar and Hanover, there have been very few identifiable vertebrate or other fossil finds here. Fragmentary skeletal remains of small-bodied therapsids, mainly dicynodonts, as well as of the small tortoise-like reptile *Eunotosaurus* have been recorded from the Lower Beaufort Group near De Aar […] (Day *et al*., 2013) but these belong to a slightly older horizon within the Lower Beaufort Group than those in the present study area. Associated fossils near De Aar include scrappy plant remains – mainly sphenophyte ferns and well-preserved silicified wood – as well as low-diversity trace fossil assemblages." (Almond, 2021).
- The Palaeontological Sensitivity of the **Jurassic Dolerite** is classified as **Insignificant/Zero** by SAHRIS. The igneous intrusive origin of the Jurassic dolerite dykes makes it unlikely that they contain fossils.
- The Palaeontological Sensitivity of the **Quaternary deposits** is classified as **Moderate** by SAHRIS. Although present, the fossil record of the Quaternary Sands is sporadic and not very diverse. Aeolian dunes are not likely to preserve fossil material, however, calcretisation of burrows (including termites) and root casts (rhizoliths) can occur. Fossils that have been recorded include ostrich egg shells (*Struthio*), shells of land snails (e.g. *Trigonephrus*), bivalves and gastropods (e.g. *Corbula*, *Unio*) and snails, ostracods (seed shrimps), charophytes (stonewort algae), diatoms (microscopic algae within siliceous shells) and stromatolites (laminated microbial limestones). The Mokolanen clacretes have also yielded calcretised burrows (including termites), root casts (rhizoliths) as well as mammalian ichnofossils (Malherbe, 1984; Almond & Pether, 2008). Previous surveys in the area (22 km South-East of current proposed area) have yielded petrified wood fossils reworked from Permian sedimentary deposits, but no vertebrate or invertebrate fossils (Almond, 2021).

4.2 Heritage Resources identified

A total of 17 archaeological observations were made within the area proposed for the Fountain PV development.

Table 1: Archaeological resources identified within the development footprint

Site No.	Site Name	Description	Density m2	Period	Co-ordinates		Grading	Mitigation
020	Fountain	Two patinated hornfels flakes	0 to 5	MSA	-30.70753	24.15583	NCW	NA
021	Fountain	Patinated hornfels flake	0 to 5	MSA	-30.70754	24.15995	NCW	NA
022	Fountain	Early MSA patinated hornfels flake	0 to 5	MSA	-30.70754	24.16425	NCW	NA
023	Fountain	Various patinated hornfels flakes and cores	5 to 10	MSA	-30.70621	24.16527	NCW	NA
024	Fountain	Patinated hornfels flake	0 to 5	MSA	-30.70543	24.16088	NCW	NA
025	Fountain	Chert core and hornfels flake	0 to 5	MSA	-30.70473	24.15455	NCW	NA
030	Fountain	Patinated hornfels flake	0 to 5	MSA	-30.69968	24.15232	NCW	NA
031	Fountain	Various hornfels flakes	5 to 10	MSA	-30.69845	24.15833	NCW	NA
032	Fountain	Kraal, dam windmill	n/a	Modern	-30.69642	24.16576	NCW	NA
033	Fountain	Patinated hornfels flakes	0 to 5	MSA	-30.69665	24.16344	NCW	NA
034	Fountain	Patinated hornfels flakes	0 to 5	MSA	-30.69634	24.15944	NCW	NA
035	Fountain	Hornfels blade and point	0 to 5	LSA	-30.69602	24.15521	NCW	NA
036	Fountain	Very patinated hornfels flakes	0 to 5	MSA	-30.69598	24.15159	NCW	NA
037	Fountain	Hornfels core and flakes	0 to 5	MSA	-30.69342	24.14989	NCW	NA
038	Fountain	Various hornfels flakes	5 to 10	MSA	-30.69189	24.15262	NCW	NA
039	Fountain	Various hornfels flakes	5 to 10	MSA	-30.69127	24.15398	NCW	NA
040	Fountain	Very patinated hornfels flakes	0 to 5	MSA	-30.69006	24.15548	NCW	NA

4.3 Mapping and spatialisation of heritage resources

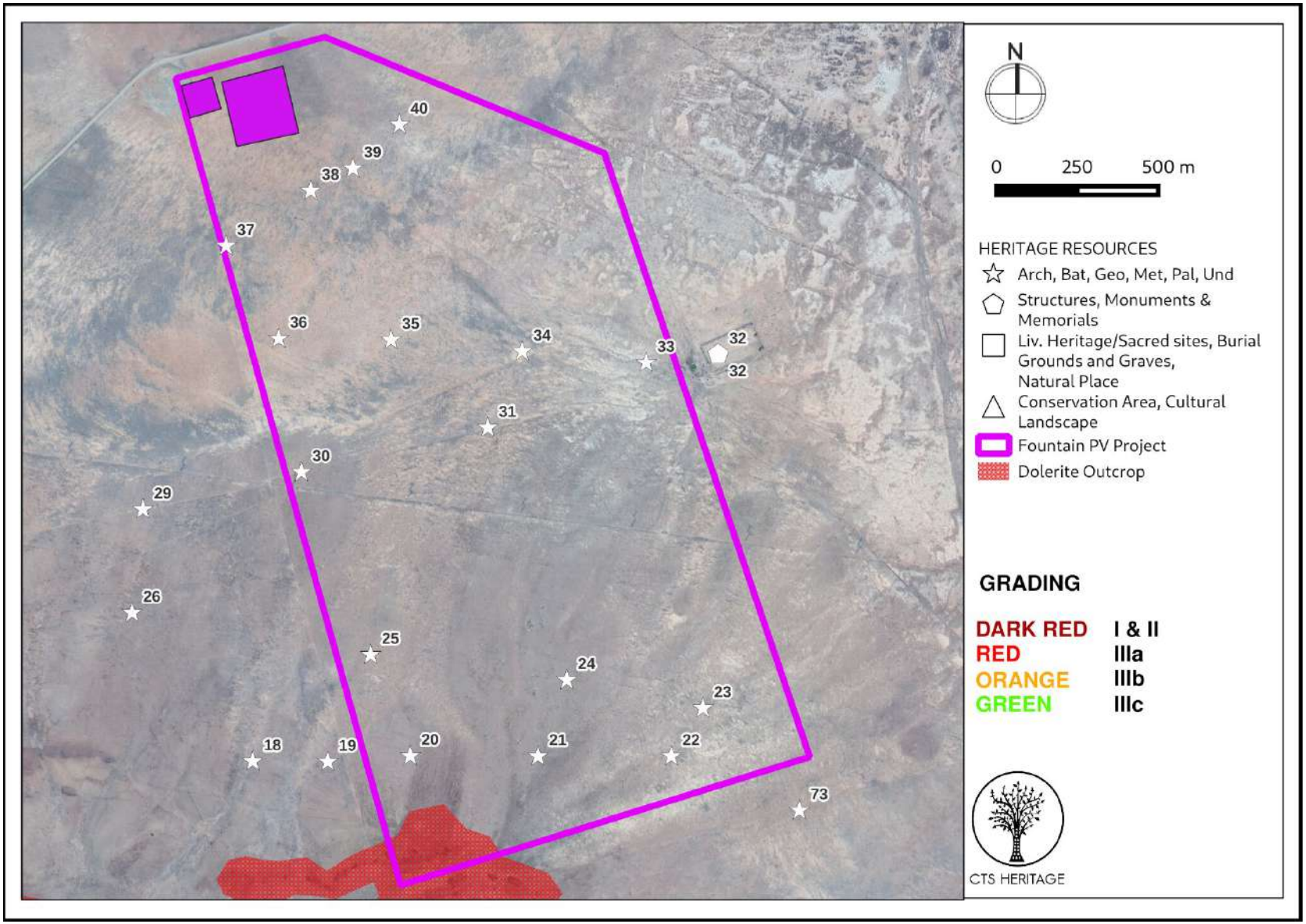

Figure 4: Map of heritage resources identified during the field assessment, relative to the proposed development (see Table 1). The sites marked as WHITE are not considered to be conservation-worthy

5. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT

5.1 Assessment of impact to Heritage Resources

According to the VIA completed for this project (Du Plessis, 2022), "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.), plays 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 environment has a predominantly rural, undeveloped character and a natural appearance. These generally undeveloped landscapes are considered to have a high visual quality, except where urban development and power generation/distribution infrastructure represents existing visual disturbances.

The anticipated visual impact of the proposed PV facility on the regional visual quality (i.e. beyond 6km of the proposed infrastructure), and by implication, on the sense of place, is difficult to quantify, but is generally expected to be of **low** significance."

A number of mitigation measures are proposed in the VIA (Du Plessis, 2022) to mitigate these visual impacts and these are endorsed from a heritage perspective.

No impacts to heritage resources are anticipated for the Design and Pre-Construction Phase, and the Post-Construction and Operational Phase. The only anticipated impacts are likely during the construction phase.

Archaeology

The results of the archaeological field assessment conducted largely aligns with the findings of previous archaeological assessments completed in the vicinity of the proposed development. The archaeological resources identified within the development area are dominated by Later and Middle Stone Age flakes, which corresponds with similar findings of others (Kruger, 2012). All of the archaeological resources identified within the area proposed for the Fountain PV development in this field assessment have been determined to be not conservation-worthy. As such, these resources have been sufficiently recorded and there is no objection to the proposed development in these locations from an archaeological perspective.

Given the uneven terrain created by the dolerite outcrops as well as the tendency for pre-colonial occupation to be concentrated around these natural shelters, we highly recommend that careful consideration is made to

placing the solar PV infrastructure away from these outcrops and utilising the flat, grassy plains where archaeological sensitivities are very low. Furthermore, access roads should, wherever possible, use existing jeep tracks and roads to minimise the impact on the landscape, particularly when nearing the dolerite outcrops.

The archaeological field assessment completed in February and May 2022 identified no structures or other kinds of heritage resources located within the areas proposed for development other than those outlined above.

Table 4.1: Impacts of the proposed development on archaeological resources

NATURE: It is possible that buried archaeological resources may be impacted by the proposed development in the preferred location				
		Without Mitigation		**With Mitigation**
MAGNITUDE	**H (8)**	No archaeological resources of significance were identified within the development area. Dolerite outcrops in the area tend to indicate the presence of significant archaeology.	**H (8)**	No archaeological resources of significance were identified within the development area. Dolerite outcrops in the area tend to indicate the presence of significant archaeology.
DURATION	**H (5)**	Where manifest, the impact will be permanent.	**H (5)**	Where manifest, the impact will be permanent.
EXTENT	**L (1)**	Limited to the development footprint	**L (1)**	Limited to the development footprint
PROBABILITY	**H (5)**	It is likely that resources will be impacted	**L (1)**	It is unlikely that resources will be impacted
SIGNIFICANCE	**L**	(8+5+1)x5 = 70	**L**	(8+5+1)x1 = 14
STATUS		Negative		Negative
REVERSIBILITY	**L**	Any impacts to heritage resources that do occur are irreversible	**L**	Any impacts to heritage resources that do occur are irreversible
IRREPLACEABLE LOSS OF RESOURCES?	**H**	Likely	**L**	Not Likely
CAN IMPACTS BE MITIGATED		Yes		
MITIGATION: ● Development on and immediately adjacent to the dolerite outcrops as mapped should be avoided as these are highly archaeologically sensitive ● 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.				
RESIDUAL RISK: None				

Palaeontology

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 some do contain fossil plant, insect, invertebrate and vertebrate material. The sands of the Quaternary period would not preserve fossils. Almond (2010) found no fossils of significance during his site visit to Vetlaagte, and the Wag 'n Bietjie farm has the same lithology. It is unknown what lies below the surface.

Based on previous surveys in the area, the presence of superficial deposits (probable Pleistocene to Recent age) covering the fossiliferous sediments (Ecca and Beaufort Groups), as well as the extensive network of intrusive dolerite dykes and sills that bake (thermally metamorphose) adjacent mudrocks, it is anticipated that the impact of the development will mainly be **LOW to MODERATE.**

Table 4.2: Impacts of the proposed development to palaeontological resources

NATURE: It is possible that buried palaeontological resources may be impacted by the proposed development in the preferred location				
		Without Mitigation		**With Mitigation**
MAGNITUDE	**L (1)**	According to the SAHRIS Palaeosensitivity Map (Figure 4), the area proposed for development of the PV facilities is underlain by sediments that have very high palaeontological sensitivity.	**L (1)**	According to the SAHRIS Palaeosensitivity Map (Figure 4), the area proposed for development of the PV facilities is underlain by sediments that have very high palaeontological sensitivity.
DURATION	**H (5)**	Where manifest, the impact will be permanent.	**H (5)**	Where manifest, the impact will be permanent.
EXTENT	**L (1)**	Limited to the development footprint	**L (1)**	Limited to the development footprint
PROBABILITY	**L (1)**	It is unlikely that significant fossils will be impacted	**L (1)**	It is unlikely that significant fossils will be impacted
SIGNIFICANCE	**L**	(1+5+1)x1=7	**L**	(1+5+1)x1=7
STATUS		Negative		Negative
REVERSIBILITY	**L**	Any impacts to heritage resources that do occur are irreversible	**L**	Any impacts to heritage resources that do occur are irreversible
IRREPLACEABLE LOSS OF RESOURCES?	**L**	Unlikely	**L**	Not Likely
CAN IMPACTS BE MITIGATED		Yes		
MITIGATION: ● 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.				
RESIDUAL RISK: None				

5.2 Sustainable Social and Economic Benefit

The findings of the SIA (Barbour, 2022) indicate that the development of the proposed 120 MW Carolus PV SEF and associated infrastructure will create employment and business opportunities for locals in the ELM during both the construction and operational phase of the project. All of the potential negative impacts, with the exception of the impact on sense of place, can also be effectively mitigated.

The establishment of a Community Trust will also benefit the local community. The enhancement measures listed in the report should be implemented in order to maximise the potential benefits. The significance of this impact is rated as **High Positive**. The proposed development also represents an investment in clean, renewable energy infrastructure, which, given the negative environmental and socio-economic impacts associated with a coal-based energy economy and the challenges created by climate change, represents a significant positive social benefit for society as a whole. The findings of the SIA also indicate that the Renewable Energy Independent Power Producers Procurement Programme (REIPPPP) has resulted in significant socio-economic benefits, both at a national level and at a local, community level. These benefits are linked to foreign Direct Investment, local employment and procurement and investment in local community initiatives. The establishment of the proposed 100 MW Carolus PV SEF and associated infrastructure including a battery energy storage system (BESS) is therefore supported by the findings of the SIA.

As such, on condition that the recommended mitigation measures are implemented, the anticipated socio-economic benefits from the proposed development outweigh the negative impacts to heritage resources.

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 as Figure 5 below.

This rationalised layout is preferred in terms of impacts to heritage resources.

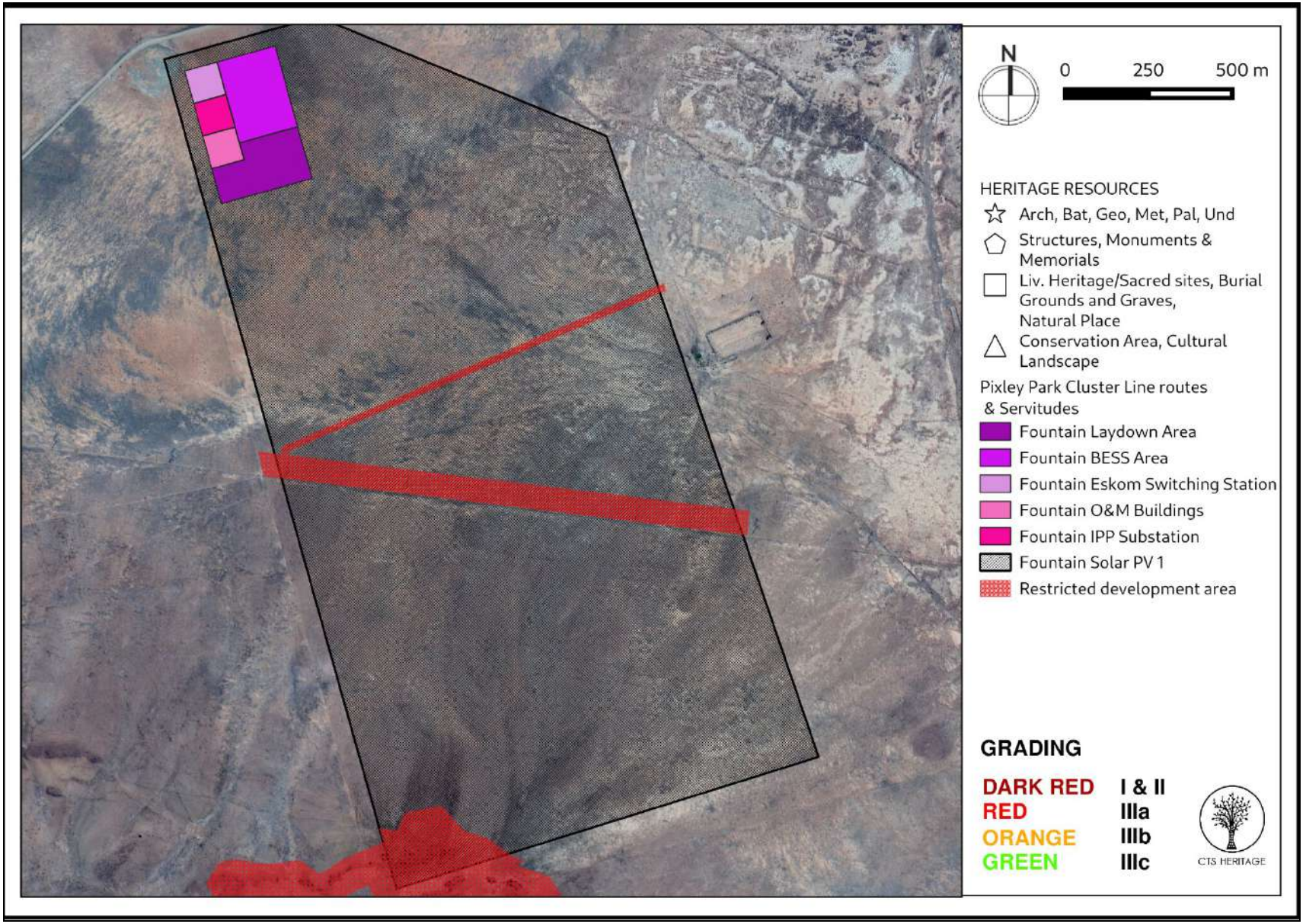

Figure 5: Rationalised layout of Fountain PV development - preferred from a heritage perspective

5.4 Cumulative Impacts

The proposed renewable energy facilities are located within a cluster of approved renewable energy facilities (Map 5) located outside of De Aar. 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 culturally significant landscape. The proposed development is therefore unlikely to result in unacceptable risk or loss, nor will the proposed development result in a complete change to the sense of place of the area or result in an unacceptable increase in impact due to its location as one of many renewable energy facilities in this area.

According to the VIA completed for this project, "The construction of the Fountain PV1 Facility may increase the cumulative visual impact of industrial type infrastructure within the region, especially in relation to the other three (3) solar energy facilities that form part of Pixley Park. The cumulative visual impact is expected to be of moderate significance due to their remote locations and the general absence of potential sensitive visual receptors."

Figure 6: Map indicating the location of authorised renewable energy facilities in proximity to the proposed development

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 overall archaeological sensitivity of the development area with regard to the preservation of Early, Middle and Later Stone Age archaeology as well as Khoe and San heritage, early colonial settlement is regarded as very high. Despite this, the field assessment conducted for this project has demonstrated that the specific area proposed for development has low sensitivity for impacts to significant archaeological heritage.

As indicated above, the results of this assessment align with the findings of other specialists such as Morris (2011) who notes that ephemeral MSA and LSA scatters are the dominant archaeological signature of the area and the majority of these are therefore not archaeologically significant. Furthermore, it is noted that pre-colonial occupation tended to be concentrated around the natural shelters created by dolerite outcrops in this area and as such, we highly recommend that careful consideration is made to placing the solar PV infrastructure away from these outcrops. These areas are mapped in Figure 4.

Based on experience, other reports and the lack of any significant previously recorded fossils from the area, it is unlikely that any fossils would be preserved in the Tierberg Formation or Adelaide Subgroup. Nonetheless, a Fossil Chance Find Protocol should be added to the EMPr.

8. RECOMMENDATIONS

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

- The rationalised layout is preferred from a heritage perspective
- The mitigation measures included in the VIA (Du Plessis, 2022) are implemented
- The dolerite outcrops spanning west-east along portions of Wag ‘n Bietjie 5 as well as the outcrops in the far northern end near Carolus Poort should ideally be avoided for the location of the solar PV laydown area and access roads carefully planned to minimise the impact on any other dolerite outcrops. Site 062 lies on a small ridge on Riet Fountain 6 and roads or PV laydown areas should be placed on the level grassy plains and not on the ridges where archaeological material is concentrated.
- 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.

9. REFERENCES

Heritage Impact Assessments				
NID	**Author(s)**	**Date**	**Type**	**Title**
104574	Heritage Scoping	Wouter Fourie	10/10/2012	Heritage Scoping Report for the Proposed Wind Farm Facility for Renosterberg Wind Energy Company (RWEC) near Petrusville, Northern Cape Province
104576	Heritage Scoping	Wouter Fourie	10/10/2012	Heritage Scoping Report for the Proposed Solar PV Facility for Renosterberg Wind Energy Company (RWEC) near Petrusville, Northern Cape Province
104804	PIA Desktop	John E Almond	01/09/2012	Palaeontological specialist assessment: desktop study PROPOSED RENOSTERBERG SOLAR PV AND WIND ENERGY FACILITIES NEAR DE AAR, NORTHERN CAPE PROVINCE
133138	HIA Phase 1	Jayson Orton, Lita Webley	09/07/2013	HERITAGE IMPACT ASSESSMENT FOR MULTIPLE PROPOSED SOLAR ENERGY FACILITIES
133536	Palaeontological Specialist Reports	John E Almond	01/07/2013	PALAEONTOLOGICAL SPECIALIST STUDY
133536	Palaeontological Specialist Reports	John E Almond	01/07/2013	PALAEONTOLOGICAL SPECIALIST STUDY
163982	Palaeontological Specialist Reports		31/08/2013	Palaeontological specialist assessment: combined desktop and field study: Proposed development PV Solar Facility near De Aar, Northern CApe Province
163994		Wouter Fourie	03/08/2013	Proposed PV Facility: Heritage Impact Report
177599	AIA Phase 1	Jonathan Kaplan	01/04/2010	ARCHAEOLOGICAL IMPACT ASSESSMENT PROPOSED PHOTOVOLTAIC POWER GENERATION FACILITY IN DE AAR NORTHERN CAPE
177600	Site Inspection Report	Will Archer, Jonathan Kaplan	01/05/2012	Reconnaissance and plan for further mitigation: sites impacted on by proposed photovoltaic power generation facility in De Aar Northern Cape
256408	Palaeontological Specialist Reports	John E Almond	16/07/2013	Palaeontological Specialist Study: Combined Desktop and Field-based Assessments - Proposed Photovoltaic (Solar) Energy Facilities on Badenhorst Dam Farm near De Aar, Northern Cape
256413	Heritage	Jayson Orton	09/07/2013	Heritage Impact Assessment for Multiple Proposed Solar Energy Facilities

	Impact Assessment Specialist Reports			on De Aar 180/1 (Badenhorst Dam Farm), De Aar, Northern Cape
339820	Heritage Impact Assessment Specialist Reports	Lita Webley, Jayson Orton	01/12/2011	Proposed De Aar Wind Energy Facility on the North and South Plateau, Northern Cape Province
339824	Heritage Impact Assessment Specialist Reports	Lita Webley, David Halkett	01/06/2015	Addendum: Proposed Wind Energy Facility situated on the Eastern plateau (South) near De Aar, Northern Cape Province.
4052	HIA Phase 1	Albert van Jaarsveld	01/03/2006	Hydra-Perseus and Beta-Perseus 765 kV Transmission Power Lines Environmental Impact Assessment. Impact on Cultural Heritage Resources
49745	AIA Phase 1	Neels Kruger	01/03/2012	ARCHAEOLOGICAL IMPACT ASSESSMENT (AIA) OF DEMARCATED SURFACE AREAS ON THE OF THE FARM VETLAAGTE 4, DE AAR, NORTHERN CAPE PROVINCE
49843	PIA Phase 1	John E Almond	01/05/2012	PALAEONTOLOGICAL SPECIALIST STUDY: COMBINED DESKTOP AND FIELD-BASED ASSESSMENTS Proposed solar power generation facilities on the remaining extent of the farm Vetlaagte No. 4, De Aar, Northern Cape Province
50006	HIA Phase 1	Jayson Orton	20/02/2012	HERITAGE IMPACT ASSESSMENT FOR THREE SOLAR ENERGY FACILITIES AT DE AAR, WESTERN CAPE
53198	HIA Phase 1	Elize Becker	20/04/2012	Phase 2 Heritage Impact Assessment De Aar Solar One Photovoltaic Power Project Heritage Impact Assessment Phase 2
53200	Heritage Scoping	Elize Becker	18/01/2012	HERITAGE IMPACT ASSESSMENT SCOPING REPORT Prepared for De Aar Solar One Photovoltaic Power Plant, Nothern Cape
58989	PIA Desktop	James Brink	10/08/2012	A Palaeontological Desktop Study of the Area to be Affected by the Proposed Photovoltaic Power Project on Portion 3 of Farm Hartebeestplaats 135
8378	HIA Phase 1	Jayson Orton	29/02/2012	HIA for three solar energy facilties at the De Aar, Northern Cape (Paarde Valley, Badenhorst Dam Farm and Annex Du Plessis Dam Farm)
89361	HIA Phase 1	Neels Kruger	01/03/2012	ENNEX DEVELOPMENTS: PROPOSED ESTABLISHMENT OF A SOLAR ENERGY FACILITY NEAR DE AAR, NORTHERN CAPE PROVINCE Phase 1 Archaeological Impact Assessment Report

CTS HERITAGE

APPENDICES

CTS HERITAGE

APPENDIX 1: Heritage Screening Assessment (2022)

CTS HERITAGE

HERITAGE SCREENER

CTS Reference Number:	**CTS21_269**
SAHRIS Ref:	
Client:	**Savannah**
Date:	**January 2022**
Title:	**Developments of the Fountain Solar PV1 Facility and associated Grid Connection Infrastructure near De Aar, Northern Cape Province**

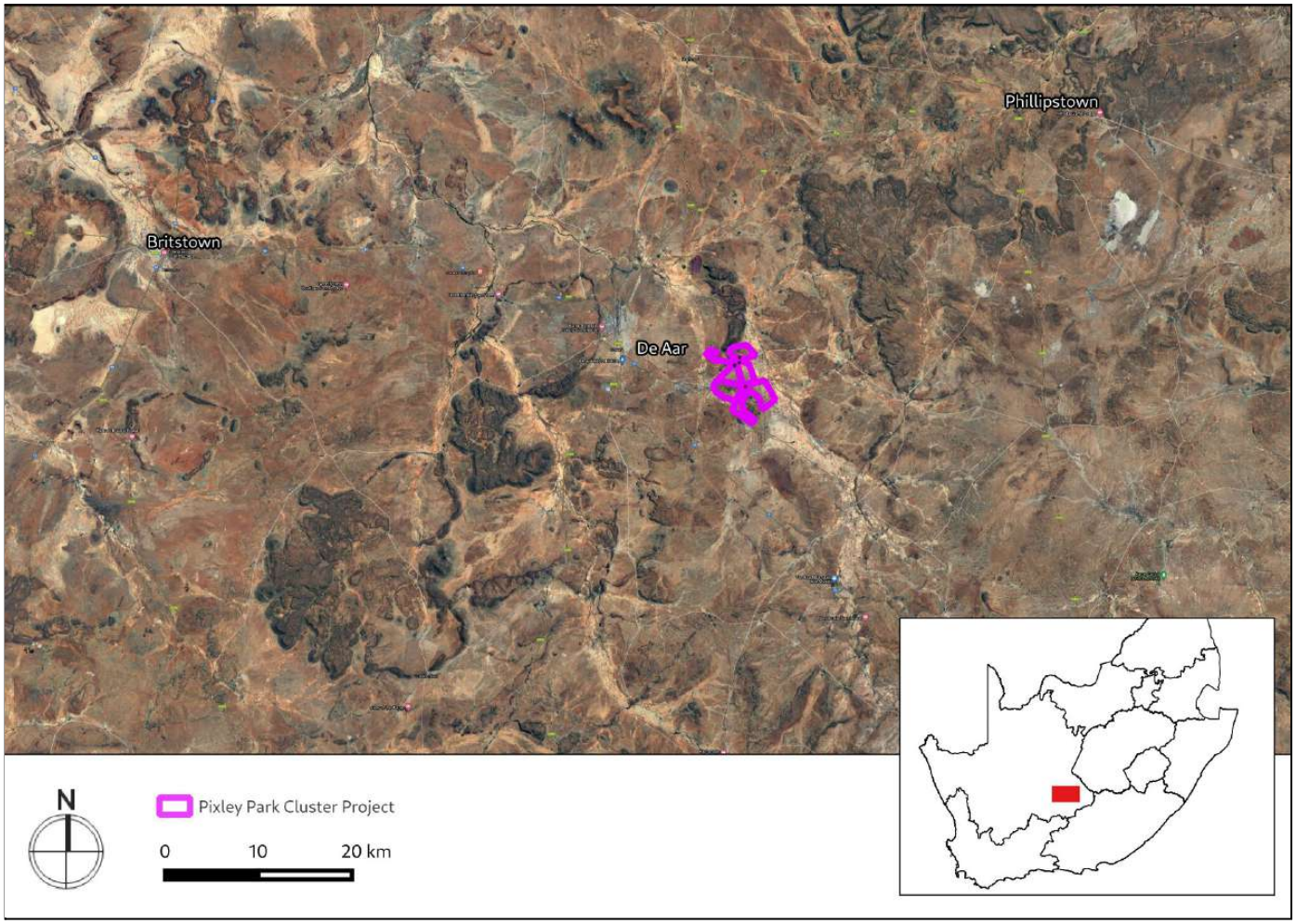

Figure 1a. Satellite map indicating the location of the proposed development in the Western Cape Province

CTS Heritage Recommendation:	**RECOMMENDATION** **Based on the information available, it is likely that the proposed development will negatively impact on significant archaeological heritage resources and as such, it is recommended that a Heritage Impact Assessment is completed that satisfies section 38(3) of the NHRA and assesses these impacts.**

CTS Heritage
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CTS HERITAGE

1. Proposed Development Summary

Fountain Solar PV1 (Pty) Ltd is proposing the development of a Photovoltaic (PV) Solar Energy Facility and associated infrastructure on Portion 1 of the Farm Riet Fountain No.6, located approximately 10km east of De Aar within the Emthanjeni Local Municipality in the Northern Cape Province. The facility will have a contracted capacity of up to 100MW and will be known as Fountain Solar PV1. The project is planned as part of a cluster of renewable energy facilities known as Pixley Park, which includes three (3) additional 100MW Solar PV Facilities (Wagt Solar PV1, Carolus PV1, and Rietfontien Solar PV), and grid connection infrastructure connecting the facilities to the existing Hydra Substation. The projects will all connect to the new Vetlaagte Main Transmission Substation (MTS) via the Wag 'n Bietjie MTS. Infrastructure associated with the Solar PV Facility will include the following:

- Solar PV array comprising bifacial PV modules and mounting structures, using single axis tracking technology
- Inverters and transformers
- Cabling between the panels
- Battery Energy Storage System (BESS)
- Laydown areas, construction camps, site offices
- 12m wide Access Road and entrance gate from the [xx rod] to project site and switching station
- 6m wide internal distribution roads
- Operations and Maintenance Building, Site Offices, Ablutions with conservancy tanks, Storage Warehouse, workshop, Guard House
- Onsite 132kV IPP Substation, including the HV Step-up transformer, and MV Interconnection building 132kV Overhead Power Line (OHPL) – 30m height from the switching station to the Main Transmission Substation (MTS) located on farms Vetlaagte and Wagt, which is to be handed back to Eskom (a separate EA is being applied for in this regard)
- Extension of the 132kV Busbar at the MTS
- 132kV Feeder Bay at the MTS
- Extension of the 400kV Busbar at the MTS
- Installation of a new 400/132kV Transformer and bay at the MTS

A development footprint of approximately 300ha has been identified within the broader project site (approximately 8200ha in extent), by the developer for the development of the Fountain Solar PV1 Facility, which 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 bid the proposed project under the Department of Mineral Resources and Energy's (DMRE's) Renewable Energy Independent Power Producer Procurement (REIPPP) Programme (or similar programme), with the aim of evacuating the generated power into the national grid. 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 Fountain Solar PV1 set to inject up to 100MW into the national grid.

2. Application References

Name of relevant heritage authority(s)	SAHRA
Name of decision making authority(s)	DFFE

CTS HERITAGE

3. Property Information

Latitude / Longitude	30°42'7.79"S 24° 9'25.76"E
Erf number / Farm number	Farm Wag 'n Bietjie 5, Portion 1 of Farm Riet Fountain 6, Portion 3 and 4 of Farm Carolus Poort 3
Local Municipality	Emthanjeni
District Municipality	Pixley ka Seme
Province	Northern Cape
Current Use	Agriculture with approved PV facility
Current Zoning	Agriculture

4. Nature of the Proposed Development

Depth of excavation (m)	TBA
Height of development (m)	TBA
Total Area	TBA

5. Category of Development

x	**Triggers: Section 38(8) of the National Heritage Resources Act**
	Triggers: Section 38(1) of the National Heritage Resources Act
x	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^2 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
	4. Rezoning of a site exceeding 10 000m^2
	5. Other (state):

6. Additional Infrastructure Required for this Development

Additional infrastructure listed under project summary.

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

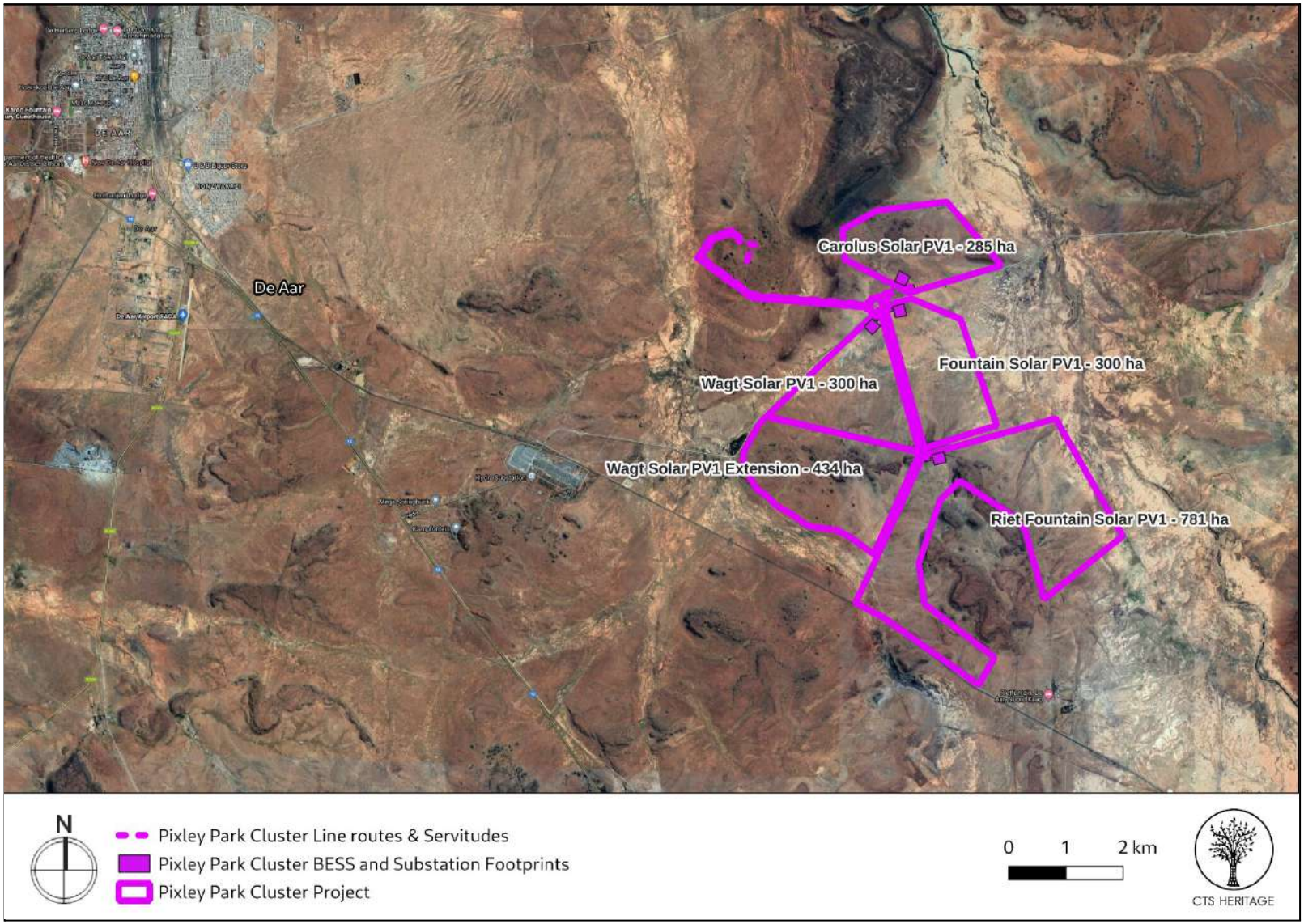

Figure 1b Overview Map. Satellite image (2019) indicating the proposed development area at closer range.

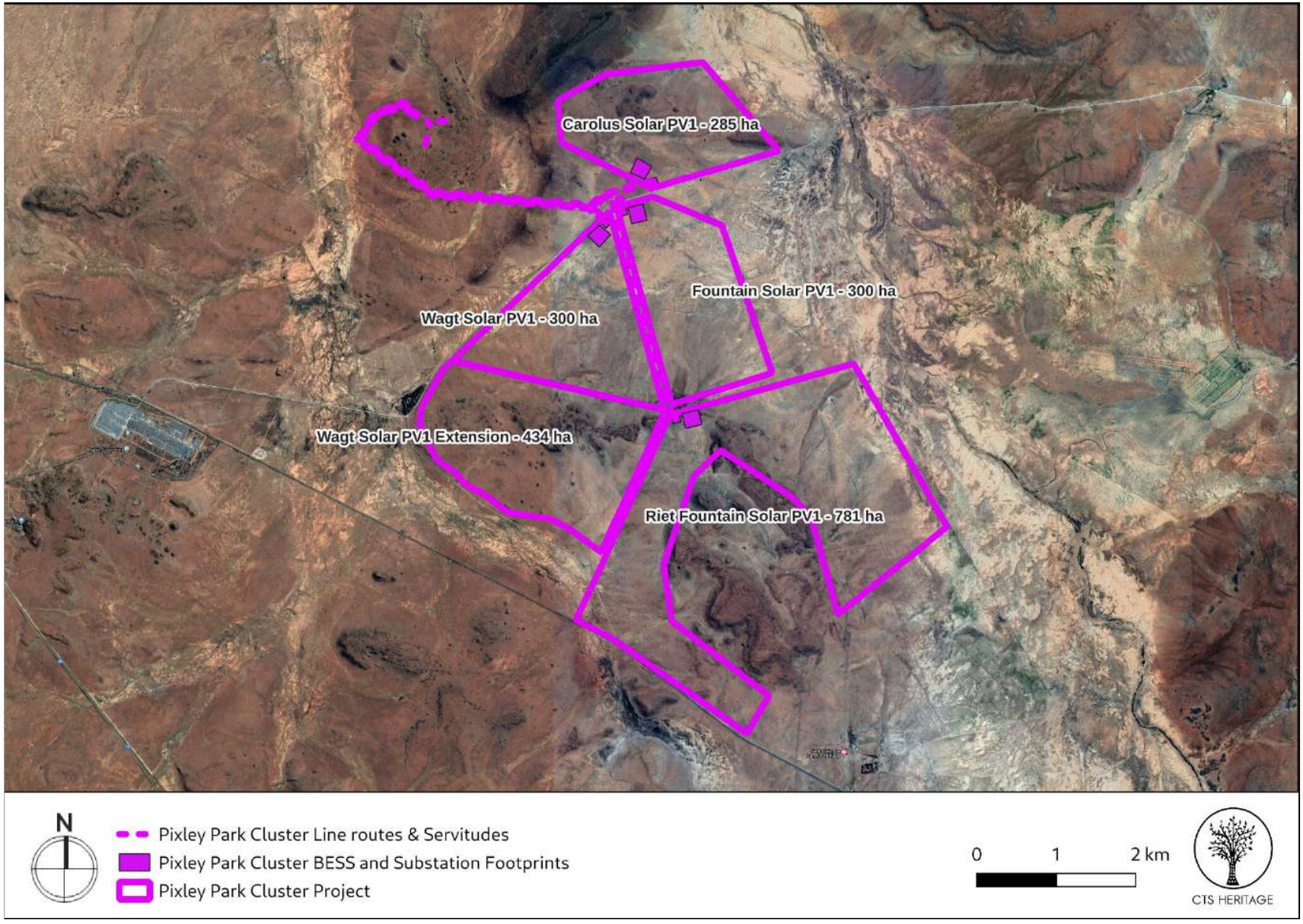

Figure 1c Overview Map. Satellite image (2019) indicating the proposed development area at closer range.

Figure 1d Overview Map. Satellite image (2019) indicating the proposed development area at closer range.

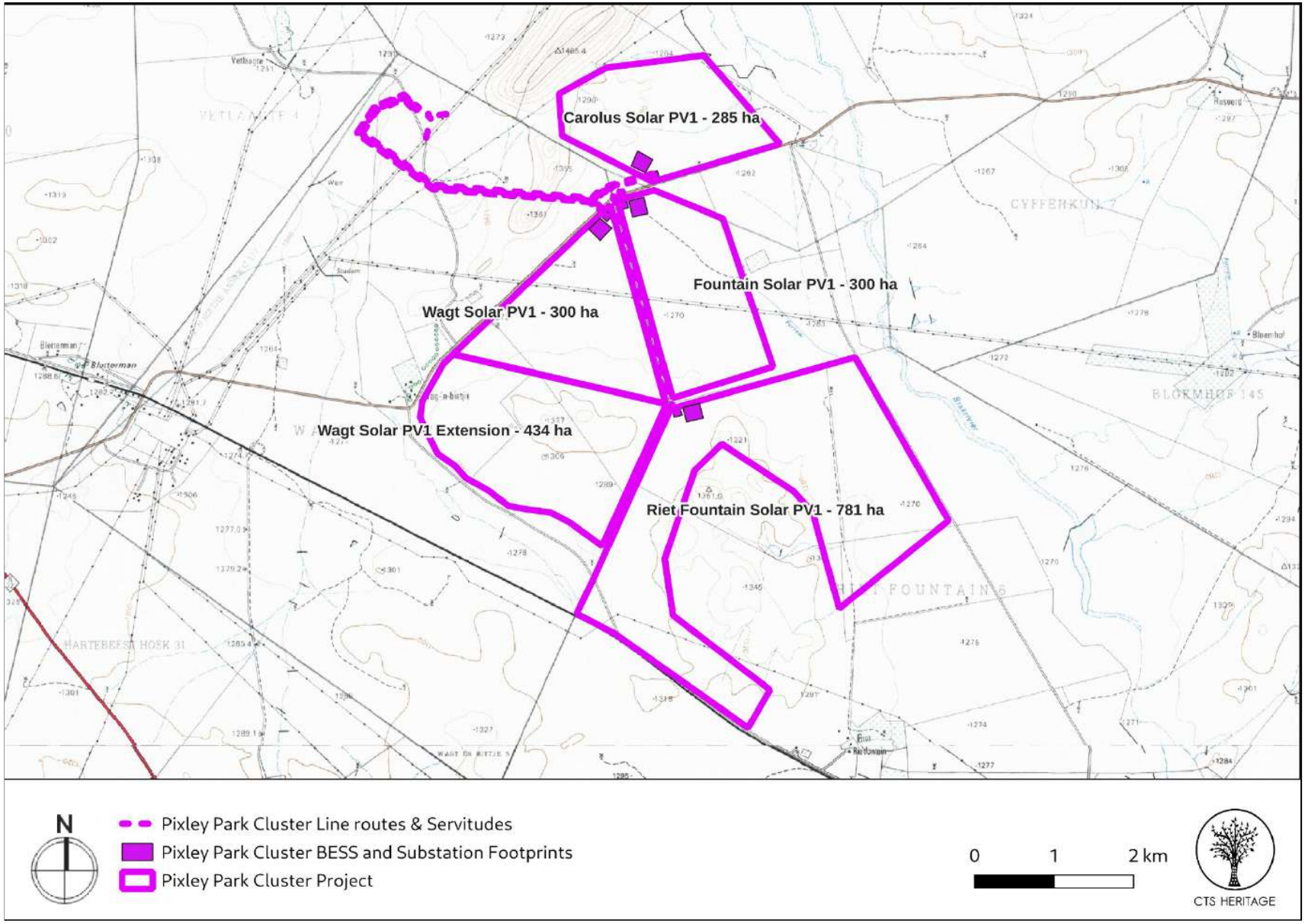

Figure 1e Overview Map. 1:50 000 Topo Map indicating the proposed development area at closer range.

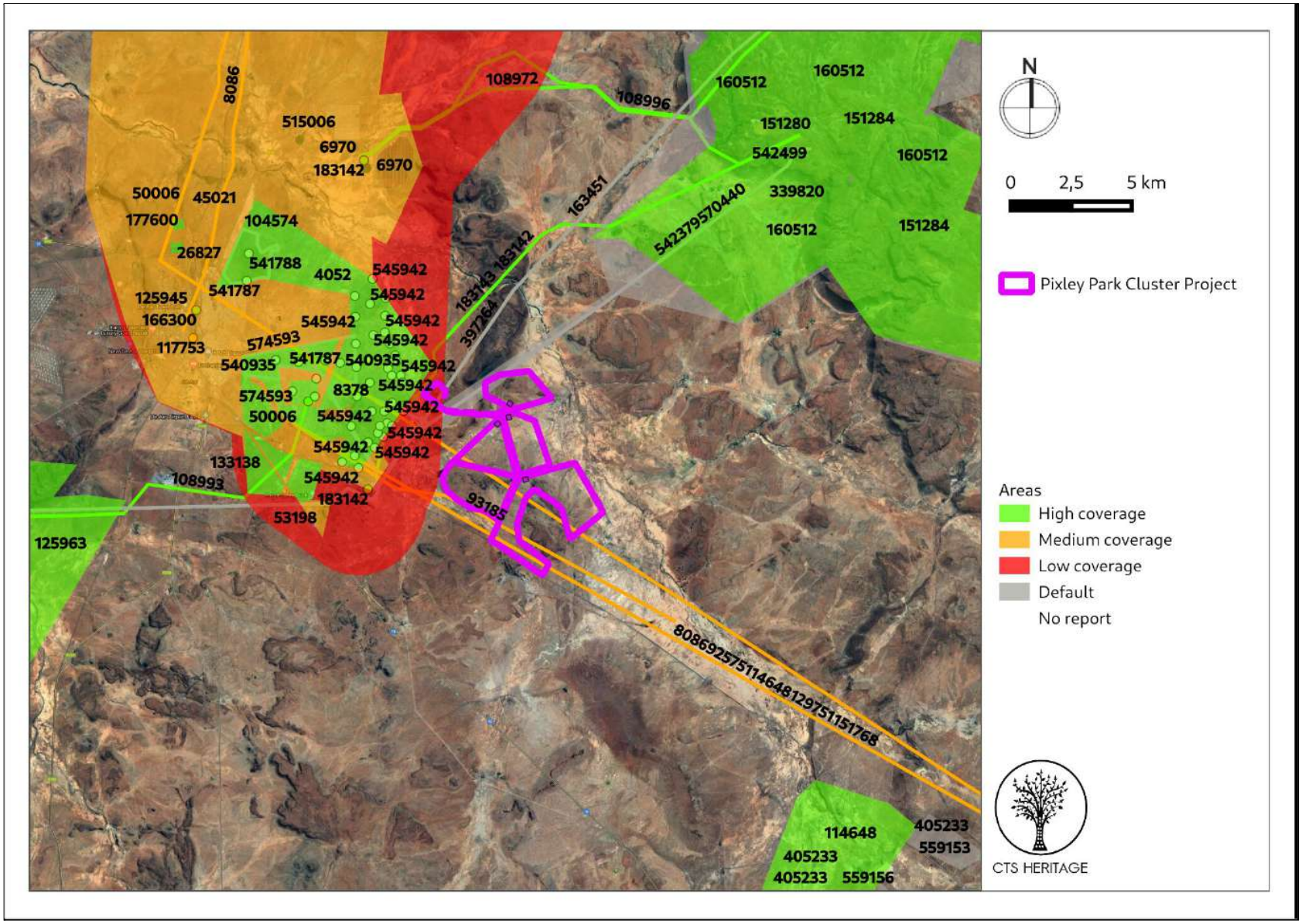

Figure 2a. Previous HIAs Map. Previous Heritage Impact Assessments surrounding the proposed development area within 10km, with SAHRIS NIDS indicated. Please see Appendix 2 for a full reference list.

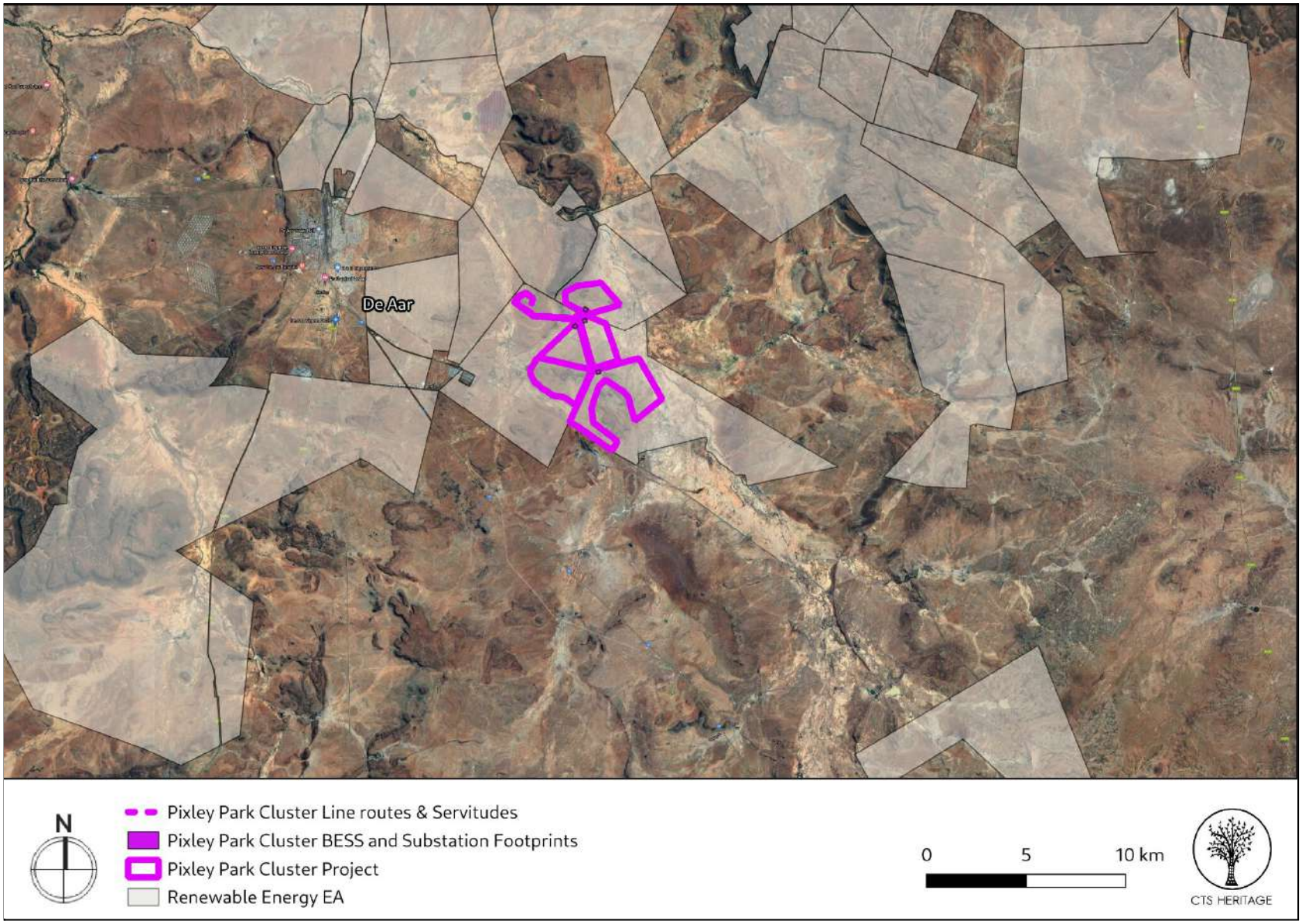

Figure 2b. Environmental Authorisations. Previous Environmental Authorisations issued for Renewable Energy Projects in the vicinity of the proposed development

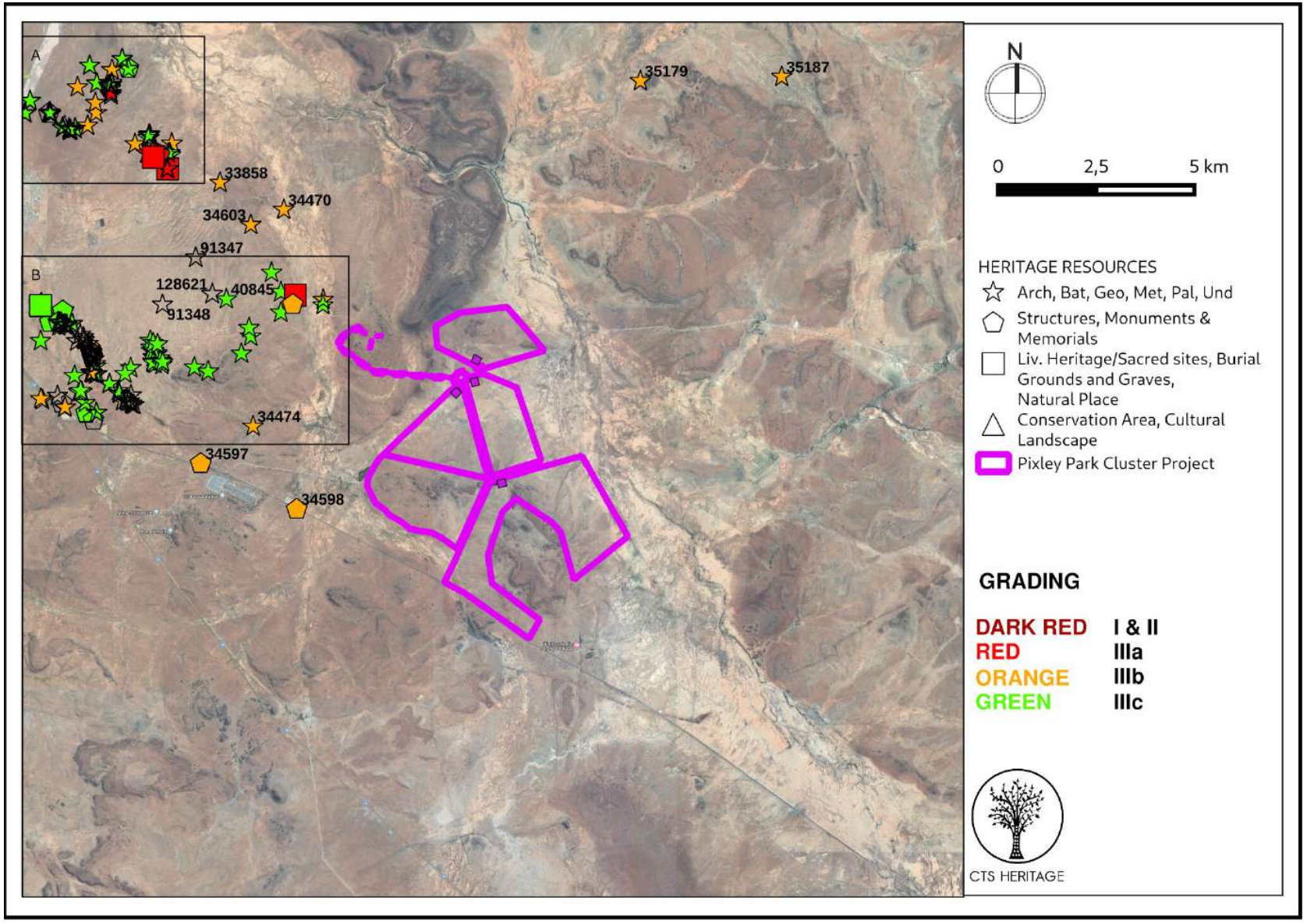

Figure 3. Heritage Resources Map. Heritage Resources previously identified in and near the study area, with SAHRIS Site IDs indicated. Please See Appendix 4 for a full description of heritage resource types.

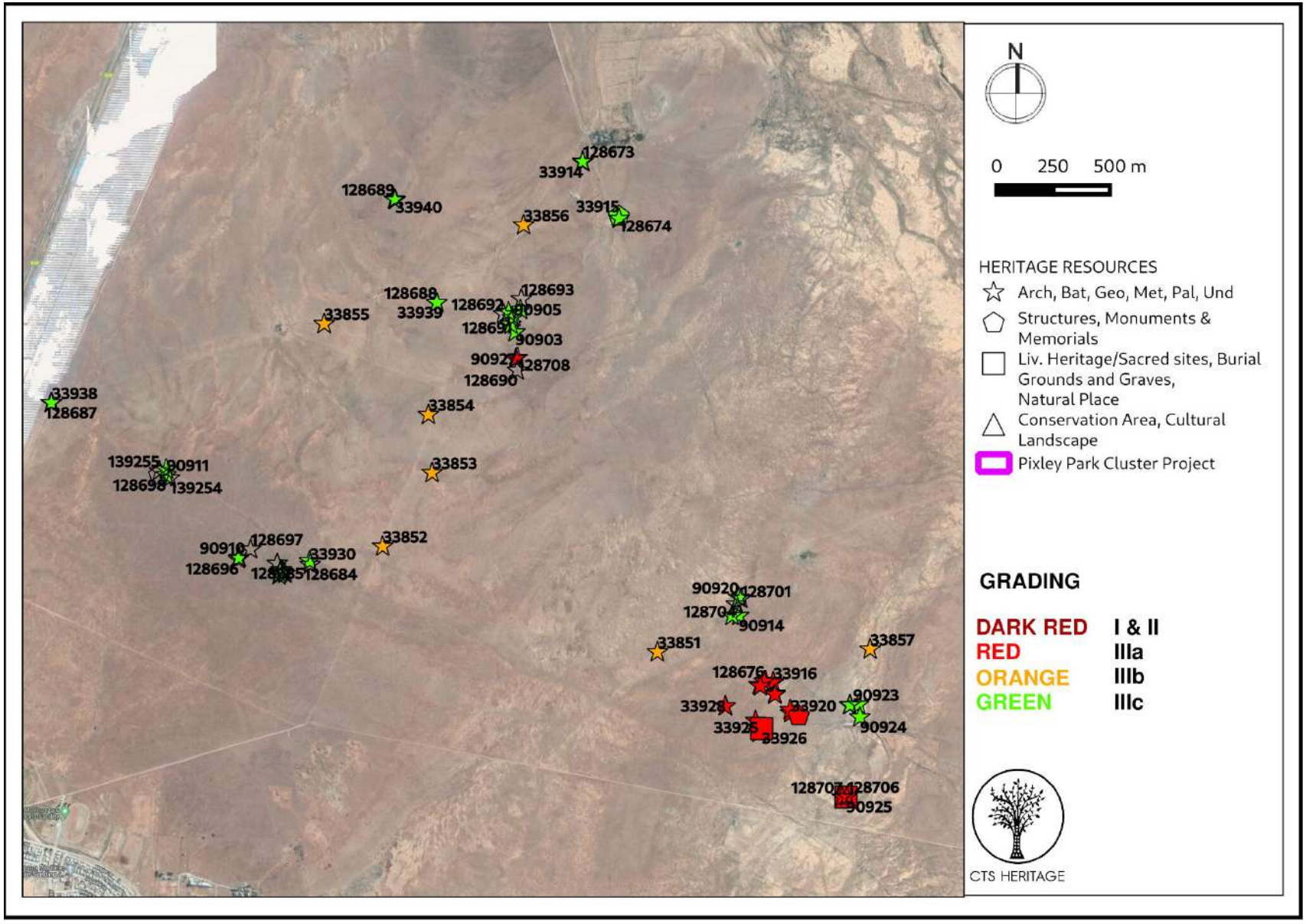

Figure 3a. Heritage Resources Map. Inset A

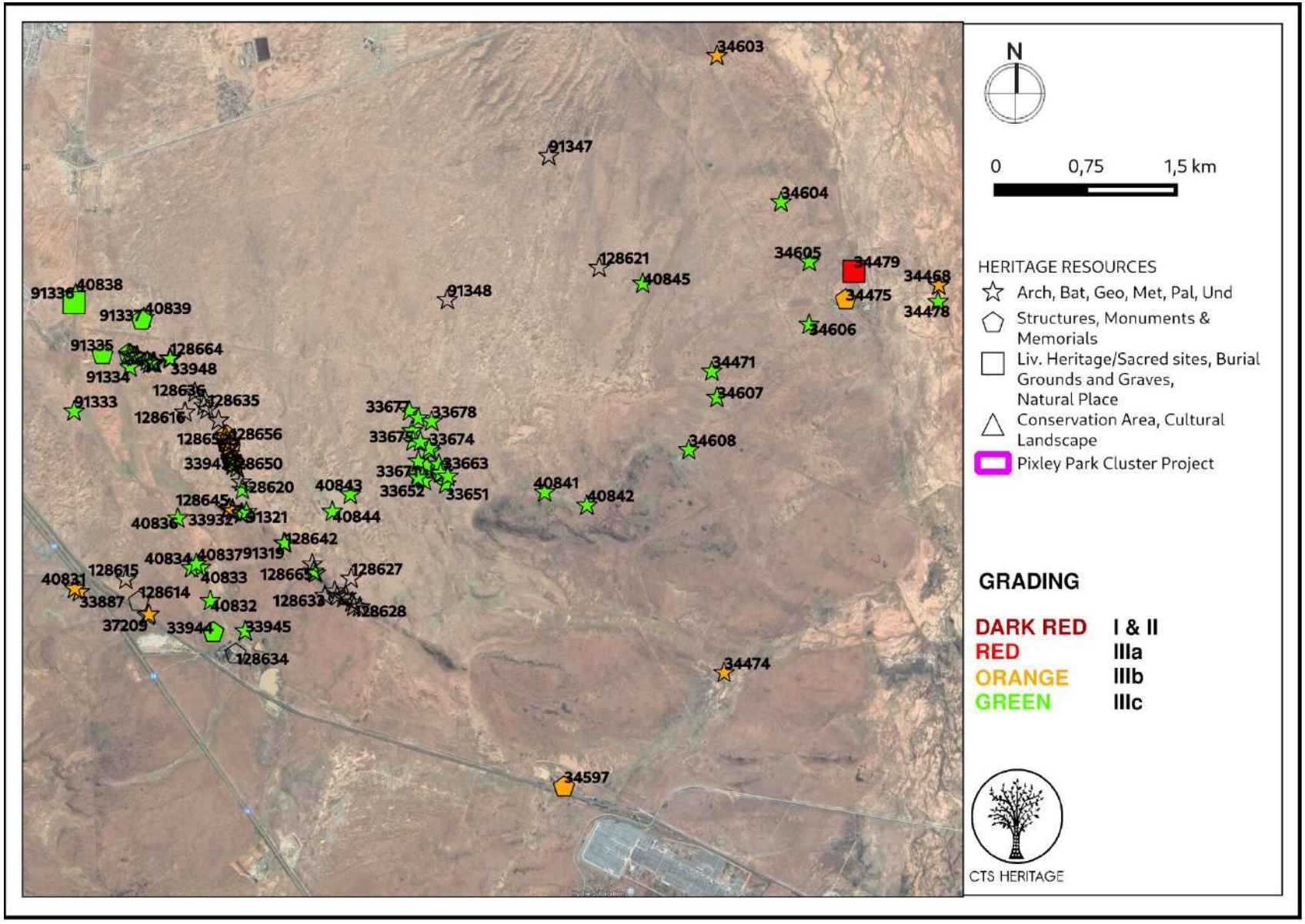

Figure 3b. Heritage Resources Map. Inset B

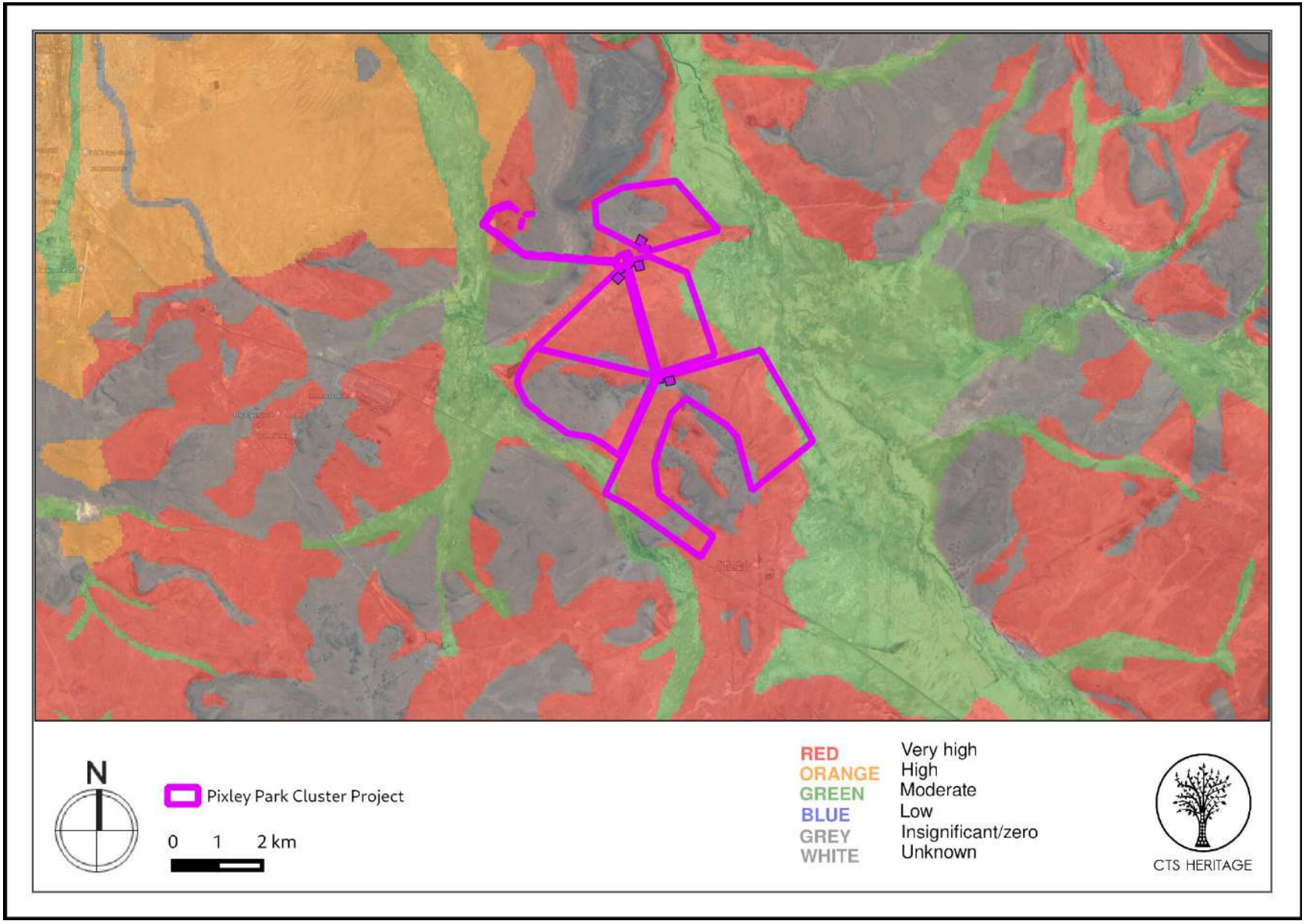

Figure 4a. Palaeosensitivity Map. Indicating very high fossil sensitivity underlying the study area. Please See Appendix 3 for a full guide to the legend.

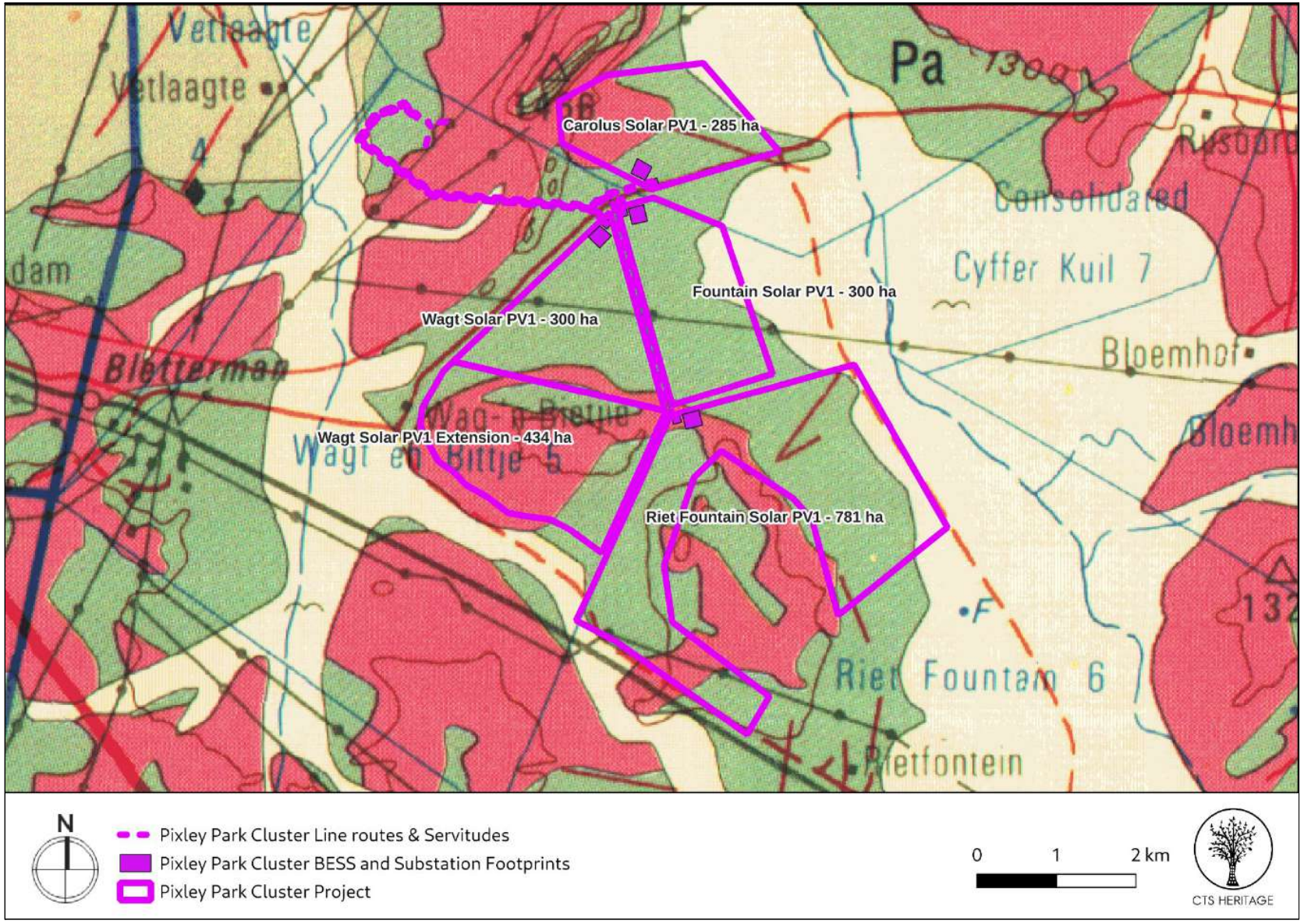

Figure 4b. Geology Map. Extracted from the Council for GeoSciences Map 3024 for Colesburg indicating that the development area is underlain by Jd: Jurassic Dolerite (red), Pt (lighter green): Tierberg Formation of the Ecca Group and Pa (darker green): Adelaide Subgroup of the Beaufort Group

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8. Brief Heritage Summary

Background

De Aar was originally established on the Farm "De Aar." The name means "the artery," a reference to its underground water supply. The Cape Government Railways were founded in 1872, and the route that the government chose for the line to connect the Kimberley diamond fields to Cape Town on the coast, ran directly through De Aar. Because of its central location, the government also selected the location for a junction between this first railway line, and the other Cape railway networks further east, in 1881. In 1899 two brothers who ran a trading store and hotel at the junction, Isaac and Wulf Friedlander, purchased the farm of De Aar. Following the Anglo Boer War, the Friedlander brothers surveyed the land for the establishment of a town. The municipality was created a year later in 1900.

Orton (2012) writes that "The colonial period history of the area is not that old. While the town of De Aar only dates back to 1903, just after the cessation of the 1899-1902 Anglo-Boer War, farms were given out and surveyed in the 1800s." He goes on to note that " The railway junction dates to 1881 when Cape Town and Kimberley were linked by rail after diamonds were discovered at the latter town. It was very important to the British during the Anglo-Boer War since railway lines from Cape Town and Port Elizabeth joined here and extended on through Kimberly to Mafikeng (AngloBoerWar.com 2011). De Aar was also the site of the first use of wireless telegraphy in South Africa where the British employed it to maintain communications between their various columns operating in the area. However, owing to the climatic conditions in the Karoo, the wireless sets, which were designed for shipboard use, could not perform properly and were soon withdrawn from inland service (Baker 1998). The town was laid out around the railway junction on the farm De Aar which was purchased in 1889 by Isaac and Wolf Friedlander, who ran a trading store and hotel at the railway junction. After the war, the brothers established the town." Orton (2012) also notes that "Two Provincial Heritage Sites occur in De Aar. These are the "Olive Schreiner house" and the "St Paul's Church". At least one other building is listed (SAHRA, n.d.). Many of the older buildings in the town are early 20th century, including some art deco, but the majority of structures date to the mid- to late 20th century. De Aar is well known as one of the places where Olive Schreiner lived. She and her husband were there from 1907 to 1914."

Kruger (2012) describes the development area as "characterised by flat undulating Karoo vegetation comprised of relatively sparse scrub and grasses, with dolerite hills in the surrounding landscape. Large portions of the land is currently devoted to livestock farming but a number of solar energy facilities are to be constructed on farms around De Aar. Shallow soils covers a combination of calcrete, shale and dolerite substrates, and large sections in the landscape are exposed to sheet erosion, specifically along low lying areas and drainage lines. Dolerite and sandstone is present, while exotic rocks occur in the gravel of the Orange River bed and terraces. These provided suitable material for stone tool production during the Earlier, Middle and Later Stone Ages."

Archaeology

As part of the 2012 process for approval of the Vetlaagte Solar Energy Facility located immediately adjacent to the proposed development area, Kruger conducted a detailed Heritage Impact Assessment of the area. According to Kruger (2012), "During the survey, widespread Middle Stone Age (MSA) material, including characteristic formal MSA stone tools such as points, blades and scrapers were documented in the survey area along a north-south oriented drainage on the (western) periphery of the property. The lithic remains occur in three large scatters and, almost without exception, in low lying areas along non-perennial drainage lines and wetland areas where precipitation and groundwater have exposed the stone tools, originally deposited on a decomposed calcrete rock layer approximately 30cm sub surface. Preliminary examinations of some of the lithics indicated that a number of flakes displayed facetted platforms, characteristic of the MSA." Part of the study area for the Wag 'n Bietjie development assessed in this report is located within the drainage described above. It is therefore likely that the proposed development will impact on significant MSA archaeology.

Kruger (2012) also documented historical period remains, "specifically the old Vetlaagte homestead with restored farmhouse, outbuildings, midden and labourers quarters, as well as a dilapidated dam wall constructed in the drainage line east of the farmstead are present on the property. The date of construction of the farm house is denoted by a year count ("1930") on the front gable of the structure. The entire farmstead is situated in an area excluded from the solar farm development. A small family graveyard, associated with the farmstead at Vetlaagte, also occurs in the exclusion zone about 100m north of the farm house."

In his assessment of areas adjacent to this proposed development, Orton (2012) found that "All the archaeological finds on Badenhorst Dam Farm were pre-colonial, but nevertheless, different types were present. This farm also had areas with artefacts best described as being 'background scatter'. The grass cover, however, meant that fewer such areas were identified. Most were in open, silty patches that clearly hold water in the rainy season…" Orton (2012) found LSA artefacts associated with the ridge running through the property that he assessed, and MSA artefacts from a pan-like area. He noted that "the artefacts in the flatter areas here appeared to be of much lower density and far fewer occurrences were recorded. However, stone artefact scatters with spatial integrity were more common. These were predominantly LSA and very much focused on the rocky ridges crossing the farm."

Orton (2012) noted that the spatially constrained scatters of artefacts that he identified "are almost certain to indicate places where people camped and the durable stone artefacts are now all that remains as evidence. It is also notable that their locations are not random – they are placed on level areas and saddles along the ridges. One of these LSA scatters, DAR2011/019 (#026) included a thumbnail scraper indicative of a mid- to late Holocene age. Some of the artefacts here were very black and shiny indicating recent flaking and deposition." Orton (2012) also identified a number of piled stone structures. These appeared to be concentrated on one particular dolerite ridge and, unlike those from elsewhere in the Karoo, only one may have been a kraal. He determined that these structures are likely to be pre-colonial in age as similar piles have been recorded in an almost certain pre-colonial context in the Seacow River valley (Hart 1989). Orton (2012) also identified a number of engraved rocks that date to the LSA and historical times. All of Orton's findings (2012) are mapped in Figure 3 and 3b. While these resources fall outside of this development area, they give an indication of the likely archaeological sensitivity of the development area under consideration in this assessment.

A recent field assessment on an adjacent farm conducted by CTS Heritage found that "The overall archaeological sensitivity of the development area with regard to the preservation of Early, Middle and Later Stone Age archaeology as well as Khoe and San heritage, early colonial settlement is regarded as very high. Despite this, the field assessment conducted for this project has demonstrated that the specific area proposed for development has low sensitivity for impacts to significant archaeological heritage." The report goes on to note that "Two sites warranted protection with an interesting scatter of Still Bay tools on top of a dolerite outcrop with excellent views of the surrounding area. It is highly unlikely this area will be developed and it is recommended that infrastructure is not placed on this outcrop. Another site was found warranting a IIIB rating with pottery, bone and an extensive stone tool assemblage amongst the dolerite outcrops on the eastern end of the property. Again, this site has been demarcated as sensitive and the project team has been advised to avoid this area when finalising the layouts. A minimum buffer of 100m is recommended from this site (Wag n Bietjie 014). The rest of the observations are typical of the area and are ubiquitously distributed in low densities of less than 5 artefacts per observation." Similar heritage resources are likely to be located within the area proposed for development.

Palaeontology

According to the SAHRIS Palaeosensitivity Map (Figure 4a), the area proposed for development is underlain by sediments of moderate. high and very high paleontological sensitivity. According to the extract from the Council for GeoSciences Map 3024 for Colesburg, the development area is underlain by Jurassic Dolerite, the Tierberg Formation of the Ecca Group and the Adelaide Subgroup of the Beaufort Group as well as Quaternary sands associated with the drainage lines.

As part of the process completed in 2012 for the approved neighbouring Vetlaagte Solar Energy Facility, Almond completed a field-based palaeontological assessment. Almond (2012) found that "The potentially fossiliferous sediments of the Late Palaeozoic Karoo Supergroup (Ecca and Lower Beaufort Groups) that underlie the study area are almost entirely mantled in a thick layer of superficial deposits of probable Pleistocene to Recent age. These include various soils, gravels and – at least in some areas - a well-developed calcrete hardpan. The upper Ecca Group bedrocks in the northern portion of the study area contain locally abundant fossil wood (of palaeontological interest for dating and palaeoenvironmental studies), as well as low diversity non-marine trace fossil assemblages typical of the Waterford Formation, rather than the Tierberg Formation as mapped. No vertebrate fossils and only scattered woody plant impressions of the Permian Glossopteris Flora were observed within the Lower Beaufort Group

rocks that are very poorly exposed in the southern portion of the Vetlaagte study area. Trace fossils, silicified wood and rare vertebrate remains (therapsids, parareptiles) of the Middle Permian Pristerognathus Assemblage Zone have recently been recorded from this succession in the De Aar region (Almond 2010b). Extensive dolerite sills and dykes of the Early Jurassic Karoo Dolerite Suite intruding the Karoo Supergroup sediments are entirely unfossiliferous, as are rare intrusive kimberlite pipe rocks of Cretaceous age. The diverse superficial deposits within the three study areas (e.g. soils, gravels, alluvium, calcrete hardpans) are of low palaeontological sensitivity as a whole . Abundant fragments of reworked fossil wood material of Ecca provenance occur widely within subsurface and surface gravels overlying the Ecca Group outcrop area."

Almond (2012) concludes that "The construction of new access roads and transmission lines in this region are likewise considered to be of low significance as far as fossil heritage is concerned… In view of the overall low significance of the proposed development on palaeontological heritage resources, it is concluded that no further palaeontological heritage studies or specialist mitigation are required for these small PV projects, pending the exposure of any substantial fossil remains (e.g. vertebrate bones and teeth, large blocks of petrified wood) during the construction phase."

RECOMMENDATION

Based on the information available, it is likely that the proposed development will negatively impact on significant archaeological heritage resources and as such, it is recommended that a Heritage Impact Assessment is completed that satisfies section 38(3) of the NHRA and assesses these impacts.

9. Scoping Assessment

Impact Destruction of significant heritage resources			
Issue	**Nature of Impact**	**Extent of Impact**	**No-go Areas**
Destruction of archaeological heritage	Direct impact to archaeological heritage of scientific significance	Within project boundary	None identified at this stage
Destruction of palaeontological heritage	Direct impact to palaeontological heritage of scientific significance	Within project boundary	None identified at this stage
Negative impact to significant cultural landscapes	Indirect impact to significant cultural landscapes and cultural landscape elements	Regional	None identified at this stage
Description of expected significance of impact Field assessment will determine the significance of the resources likely to be impacted. Impacts can be minimised through the implementation of appropriate mitigation measures.			
Gaps in knowledge & recommendations for further study The project area and the area more broadly have not been subjected to many heritage impact assessments and therefore substantial gaps in knowledge exist. Field assessment will fill these gaps.			
Recommendations with regards to general field surveys Archaeological field surveys must provide sufficient ground-coverage of the areas to be developed to be able to determine the nature of the resources likely to be impacted. Palaeontological and cultural landscape field surveys will target sensitive geological and cultural landscape features.			

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APPENDIX 1

List of built environment and archaeological heritage resources identified within 15km of the development area

Site ID	Site/Observation no.	Full Site Name/Description	Site Type	Grading
33933	DAR2011/004	BADENHORST DAM FARM 2011/004	Artefacts	Grade IIIb
33947	DAR2011/010	BADENHORST DAM FARM 2011/010	Stone walling	Grade IIIb
33955	DAR2011/014	BADENHORST DAM FARM 2011/014	Stone walling	Grade IIIb
33851	DPLE1	DU PLESSIS 1	Palaeontological	Grade IIIb
33852	DPLE2	DU PLESSIS 2	Palaeontological	Grade IIIb
33853	DPLE3	DU PLESSIS 3	Palaeontological	Grade IIIb
33854	DPLE4	DU PLESSIS 4	Palaeontological	Grade IIIb
33855	DPLE5	DU PLESSIS 5	Palaeontological	Grade IIIb
33856	DPLE6	DU PLESSIS 6	Palaeontological	Grade IIIb
33858	DPLE8	DU PLESSIS 8	Palaeontological	Grade IIIb
33887	RNSB244	Renosterburg244	Palaeontological	Grade IIIb
33891	RNSB245	Renosterburg245	Palaeontological	Grade IIIb
35187	EMJ-5	Emthanjeni 5	Palaeontological	Grade IIIb
34597	TBS003	Taaiboschfontein 003	Archaeological, Transport infrastructure	Grade IIIb
34598	TBS002	Taaiboschfontein 002	Structures	Grade IIIb
34603	VLG008	Vetlaagte 008	Palaeontological	Grade IIIb

33929	DAR2011/001	BADENHORST DAM FARM 2011/001	Stone walling	Grade IIIc
33931	DAR2011/002	BADENHORST DAM FARM 2011/002	Artefacts	Grade IIIc
33932	DAR2011/003	BADENHORST DAM FARM 2011/003	Artefacts	Grade IIIc
33934	DAR2011/005	BADENHORST DAM FARM 2011/005	Stone walling, Artefacts	Grade IIIc
33937	DAR2011/006	BADENHORST DAM FARM 2011/006	Stone walling	Grade IIIc
33941	DAR2011/007	BADENHORST DAM FARM 2011/007	Archaeological	Grade IIIc
33942	DAR2011/008	BADENHORST DAM FARM 2011/008	Stone walling, Artefacts	Grade IIIc
33943	DAR2011/009	BADENHORST DAM FARM 2011/009	Stone walling	Grade IIIc
33950	DAR2011/011	BADENHORST DAM FARM 2011/011	Stone walling	Grade IIIc
33949	DAR2011/012	BADENHORST DAM FARM 2011/012	Stone walling	Grade IIIc
33954	DAR2011/013	BADENHORST DAM FARM 2011/013	Stone walling	Grade IIIc
33956	DAR2011/015	BADENHORST DAM FARM 2011/015	Stone walling	Grade IIIc
33957	DAR2011/016	BADENHORST DAM FARM 2011/016	Stone walling	Grade IIIc
33958	DAR2011/017	BADENHORST DAM FARM 2011/017	Stone walling	Grade IIIc
33951	DAR2011/018	BADENHORST DAM FARM 2011/018	Artefacts	Grade IIIc
33952	DAR2011/019	BADENHORST DAM FARM 2011/019	Artefacts	Grade IIIc
33953	DAR2011/020	BADENHORST DAM FARM 2011/020	Artefacts	Grade IIIc
33948	DAR2011/021	BADENHORST DAM FARM 2011/021	Stone walling	Grade IIIc
33946	DAR2011/022	BADENHORST DAM FARM 2011/022	Archaeological	Grade IIIc

33945	DAR2011/023	BADENHORST DAM FARM 2011/023	Stone walling	Grade IIIc
33944	DAR2011/024	BADENHORST DAM FARM 2011/024	Building	Grade IIIc
33667	DASE13	De Aar South East 13	Artefacts	Grade IIIc
33668	DASE14	De Aar South East 14	Artefacts	Grade IIIc
33669	DASE15	De Aar South East 15	Artefacts	Grade IIIc
33670	DASE16	De Aar South East 16	Artefacts	Grade IIIc
33651	DASE1	De Aar South East 1	Artefacts	Grade IIIc
33666	DASE12	De Aar South East 12	Artefacts	Grade IIIc
33663	DASE10	De Aar South East 10	Artefacts	Grade IIIc
33671	DASE17	De Aar South East 17	Artefacts	Grade IIIc
33672	DASE18	De Aar South East 18	Artefacts	Grade IIIc
33673	DASE19	De Aar South East 19	Artefacts	Grade IIIc
33674	DASE20	De Aar South East 20	Artefacts	Grade IIIc
33675	DASE21	De Aar South East 21	Artefacts	Grade IIIc
33676	DASE22	De Aar South East 22	Artefacts	Grade IIIc
33677	DASE25	De Aar South East 25	Artefacts	Grade IIIc
33679	DASE26	De Aar South East 26	Artefacts	Grade IIIc
33678	DASE27	De Aar South East 26	Artefacts	Grade IIIc
33653	DASE4	De Aar South East 4	Artefacts	Grade IIIc

33661	DASE8	De Aar South East 8	Artefacts	Grade IIIc
33664	DASE9	De Aar South East 9	Artefacts	Grade IIIc
33662	DASE7	De Aar South East 7	Artefacts	Grade IIIc
33655	DASE6	De Aar South East 6	Artefacts	Grade IIIc
33914	DPD2011/001	DU PLESSIS DAM 2011/001	Stone walling	Grade IIIc
33915	DPD2011/002	DU PLESSIS DAM 2011/002	Structures, Artefacts	Grade IIIc
33916	DPD2011/003	DU PLESSIS DAM 2011/003	Artefacts, Ruin > 100 years	Grade IIIa
33918	DPD2011/004	DU PLESSIS DAM 2011/004	Artefacts, Ruin > 100 years	Grade IIIa
33919	DPD2011/005	DU PLESSIS DAM 2011/005	Artefacts, Ruin > 100 years	Grade IIIa
33920	DPD2011/006	DU PLESSIS DAM 2011/006	Artefacts	Grade IIIa
33922	DPD2011/007	DU PLESSIS DAM 2011/007	Ruin > 100 years, Artefacts	Grade IIIa
33925	DPD2011/008	DU PLESSIS DAM 2011/008	Ruin > 100 years, Artefacts	Grade IIIa
33927	DPD2011/010	DU PLESSIS DAM 2011/010	Archaeological	Grade IIIa
33928	DPD2011/011	DU PLESSIS DAM 2011/011	Artefacts	Grade IIIa
33930	DPD2011/012	DU PLESSIS DAM 2011/012	Artefacts	Grade IIIc
33935	DPD2011/013	DU PLESSIS DAM 2011/013	Artefacts	Grade IIIc
33936	DPD2011/014	DU PLESSIS DAM 2011/014	Artefacts	Grade IIIc
33938	DPD2011/015	DU PLESSIS DAM 2011/015	Artefacts	Grade IIIc
33939	DPD2011/016	DU PLESSIS DAM 2011/016	Artefacts	Grade IIIc

33940	DPD2011/017	DU PLESSIS DAM 2011/017	Artefacts	Grade IIIc
33652	DASE2	De Aar South East 2	Artefacts	Grade IIIc
33857	DPLE7	DU PLESSIS 7	Palaeontological	Grade IIIb
33654	DASE5	De Aar South East 5	Artefacts	Grade IIIc
37209	TRANS-ECNC013	Transnet - Eastern Cape, Northern Cape 013	Ruin > 100 years, Artefacts	Grade IIIc
34468	VLG001	VETLAAGTE 1	Artefacts	Grade IIIb
34470	VLG002	Vetlaagte 2	Artefacts	Grade IIIb
34471	VLG003	VETLAAGTE 3	Artefacts	Grade IIIc
34474	VLG004	VETLAAGTE 4	Artefacts	Grade IIIb
34475	VLG005	VETLAAGTE 5	Building	Grade IIIb
34478	VLG006	VETLAAGTE 6	Stone walling	Grade IIIc
35179	EMJ-2	Emthanjeni 1	Palaeontological	Grade IIIb
34604	VLG009	Vetlaagte 009	Palaeontological	Grade IIIc
34605	VLG010	Vetlaagte 010	Palaeontological	Grade IIIc
34606	VLG011	Vetlaagte 011	Palaeontological	Grade IIIc
34607	VLG012	Vetlaagte 012	Palaeontological	Grade IIIc
34608	VLG013	Vetlaagte 013	Palaeontological	Grade IIIc
40830	DAR2011/025	BADENHORST DAM FARM 2011/025	Palaeontological	Grade IIIc
40831	DAR2011/026	BADENHORST DAM FARM 2011/026	Palaeontological	Grade IIIc

40832	DAR2011/027	BADENHORST DAM FARM 2011/027	Palaeontological	Grade IIIc
40833	DAR2011/028	BADENHORST DAM FARM 2011/028	Palaeontological	Grade IIIc
40834	DAR2011/029	BADENHORST DAM FARM 2011/029	Palaeontological	Grade IIIc
40836	DAR2011/031	BADENHORST DAM FARM 2011/031	Palaeontological	Grade IIIc
40837	DAR2011/030	BADENHORST DAM FARM 2011/030	Palaeontological	Grade IIIc
40838	DAR2011/032	BADENHORST DAM FARM 2011/032	Palaeontological	Grade IIIc
40839	DAR2011/033	BADENHORST DAM FARM 2011/033	Palaeontological	Grade IIIc
40841	DAR2011/035	BADENHORST DAM FARM 2011/035	Palaeontological	Grade IIIc
40842	DAR2011/036	BADENHORST DAM FARM 2011/036	Palaeontological	Grade IIIc
40843	DAR2011/037	BADENHORST DAM FARM 2011/037	Palaeontological	Grade IIIc
40844	DAR2011/038	BADENHORST DAM FARM 2011/038	Palaeontological	Grade IIIc
40845	DAR2011/034	BADENHORST DAM FARM 2011/034	Palaeontological	Grade IIIc
34479	VLG007	VETLAAGTE 7	Burial Grounds & Graves	Grade IIIa
90903	DPD018	Du Plessis Dam 018	Artefacts	Grade IIIc
90904	DPD019	Du Plessis Dam 019	Artefacts	Grade IIIc
90905	DPD020	Du Plessis Dam 020	Artefacts	Grade IIIc
90906	DPD021	Du Plessis Dam 021	Artefacts	Grade IIIc
90907	DPD022	Du Plessis Dam 022	Artefacts	Grade IIIc
90908	DPD023	Du Plessis Dam 023	Artefacts	Grade IIIc

90909	DPD024	Du Plessis Dam 024	Artefacts	
90910	DPD024	Du Plessis Dam 024	Artefacts	Grade IIIc
90911	DPD025	Du Plessis Dam 025	Artefacts	Grade IIIc
90912	DPD026	Du Plessis Dam 026	Artefacts	Grade IIIc
90913	DPD027	Du Plessis Dam 027	Artefacts	Grade IIIc
90914	DPD028	Du Plessis Dam 028	Artefacts	Grade IIIc
90919	DPD029	Du Plessis Dam 029	Artefacts	Grade IIIc
90920	DPD030	Du Plessis Dam 030	Artefacts	Grade IIIc
90921	DPD031	Du Plessis Dam 031	Artefacts	Grade IIIc
90922	DPD032	Du Plessis Dam 032	Artefacts	Grade IIIc
90923	DPD033	Du Plessis Dam 033	Artefacts	Grade IIIc
90924	DPD034	Du Plessis Dam 034	Artefacts	Grade IIIc
90925	DPD035	Du Plessis Dam 035	Artefacts	Grade IIIc
90926	DPD036	Du Plessis Dam 036	Burial Grounds & Graves	Grade IIIa
90927	DPD037	Du Plessis Dam 037	Archaeological	Grade IIIa
91325	BADE007	Badenhorst PV3/007	Artefacts	Grade IIIc
91326	BADE008	Badenhorst PV3/008	Structures	Grade IIIc
91319	BADE001	Badenhorst PV3/001	Stone walling	Grade IIIc
91320	BADE002	Badenhorst PV3/002	Artefacts	Grade IIIc

91321	BADE003	Badenhorst PV3/003	Artefacts	Grade IIIc
91322	BADE004	Badenhorst PV3/004	Artefacts	Grade IIIc
91323	BADE005	Badenhorst PV3/005	Artefacts	Grade IIIc
91324	BADE006	Badenhorst PV3/006	Artefacts	Grade IIIb
91328	BADE010	Badenhorst PV3/010	Stone walling	Grade IIIc
91329	BADE011	Badenhorst PV3/011	Structures	Grade IIIc
91330	BADE012	Badenhorst PV3/012	Structures	Grade IIIb
91331	BADE013	Badenhorst PV3/013	Structures	Grade IIIb
91333	BADE015	Badenhorst PV3/015	Artefacts	Grade IIIc
91334	BADE016	Badenhorst PV3/016	Artefacts	Grade IIIc
91335	BADE017	Badenhorst PV3/017	Structures	Grade IIIc
91336	BADE018	Badenhorst PV3/018	Burial Grounds & Graves	Grade IIIc
91337	BADE019	Badenhorst PV3/019	Structures	Grade IIIc
91338	BADE020	Badenhorst PV3/020	Structures	Grade IIIc
91339	BADE021	Badenhorst PV3/021	Artefacts	
91341	BADE022	Badenhorst PV3/022	Artefacts	
91342	BADE023	Badenhorst PV3/023	Artefacts	
91343	BADE024	Badenhorst PV3/024	Artefacts	
91344	BADE025	Badenhorst PV3/025	Artefacts	

91345	BADE026	Badenhorst PV3/026	Artefacts	
91346	BADE027	Badenhorst PV3/027	Artefacts	
91347	BADE028	Badenhorst PV3/028	Artefacts	
91348	BADE029	Badenhorst PV3/029	Artefacts	
91349	BADE030	Badenhorst PV3/030	Artefacts	
91332	BADE014	Badenhorst PV3/014	Structures	Grade IIIb
132051	DAR2013/001	BADENHORST DAM FARM	Stone walling	Grade IIIb
128603	3024CA/SEF/2012/SA01	Solar Energy Facility- site SA01	Artefacts	
128608	3024CA/DASP/2012/2	De Aar Solar Park- Site 2	Stone walling	Ungraded
128614	3024CA/SEFFDA180/2013/DAR2013/001	Solar Energy Facilities on the Farm De Aar 180- Site DAR2013/001	Building	Ungraded
128615	3024CA/SEFFDA180/2013/DAR2013/002	Solar Energy Facilities on the Farm De Aar 180- Site DAR2013/002	Artefacts	Ungraded
128616	3024CA/SEFFDA180/2013/DAR2013/003	Solar Energy Facilities on the Farm De Aar 180- Site DAR2013/003	Artefacts	Ungraded
128618	3024CA/SEFFDA180/2013/DAR2013/004	Solar Energy Facilities on the Farm De Aar 180- Site DAR2013/004	Artefacts	Ungraded
128619	3024CA/SEFFDA180/2013/DAR2013/005	Solar Energy Facilities on the Farm De Aar 180- Site DAR2013/005	Artefacts	Ungraded
128620	3024CA/SEFFDA180/2013/DAR2013/013	Solar Energy Facilities on the Farm De Aar 180- Site DAR2013/013	Artefacts	Ungraded
128621	3024CA/SEFFDA180/2013/DAR2013/014	Solar Energy Facilities on the Farm De Aar 180- Site DAR2013/014	Artefacts	Ungraded
128623	3024CA/SEFFDA180/2013/DAR2013/015	Solar Energy Facilities on the Farm De Aar 180- Site DAR2013/015	Artefacts	Ungraded
128624	3024CA/SEFFDA180/2013/DAR2013/016	Solar Energy Facilities on the Farm De Aar 180- Site DAR2013/016	Artefacts	Ungraded
128627	3024CA/SEFFDA180/2013/DAR2013/017	Solar Energy Facilities on the Farm De Aar 180- Site DAR2013/017	Artefacts	Ungraded

128628	3024CA/SEFFDA180/2013/DAR2013/018	Solar Energy Facilities on the Farm De Aar 180- Site DAR2013/018	Artefacts	Ungraded
128629	3024CA/SEFFDA180/2013/DAR2013/019	Solar Energy Facilities on the Farm De Aar 180- Site DAR2013/019	Artefacts	Ungraded
128630	3024CA/SEFFDA180/2013/DAR2013/020	Solar Energy Facilities on the Farm De Aar 180- Site DAR2013/020	Artefacts	Ungraded
128631	3024CA/SEFFDA180/2013/DAR2013/021	Solar Energy Facilities on the Farm De Aar 180- Site DAR2013/021	Artefacts	Ungraded
128632	3024CA/SEFFDA180/2013/DAR2013/022	Solar Energy Facilities on the Farm De Aar 180- Site DAR2013/022	Artefacts	Ungraded
128633	3024CA/SEFFDA180/2013/DAR2013/023	Solar Energy Facilities on the Farm De Aar 180- Site DAR2013/023	Artefacts	Ungraded
128634	3024CA/SEFFDA180/2013/DAR2013/024	Solar Energy Facilities on the Farm De Aar 180- Site DAR2013/024	Building	Ungraded
128635	3024CA/SEFFDA180/2013/DAR2013/006	Solar Energy Facilities on the Farm De Aar 180- Site DAR2013/006	Artefacts	Ungraded
128636	3024CA/SEFFDA180/2013/DAR2013/007	Solar Energy Facilities on the Farm De Aar 180- Site DAR2013/007	Artefacts	Ungraded
128637	3024CA/SEFFDA180/2013/DAR2013/008	Solar Energy Facilities on the Farm De Aar 180- Site DAR2013/008	Stone walling	Ungraded
128638	3024CA/SEFFDA180/2013/DAR2013/009	Solar Energy Facilities on the Farm De Aar 180- Site DAR2013/009	Stone walling	Ungraded
128639	3024CA/SEFFDA180/2013/DAR2013/010	Solar Energy Facilities on the Farm De Aar 180- Site DAR2013/010	Artefacts	Ungraded
128640	3024CA/SEFFDA180/2013/DAR2013/011	Solar Energy Facilities on the Farm De Aar 180- Site DAR2013/011	Artefacts	Ungraded
128641	3024CA/SEFFDA180/2013/DAR2013/012	Solar Energy Facilities on the Farm De Aar 180- Site DAR2013/012	Artefacts	Ungraded
128642	3024CA/SEFFDA180/2013/DAR2011/001	Solar Energy Facilities on the Farm De Aar 180- Site DAR2011/001	Artefacts	Ungraded
128643	3024CA/SEFFDA180/2013/DAR2011/002	Solar Energy Facilities on the Farm De Aar 180- Site DAR2011/002	Artefacts	Ungraded
128644	3024CA/SEFFDA180/2013/DAR2011/003	Solar Energy Facilities on the Farm De Aar 180- Site DAR2011/003	Artefacts	Ungraded
128645	3024CA/SEFFDA180/2013/DAR2011/004	Solar Energy Facilities on the Farm De Aar 180- Site DAR2011/004	Artefacts	Ungraded
128646	3024CA/SEFFDA180/2013/DAR2011/005	Solar Energy Facilities on the Farm De Aar 180- Site DAR2011/005	Artefacts	Ungraded

128647	3024CA/SEFFDA180/2013/DAR2011/006	Solar Energy Facilities on the Farm De Aar 180- Site DAR2011/006	Artefacts	
128648	3024CA/SEFFDA180/2013/DAR2011/007	Solar Energy Facilities on the Farm De Aar 180- Site DAR2011/007	Artefacts	Ungraded
128650	3024CA/SEFFDA180/2013/DAR2011/008	Solar Energy Facilities on the Farm De Aar 180- Site DAR2011/008	Artefacts	Ungraded
128652	3024CA/SEFFDA180/2013/DAR2011/009	Solar Energy Facilities on the Farm De Aar 180- Site DAR2011/009	Artefacts	Ungraded
128653	3024CA/SEFFDA180/2013/DAR2011/010	Solar Energy Facilities on the Farm De Aar 180- Site DAR2011/010	Artefacts	Ungraded
128654	3024CA/SEFFDA180/2013/DAR2011/011	Solar Energy Facilities on the Farm De Aar 180- Site DAR2011/011	Artefacts	Ungraded
128655	3024CA/SEFFDA180/2013/DAR2011/012	Solar Energy Facilities on the Farm De Aar 180- Site DAR2011/012	Artefacts	Ungraded
128656	3024CA/SEFFDA180/2013/DAR2011/013	Solar Energy Facilities on the Farm De Aar 180- Site DAR2011/013	Artefacts	Ungraded
128657	3024CA/SEFFDA180/2013/DAR2011/014	Solar Energy Facilities on the Farm De Aar 180- Site DAR2011/014	Artefacts	Ungraded
128658	3024CA/SEFFDA180/2013/DAR2011/015	Solar Energy Facilities on the Farm De Aar 180- Site DAR2011/015	Artefacts	Ungraded
128659	3024CA/SEFFDA180/2013/DAR2011/016	Solar Energy Facilities on the Farm De Aar 180- Site DAR2011/016	Stone walling	Ungraded
128660	3024CA/SEFFDA180/2013/DAR2011/017	Solar Energy Facilities on the Farm De Aar 180- Site DAR2011/017	Artefacts	Ungraded
128661	3024CA/SEFFDA180/2013/DAR2011/018	Solar Energy Facilities on the Farm De Aar 180- Site DAR2011/018	Artefacts	Ungraded
128662	3024CA/SEFFDA180/2013/DAR2011/019	Solar Energy Facilities on the Farm De Aar 180- Site DAR2011/019	Artefacts	Ungraded
128663	3024CA/SEFFDA180/2013/DAR2011/020	Solar Energy Facilities on the Farm De Aar 180- Site DAR2011/020	Artefacts	Ungraded
128664	3024CA/SEFFDA180/2013/DAR2011/021	Solar Energy Facilities on the Farm De Aar 180- Site DAR2011/021	Artefacts	Ungraded
128665	3024CA/SEFFDA180/2013/DAR2011/022	Solar Energy Facilities on the Farm De Aar 180- Site DAR2011/022	Artefacts	Ungraded
128666	3024CA/SEFFDA180/2013/DAR2011/023	Solar Energy Facilities on the Farm De Aar 180- Site DAR2011/023	Artefacts	Ungraded
128668	3024CA/SEFFDA180/2013/DAR2011/024	Solar Energy Facilities on the Farm De Aar 180- Site DAR2011/024	Building	Ungraded

128673	3024CA/SEFDPD179/2013/DPD2011/001	Solar Energy Facilities on the Farm Du Plessis Dam 179- Site DPD2011/001	Artefacts	Ungraded
128674	3024CA/SEFDPD179/2013/DPD2011/002	Solar Energy Facilities on the Farm Du Plessis Dam 179- Site DPD2011/002	Artefacts	Ungraded
128675	3024CA/SEFDPD179/2013/DPD2011/003	Solar Energy Facilities on the Farm Du Plessis Dam 179- Site DPD2011/003	Artefacts	Grade IIIa
139253	DP2013/006	DP2013/006	Artefacts	
128676	3024CA/SEFDPD179/2013/DPD2011/004	Solar Energy Facilities on the Farm Du Plessis Dam 179- Site DPD2011/004	Artefacts	Grade IIIa
139254	DP2021/001	DP2021/001	Artefacts	
128677	3024CA/SEFDPD179/2013/DPD2011/005	Solar Energy Facilities on the Farm Du Plessis Dam 179- Site DPD2011/005	Artefacts	Grade IIIa
33926	DPD2011/009	DU PLESSIS DAM 2011/009	Burial Grounds & Graves	Grade IIIa
139255	DP2013/009	DP2013/009	Artefacts	
128678	3024CA/SEFDPD179/2013/DPD2011/006	Solar Energy Facilities on the Farm Du Plessis Dam 179- Site DPD2011/006	Artefacts	Grade IIIa
128679	3024CA/SEFDPD179/2013/DPD2011/007	Solar Energy Facilities on the Farm Du Plessis Dam 179- Site DPD2011/007	Building	Grade IIIa
128680	3024CA/SEFDPD179/2013/DPD2011/008	Solar Energy Facilities on the Farm Du Plessis Dam 179- Site DPD2011/008	Artefacts	Grade IIIa
128681	3024CA/SEFDPD179/2013/DPD2011/009	Solar Energy Facilities on the Farm Du Plessis Dam 179- Site DPD2011/009	Artefacts	Grade IIIa
128682	3024CA/SEFDPD179/2013/DPD2011/010	Solar Energy Facilities on the Farm Du Plessis Dam 179- Site DPD2011/010	Artefacts	Grade IIIa

128683	3024CA/SEFDPD179/2013/DPD2011/011	Solar Energy Facilities on the Farm Du Plessis Dam 179- Site DPD2011/011	Artefacts	Grade IIIa
128684	3024CA/SEFDPD179/2013/DPD2011/012	Solar Energy Facilities on the Farm Du Plessis Dam 179- Site DPD2011/012	Artefacts	Ungraded
128685	3024CA/SEFDPD179/2013/DPD2011/013	Solar Energy Facilities on the Farm Du Plessis Dam 179- Site DPD2011/013	Artefacts	Ungraded
128686	3024CA/SEFDPD179/2013/DPD2011/014	Solar Energy Facilities on the Farm Du Plessis Dam 179- Site DPD2011/014	Artefacts	Ungraded
128687	3024CA/SEFDPD179/2013/DPD2011/015	Solar Energy Facilities on the Farm Du Plessis Dam 179- Site DPD2011/015	Artefacts	Ungraded
128688	3024CA/SEFDPD179/2013/DPD2011/016	Solar Energy Facilities on the Farm Du Plessis Dam 179- Site DPD2011/016	Artefacts	Ungraded
128689	3024CA/SEFDPD179/2013/DPD2011/017	Solar Energy Facilities on the Farm Du Plessis Dam 179- Site DPD2011/017	Artefacts	Ungraded
128690	3024CA/SEFDPD179/2013/DPD2013/001	Solar Energy Facilities on the Farm Du Plessis Dam 179- Site DPD2013/001	Artefacts	Ungraded
128691	3024CA/SEFDPD179/2013/DPD2013/002	Solar Energy Facilities on the Farm Du Plessis Dam 179- Site DPD2013/002	Artefacts	Ungraded
128692	3024CA/SEFDPD179/2013/DPD2013/003	Solar Energy Facilities on the Farm Du Plessis Dam 179- Site DPD2013/003	Artefacts	Ungraded
128693	3024CA/SEFDPD179/2013/DPD2013/004	Solar Energy Facilities on the Farm Du Plessis Dam 179- Site DPD2013/004	Artefacts	Ungraded
128695	3024CA/SEFDPD179/2013/DPD2013/006	Solar Energy Facilities on the Farm Du Plessis Dam 179- Site DPD2013/006	Artefacts	Ungraded
128696	3024CA/SEFDPD179/2013/DPD2013/007	Solar Energy Facilities on the Farm Du Plessis Dam 179- Site	Artefacts	Ungraded

		DPD2013/007		
128697	3024CA/SEFDPD179/2013/DPD2013/008	Solar Energy Facilities on the Farm Du Plessis Dam 179- Site DPD2013/008	Artefacts	Ungraded
128698	3024CA/SEFDPD179/2013/DPD2013/009	Solar Energy Facilities on the Farm Du Plessis Dam 179- Site DPD2013/009	Structures	Ungraded
128699	3024CA/SEFDPD179/2013/DPD2013/010	Solar Energy Facilities on the Farm Du Plessis Dam 179- Site DPD2013/010	Artefacts	Ungraded
128701	3024CA/SEFDPD179/2013/DPD2013/011	Solar Energy Facilities on the Farm Du Plessis Dam 179- Site DPD2013/011	Artefacts	Ungraded
128704	3024CA/SEFDPD179/2013/DPD2013/012	Solar Energy Facilities on the Farm Du Plessis Dam 179- Site DPD2013/012	Artefacts	Ungraded
128705	3024CA/SEFDPD179/2013/DPD2013/013	Solar Energy Facilities on the Farm Du Plessis Dam 179- Site DPD2013/013	Artefacts	Ungraded
128706	3024CA/SEFDPD179/2013/DPD2013/014	Solar Energy Facilities on the Farm Du Plessis Dam 179- Site DPD2013/014	Artefacts	Ungraded
128707	3024CA/SEFDPD179/2013/DPD2013/015	Solar Energy Facilities on the Farm Du Plessis Dam 179- Site DPD2013/015	Artefacts	Ungraded
128708	3024CA/SEFDPD179/2013/DPD2013/016	Solar Energy Facilities on the Farm Du Plessis Dam 179- Site DPD2013/016	Artefacts	Ungraded

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APPENDIX 2

Reference List from SAHRIS

Heritage Impact Assessments				
Nid	**Report Type**	**Author/s**	**Date**	**Title**
104574	Heritage Scoping	Wouter Fourie	10/10/2012	Heritage Scoping Report for the Proposed Wind Farm Facility for Renosterberg Wind Energy Company (RWEC) near Petrusville, Northern Cape Province
104576	Heritage Scoping	Wouter Fourie	10/10/2012	Heritage Scoping Report for the Proposed Solar PV Facility for Renosterberg Wind Energy Company (RWEC) near Petrusville, Northern Cape Province
104804	PIA Desktop	John E Almond	01/09/2012	Palaeontological specialist assessment: desktop study PROPOSED RENOSTERBERG SOLAR PV AND WIND ENERGY FACILITIES NEAR DE AAR, NORTHERN CAPE PROVINCE
104804	PIA Desktop	John E Almond	01/09/2012	Palaeontological specialist assessment: desktop study PROPOSED RENOSTERBERG SOLAR PV AND WIND ENERGY FACILITIES NEAR DE AAR, NORTHERN CAPE PROVINCE
109347	AIA Phase 1	David Morris	01/12/2012	ARCHAEOLOGY SPECIALIST INPUT ON THE PROPOSED ACCESS ROAD FOR THE VANDERLINDESKRAAL PHOTOVOLTAIC SITE SITUATED NEAR HANOVER, NORTHERN CAPE
109627	PIA Phase 1	Gideon Groenewald	24/01/2013	PALAEONTOLOGICAL FIELD INVESTIGATION PHASE 1 REPORT FOR THE PROPOSED ACCESS ROAD ON THE REMAINDER OF THE FARM VAN DER LINDES KRAAL NO. 79, HANOVER, NORTHERN CAPE
114648	PIA Desktop	John E Almond	01/09/2012	Palaeontological specialist assessment: desktop study PROPOSED 16 MTPA EXPANSION OF TRANSNETâ€™S EXISTING MANGANESE ORE EXPORT RAILWAY LINE & ASSOCIATED INFRASTRUCTURE BETWEEN HOTAZEL AND THE PORT OF NGQURA, NORTHERN & EASTERN CAPE. Part 1: Hotazel to Kimberley, Northern Cape
125945	AIA Phase 1	Thomas Huffman	31/03/2013	ARCHAEOLOGICAL IMPACT ASSESSMENT FOR THE DE AAR PROJECT, NORTHERN CAPE
125963	PIA Desktop	John E Almond		PALAEONTOLOGICAL IMPACT ASSESSMENT: DESKTOP STUDY Proposed windfarm at Maanhaarberg near De Aar, Northern Cape Province
129751	HIA Phase 1	Elize Becker	20/02/2013	Phase 1 Heritage Impact Assessment Hotazel to Kimberley and De Aar to Port of Ngqura
133138	HIA Phase 1	Jayson Orton, Lita	09/07/2013	HERITAGE IMPACT ASSESSMENT FOR MULTIPLE PROPOSED SOLAR ENERGY FACILITIES

		Webley		
133536	Palaeontological Specialist Reports	John E Almond	01/07/2013	PALAEONTOLOGICAL SPECIALIST STUDY
138865	HIA Phase 1	Jayson Orton	10/07/2013	HERITAGE IMPACT ASSESSMENT FOR MULTIPLE PROPOSED SOLAR ENERGY FACILITIES ON DU PLESSIS DAM 179, DE AAR, NORTHERN CAPE
138940	PIA Phase 1	John E Almond	10/07/2013	Palaeontological Specialist Study: Combined desktop and field-based assessments for the proposed Photovoltaic (Solar) Energy Facilities on Du Plessis Dam Farm near De Aar, Northern Cape
151280	Archaeological Specialist Reports	Jaco van der Walt	26/08/2013	Archeological Scoping Report for the Proposed Castle WEF near De Aar, Northern Cape Province
151284	PIA Desktop	John E Almond	31/08/2013	Palaeontological Heritage Assessment: Desktop Study
155456	Archaeological Specialist Reports	Jonathan Kaplan	20/01/2014	RECOMMENDED EXEMPTION FROM HAVING TO CONDUCT AN ARCHAEOLOGICAL SURVEY OF 67 WIND TURBINES, PROPOSED DE AAR 1 (MAANHAARBERG) WIND ENERGY FARM, DE AAR, NORTHERN CAPE PROVINCE (CaseID 2944)
160512	Archaeological Monitoring	Lita Webley, Dave Halkett	17/03/2014	HERITAGE IMPACT ASSESSMENT: WALKDOWN OF FINAL LAYOUT OF THE LONGYUAN MULILO DE AAR 2 NORTH WIND ENERGY FACILITY, NORTHERN CAPE PROVINCE
163982	Palaeontological Specialist Reports		31/08/2013	Palaeontological specialist assessment: combined desktop and field study: Proposed development PV Solar Facility near De Aar, Northern CApe Province
163994		Wouter Fourie	03/08/2013	Proposed PV Facility: Heritage Impact Report
166300	Archaeological Specialist Reports	Jonathan Kaplan	28/02/2014	Archaeological Impact Assessment: Proposed Construction Yards and Sub Station, Longyuan Mulilo De Aar Wind Energy Facility, Northern Cape.
177599	AIA Phase 1	Jonathan Kaplan	01/04/2010	ARCHAEOLOGICAL IMPACT ASSESSMENT PROPOSED PHOTOVOLTAIC POWER GENERATION FACILITY IN DE AAR NORTHERN CAPE
177600	Site Inspection Report	Will Archer, Jonathan Kaplan	01/05/2012	Reconnaissance and plan for further mitigation: sites impacted on by proposed photovoltaic power generation facility in De Aar Northern Cape

183142	Archaeological Specialist Reports	Jaco van der Walt	30/10/2014	Archaeological Impact Assessment Report for the Proposed Castle Wind Energy Facility, De Aar, Northern Cape
183143	Heritage Impact Assessment Specialist Reports	Barry Millsteed	24/11/2014	Full Palaeontological Heritage Impact Assessment Report on a Portion of a Proposed Wind Energy Generation Facility (The Castle Project); This Being on the Eastern Extent of the Farm Knapdaar 8 near De Aar, Northern Cape Province
256363	Palaeontological Specialist Reports	John Almond	15/06/2013	Palaeontological Specialist Study: Combined Desktop and Field-based Assessments: Proposed Photovoltaic (Solar) Energy Facilities on Du Plessis Dam Farm near De Aar, Northern Cape.
256364	Heritage Impact Assessment Specialist Reports	Jayson Orton	10/07/2013	Heritage Impact Assessment for Multiple Proposed Solar Energy Facilities on Du Plessis Dam 179, De Aar, Northern Cape
256408	Palaeontological Specialist Reports	John E Almond	16/07/2013	Palaeontological Specialist Study: Combined Desktop and Field-based Assessments - Proposed Photovoltaic (Solar) Energy Facilities on Badenhorst Dam Farm near De Aar, Northern Cape
256413	Heritage Impact Assessment Specialist Reports	Jayson Orton	09/07/2013	Heritage Impact Assessment for Multiple Proposed Solar Energy Facilities on De Aar 180/1 (Badenhorst Dam Farm), De Aar, Northern Cape
26827	AIA Phase 1	William Archer	01/06/2012	Archaeological Impact Assessment: proposed photovoltaic power generation facility in De Aar, Northern Cape
339820	Heritage Impact Assessment Specialist Reports	Lita Webley, Jayson Orton	01/12/2011	Proposed De Aar Wind Energy Facility on the North and South Plateau, Northern Cape Province
339824	Heritage Impact Assessment Specialist Reports	Lita Webley, David Halkett	01/06/2015	Addendum: Proposed Wind Energy Facility situated on the Eastern plateau (South) near De Aar, Northern Cape Province.
4052	HIA Phase 1	Albert van Jaarsveld	01/03/2006	Hydra-Perseus and Beta-Perseus 765 kV Transmission Power Lines Environmental Impact Assessment. Impact on Cultural Heritage Resources
45021	HIA Phase 1	Wouter Fourie	13/04/2012	CONCENTRATED SOLAR POWER EIAâ€“DE AAR Heritage Impact Assessment
49745	AIA Phase 1	Neels Kruger	01/03/2012	ARCHAEOLOGICAL IMPACT ASSESSMENT (AIA) OF DEMARCATED SURFACE AREAS ON THE OF THE FARM VETLAAGTE

				4, DE AAR, NORTHERN CAPE PROVINCE
49843	PIA Phase 1	John E Almond	01/05/2012	PALAEONTOLOGICAL SPECIALIST STUDY: COMBINED DESKTOP AND FIELD-BASED ASSESSMENTS Proposed solar power generation facilities on the remaining extent of the farm Vetlaagte No. 4, De Aar, Northern Cape Province
50006	HIA Phase 1	Jayson Orton	20/02/2012	HERITAGE IMPACT ASSESSMENT FOR THREE SOLAR ENERGY FACILITIES AT DE AAR, WESTERN CAPE
53198	HIA Phase 1	Elize Becker	20/04/2012	Phase 2 Heritage Impact Assessment De Aar Solar One Photovoltaic Power Project Heritage Impact Assessment Phase 2
53200	Heritage Scoping	Elize Becker	18/01/2012	HERITAGE IMPACT ASSESSMENT SCOPING REPORT Prepared for De Aar Solar One Photovoltaic Power Plant, Nothern Cape
58989	PIA Desktop	James Brink	10/08/2012	A Palaeontological Desktop Study of the Area to be Affected by the Proposed Photovoltaic Power Project on Portion 3 of Farm Hartebeestplaats 135
6475	AIA Phase 1	Jonathan Kaplan	10/10/2010	ARCHAEOLOGICAL IMPACT ASSESSMENT OF A PROPOSED WIND ENERGY FACILITY NEAR De Aar, Northern Cape
6970	AIA Phase 1	David Morris	02/09/2011	Paarde Valley. Ilanga Lethemba PV Solar Energy Facility. Specailist input for the environmental impact asssessment phase and environmental management programme for the proposed Ilanga Lethemba Solar Energy Facility, near De Aar, Northern Cape province
6970	AIA Phase 1	David Morris	02/09/2011	Paarde Valley. Ilanga Lethemba PV Solar Energy Facility. Specailist input for the environmental impact asssessment phase and environmental management programme for the proposed Ilanga Lethemba Solar Energy Facility, near De Aar, Northern Cape province
6971	AIA Desktop	Johnny Van Schalkwyk	30/04/2011	Heritage Impact Scoping report for the proposed establishment of the Ilanga Lethemba PV Solar Energy Facility, near De Aar, Northern Cape Province.
7020	AIA Phase 1	David Morris	03/09/2011	Archaeology specialist input on the site of the proposed Kalkbult Photovoltaic construction site north of De Aar, Northern Cape
7243	AIA Desktop	Jonathan Kaplan	08/04/2010	ARCHAEOLOGICAL SCOPING STUDY OF A PROPOSED WIND ENERGY FACILITY ON THE MAANHAARBERGE & KOMBUISFONTEINBERGE DE AAR NORTHERN CAPE
7368	AIA Phase 1	William Archer	18/05/2012	Archer, W. May 2012. RECONNAISSANCE AND PLAN FOR FURTHER MITIGATION: SITES IMPACTED ON BY PROPOSED PHOTOVOLTAIC POWER GENERATION FACILITY IN DE AAR NORTHERN CAPE

7634	AIA Phase 1	Jonathan Kaplan	08/04/2010	ARCHAEOLOGICAL IMPACT ASSESSMENT PROPOSED PHOTOVOLTAIC POWER GENERATION FACILITY IN DE AAR NORTHERN CAPE
8023	AIA Phase 1	David Morris	03/09/2011	Archaeology specialist input on the site of the proposed Taaiboschfontein Photovoltaic construction site between De Aar and Hanover, Northern Cape
8023	AIA Phase 1	David Morris	03/09/2011	Archaeology specialist input on the site of the proposed Taaiboschfontein Photovoltaic construction site between De Aar and Hanover, Northern Cape
8023	AIA Phase 1	David Morris	03/09/2011	Archaeology specialist input on the site of the proposed Taaiboschfontein Photovoltaic construction site between De Aar and Hanover, Northern Cape
8023	AIA Phase 1	David Morris	03/09/2011	Archaeology specialist input on the site of the proposed Taaiboschfontein Photovoltaic construction site between De Aar and Hanover, Northern Cape
8167	AIA Phase 1	David Morris	03/09/2011	Archaeology specialist input on the site of the proposed Vanderlindeskraal Photovoltaic construction site near Hanover, Northern Cape
8378	HIA Phase 1	Jayson Orton	29/02/2012	HIA for three solar energy facilities at the De Aar, Northern Cape (Paarde Valley, Badenhorst Dam Farm and Annex Du Plessis Dam Farm)
8493	HIA Phase 1		28/02/2011	CULTURAL HERITAGE REVIEW OF PROPOSED ESTABLISHMENT OF PHOTO VOLTAIC (SOLAR POWER) PANELS ON THE FARM TAAIBOSCHFONTEIN, NO 41, HANOVER DISTRICT, NORTHERN CAPE
8512	HIA Phase 1		03/09/2011	Cultural Heritage Review Of Proposed Establishment Of Photo Voltaic (Solar Power) Panels On The Farm Taaiboschfontein, No 41, Hanover District, Northern Cape
8523	HIA Phase 1		03/08/2011	Annexure 2 Cultural heritage Survey of sites for the Solar Power Project Report: Farm Vanderlindeskraal no 79, Northern Cape Province
89361	HIA Phase 1	Neels Kruger	01/03/2012	ENNEX DEVELOPMENTS: PROPOSED ESTABLISHMENT OF A SOLAR ENERGY FACILITY NEAR DE AAR, NORTHERN CAPE PROVINCE Phase 1 Archaeological Impact Assessment Report
8992	PIA Phase 1	John E Almond	29/01/2012	Palaeontological Specialist Study: Combined Desktop and Field -based Assessments. Two wind energy facilities on the Eastern Plateau near De Aar, Northern Cape Province proposed by Mulilo Renewable Eneergy (Pty) Ltd

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APPENDIX 3 - Keys/Guides

Key/Guide to Acronyms

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

Full guide to Palaeosensitivity Map legend

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

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
- 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.

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APPENDIX 2: Archaeological Assessment (2022)

ARCHAEOLOGICAL SPECIALIST STUDY

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

Proposed Development of the Pixley Park REF and associated infrastructure near De Aar

Prepared by

CTS HERITAGE

Nicholas Wiltshire
Jenna Lavin

In Association with

Savannah Environmental

June 2022

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EXECUTIVE SUMMARY

Mulilo is proposing the development of up to 4 x 100MW PV facilities on a site near de Aar. The projects will all connect to the new Vetlaagte Main Transmission Substation (MTS) via the Wag 'n Bietjie MTS. The 4 projects are referred to as Carolus PV, Fountain PV, Rietfontein PV and Wagt PV and will have a combined output of 700MW.

The overall archaeological sensitivity of the development area with regard to the preservation of Early, Middle and Later Stone Age archaeology as well as Khoe and San heritage, early colonial settlement is regarded as very high. Despite this, the field assessment conducted for this project has demonstrated that the specific area proposed for development has low sensitivity for impacts to significant archaeological heritage on the flat, grassy plains with higher sensitivities in the immediate areas on and surrounding the dolerite outcrops.

As indicated above, the results of this assessment align with the findings of other specialists such as Morris (2011) who notes that ephemeral MSA and LSA scatters are the dominant archaeological signature of the area and are therefore not archaeologically significant.

Recommendations

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

- Sites Pixley 012, 013 and 014 are given a 100m buffers and demarcated during the construction period if any infrastructure is planned near these sites.
- Sites Pixley 042 and 062 are given 50m buffers
- The site development plan of the PV laydown areas and roads should be set to avoid the sites identified above
- The dolerite outcrops spanning west-east along portions of Wag 'n Bietjie 5 as well as the outcrops in the far northern end near Carolus Poort should ideally be avoided for the location of the solar PV laydown area and access roads carefully planned to minimise the impact on any other dolerite outcrops. Site 062 lies on a small ridge on Riet Fountain 6 and roads or PV laydown areas should be placed on the level grassy plains and not on the ridges where archaeological material is concentrated.
- The construction of powerlines is far less impactful on archaeological sites and the siting of pylons can be made through most of the area without causing significant damage to archaeological sites.
- 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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CONTENTS

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1. INTRODUCTION

1.1 Background Information on Project

Mulilo is proposing the development of up to 4 x PV facilities on a site near de Aar. The projects will all connect to the new Vetlaagte Main Transmission Substation (MTS) via the Wag 'n Bietjie MTS. The grid connection infrastructure would include the following:

» Onsite 132kV switching station - 100m x 100m and 30m height
» 132kV Overhead Power Line (OHPL) – 30m height from the switching station to the MTS within a 200m grid corridor
» Extension of the 132kV Busbar at the MTS
» 132kV Feeder Bay at the MTS
» Extension of the 400kV Busbar at the MTS
» 400/132kV Transformer at the MTS
» Access Road to switching station and along the powerline route up to the MTS
» Generic electrical infrastructure EMPs

Property details are as follows:

» Farm Wag 'n Bietjie 5
» Portion 1 of Farm Riet Fountain 6
» Portion 3 & 4 of Farm Carolus Poort 3

The 4 projects are referred to as Carolus PV, Fountain PV, Rietfontein PV and Wagt PV and will have a combined output of 700MW.

1.2 Description of Property and Affected Environment

The four Pixley Park solar PV projects lie on three farms, Wag 'n Bietjie 5, Riet Fountain 6 and Carolus Poort 3. These properties are to the east and north east of the Hydra substation which is roughly 10km south of De Aar in the Northern Cape. A number of renewable energy projects, particularly solar PV farms, have been proposed immediately surrounding this substation and three completed solar farms lie north and northwest such as De Aar Solar and Paarde Valley. A completed 144MW wind farm lies on the plateau north east of the development. Large 765kV powerlines traverse the area connecting up the grid to and from the Hydra substation. The northern boundary at Carolus Poort holds a prominent koppie while smaller dolerite outcrops run in a west to east line on Wag 'n Bietjie 5. Another dolerite ridge lies on Riet Fountain 6 but much of the development footprint has been planned to avoid this rocky topography.

The designated areas for the solar PV farms mostly fall on flat grassland dotted with typical Karoo windmills, kraals and tanks for sheep and cattle farming.The vegetation is typical of the Karoo and the grassland was dense enough over much of the site to hamper visibility of archaeological material lying on the surface, especially due to the recent high rainfall this year.

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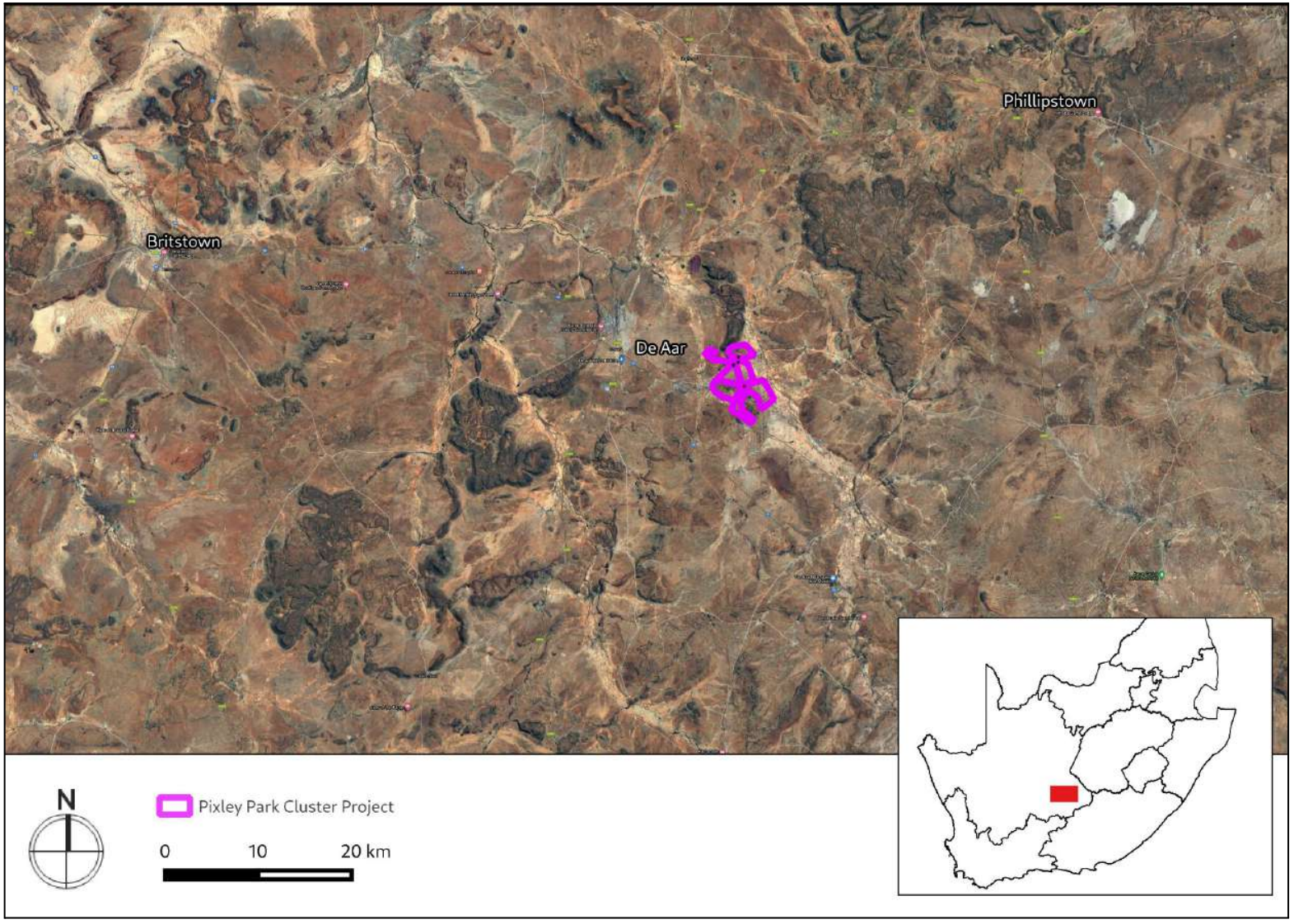

Figure 1.1: Close up satellite image indicating proposed location of study area

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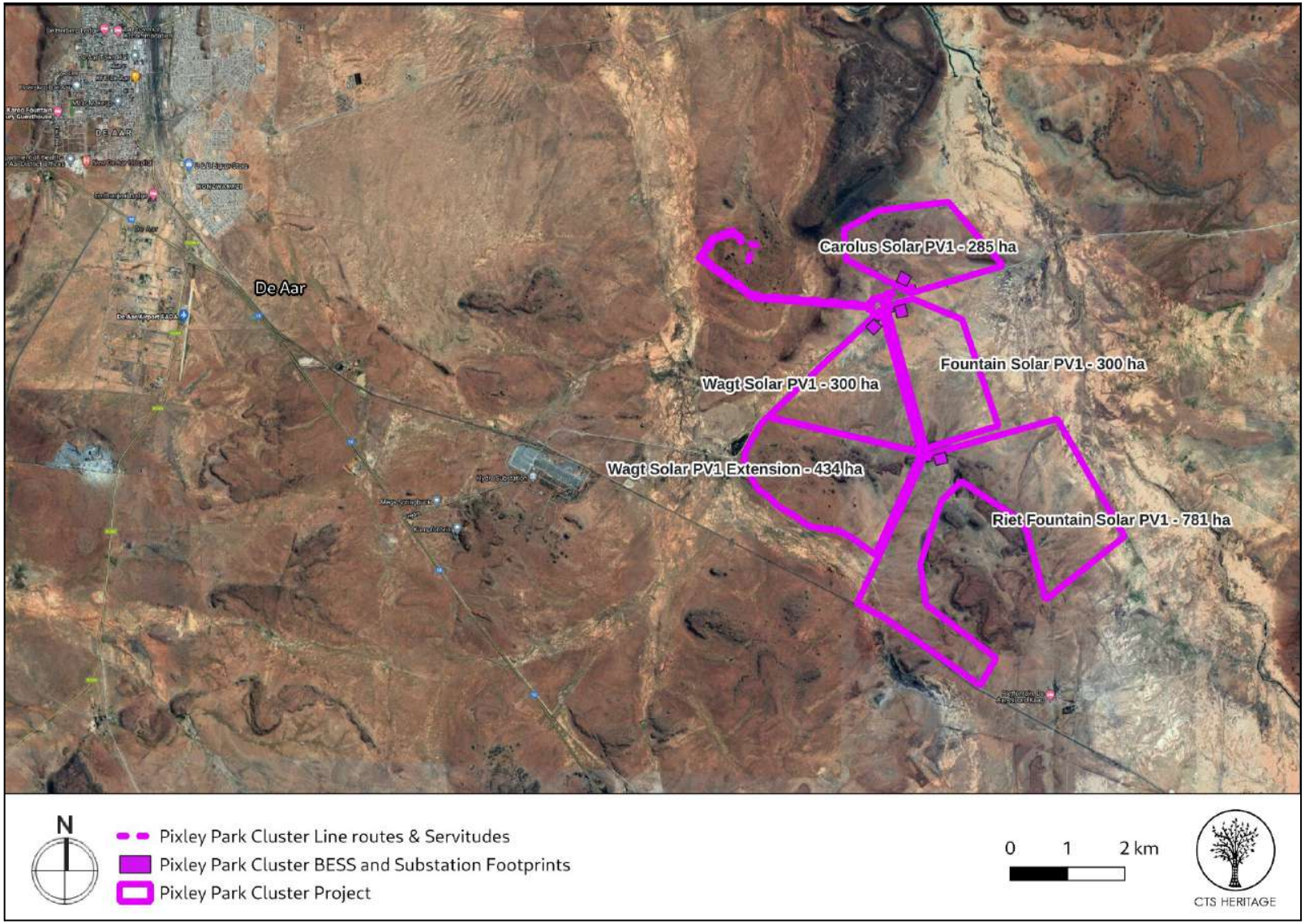

Figure 1.2: Study Area

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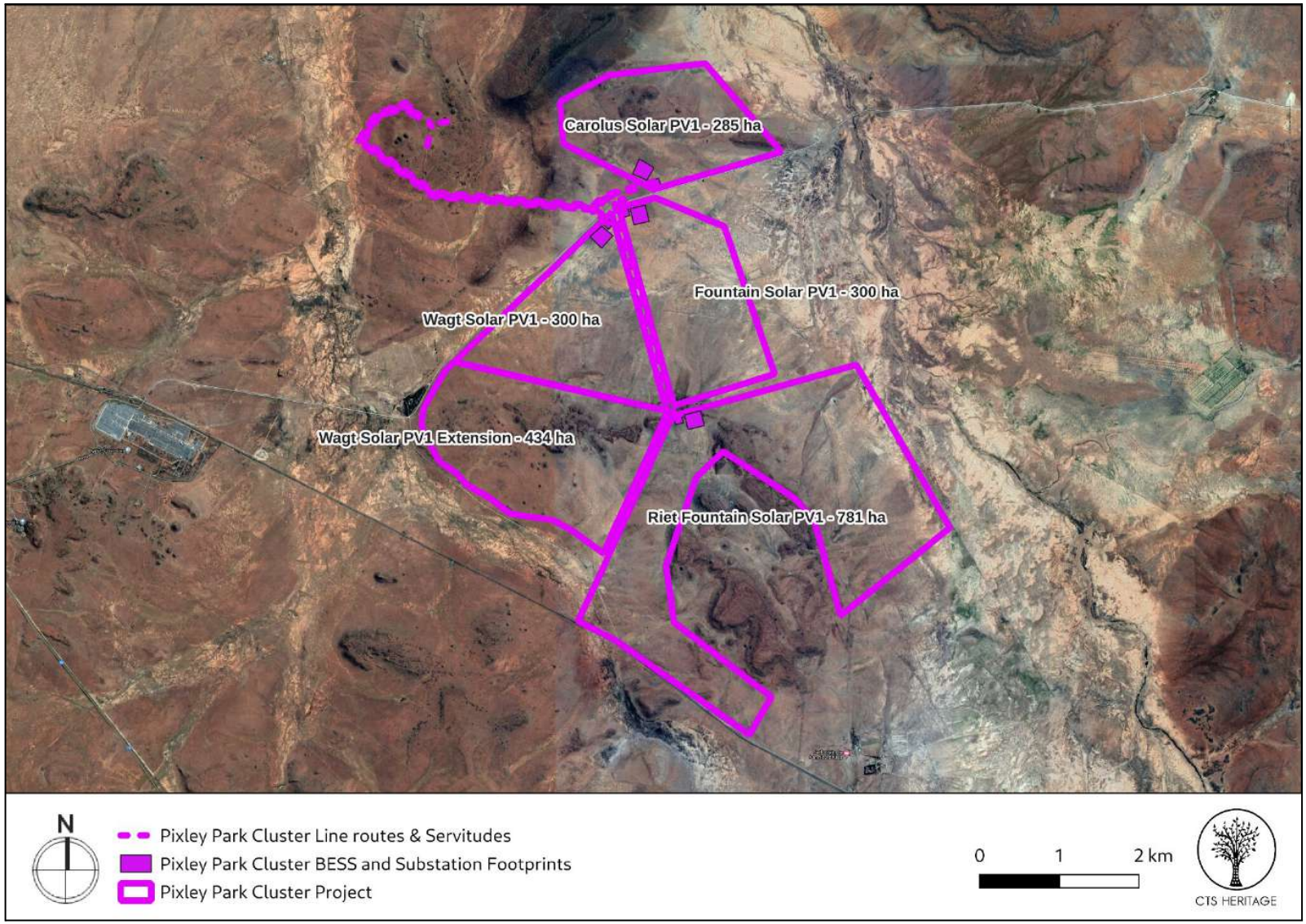

Figure 1.3: Study Area

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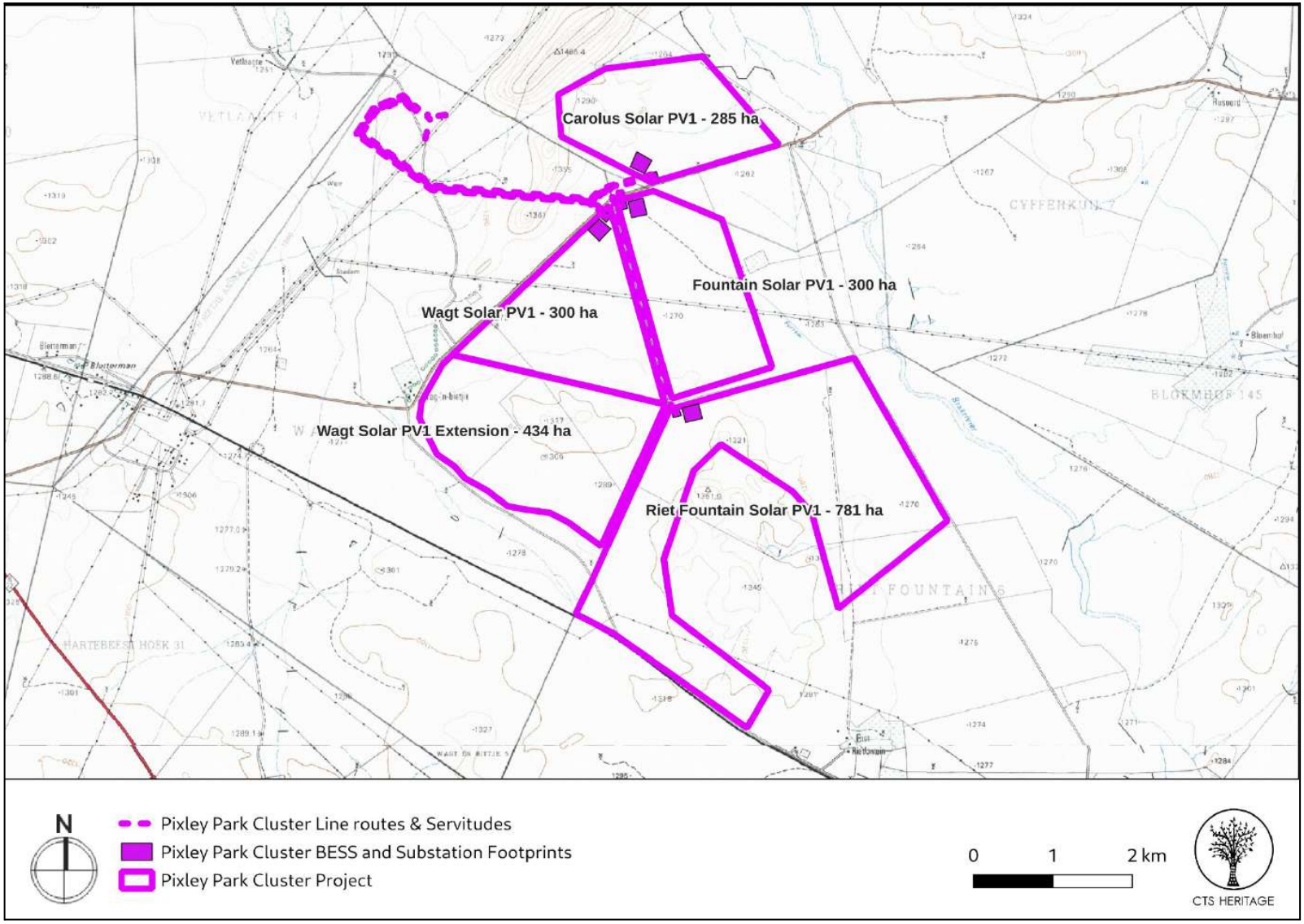

Figure 1.4: Study Area reflected on the 1:50 000 Topo Map

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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 7-11 February and 23-24 May 2022 to determine what archaeological resources are likely to be impacted by the proposed development.
- The study area was assessed on foot in transects, 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.

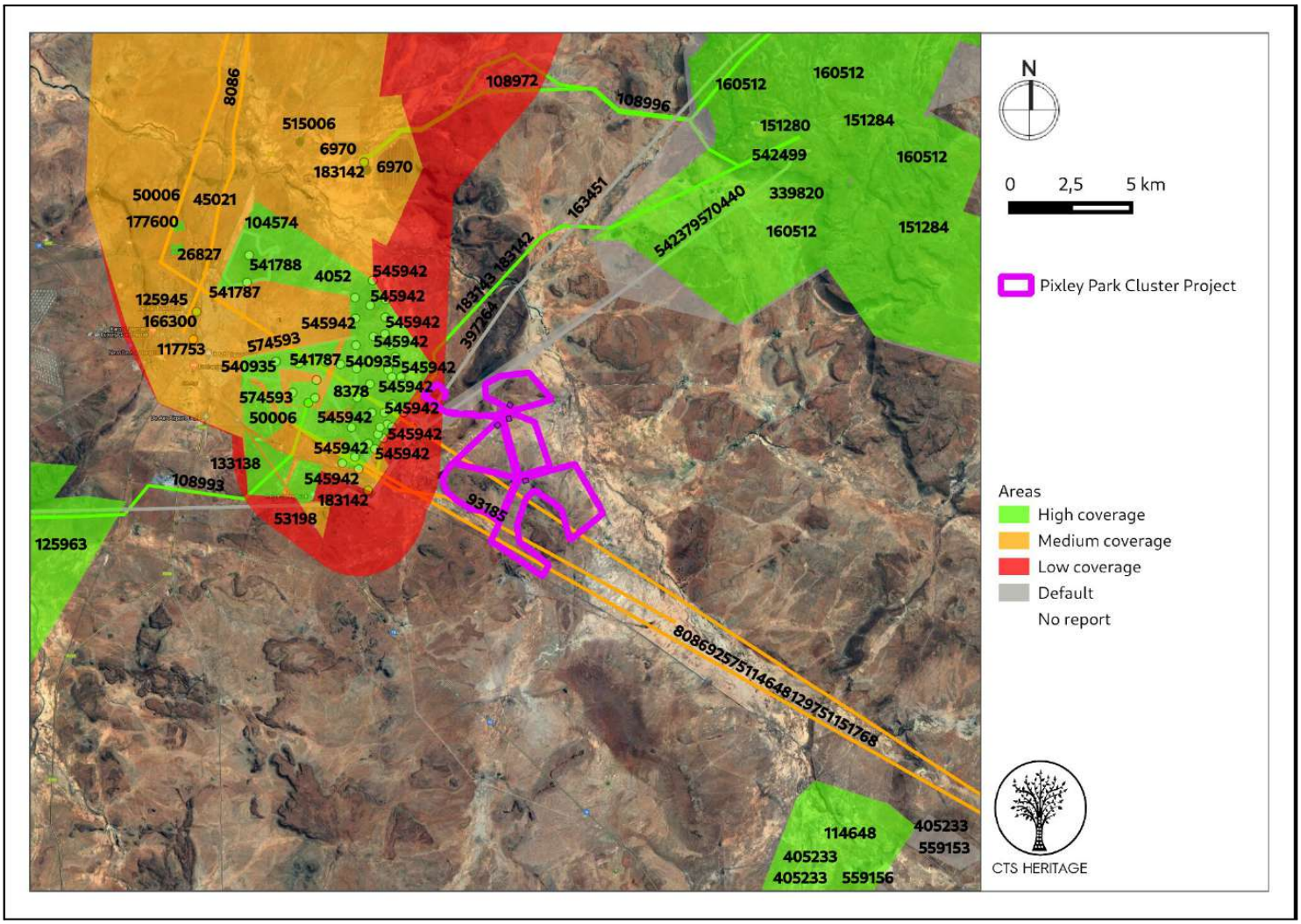

Figure 2: Close up satellite image indicating proposed location of the study area in relation to heritage studies previously conducted

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2.3 Constraints & Limitations

Recent good rains in the area had significantly elevated the vegetation density (mostly grassland) for the survey but sufficient open ground was found throughout the study area to properly document the archaeological material. Much of the project area is relatively flat and easily traversed which enabled very high survey coverage to be achieved. Archaeological visibility was very high in the areas on and immediately adjacent to the dolerite outcrops where most of the archaeological material is concentrated.

3. HISTORY AND EVOLUTION OF THE SITE AND CONTEXT

De Aar was originally established on the Farm "De Aar." The name means "the artery," a reference to its underground water supply. The Cape Government Railways were founded in 1872, and the route that the government chose for the line to connect the Kimberley diamond fields to Cape Town on the coast, ran directly through De Aar. Because of its central location, the government also selected the location for a junction between this first railway line, and the other Cape railway networks further east, in 1881. In 1899 two brothers who ran a trading store and hotel at the junction, Isaac and Wulf Friedlander, purchased the farm of De Aar. Following the Anglo Boer War, the Friedlander brothers surveyed the land for the establishment of a town. The municipality was created a year later in 1900.

Orton (2012) writes that “The colonial period history of the area is not that old. While the town of De Aar only dates back to 1903, just after the cessation of the 1899-1902 Anglo-Boer War, farms were given out and surveyed in the 1800s.” He goes on to note that “ The railway junction dates to 1881 when Cape Town and Kimberley were linked by rail after diamonds were discovered at the latter town. It was very important to the British during the Anglo-Boer War since railway lines from Cape Town and Port Elizabeth joined here and extended on through Kimberley to Mafikeng (AngloBoerWar.com 2011). De Aar was also the site of the first use of wireless telegraphy in South Africa where the British employed it to maintain communications between their various columns operating in the area. However, owing to the climatic conditions in the Karoo, the wireless sets, which were designed for shipboard use, could not perform properly and were soon withdrawn from inland service (Baker 1998). The town was laid out around the railway junction on the farm De Aar which was purchased in 1889 by Isaac and Wolf Friedlander, who ran a trading store and hotel at the railway junction. After the war, the brothers established the town.” Orton (2012) also notes that “Two Provincial Heritage Sites occur in De Aar. These are the “Olive Schreiner house” and the “St Paul’s Church”. At least one other building is listed (SAHRA, n.d.). Many of the older buildings in the town are early 20th century, including some art deco, but the majority of structures date to the mid- to late 20th century. De Aar is well known as one of the places where Olive Schreiner lived. She and her husband were there from 1907 to 1914.”

Kruger (2012) describes the development area as “characterised by flat undulating Karoo vegetation comprised of relatively sparse scrub and grasses, with dolerite hills in the surrounding landscape. Large portions of the land is currently devoted to livestock farming but a number of solar energy facilities are to be constructed on farms around De Aar. Shallow soils covers a combination of calcrete, shale and dolerite substrates, and large sections in the landscape are exposed to sheet erosion, specifically along low lying areas and drainage lines. Dolerite and sandstone is present, while exotic rocks occur in the gravel of the Orange River bed and terraces. These provided suitable material

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for stone tool production during the Earlier, Middle and Later Stone Ages."

Archaeology

As part of the 2012 process for approval of the Vetlaagte Solar Energy Facility located immediately adjacent to the proposed development area, Kruger conducted a detailed Heritage Impact Assessment of the area. According to Kruger (2012), "During the survey, widespread Middle Stone Age (MSA) material, including characteristic formal MSA stone tools such as points, blades and scrapers were documented in the survey area along a north-south oriented drainage on the (western) periphery of the property. The lithic remains occur in three large scatters and, almost without exception, in low lying areas along non-perennial drainage lines and wetland areas where precipitation and groundwater have exposed the stone tools, originally deposited on a decomposed calcrete rock layer approximately 30cm sub surface. Preliminary examinations of some of the lithics indicated that a number of flakes displayed facetted platforms, characteristic of the MSA." Part of the study area for the Wag 'n Bietjie development assessed in this report is located within the drainage described above. It is therefore likely that the proposed development will impact on significant MSA archaeology.

Kruger (2012) also documented historical period remains, "specifically the old Vetlaagte homestead with restored farmhouse, outbuildings, midden and labourers quarters, as well as a dilapidated dam wall constructed in the drainage line east of the farmstead are present on the property. The date of construction of the farm house is denoted by a year count ("1930") on the front gable of the structure. The entire farmstead is situated in an area excluded from the solar farm development. A small family graveyard, associated with the farmstead at Vetlaagte, also occurs in the exclusion zone about 100m north of the farm house."

In his assessment of areas adjacent to this proposed development, Orton (2012) found that "All the archaeological finds on Badenhorst Dam Farm were pre-colonial, but nevertheless, different types were present. This farm also had areas with artefacts best described as being 'background scatter'. The grass cover, however, meant that fewer such areas were identified. Most were in open, silty patches that clearly hold water in the rainy season…" Orton (2012) found LSA artefacts associated with the ridge running through the property that he assessed, and MSA artefacts from a pan-like area. He noted that "the artefacts in the flatter areas here appeared to be of much lower density and far fewer occurrences were recorded. However, stone artefact scatters with spatial integrity were more common. These were predominantly LSA and very much focused on the rocky ridges crossing the farm."

Orton (2012) noted that the spatially constrained scatters of artefacts that he identified "are almost certain to indicate places where people camped and the durable stone artefacts are now all that remains as evidence. It is also notable that their locations are not random – they are placed on level areas and saddles along the ridges. One of these LSA scatters, DAR2011/019 (#026) included a thumbnail scraper indicative of a mid- to late Holocene age. Some of the artefacts here were very black and shiny indicating recent flaking and deposition." Orton (2012) also identified a number of piled stone structures. These appeared to be concentrated on one particular dolerite ridge and, unlike those from elsewhere in the Karoo, only one may have been a kraal. He determined that these structures are likely to be

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pre-colonial in age as similar piles have been recorded in an almost certain pre-colonial context in the Seacow River valley (Hart 1989). Orton (2012) also identified a number of engraved rocks that date to the LSA and historical times. All of Orton's findings (2012) are mapped in Figure 3 and 3b. While these resources fall outside of this development area, they give an indication of the likely archaeological sensitivity of the development area under consideration in this assessment.

A recent field assessment on an adjacent farm conducted by CTS Heritage found that "The overall archaeological sensitivity of the development area with regard to the preservation of Early, Middle and Later Stone Age archaeology as well as Khoe and San heritage, early colonial settlement is regarded as very high. Despite this, the field assessment conducted for this project has demonstrated that the specific area proposed for development has low sensitivity for impacts to significant archaeological heritage." The report goes on to note that "Two sites warranted protection with an interesting scatter of Still Bay tools on top of a dolerite outcrop with excellent views of the surrounding area. It is highly unlikely this area will be developed and it is recommended that infrastructure is not placed on this outcrop. Another site was found warranting a IIIB rating with pottery, bone and an extensive stone tool assemblage amongst the dolerite outcrops on the eastern end of the property. Again, this site has been demarcated as sensitive and the project team has been advised to avoid this area when finalising the layouts. A minimum buffer of 100m is recommended from this site (Wag n Bietjie 014). The rest of the observations are typical of the area and are ubiquitously distributed in low densities of less than 5 artefacts per observation." Similar heritage resources are likely to be located within the area proposed for development.

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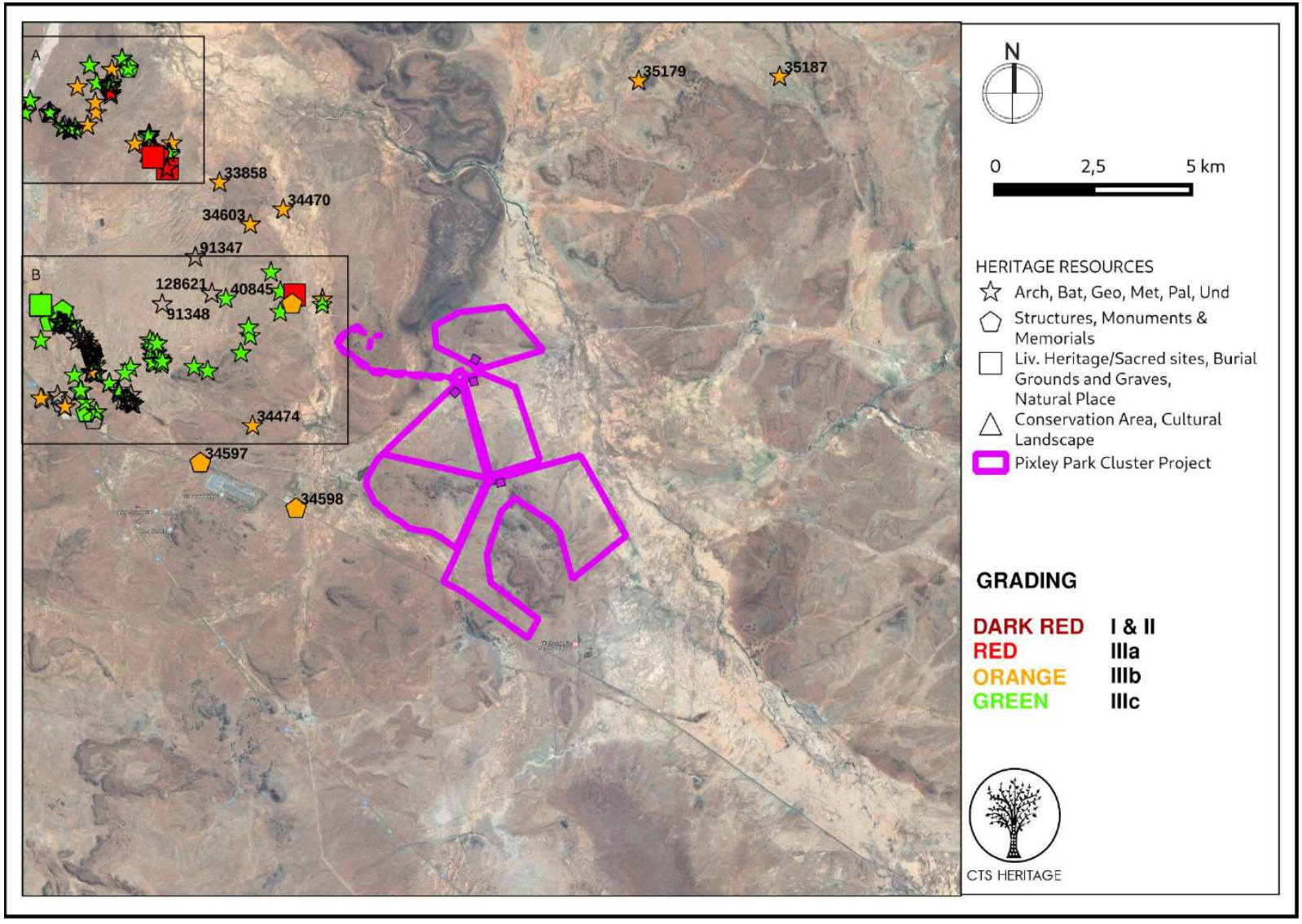

Figure 3. Heritage Resources Map. Heritage Resources previously identified in and near the study area, with SAHRIS Site IDs indicated

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4. IDENTIFICATION OF HERITAGE RESOURCES

4.1 Field Assessment

Over 79 archaeological observations were made during the survey. Hornfels dominated the assemblages with smaller numbers of flakes struck from siltstones. It is very likely that the main dolerite outcrop at Riet Fountain 6 surrounded by this development footprint will contain more sites with a wider range of imported stone such as CCS observed during surveys of Vetlaagte and the Castle WEF. While the vast majority of the scatters were made during the Middle Stone Age, there was also a relatively clear Later Stone Age presence in the study area. Many examples of blade forms were found which is typical of the Still Bay period (>70 000 years BP). Relatively dense Later Stone Age sites were found on the far eastern end of Wag 'n Bietjie and these date within the last 2000 years due to the presence of pottery in these sites.

Five archaeological sites are significant enough to require buffer zones around them to avoid negative impacts from solar PV panels, roads and other related infrastructure. Three of these are rock art sites with engravings on dolerite boulders that were graded with local medium significance (IIIB) and two LSA sites were identified with relatively dense scatters of stone tools. The rest of the observations do not warrant further study as they are typical of the area and are ubiquitously distributed in low densities of less than 5 artefacts per observation. Much of the archaeological material will be well conserved within a series of areas that can't be developed for the solar PV arrays while the flat, grassy vlaktes that are ideal for the solar PV farms are also the areas with the lowest archaeological sensitivity.

Figure 4.1: Contextual Images - view of Wag 'n Bietjie farmhouse complex along western end of study area and looking north towards the low koppies.

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Figure 4.2: Contextual Images - looking east from the western end of the study area - much of the ground is level with a low ridgeline.

Figure 4.3: Contextual Images - views of the open grassland in the eastern end of the study area showing small dolerite outcrops.

Figure 4.4: Contextual Images - view of some typical dolerite boulder outcrops.

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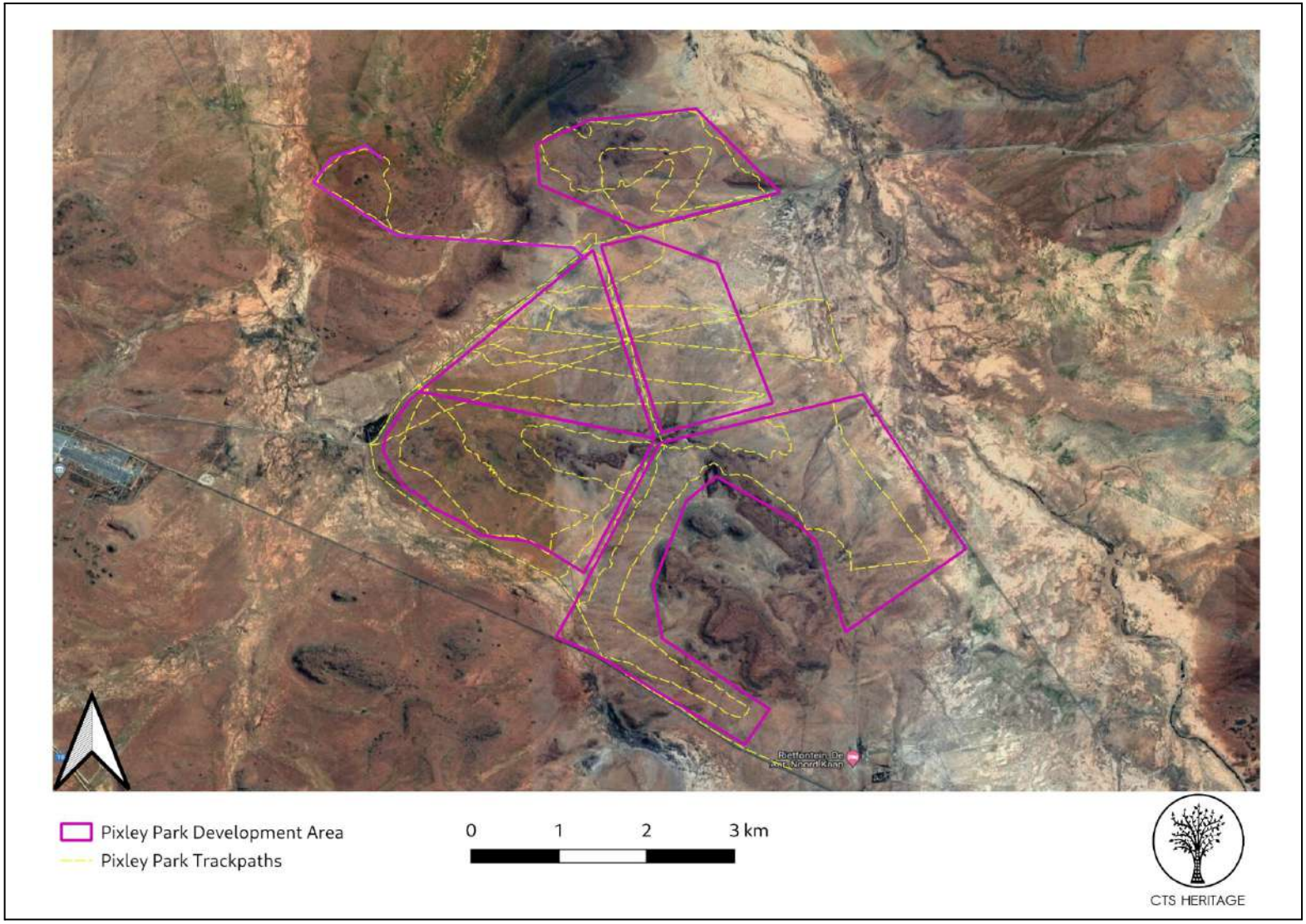

Figure 5.1: Overall track paths of foot survey

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4.2 Archaeological Resources identified

Table 2: Observations noted during the field assessment

Site No.	Site Name	Description	Density m2	Period	Co-ordinates		Grading	Mitigation
001	Wagt	Hornfels point, retouched patinated, hornfels core LSA	0 to 5	LSA+MSA	-30.70736	24.12672	NCW	NA
002	Wagt	Siltstone flake	0 to 5	MSA	-30.71072	24.12514	NCW	NA
003	Wagt	Very patinated hornfels flakes, bladelet forms dominant	5 to 10	MSA	-30.71371	24.12437	NCW	NA
004	Wagt	Hornfels chunk and thinned point flake	0 to 5	MSA	-30.71465	24.12452	NCW	NA
005	Wagt	Siltstone flake	0 to 5	MSA	-30.71877	24.13032	NCW	NA
006	Wagt	Blade struck retouched flake, patinated	0 to 5	MSA	-30.71987	24.13132	NCW	NA
007	Wagt	Siltstone cores with multiple flake scars, hornfels flakes, porcelain, metal sheet and wire	10 to 30	MSA, LSA, historic	-30.7223	24.13362	NCW	NA
008	Wagt	Patinated hornfels point	0 to 5	MSA	-30.72342	24.13787	NCW	NA
009	Wagt	Patinated hornfels flake	0 to 5	MSA	-30.72547	24.14207	NCW	NA
010	Wagt	Hornfels core, edge flaked	0 to 5	LSA	-30.72326	24.14242	NCW	NA
011	Wagt	Patinated hornfels flake	0 to 5	MSA	-30.71667	24.13618	NCW	NA
012	**Wagt**	**Engravings, roughly scratched, crude form of animal, for legs, crab like figure, ostrich eggshell**	**0 to 5**	**LSA**	**-30.71583**	**24.13549**	**IIIB**	**100m buffer**
013	**Wagt**	**Outlined scratched antelope engraving**		**LSA**	**-30.71555**	**24.13556**	**IIIB**	**100m buffer**
014	**Wagt**	**Engravings, also similar crudely scratched. Animal form, 2 long ostrich figures**		**LSA**	**-30.71528**	**24.13506**	**IIIB**	**100m buffer**
015	Wagt	Fine grained hornfels flakes, LSA and MSA, retouched	5 to 10	LSA+MSA	-30.7125	24.1319	NCW	NA
016	Wagt	Patinated hornfels flake	0 to 5	MSA	-30.70593	24.12877	NCW	NA
017	Wagt	Patinated hornfels flake	0 to 5	MSA	-30.70727	24.14252	NCW	NA
018	Wagt	Patinated hornfels flake	0 to 5	MSA	-30.70768	24.15075	NCW	NA
019	Wagt	Patinated hornfels flake	0 to 5	MSA	-30.70769	24.15317	NCW	NA
020	Fountain	Two patinated hornfels flakes	0 to 5	MSA	-30.70753	24.15583	NCW	NA
021	Fountain	Patinated hornfels flake	0 to 5	MSA	-30.70754	24.15995	NCW	NA
022	Fountain	Early MSA patinated hornfels flake	0 to 5	MSA	-30.70754	24.16425	NCW	NA
023	Fountain	Various patinated hornfels flakes and cores	5 to 10	MSA	-30.70621	24.16527	NCW	NA
024	Fountain	Patinated hornfels flake	0 to 5	MSA	-30.70543	24.16088	NCW	NA
025	Fountain	Chert core and hornfels flake	0 to 5	MSA	-30.70473	24.15455	NCW	NA
026	Wagt	Patinated hornfels point	0 to 5	MSA	-30.70357	24.14686	NCW	NA
027	Wagt	Hornfels core flake	0 to 5	MSA	-30.70283	24.14258	NCW	NA
028	Wagt	Thin hornfels points	0 to 5	MSA	-30.70139	24.14258	NCW	NA

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029	Wagt	Patinated hornfels flakes	0 to 5	MSA	-30.70071	24.14721	NCW	NA
030	Fountain	Patinated hornfels flake	0 to 5	MSA	-30.69968	24.15232	NCW	NA
031	Fountain	Various hornfels flakes	5 to 10	MSA	-30.69845	24.15833	NCW	NA
032	Fountain	Kraal, dam windmill	n/a	Modern	-30.69642	24.16576	NCW	NA
033	Fountain	Patinated hornfels flakes	0 to 5	MSA	-30.69665	24.16344	NCW	NA
034	Fountain	Patinated hornfels flakes	0 to 5	MSA	-30.69634	24.15944	NCW	NA
035	Fountain	Hornfels blade and point	0 to 5	LSA	-30.69602	24.15521	NCW	NA
036	Fountain	Very patinated hornfels flakes	0 to 5	MSA	-30.69598	24.15159	NCW	NA
037	Fountain	Hornfels core and flakes	0 to 5	MSA	-30.69342	24.14989	NCW	NA
038	Fountain	Various hornfels flakes	5 to 10	MSA	-30.69189	24.15262	NCW	NA
039	Fountain	Various hornfels flakes	5 to 10	MSA	-30.69127	24.15398	NCW	NA
040	Fountain	Very patinated hornfels flakes	0 to 5	MSA	-30.69006	24.15548	NCW	NA
041	Carolus	Unifacial point and hornfels flakes	0 to 5	MSA	-30.68516	24.15658	NCW	NA
042	**Carolus**	**Hornfels core, flakes, retouched, bladelet**	**30+**	**LSA**	**-30.68147**	**24.15974**	**IIIB**	**50m buffer**
043	Carolus	Early MSA cores and flakes	5 to 10	MSA	-30.67963	24.16045	NCW	NA
044	Carolus	Hornfels radial core	0 to 5	MSA	-30.67719	24.16139	NCW	NA
045	Carolus	Kraal and tank	n/a	Modern	-30.67257	24.15848	NCW	NA
046	Carolus	Various hornfels flakes edge retouched	0 to 5	MSA	-30.67744	24.1583	NCW	NA
047	Carolus	Hornfels core	0 to 5	MSA	-30.67723	24.15582	NCW	NA
048	Carolus	Hornfels core flake	0 to 5	MSA	-30.67722	24.15211	NCW	NA
049	Carolus	Hornfels core and flake	0 to 5	MSA	-30.67763	24.14843	NCW	NA
050	Carolus	Early MSA hornfels flakes, cores	10 to 30	MSA	-30.68001	24.14847	NCW	NA
051	Carolus	Fine grained hornfels flakes and cores	10 to 30	MSA	-30.68343	24.14963	NCW	NA
052	Riet Fountain	Patinated hornfels flake	0 to 5	MSA	-30.73148	24.14537	NCW	NA
053	Riet Fountain	Isolated hornfels flake	0 to 5	LSA	-30.73806	24.14971	NCW	NA
054	Riet Fountain	Quartzite flake	0 to 5	MSA	-30.74231	24.15942	NCW	NA
055	Riet Fountain	Retouched hornfels flakes	0 to 5	MSA	-30.7434	24.16153	NCW	NA
056	Riet Fountain	Retouched hornfels flakes	0 to 5	MSA	-30.74502	24.16462	NCW	NA
057	Riet Fountain	Hornfels flake with dented b. Percussion	0 to 5	MSA	-30.74397	24.16588	NCW	NA
058	Riet Fountain	Hornfels flake	0 to 5	MSA	-30.73311	24.14981	NCW	NA
059	Riet Fountain	Hornfels flake with pointed end	0 to 5	MSA	-30.72309	24.15471	NCW	NA
060	Riet Fountain	Siltstone early Msa flake	0 to 5	MSA	-30.71886	24.15737	NCW	NA
061	Riet Fountain	Hornfels retouched flake	0 to 5	LSA	-30.71497	24.16215	NCW	NA
062	**Riet Fountain**	**Various hornfels microliths on view point**	**30+**	**LSA**	**-30.71609**	**24.16361**	**IIIC**	**50m buffer**
063	Riet Fountain	Patinated hornfels flake core	0 to 5	MSA	-30.71804	24.16811	NCW	NA

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064	Riet Fountain	Patinated hornfels flake	0 to 5	MSA	-30.72058	24.17171	NCW	NA
065	Riet Fountain	Patinated hornfels flake	0 to 5	MSA	-30.72294	24.1755	NCW	NA
066	Riet Fountain	Patinated hornfels flakes	0 to 5	MSA	-30.72689	24.18172	NCW	NA
067	Riet Fountain	Hornfels flakes in washed-out area	0 to 5	MSA	-30.72504	24.18691	NCW	NA
068	Riet Fountain	Patinated hornfels flake blade	0 to 5	MSA	-30.72128	24.18422	NCW	NA
069	Riet Fountain	Hornfels flake blade lateral retouch	0 to 5	MSA	-30.71935	24.18286	NCW	NA
070	Riet Fountain	Patinated hornfels flakes in wetland	5 to 10	MSA	-30.71775	24.18149	NCW	NA
071	Riet Fountain	Triangular retouched flake, point	0 to 5	MSA	-30.71541	24.17958	NCW	NA
072	Riet Fountain	Jagged hornfels flake with dorsal scars	0 to 5	MSA	-30.71197	24.17723	NCW	NA
073	Riet Fountain	Hornfels debitage and flakes	0 to 5	MSA	-30.70904	24.16838	NCW	NA
074	Riet Fountain	Hornfels core flake with lateral retouch	0 to 5	MSA	-30.71346	24.16968	NCW	NA
075	Wagt	Hornfels core	0 to 5	MSA	-30.71095	24.14137	NCW	NA
076	Grid	Hornfels blade, edge retouched	0 to 5	MSA	-30.68882022	24.14215164	NCW	NA
077	Grid	Early MSA siltstone flake edge retouched	0 to 5	MSA	-30.68839403	24.13644379	NCW	NA
078	Grid	Old farm dam, earthen	n/a	Modern	-30.68789437	24.13177839	NCW	NA
079	Grid	Hornfels core and flake, edge retouched	0 to 5	MSA	-30.68242723	24.11585108	NCW	NA

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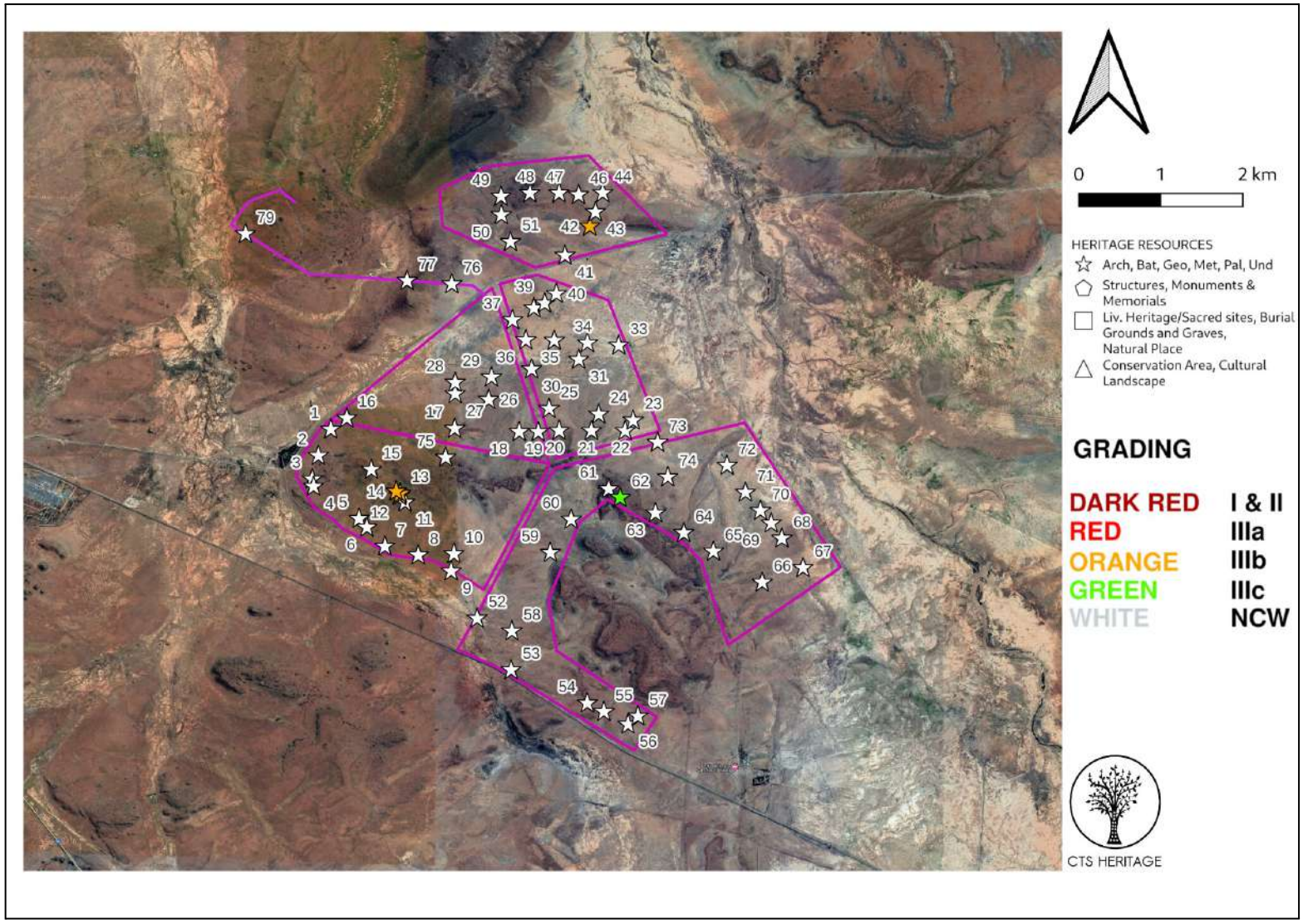

Figure 6.1: Map of field observations relative to the proposed development

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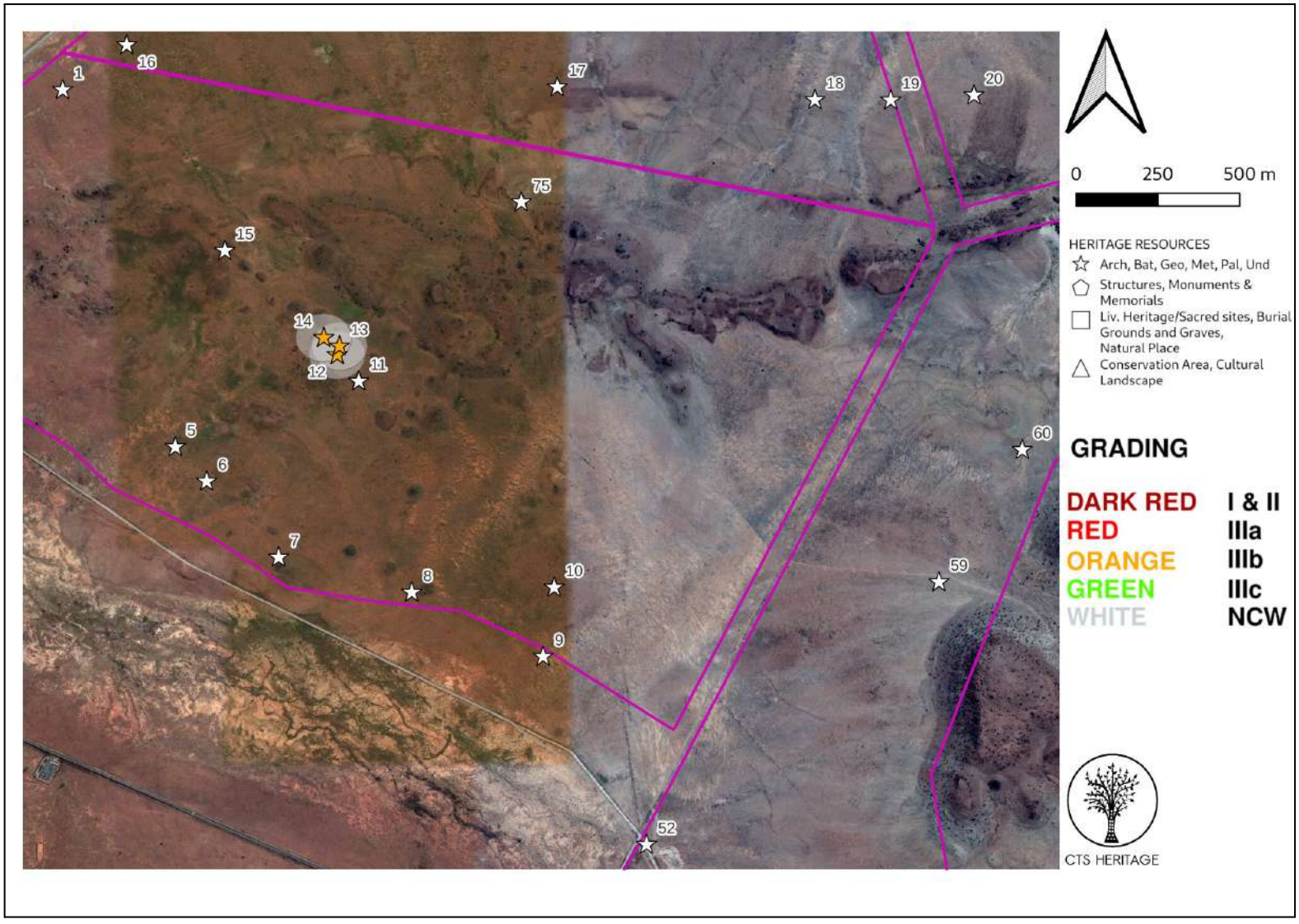

Figure 6.2: Map of field observations with 100m buffers set around the rock art sites

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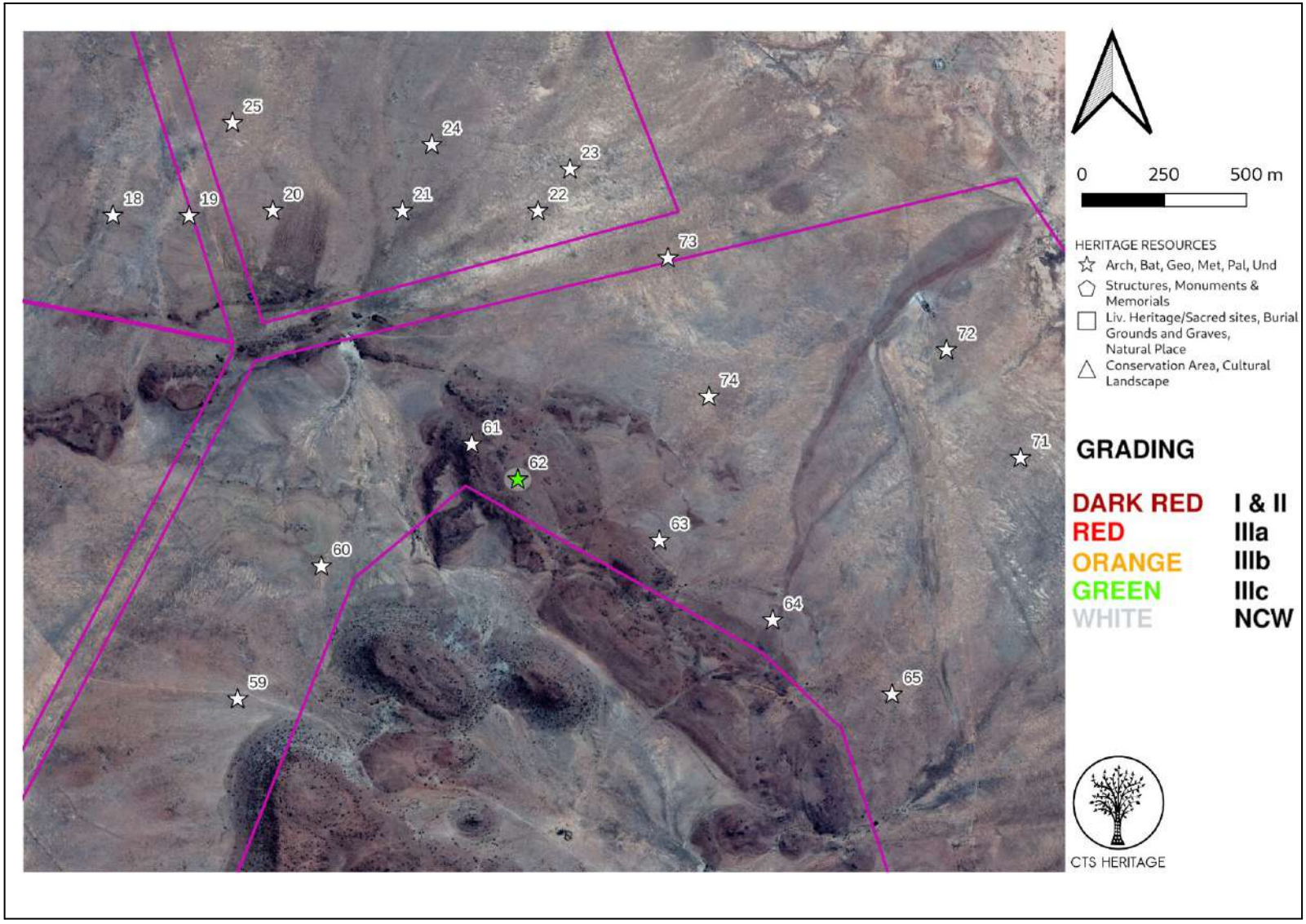

Figure 6.3: Map of field observations with 50m buffers set around the significant sites

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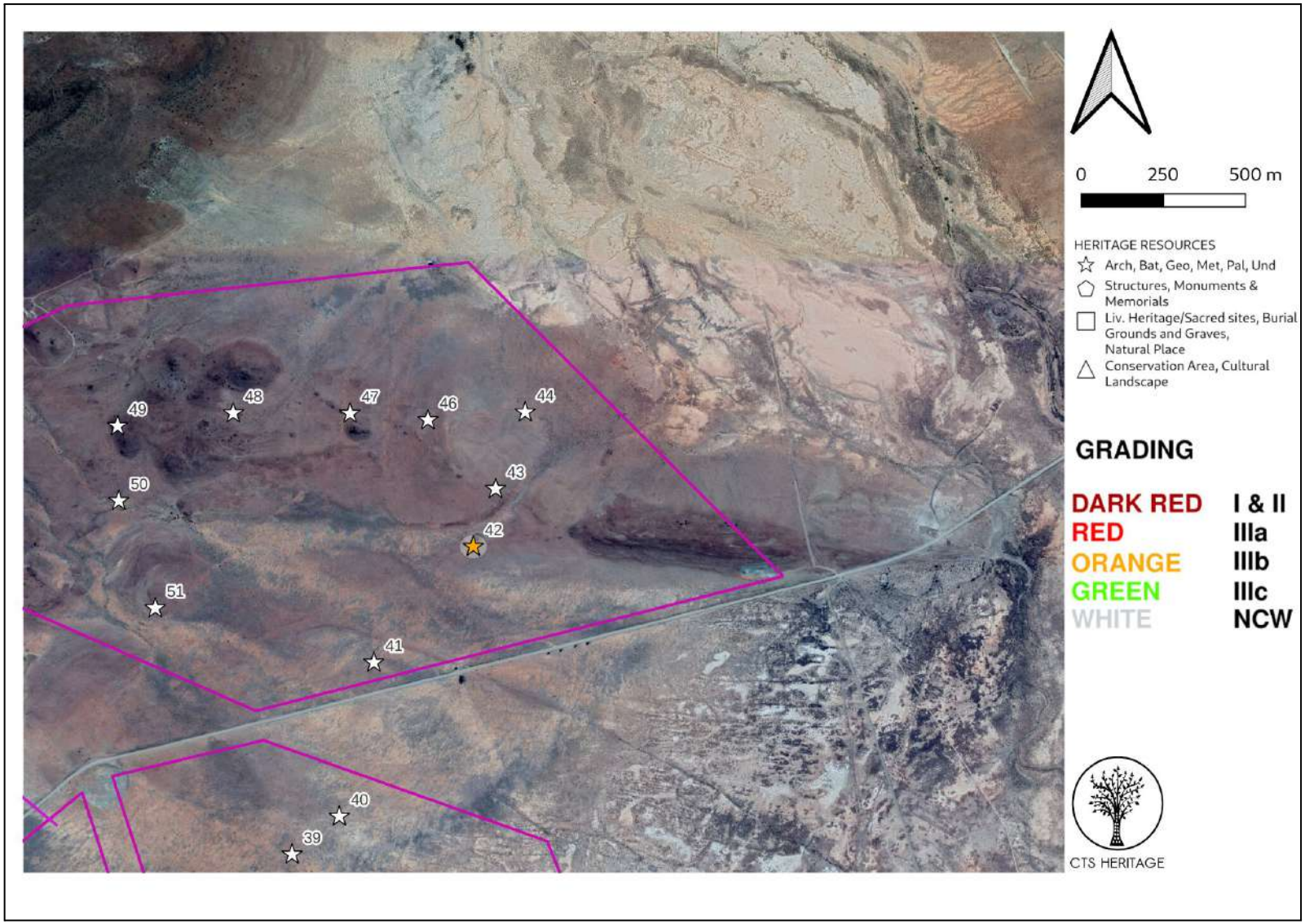

Figure 6.4: Map of field observations with 50m buffers set around the significant sites

4.3 Selected photographic record

(a full photographic record is available upon request)

Figure 7.1: Observation Pixley 007

Figure 7.2: Observations Pixley 012

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Figure 7.3: Observation Pixley 013 - DStretched image on the right

Figure 7.4: Observation Pixley 014

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Figure 7.5: Observation Pixley 042

Figure 7.6: Observation Pixley 062


Figure 7.7: Observation Pixley 044

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5. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT

5.1 Assessment of impact to Archaeological Resources

The results of the archaeological field assessment conducted largely aligns with the findings of previous archaeological assessments completed in the vicinity of the proposed development. The archaeological resources identified within the development area are dominated by Later and Middle Stone Age flakes, which corresponds with similar findings of others (Kruger, 2012). All except 5 of the archaeological resources identified within the areas proposed for the development in this field assessment have been determined to be not conservation-worthy. As such, these resources have been sufficiently recorded and there is no objection to the proposed development in these locations from an archaeological perspective. The five archaeological sites, numbers 012, 013, 014, 042 and 062 have been given buffer zones to demarcate and protect these sites from the development footprint. Sites 012-014 are rock engravings and associated stone tools surrounding these dolerite outcrops - a 100m buffer has been set for these sites. 50m buffers have been assigned to sites 042 and 062 which consist of higher concentrations of LSA stone tool assemblages.

Given the uneven terrain created by the dolerite outcrop as well as the tendency for pre-colonial occupation to be concentrated around these natural shelters, we highly recommend that careful consideration is made to placing the solar PV infrastructure away from these outcrops and utilising the flat, grassy plains where archaeological sensitivities are very low (see Figure 7 for sensitive dolerite outcrop area). Furthermore, access roads should, wherever possible, use existing jeep tracks and roads to minimise the impact on the landscape, particularly when nearing the dolerite outcrops.

The archaeological field assessment completed in February and May 2022 identified no structures or other kinds of heritage resources located within the areas proposed for development other than those outlined above.

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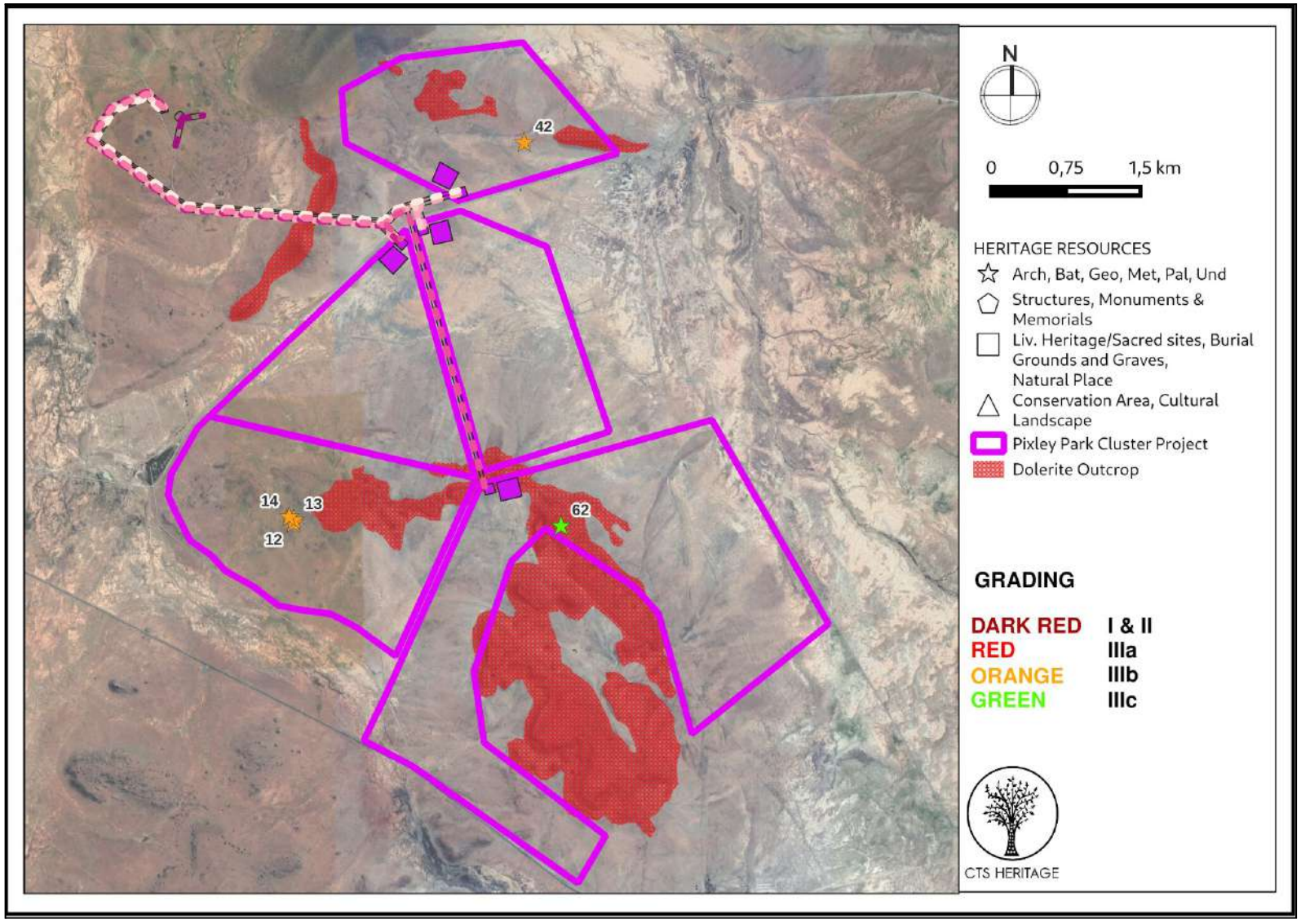

Figure 6.4: Map of field observations with 50m buffers set around the significant sites

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6. CONCLUSION AND RECOMMENDATIONS

The overall archaeological sensitivity of the development area with regard to the preservation of Early, Middle and Later Stone Age archaeology as well as Khoe and San heritage, early colonial settlement is regarded as very high. Despite this, the field assessment conducted for this project has demonstrated that the specific area proposed for development has low sensitivity for impacts to significant archaeological heritage on the flat, grassy plains with higher sensitivities in the immediate areas on and surrounding the dolerite outcrops.

As indicated above, the results of this assessment align with the findings of other specialists such as Morris (2011) who notes that ephemeral MSA and LSA scatters are the dominant archaeological signature of the area and are therefore not archaeologically significant.

Recommendations

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

- Sites Pixley 012, 013 and 014 are given a 100m buffers and demarcated during the construction period if any infrastructure is planned near these sites.
- Sites Pixley 042 and 062 are given 50m buffers
- The site development plan of the PV laydown areas and roads should be set to avoid the sites identified above
- The dolerite outcrops spanning west-east along portions of Wag ‘n Bietjie 5 as well as the outcrops in the far northern end near Carolus Poort should ideally be avoided for the location of the solar PV laydown area and access roads carefully planned to minimise the impact on any other dolerite outcrops. Site 062 lies on a small ridge on Riet Fountain 6 and roads or PV laydown areas should be placed on the level grassy plains and not on the ridges where archaeological material is concentrated.
- The construction of powerlines is far less impactful on archaeological sites and the siting of pylons can be made through most of the area without causing significant damage to archaeological sites.
- 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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7. REFERENCES

Heritage Impact Assessments				
Nid	**Report Type**	**Author/s**	**Date**	**Title**
104574	Heritage Scoping	Wouter Fourie	10/10/2012	Heritage Scoping Report for the Proposed Wind Farm Facility for Renosterberg Wind Energy Company (RWEC) near Petrusville, Northern Cape Province
104576	Heritage Scoping	Wouter Fourie	10/10/2012	Heritage Scoping Report for the Proposed Solar PV Facility for Renosterberg Wind Energy Company (RWEC) near Petrusville, Northern Cape Province
104804	PIA Desktop	John E Almond	01/09/2012	Palaeontological specialist assessment: desktop study PROPOSED RENOSTERBERG SOLAR PV AND WIND ENERGY FACILITIES NEAR DE AAR, NORTHERN CAPE PROVINCE
133138	HIA Phase 1	Jayson Orton, Lita Webley	09/07/2013	HERITAGE IMPACT ASSESSMENT FOR MULTIPLE PROPOSED SOLAR ENERGY FACILITIES
133536	Palaeontological Specialist Reports	John E Almond	01/07/2013	PALAEONTOLOGICAL SPECIALIST STUDY
133536	Palaeontological Specialist Reports	John E Almond	01/07/2013	PALAEONTOLOGICAL SPECIALIST STUDY
163982	Palaeontological Specialist Reports		31/08/2013	Palaeontological specialist assessment: combined desktop and field study: Proposed development PV Solar Facility near De Aar, Northern CApe Province
163994	HIA	Wouter Fourie	03/08/2013	Proposed PV Facility: Heritage Impact Report
177599	AIA Phase 1	Jonathan Kaplan	01/04/2010	ARCHAEOLOGICAL IMPACT ASSESSMENT PROPOSED PHOTOVOLTAIC POWER GENERATION FACILITY IN DE AAR NORTHERN CAPE
177600	Site Inspection Report	Will Archer, Jonathan Kaplan	01/05/2012	Reconnaissance and plan for further mitigation: sites impacted on by proposed photovoltaic power generation facility in De Aar Northern Cape
256408	Palaeontological Specialist Reports	John E Almond	16/07/2013	Palaeontological Specialist Study: Combined Desktop and Field-based Assessments - Proposed Photovoltaic (Solar) Energy Facilities on Badenhorst Dam Farm near De Aar, Northern Cape
256413	Heritage Impact Assessment Specialist Reports	Jayson Orton	09/07/2013	Heritage Impact Assessment for Multiple Proposed Solar Energy Facilities on De Aar 180/1 (Badenhorst Dam Farm), De Aar, Northern Cape

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339820	Heritage Impact Assessment Specialist Reports	Lita Webley, Jayson Orton	01/12/2011	Proposed De Aar Wind Energy Facility on the North and South Plateau, Northern Cape Province
339824	Heritage Impact Assessment Specialist Reports	Lita Webley, David Halkett	01/06/2015	Addendum: Proposed Wind Energy Facility situated on the Eastern plateau (South) near De Aar, Northern Cape Province.
4052	HIA Phase 1	Albert van Jaarsveld	01/03/2006	Hydra-Perseus and Beta-Perseus 765 kV Transmission Power Lines Environmental Impact Assessment. Impact on Cultural Heritage Resources
49745	AIA Phase 1	Neels Kruger	01/03/2012	ARCHAEOLOGICAL IMPACT ASSESSMENT (AIA) OF DEMARCATED SURFACE AREAS ON THE OF THE FARM VETLAAGTE 4, DE AAR, NORTHERN CAPE PROVINCE
49843	PIA Phase 1	John E Almond	01/05/2012	PALAEONTOLOGICAL SPECIALIST STUDY: COMBINED DESKTOP AND FIELD-BASED ASSESSMENTS Proposed solar power generation facilities on the remaining extent of the farm Vetlaagte No. 4, De Aar, Northern Cape Province
50006	HIA Phase 1	Jayson Orton	20/02/2012	HERITAGE IMPACT ASSESSMENT FOR THREE SOLAR ENERGY FACILITIES AT DE AAR, WESTERN CAPE
53198	HIA Phase 1	Elize Becker	20/04/2012	Phase 2 Heritage Impact Assessment De Aar Solar One Photovoltaic Power Project Heritage Impact Assessment Phase 2
53200	Heritage Scoping	Elize Becker	18/01/2012	HERITAGE IMPACT ASSESSMENT SCOPING REPORT Prepared for De Aar Solar One Photovoltaic Power Plant, Nothern Cape
58989	PIA Desktop	James Brink	10/08/2012	A Palaeontological Desktop Study of the Area to be Affected by the Proposed Photovoltaic Power Project on Portion 3 of Farm Hartebeestplaats 135
8378	HIA Phase 1	Jayson Orton	29/02/2012	HIA for three solar energy facilties at the De Aar, Northern Cape (Paarde Valley, Badenhorst Dam Farm and Annex Du Plessis Dam Farm)
89361	HIA Phase 1	Neels Kruger	01/03/2012	ENNEX DEVELOPMENTS: PROPOSED ESTABLISHMENT OF A SOLAR ENERGY FACILITY NEAR DE AAR, NORTHERN CAPE PROVINCE Phase 1 Archaeological Impact Assessment Report

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APPENDIX 3: Palaeontological Assessment (2022)

PALAEONTOLOGICAL SPECIALIST STUDY

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

Proposed Development of the Pixley Park REF and associated infrastructure near De Aar

Prepared by

CTS HERITAGE

And Dr Kimberley Chapelle

In Association with

Savannah Environmental

June 2022

CTS HERITAGE

EXECUTIVE SUMMARY

Mulilo is proposing the development of up to 4 x 100MW PV facilities on a site near de Aar. The projects will all connect to the new Vetlaagte Main Transmission Substation (MTS) via the Wag 'n Bietjie MTS. The 4 projects are referred to as Carolus PV, Fountain PV, Rietfontein PV and Wagt PV and will have a combined output of 700MW.

According to the SAHRIS Palaeosensitivity Map (Figure 4a), the area proposed for development is underlain by sediments of moderate and very high paleontological sensitivity. The purpose of this desktop palaeontological 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.

Based on previous surveys in the area, the presence of superficial deposits (probable Pleistocene to Recent age) covering the fossiliferous sediments (Ecca and Beaufort Groups), as well as the extensive network of intrusive dolerite dykes and sills that bake (thermally metamorphose) adjacent mudrocks, it is anticipated that the impact of the development will mainly be **LOW to MODERATE.**

There are no objections on palaeontological heritage grounds. Any fossil finds, most likely in the Adelaide Subgroup sediments and Quaternary Sands, are to be reported by the developer. Should important fossil material be found during excavations, the attached Fossil Finds Procedure must be implemented (Appendix 1).

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1. INTRODUCTION

1.1 Background Information on Project

Mulilo is proposing the development of up to 4 x PV facilities on a site near de Aar. The projects will all connect to the new Vetlaagte Main Transmission Substation (MTS) via the Wag 'n Bietjie MTS. The grid connection infrastructure would include the following:

» Onsite 132kV switching station - 100m x 100m and 30m height
» 132kV Overhead Power Line (OHPL) – 30m height from the switching station to the MTS within a 200m grid corridor
» Extension of the 132kV Busbar at the MTS
» 132kV Feeder Bay at the MTS
» Extension of the 400kV Busbar at the MTS
» 400/132kV Transformer at the MTS
» Access Road to switching station and along the powerline route up to the MTS
» Generic electrical infrastructure EMPs

Property details are as follows:

» Farm Wag 'n Bietjie 5
» Portion 1 of Farm Riet Fountain 6
» Portion 3 & 4 of Farm Carolus Poort 3

The 4 projects are referred to as Carolus PV, Fountain PV, Rietfontein PV and Wagt PV and will have a combined output of 700MW.

1.2 Description of Property and Affected Environment

The farm, Vetlaagte 4, lies 5.5 km east of the town of De Aar and about 2km north of the large Hydra substation. A number of renewable energy projects, particularly solar PV farms, have been proposed immediately surrounding this development and three completed solar farms lie north and northwest of Vetlaagte 4 such as De Aar Solar and Paarde Valley. A completed 144MW wind farm lies on the plateau north east of the development and can be seen from parts of Vetlaagte. An existing powerline as well as the various solar PV panels and infrastructure are clustered on the southern end of the development area. Much of the eastern half of Vetlaagte is similarly flat with only a few very small dolerite outcrops. The western half of Vetlaagte is rockier and hilly with two clusters of dolerite outcrops split either side of a jeep track.

The farms are currently used for grazing by sheep and a few farm kraals, dams and windmills were observed. The vegetation is typical of the Karoo and the grassland was dense enough over much of the site to hamper visibility of archaeological material lying on the surface. Some small scale crop agricultural production is placed at the Vetlaagte farmhouse complex which lies on the banks of a floodplain running north - south past the eastern end of the study area. A few (currently dry) farm dams were evident that appear to be in a state of disuse within the floodplain.

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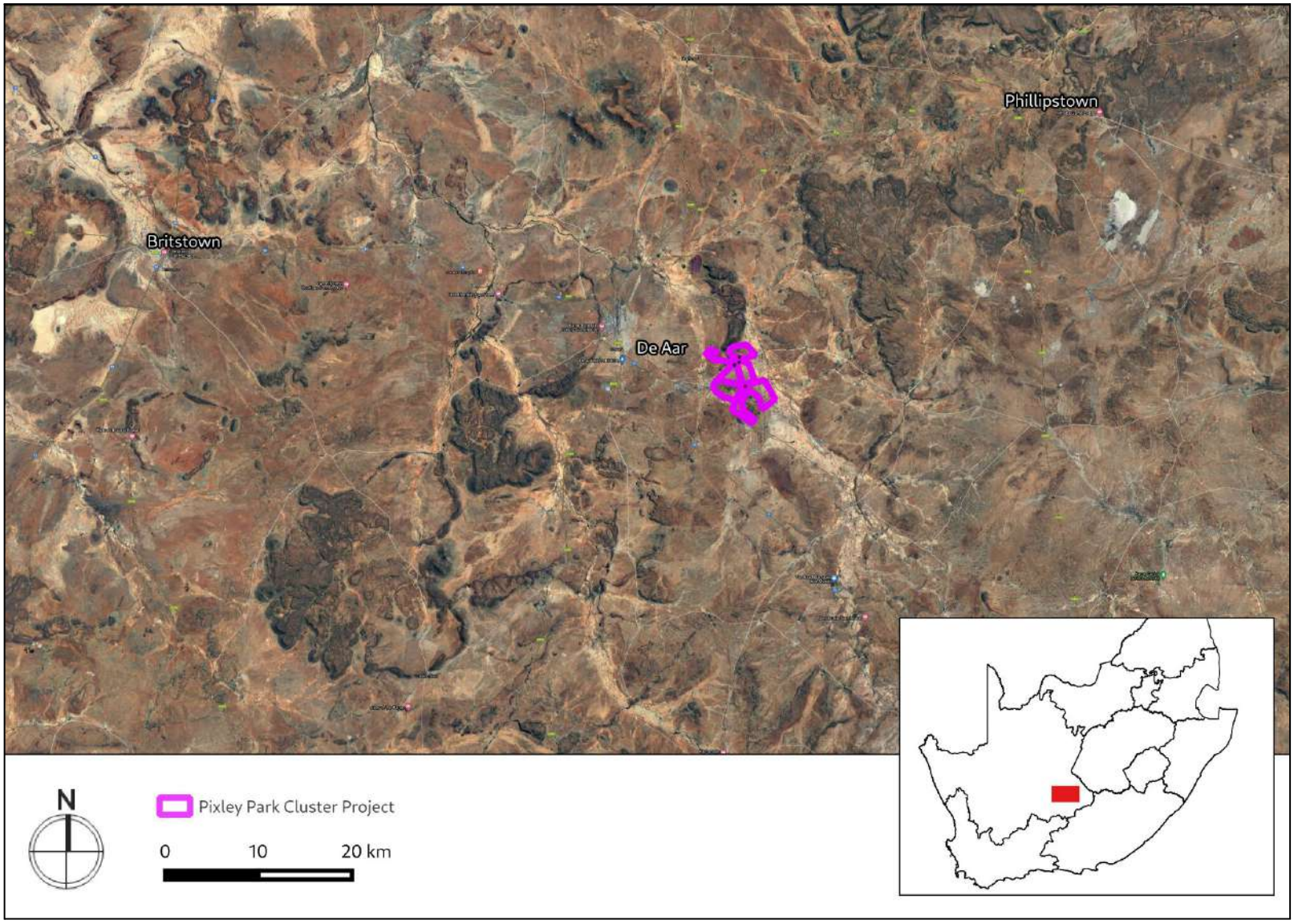

Figure 1.1: Close up satellite image indicating proposed location of study area

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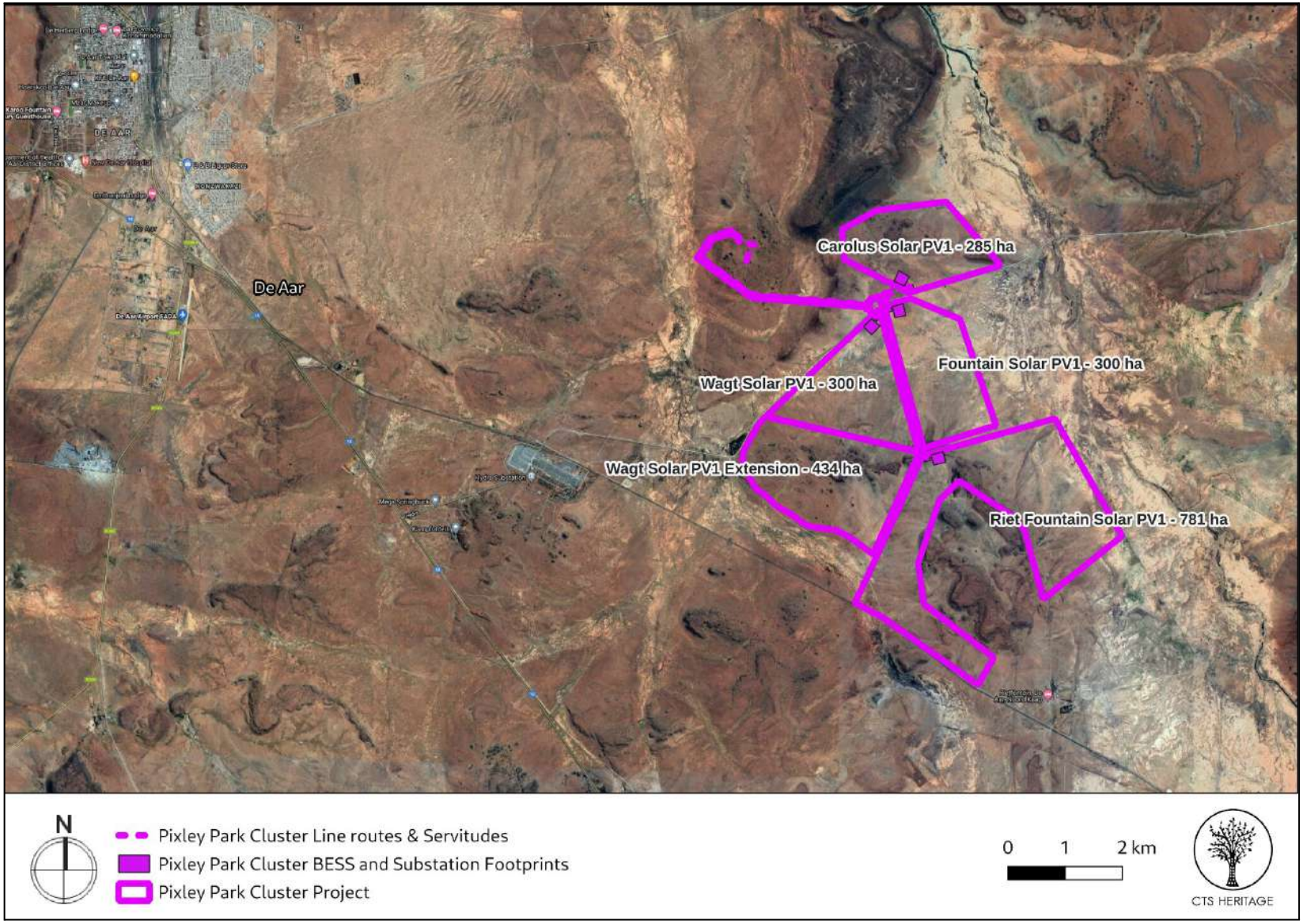

Figure 1.2: Study Area

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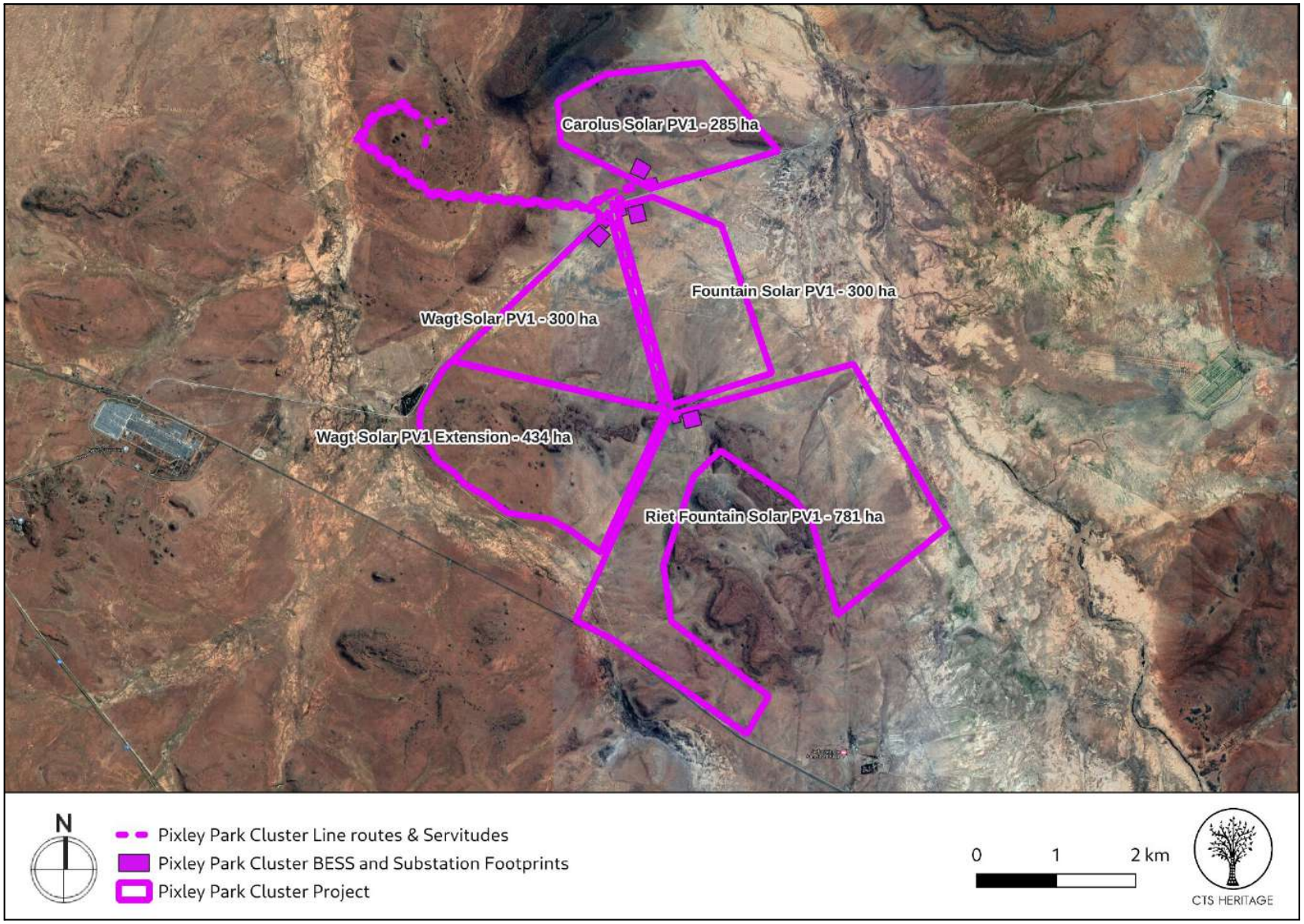

Figure 1.3: Study Area

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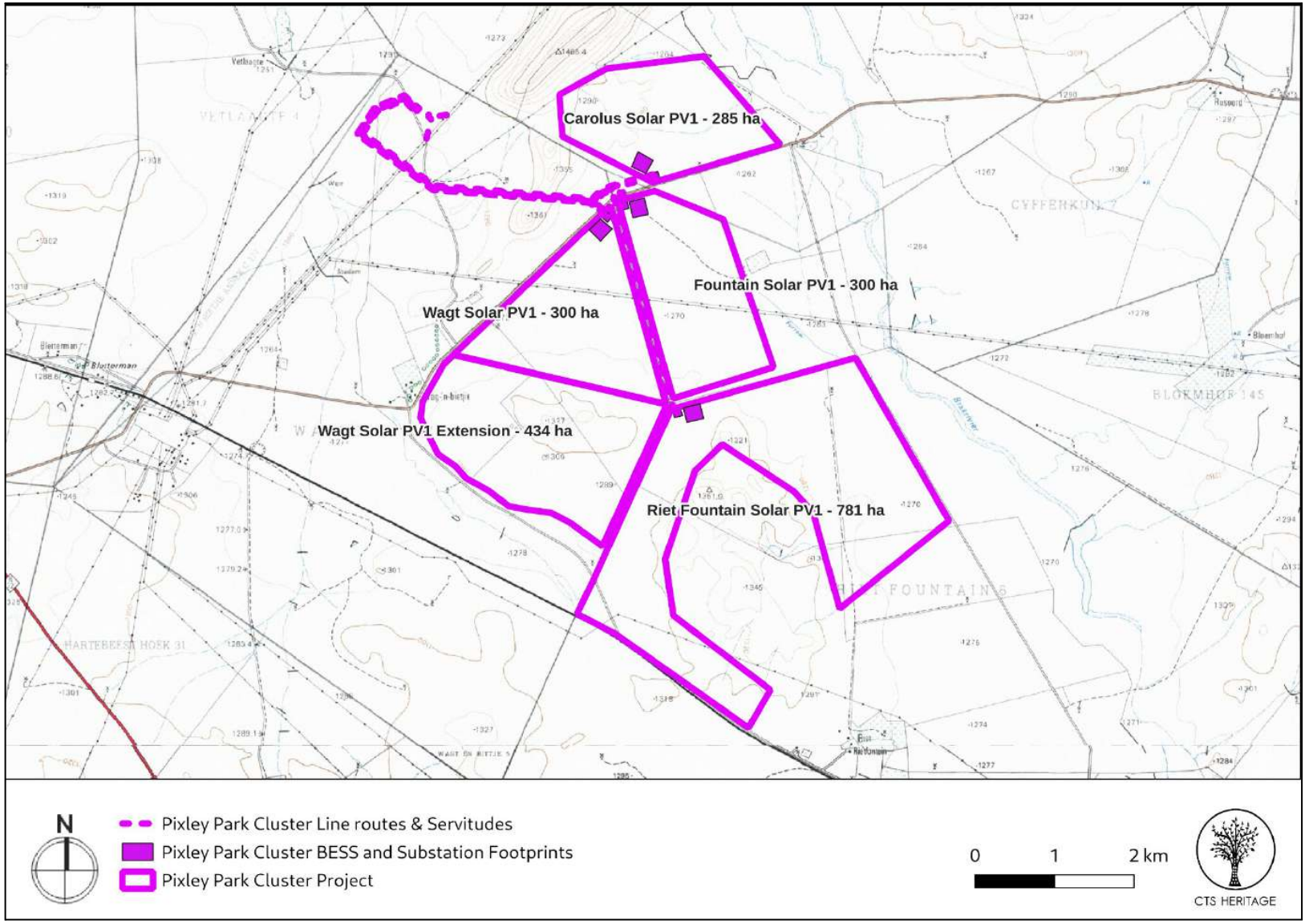

Figure 1.4: Study Area reflected on the 1:50 000 Topo Map

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2. METHODOLOGY

2.1 Purpose of Palaeontological Study

According to the SAHRIS Palaeosensitivity Map (Figure 4a), the area proposed for development is underlain by sediments of moderate and very high paleontological sensitivity. The purpose of this desktop palaeontological 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

- Primary research literature was consulted for detailed accounts of the geology and palaeontological representation across the study area. References of these primary research articles are provided.
- Geological maps (provided at various scales by CTS heritage and the South African Council for Geosciences) were consulted to identify represented geological contexts within the study area.
- Where possible, other Palaeontological Impact Assessments were consulted to provide additional information on local geomorphological, geological and palaeontological contexts. These often provide valuable additional information to primary research publications and formal geological maps, which can lack resolution at a local scale and it is important that discussions regarding alternative stratigraphic attributions of exposed rocks are noted and considered.

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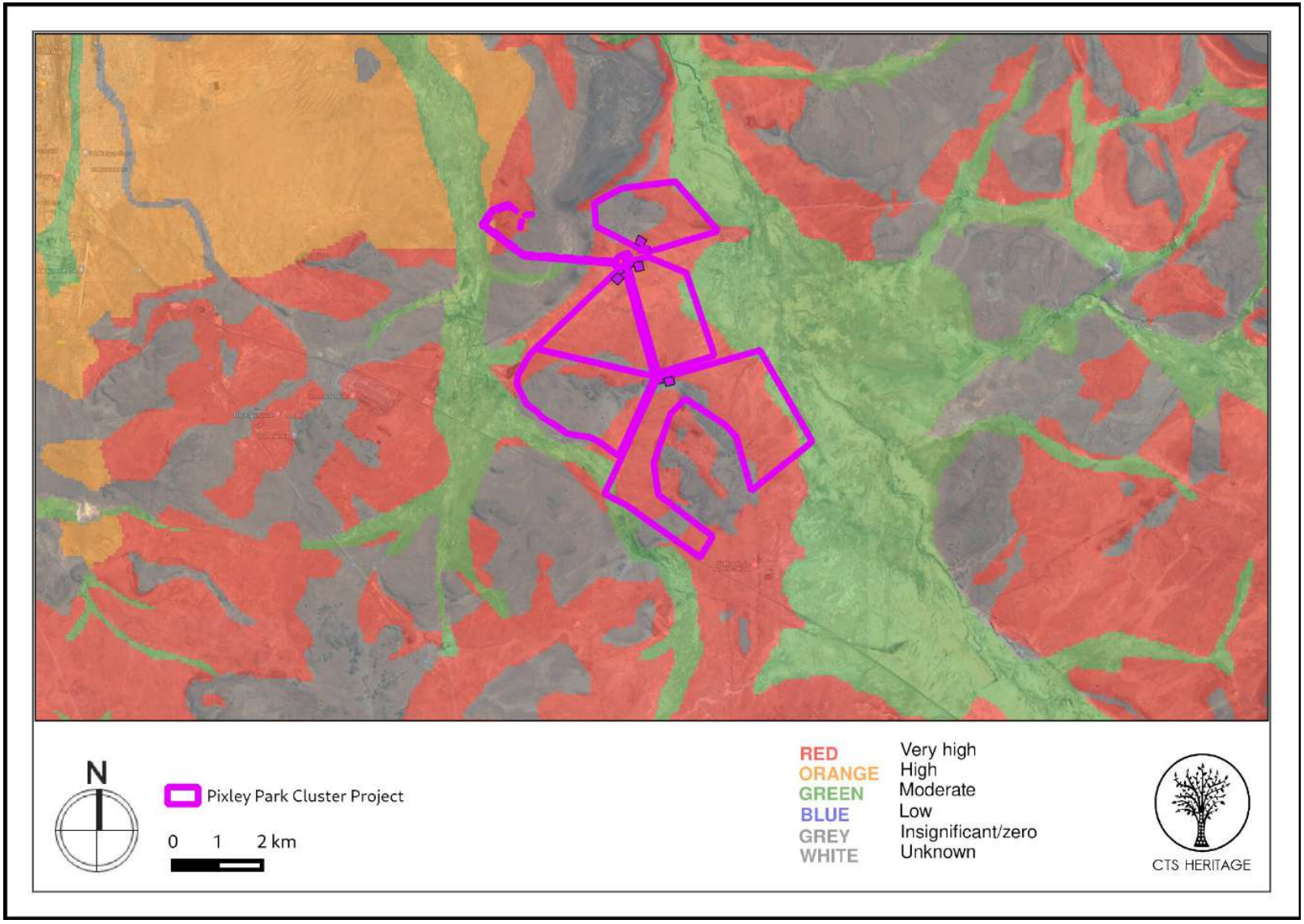

Figure 2: Palaeontological sensitivity of the development area from the SAHRIS PalaeoMap

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3. SITE SENSITIVITY

According to the extract from the Council for GeoSciences Map 3024 for Colesburg, the development area is underlain by Jurassic Dolerite, the Tierberg Formation of the Ecca Group and the Adelaide Subgroup of the Beaufort Group as well as Quaternary sands associated with the drainage lines.

As part of the process completed in 2012 for the approved neighbouring Vetlaagte Solar Energy Facility, Almond completed a field-based palaeontological assessment. Almond (2012) found that "The potentially fossiliferous sediments of the Late Palaeozoic Karoo Supergroup (Ecca and Lower Beaufort Groups) that underlie the study area are almost entirely mantled in a thick layer of superficial deposits of probable Pleistocene to Recent age. These include various soils, gravels and – at least in some areas - a well-developed calcrete hardpan. The upper Ecca Group bedrocks in the northern portion of the study area contain locally abundant fossil wood (of palaeontological interest for dating and palaeoenvironmental studies), as well as low diversity non-marine trace fossil assemblages typical of the Waterford Formation, rather than the Tierberg Formation as mapped. No vertebrate fossils and only scattered woody plant impressions of the Permian Glossopteris Flora were observed within the Lower Beaufort Group rocks that are very poorly exposed in the southern portion of the Vetlaagte study area. Trace fossils, silicified wood and rare vertebrate remains (therapsids, parareptiles) of the Middle Permian Pristerognathus Assemblage Zone have recently been recorded from this succession in the De Aar region (Almond 2010b). Extensive dolerite sills and dykes of the Early Jurassic Karoo Dolerite Suite intruding the Karoo Supergroup sediments are entirely unfossiliferous, as are rare intrusive kimberlite pipe rocks of Cretaceous age. The diverse superficial deposits within the three study areas (e.g. soils, gravels, alluvium, calcrete hardpans) are of low palaeontological sensitivity as a whole . Abundant fragments of reworked fossil wood material of Ecca provenance occur widely within subsurface and surface gravels overlying the Ecca Group outcrop area."

Almond (2012) concludes that "The construction of new access roads and transmission lines in this region are likewise considered to be of low significance as far as fossil heritage is concerned… In view of the overall low significance of the proposed development on palaeontological heritage resources, it is concluded that no further palaeontological heritage studies or specialist mitigation are required for these small PV projects, pending the exposure of any substantial fossil remains (e.g. vertebrate bones and teeth, large blocks of petrified wood) during the construction phase."

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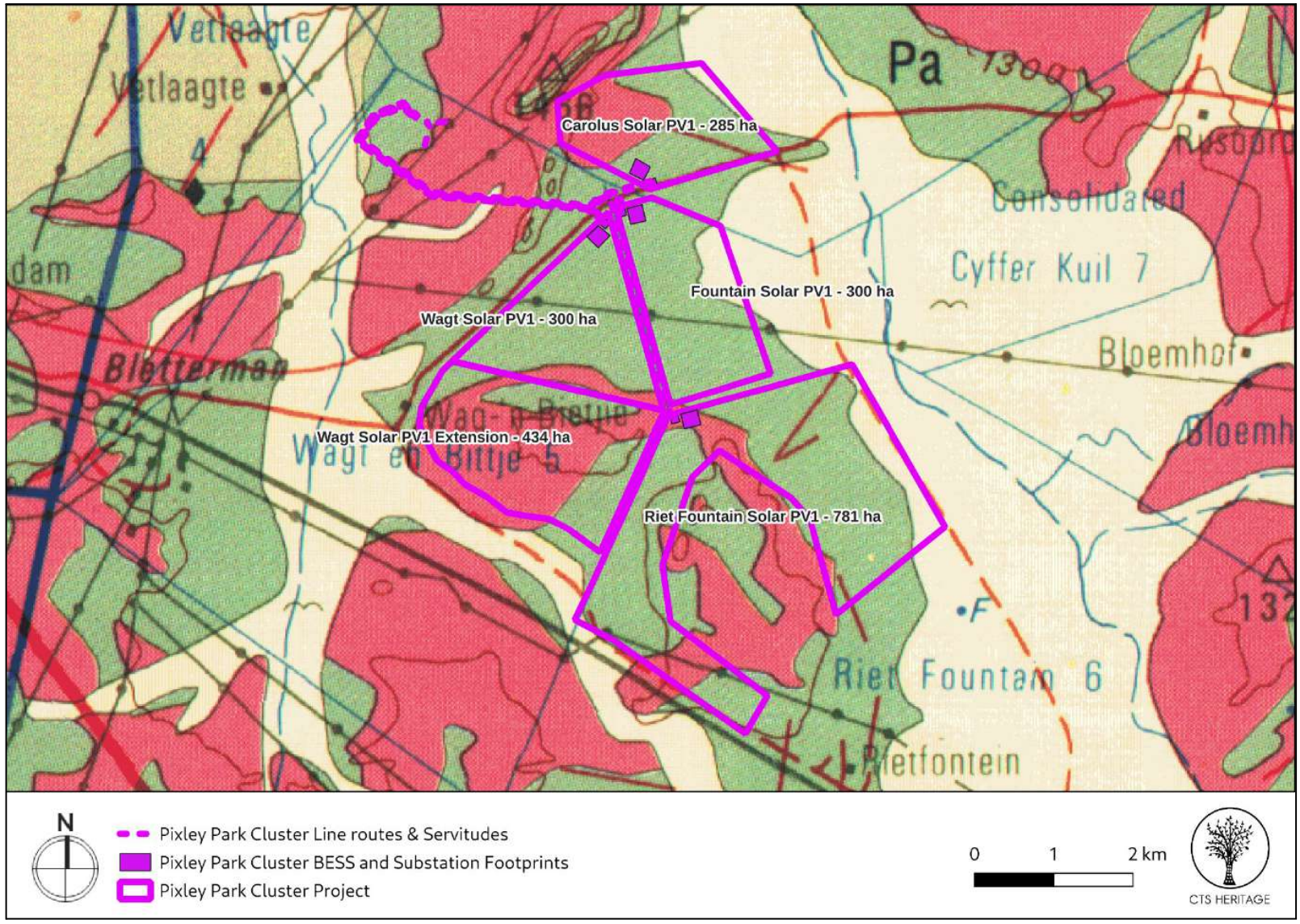

Figure 3. Geology Map. Extracted from the Council for GeoSciences Map 3024 for Colesburg indicating that the development area is underlain by Jd: Jurassic Dolerite (red), Pt (lighter green): Tierberg Formation of the Ecca Group and Pa (darker green): Adelaide Subgroup of the Beaufort Group

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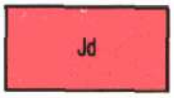
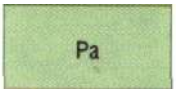
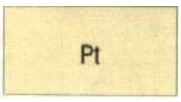
Table 1: Geological Summary Table

Geological unit	Age	Lithology	Symbol on figure 3	Fossil heritage	Palaeontological sensitivity (almond and pether, 2008)	Recommended mitigation
Quaternary	2.58 mya to 0 mya	Alluvium and debris		Calcretised insect burrows (including termites) and root casts (rhizoliths), ostrich egg shells (S*truthio*), shells of land snails (e.g. *Trigonephrus*), bivalves and gastropods (e.g. *Corbula*, *unio*) and ostracods (seed shrimps), charophytes (stonewort algae), diatoms, stromatolites, mammalian ichnofossils	Moderate	Any fossil finds to be reported by developer
Jurassic dolerite	200 mya	Intrusive dolerite		None	Insignificant/Zero	No action required
Adelaide Subgroup - Beaufort Group - Karoo Supergroup	262 mya to 251 mya	Blue-grey silty mudstone, subordinate brownish-red mudstone; sandstone		Rich fossil tetrapod assemblage (including amphibians, pan-testudines, therapsids, pisces); fossil plants (including *Glossopteris,* lycopods, sphenophytes, ferns, silicified wood)	Very High	Any fossil finds to be reported by developer
Tierberg Formation - Ecca Group - Karoo Supergroup	273 mya to 269.5 mya	Blue-grey to black shale with carbonate-rich concretions; subordinate siltstone and sandstone in upper part		Rare microvertebrate fossils (including fish scales and teeth); plant fossils (including leaves and petrified wood); abundant trace fossils (including burrows, arthropod trackways)	High	Any fossil finds to be reported by developer

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4. IDENTIFICATION OF HERITAGE RESOURCES

4.1 Underlying geology of development area

The geological context of the proposed development area is characterised by Quaternary sands, Jurassic Dolerite (Jd), the Permian Adelaide Subgroup (Pa) of the Beaufort Group (Karoo Supergroup), and the Permian Tierberg Formation (Pt) of the Ecca Group (Karoo Supergroup) (see table 1 for summary).

- The Northwest most corner of the development area (Pixley Park Cluster Line Routes and Servitude) traverses a small 180 m (East to West) by 500 m (North to South) area of the oldest deposit in the area, the Tierberg Formation (Ecca Group, Karoo Supergroup) (figure 3). This fine sediments of this formation were accumulated in the middle Permian (approximately 273 to 269.5 mya) (Johnson, Anhauesser & Thomas, 2006; Fildani *et al.*, 2009; Belica *et al.*, 2017; Groenewald, Day & Rubidge, 2019). The depositional environment of this unit has been described as restricted, brackish water (corresponding to offshore, quiet environments below wave base) (Johnson *et al.*, 1996; Almond, 2013; Groenewald *et al.*, 2022). The mudrock-dominated Tierberg Formation consists of dark, well-laminated shales, carbonate-rich concretions, and subordinate thin and fine-grained sandstones (table 1) (Johnson, Anhauesser & Thomas, 2006; Almond, 2013). Previous survey work 7.5 km North-West of the Pixley Park PV area suggested that the Tierberg Formation in the area rather corresponds to the overlying Waterford Formation (top of the Ecca Group defined by shallow shelf, storm-dominated, sandstone-rich facies) (Almond, 2013).
- The majority of the Pixley Park PV development area is geologically represented by the Adelaide Subgroup (Beaufort Group, Karoo Supergroup). This unit was deposited in the middle to upper Permian (approximately 262 to 251 mya) (Groenewald *et al.*, 2022). This subgroup is subdivided into the Abrahamskraal and Teekloof formations in the South-West part of the Karoo basin, and the Abrahamskraal, Middleton and Balfour formations in the South-East part of the basin (Johnson *et al.*, 1996). In some areas of the country, including the Pixley Park PV area, the representation and distribution of Adelaide Subgroup stratigraphic divisions is unresolved (Almond, 2021; Groenewald *et al.*, 2022). The sedimentary change from Ecca to Beaufort Group reflects a shift from subaqueous conditions to subaerial fluvial environments (Groenewald *et al.*, 2022), in which the Adelaide Subgroup was formed through fluvial processes relating to large-scale meandering river systems (Johnson, Anhauesser & Thomas, 2006; Almond, 2021). The sediments of the Adelaide Subgroup comprise fine-grained overbank mudrocks and subordinate lenticular channel sandstones (Almond, 2013; Almond, 2021).
- The entire proposed project area is abundantly intruded by an extensive network of igneous Jurassic Dolerite sills and dykes (part of the Karoo Igneous Province of Southern Africa). These were formed through crustal doming and stretching during the break-up of Gondwana, (Johnson, Anhauesser & Thomas, 2006; Almond, 2013).
- Finally, superficial Quaternary (<2.5 mya) to Recent alluvial deposits are represented at the Eastern border of the Pixey Park PV area. These cover the slopes of the dolerite ridges, valley sides and dry riverbeds (such as the Brakriver on the West of the proposed project area) (Johnson, Anhauesser & Thomas, 2006; Almond, 2013; Almond, 2021). Recent surveys in the area including 7.5 km North-West and 22 km South-East of the Pixley Park PV project area found that the local Quaternary sands are fine-grained, pale brown to orange-brown sandy to

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gravelly alluvial deposits (up to several meters in thickness) of various ages related to the Brakrivier and associated channels and tributaries (Almond, 2013; Almond, 2021).

4.2 Palaeontological Sensitivity of the Development Area

- The Palaeontological Sensitivity of the **Tierberg Formation** is classified as **High Risk** by SAHRIS (figure 2). The most abundant fossils from the formation are trace fossils. These include approximately ten ichnogenera including invertebrate burrows (e.g. *Planolites, Palaeophycus*), arthropod trackways (e.g. *Umfolozia*), and fish swimming trails (e.g. *Undichna*). Rare microvertebrate remains (fish scales and teeth) in calcareous concretions as well as plant fossils (leaves and petrified wood) have also been recovered (Van Dijk, Channing & Van Den Heever, 2002; Almond, 2008; Almond, 2013). If the Tierberg Formation exposures in the area are instead Waterford Formation deposits, these sediments have yielded poorly preserved tetrapod remains (possibly temnospondyl), microvertebrates (fish scales), fish coprolites, non-marine bivalves, trace fossils (e.g. invertebrate burrows *Scoyenia*,), and plant fossils (e.g. petrified wood and *Glossopteris*) (Rubidge, Hancox & Catuneanu, 2000; Johnson, Anhauesser & Thomas, 2006; Almond, 2013).
- The Palaeontological Sensitivity of the **Adelaide Subgroup** is classified as **Very High Risk** by SAHRIS (figure 2). The unit contains a highly diverse tetrapod assemblage and three Assemblage Zones: the *Tapinocephalus*, *Endothiodon*, and *Cistecephalus* Assemblage Zones (Day & Rubidge, 2020; Day & Smith, 2020; Rubidge & Day, 2020). These have yielded amphibian fossils (including temnospondyls like *Rhinesuchus*), Pan-testudines (e.e. *Eunotososaurus*), therapsids (including biarmosuchians, anomodonts, gorgonopsians and therocephalians) as well as fish (e.g. *Namaichthys*). Plant fossils (including petrified wood, plant remains, leaf & stem impressions), non-marine molluscs, and trace fossils (trackways, invertebrate burrows, coprolites) have also been recovered in the Adelaide Subgroup (Johnson, Anhauesser & Thomas, 2006; Bordy & Prevec, 2008; Bordy, Linkermann & Prevec, 2011; Bamford, Cairncross & Lombard, 2020; Almond, 2021). Previous surveys in the area (22 km South-East of current proposed area) have reported that "Due to the generally very poor exposure of Lower Beaufort Group (Adelaide Subgroup) bedrocks in the region between De Aar and Hanover, there have been very few identifiable vertebrate or other fossil finds here. Fragmentary skeletal remains of small-bodied therapsids, mainly dicynodonts, as well as of the small tortoise-like reptile *Eunotosaurus* have been recorded from the Lower Beaufort Group near De Aar […] (Day *et al.*, 2013) but these belong to a slightly older horizon within the Lower Beaufort Group than those in the present study area. Associated fossils near De Aar include scrappy plant remains – mainly sphenophyte ferns and well-preserved silicified wood – as well as low-diversity trace fossil assemblages." (Almond, 2021).
- The Palaeontological Sensitivity of the **Jurassic Dolerite** is classified as **Insignificant/Zero** by SAHRIS (figure 2). The igneous intrusive origin of the Jurassic dolerite dykes makes it unlikely that they contain fossils.
- The Palaeontological Sensitivity of the **Quaternary deposits** is classified as **Moderate** by SAHRIS (figure 2). Although present, the fossil record of the Quaternary Sands is sporadic and not very diverse. Aeolian dunes are not likely to preserve fossil material, however, calcretisation of burrows (including termites) and root casts (rhizoliths) can occur. Fossils that have been recorded include ostrich egg shells (*Struthio*), shells of land snails (e.g. *Trigonephrus*), bivalves and gastropods (e.g. *Corbula*, *Unio*) and snails, ostracods (seed shrimps),

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charophytes (stonewort algae), diatoms (microscopic algae within siliceous shells) and stromatolites (laminated microbial limestones). The Mokolanen clacretes have also yielded calcretised burrows (including termites), root casts (rhizoliths) as well as mammalian ichnofossils (Malherbe, 1984; Almond & Pether, 2008). Previous surveys in the area (22 km South-East of current proposed area) have yielded petrified wood fossils reworked from Permian sedimentary deposits, but no vertebrate or invertebrate fossils (Almond, 2021). It is worth noting that the Quaternary deposits may contain stone tools from various lithic industries and these should be the subject of further specialist assessment.

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5. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT

5.1 Assessment of impact to Palaeontological Resources

Based on previous surveys in the area, the presence of superficial deposits (probable Pleistocene to Recent age) covering the fossiliferous sediments (Ecca and Beaufort Groups), as well as the extensive network of intrusive dolerite dykes and sills that bake (thermally metamorphose) adjacent mudrocks, it is anticipated that the impact of the development will mainly be **LOW to MODERATE.**

6. CONCLUSION AND RECOMMENDATIONS

There are no objections on palaeontological heritage grounds. Any fossil finds, most likely in the Adelaide Subgroup sediments and Quaternary Sands, are to be reported by the developer. Should important fossil material be found during excavations, the attached Fossil Finds Procedure must be implemented (Appendix 1).

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7. REFERENCES

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Nid	**Report Type**	**Author/s**	**Date**	**Title**
104804	PIA Desktop	John E Almond	01/09/2012	Palaeontological specialist assessment: desktop study PROPOSED RENOSTERBERG SOLAR PV AND WIND ENERGY FACILITIES NEAR DE AAR, NORTHERN CAPE PROVINCE
133536	Palaeontological Specialist Reports	John E Almond	01/07/2013	PALAEONTOLOGICAL SPECIALIST STUDY
133536	Palaeontological Specialist Reports	John E Almond	01/07/2013	PALAEONTOLOGICAL SPECIALIST STUDY
163982	Palaeontological Specialist Reports		31/08/2013	Palaeontological specialist assessment: combined desktop and field study: Proposed development PV Solar Facility near De Aar, Northern CApe Province
256408	Palaeontological Specialist Reports	John E Almond	16/07/2013	Palaeontological Specialist Study: Combined Desktop and Field-based Assessments - Proposed Photovoltaic (Solar) Energy Facilities on Badenhorst Dam Farm near De Aar, Northern Cape
49843	PIA Phase 1	John E Almond	01/05/2012	PALAEONTOLOGICAL SPECIALIST STUDY: COMBINED DESKTOP AND FIELD-BASED ASSESSMENTS Proposed solar power generation facilities on the remaining extent of the farm Vetlaagte No. 4, De Aar, Northern Cape Province
58989	PIA Desktop	James Brink	10/08/2012	A Palaeontological Desktop Study of the Area to be Affected by the Proposed Photovoltaic Power Project on Portion 3 of Farm Hartebeestplaats 135

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APPENDIX 4: Chance Fossil Finds Procedure

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CHANCE FINDS OF PALAEONTOLOGICAL MATERIAL

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

Introduction

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

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

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

Training

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

Actions to be taken

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

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

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

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

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

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

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

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