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17 July 2022

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MULILO DE AAR PV EA VALIDITY EXTENSION – HERITAGE INPUT

Dear Annelize

1. Introduction

Thank you for providing the details of the application to extend the validity of the Environmental Authorisation (EA) for the authorised Mulilo De Aar Photo-voltaic (PV) Facility which is proposed to be located on Portion 1 of the Farm De Aar No 180. The project is one of three PV facilities that together are referred to as the Mulilo Total Hydra Storage (MTHS) project. The MTHS is Preferred Bidder in the Risk Mitigation Independent Power Producer Procurement Programme (RMIPPPP). The three solar facilities will be developed as one project and it is envisaged that the development thereof will take place simultaneously. The three facilities are as follows

- 75MW Badenhorst Solar PV2;
- 75MW Badenhorst Dam Solar PV3; and
- 100MW Mulilo De Aar PV.

Note that all the relevant NEMA authorisations for the above three PV facilities are currently in place, but the EA for the Mulilo De Aar PV facility will expire by 12 September 2022 if not extended. The final layout of this combined PV facility was approved on 8 June 2021. This approved layout was guided by the Environmental Sensitivity Map which was produced using the specialist input obtained during the original impact assessment, as well as during the course of numerous EA Amendment Applications. The site is thus well understood.

2. Desktop study and baseline environment of original assessment

The present writer carried out the original impact assessment for the PV facility as well as another on the same farm. These reports provide the data on which the conclusions of the present letter are based and are as follows:

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- Orton, J. 2012. Heritage Impact Assessment for three Solar Energy Facilities at De Aar, Western Cape. Unpublished report prepared for Aurecon South Africa (Pty) Ltd. St James: ACO Associates cc.
- Orton, J. & Webley, L. 2013. Heritage Impact Assessment for multiple proposed Solar Energy Facilities on De Aar 180/1 (Badenhorst Dam Farm), De Aar, Northern Cape. Unpublished report prepared for Savannah Environmental (Pty) Ltd. Diep River: ACO Associates cc.

The survey was relatively low density, but it focused on landscape features with fewer transects through the open grasslands. With one local exception, the open grasslands typically contain minimal to no heritage. What follows is a desktop review of heritage resources in and around the study area. The focus is strongly on archaeology and palaeontology, since no other types of heritage will be affected by construction of the facility. Heritage resources mapped close to the Mulilo De Aar PV footprint are mapped in Figure 1.

2.1. Archaeology

The original survey revealed that the distribution of archaeological resources was strongly associated with dolerite outcrops. These outcrops occurred in two areas: one is a long dyke extending from northwest to southeast and passing by the south-western edge of the authorised facility, while the other is a low rise located well to the northeast of the facility (Figure 1). The only archaeological materials seen on the flat, intervening featureless plains were occasional isolated background scatter artefacts that were generally weathered and can be attributed to the MSA. These are thus the only archaeological materials that might possibly be impacted during construction of the proposed facility. Such materials are of very low to no cultural significance and require no further action.

Other surveys in the immediate area have confirmed this pattern. Local examples of MSA low density scatters have been recorded by Kaplan (2010b), Morris (2011), Fourie (2011), Kruger (2012) and Orton (2012, 2022b, 2022c). One of the MSA scatters referred to as SA03 in Kruger (2012) and graded GPB by him was subsequently renamed Vetlaagte 3 by CTS Heritage (2021) who recommended recording of this locality. They carried out this mitigation but managed to find only six artefacts in the area (CTS Heritage 2022). Although denser scatters of such artefacts occur in the same general area (Orton 2022b, 2022c), none of them are worthy of any mitigation. Mixed scatters of MSA and LSA artefacts were recorded to the north of De Aar by Archer (n.d.), Kaplan (2010a) and Archer and Kaplan (2012) and accorded slightly higher significance. These sites lie close to the Brak River where, like along the dolerite ridges, one would expect a higher density of artefacts. Becker (2012) worked to the southeast of De Aar. No findings were discussed but a photograph of a single artefact was shown.

The most important sites in the surrounding area are a historical farmstead located 3.45 km north of the proposed project (Orton 2012) and a Later Stone Age site located 4.3 km north-northwest of the proposed project (Orton & Webley 2013). This latter has recently been excavated and found to be a dense accumulation of LSA occupation debris (Orton 2022a). This site lay on the highest point of a dolerite ridge but further to the northwest, on the same ridge, another light scatter of LSA material was recorded (Orton 2021) and sampled. On the north-western end of this ridge a small scatter of historical material was also sampled. This site appears to have been a British lookout point during the Anglo-Boer War (Orton 2022a). Fourie (2011) recorded some remnants of structures to the north of De Aar which he thought might be the foundations of Anglo-Boer War blockhouses. Some small, circular piled stone enclosures were attributed to animal kraals. Other work further away from the study area has recorded sites in the surrounding

mountains. These sites include historical stone walled features pertaining to shepherds who camped out in the hills with their flocks (Webley & Orton 2011). Kaplan (2010b) recorded historical stone walling and a water well in the mountains to the southwest of De Aar.

Very little change to the archaeological environment is expected to have occurred. This is because of the small amount of development that has occurred in the surrounding area. Impact assessment surveys and pre-construction surveys (where required) ensure that impacts are minimised and that significant resources are avoided or protected. To the best of the authors' knowledge, no significant heritage resources have been destroyed by construction of any other renewable energy facilities or other development in the De Aar area since the original assessment. It is noted, however, that a recent preconstruction survey for a solar facility to the northwest of the study area did require that three significant archaeological sites be subjected to archaeological mitigation (Orton 2021). As noted above, this work has recently been completed which ensures that the impacts are largely eliminated (Orton 2022a). Although some residual impact will still occur, the excavation and sampling results in a positive impact (benefit) in academic terms because of the knowledge that would not have been gained had the sites been avoided. No significant natural changes to the archaeological landscape are expected to have occurred since the original impact assessment with the only possible changes relating to the shifting of individual artefacts through the action of water runoff or flooding. The general environment is a very slowly deflating and/or eroding environment rather than an accretionary one, and thus if the De Aar PV site were resurveyed today no difference in results would be expected.

The significance of the impacts to archaeology can thus be considered to be **very low negative**. The original rating after mitigation was very low negative and the mitigation was applied. This involved ensuring that dolerite landscape features were avoided.

2.2. Palaeontology

The palaeontological sensitivity of the proposed PV footprint and surrounds is generally rated as high (Figure 2). Almond (2012a) has studied the palaeontology in the field for this and adjacent projects. The Ecca (below) and Beaufort Group sediments (above), both of which pertain to the Late Palaeozoic Karoo Supergroup, are considered to be potentially fossiliferous. However, field survey of the site has demonstrated that the surface is almost entirely mantled by thick superficial deposits of probable Pleistocene to Recent age. These comprise of soil, gravel and/or calcrete hardpan, all of which buries the potentially fossiliferous bedrocks. The upper Ecca Group bedrocks in the De Aar area are known to contain locally abundant fossil wood and low diversity trace fossil assemblages considered typical of the Waterford Formation, rather than the Tierberg Formation as mapped. The fossil wood is of general palaeontological research interest for dating and palaeoenvironmental studies.

No fossils were observed within the Lower Beaufort Group rocks that are only exposed just beyond the southern edge of the proposed footprint (red shaded area on Figure 2; Almond 2012a), although trace fossils, silicified wood and rare vertebrate remains (therapsids) of the formally recognised Middle Permian *Pristerognathus* Assemblage Zone (AZ) have recently been recorded from this succession in the De Aar area). This assemblage zone has recently been partitioned between the revised *Tapinocephalus* AZ and a new *Endothiodon* AZ (Smith *et al.* 2020) but there is currently insufficient fossil data to determine precisely which AZ is represented to the east of De Aar (An upper *Tapinocephalus* AZ assignation is proposed in

recent biostratigraphic mapping by Day & Rubidge 2020a, 2020b). Early Jurassic Karoo Dolerite Suite sills and dykes occur widely (grey areas on Figure 2) and are entirely unfossiliferous, as are rare Cretaceous-aged intrusive kimberlite pipe rocks.

The superficial deposits (soils, gravels, alluvium, calcrete) are generally of low palaeontological sensitivity. Relevant observations from these deposits include calcretized rhizoliths (root casts) of probable Quaternary age as well as reworked fossil wood material of Ecca provenance which likely occurs widely within the local gravels.

These observations have been confirmed by other studies in the immediate vicinity (Almond 2012b, 2013, 2015; Bamford 2022). Bamford (2022) further notes that the typically rounded and shiny appearance of some of the fossil wood indicates its transport prior to deposition in the area. In other words, some of it is in secondary context, which reduces its research value to some degree. Almond (2012a) did record some moderate-sized blocks (up to 80 mm maximum dimension) in an area to the northeast of the present study area. Such larger blocks are less likely to have been transported far from their point of origin.

Almond (2012a:1-2) concluded that:

- “The potentially fossiliferous Karoo Supergroup rocks within the development footprints (solar panel arrays, transmission lines, roads and other infrastructure) are generally buried beneath a thick mantle of fossil-poor superficial sediments (soils, gravels, calcretes);
- The Karoo Supergroup rocks are extensively disrupted by near-surface secondary calcrete formation. In many cases they have suffered baking during dolerite magma intrusion, further compromising their fossil heritage;
- The solar energy facilities each have a small footprint while extensive, deep bedrock excavations are not envisaged for this sort of alternative energy development.”

Very little change to the palaeontological environment is expected to have occurred since the original assessment and field survey. This is because significant impacts to fossils are not expected to have occurred through development of renewable energy facilities or any other developments in the surrounding area. Natural processes of weathering and erosion are unlikely to have exposed or destroyed fossils preserved at or near the ground surface over a time span of a few years. The most common fossils found on the De Aar landscape (fossil wood, rhizoliths, trace fossils) are of generally low palaeontological significance and their loss is of little to no consequence after they are recorded during impact assessment surveys. Furthermore, the most important fossils would be deeply buried within bedrock, beneath the generally unconsolidated to weakly consolidated surface sediments. As such, any new survey of the De Aar PV site will not produce any different or new results.

The significance of the impacts to palaeontology can thus be considered to be **low negative**. The original significance rating was low negative and no mitigation measures were proposed. The rating of low (rather than very low) is partly for precautionary reasons.

2.3. Graves

No graves were recorded during the original survey. The chances of graves being present are extremely low because of the nature of the substrate (thin soil overlying rock), but not zero. Nevertheless, the locations of

unmarked precolonial graves cannot be predicted and thus they cannot be meaningfully assessed. They can only be dealt with at the time of accidental discovery should this happen. This aspect of heritage thus requires no further consideration.

With the exception of farm graveyards associated with farmsteads (e.g. Kruger 2012; Morris 2011), other surveys in the area have also failed to reveal graves within renewable energy development sites.

2.4. Built heritage

There are no built heritage resources in close proximity of the study area and no structures of any sort within the broader PV area. The nearest are farmsteads lying 1.5 km to the south and 1.8 km to the north of the proposed footprint. Buildings are always avoided by renewable energy developments and thus this aspect of heritage requires no further attention.

2.5. Cultural landscape

The Karoo landscape is well-known for its wide open spaces, flat grassland plains, dolerite dykes and flat-topped hills. It is predominantly a natural landscape and, while many areas are remote and relatively untouched by development other than low intensity farming (livestock grazing), the vicinity of De Aar is quite strongly dominated by electrical infrastructure. Several wind and solar facilities are present in the surrounding landscape and high voltage powerlines are abundant. Part of the reason for these developments is the very large Hydra Substation which lies to the southeast of De Aar, and 3.5 km southeast of the proposed PV footprint. These facilities have effectively added a modern electrical 'layer' to the cultural landscape and, visually, this infrastructure is fairly dominant in the foreground and middle ground. Given the existing projects in the area, there will not be any new impacts to the cultural landscape. Although the intensity of impacts would increase marginally, this change would be too small to affect the significance since the landscape is already strongly electrical.

The significance of the impacts to the landscape can thus be considered to be **very low negative**. The original assessment also rated these impacts as **very low negative**. Mitigation measures related to avoiding landscape features such as rocky outcrops and ridges, minimising land clearance and staying within the authorised footprint. The first has been complied with, while the others will need to be carried forward into the amended EA.

3. Current environmental baseline

Recent aerial photography and site visits for adjoining projects by the present author (Orton 2022a, 2022b, 2022c) show that no alteration of the environment has taken place. The site was undeveloped grazing land in 2012 and remains that way today. The kind of change that is relevant to heritage is, for example, if the site has been ploughed which would result in the soil and any surface archaeology and or palaeontology being turned over and mixed. No such change is evident and there is no reason to believe that the heritage resources – both on and beneath the ground – would have changed in the last ten years. The current baseline environment is thus considered to be identical in archaeological and palaeontological terms to that assessed in 2012. It is pertinent to note that with the good rains of the last year the grass cover is often greater now than it was in the past. New surveys today might therefore actually produce less finds than

was the case during 2012. This same conclusion was reached by Orton (2022d) at a PV site at the northern edge of De Aar town. With the extra electrical developments that have occurred in the intervening years the landscape is considered to be of lesser cultural significance than what it was in 2012. Electrical infrastructure is the dominant anthropogenic signature in the area.

4. Further requirements, new guidelines, etc

Given that there has been no change in the baseline environment on the site, no new field assessment is required.

The current minimum reporting standards were published by SAHRA in 2007 and remain applicable today.

5. Cumulative impacts

It has already been noted that impacts to built environment and graves will not occur. Impacts to archaeology, palaeontology and the cultural landscape will occur but all are of low significance. Cumulative impacts to these aspects of heritage would therefore also occur, but, again, they are of low significance. Based on the desktop study above, these are explored individually below.

5.1. Archaeology

The only archaeological materials expected to be impacted are rare, isolated background scatter artefacts which have very low to zero cultural significance and are not worthy of any sort of mitigation. The loss of these artefacts would mean that fewer of them would occur on the landscape but their very low cultural significance means that the cumulative impact is of no consequence and does not need any further consideration. The cumulative impact cannot be quantified because such materials occur widely in the Karoo, well beyond the 30 km limit considered here, and in variable densities.

The significance of the cumulative impacts to archaeology can thus be considered to be **very low negative**.

5.2. Palaeontology

The only fossil materials expected to be impacted are *ex situ* fossil wood fragments contained within the surface gravels (where these occur), as well as rhizoliths in calcretised areas. These materials are commonly encountered in the area and have generally low cultural significance with impacts to them consequently being of low significance. The loss of such fossils will not significantly affect the fossil heritage of the region because of the limited research potential of these materials and the fact that they are so common. As such, even with similar fossils lost in other nearby developments, the cumulative impact is of no further concern. The cumulative impact cannot be quantified because such fossils occur widely in the Karoo, well beyond the 30 km limit considered here.

The significance of the cumulative impacts to palaeontology can thus be considered to be **low negative**.

5.3. Cultural landscape

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The cultural landscape is already dominated by its modern electrical 'layer'. As such, any further electrical development, such as the PV facility under consideration here, will be adding to an existing layer. New impacts to the landscape will not occur, but the existing impact would be slightly extended. The original report noted that the construction of multiple PV facilities in the area would detract from the visual qualities of the landscape. However, given the establishment of the De Aar area as an electricity producing hub, the intensity of cumulative impacts to the landscape becomes less and less of an issue. Importantly, landscape features such as dolerite hills and ridges are avoided by the project which means that rehabilitation of the site at the end of its lifespan will be relatively straightforward. It is not possible to quantify impacts to the cultural landscape since they would appear different from any one of countless vantage points along the various local roads.

The significance of the cumulative impacts can thus be considered to be **very low negative**.

6. Need and desirability

It is well-known that South Africa has an electricity crisis. The need for additional electricity generation is thus obvious. The National Heritage Resources Act (No. 25 of 1999) requires that impacts on heritage be evaluated against socio-economic benefits. Given the above need and the very low significance of individual and cumulative impacts to all heritage resources, it is considered that the socio-economic benefit outweighs the very minimal negative impacts to heritage resources.

7. Conclusion

Based on the above review the following conclusions can be drawn:

1. The baseline environment for archaeology and palaeontology has not changed since 2012;
2. The baseline environment for the cultural landscape is of lesser quality than it was in 2012;
3. The impact assessment ratings provided in 2012 remain valid today;
4. Some mitigation measures have been complied with (i.e. areas to be avoided have been avoided through layout design), while others remain applicable and have been included in the project EMP; and
5. No new mitigation measures are required; and
6. The existing MTHS project layout as approved is sensitive to heritage resources in that all known significant heritage sites have been avoided. The layout is therefore still appropriate in heritage terms.

8. Reasoned opinion

Based on the reviews of individual and cumulative impacts above, it is the opinion of the heritage specialist that the proposed De Aar PV facility should be allowed to proceed and that the amended EA should be issued.

9. Recommendations

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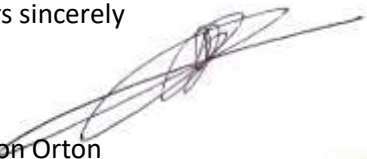
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The heritage environment has not changed significantly since 2012; therefore, there is no objection to the extension of the validity of the Environmental Authorisation. Given that previous conditions have either been complied with or included in the EMP, no new conditions are required.

Yours sincerely


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10. References

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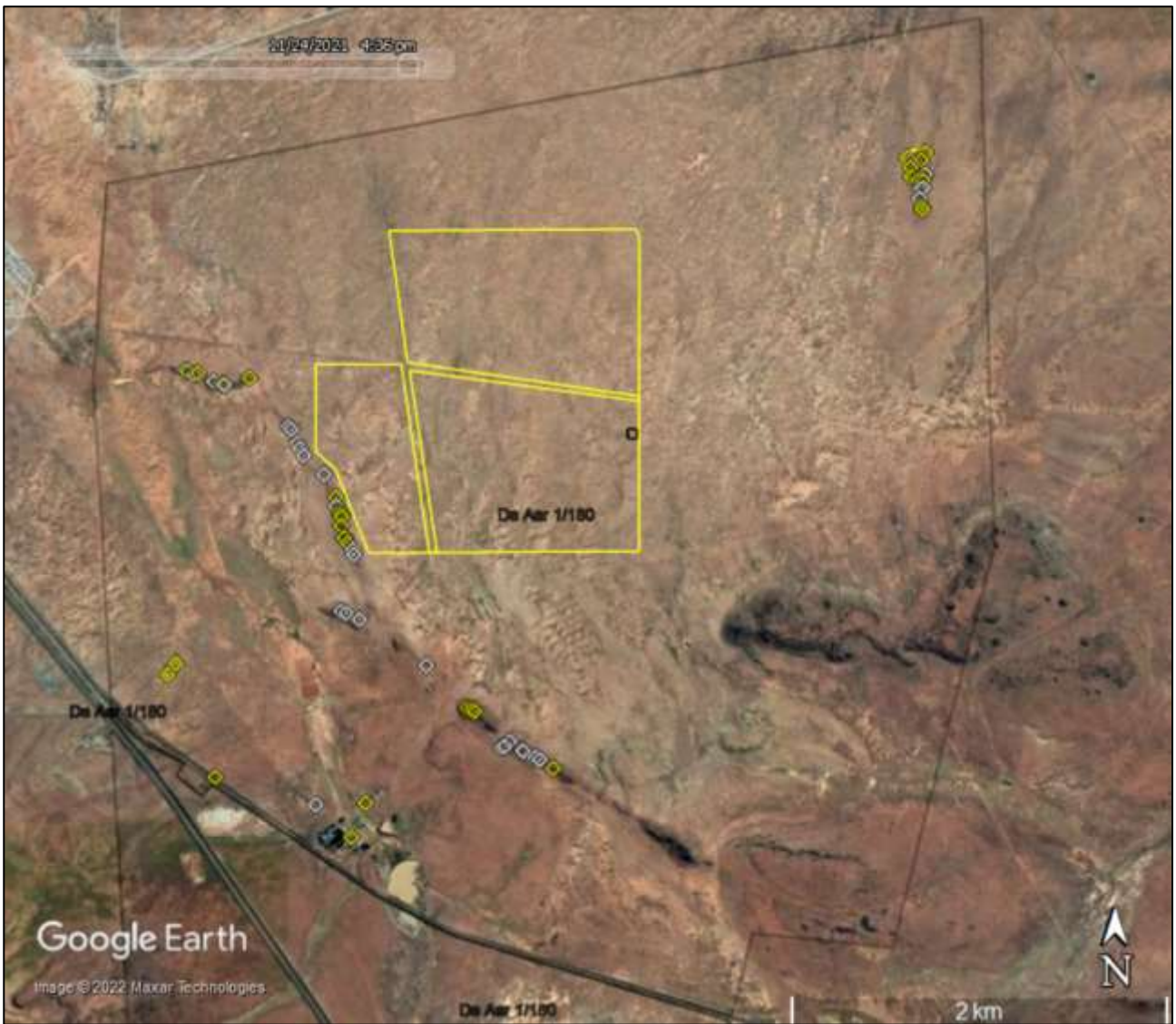


Figure 1: Aerial view of the Mulilo De Aar PV facility footprint (yellow polygons with generator sets in the small black square) within Portion 1 of De Aar 180 (black polygons). Heritage resources are marked by diamond symbols (yellow = grade GPB; white = grade GPC).

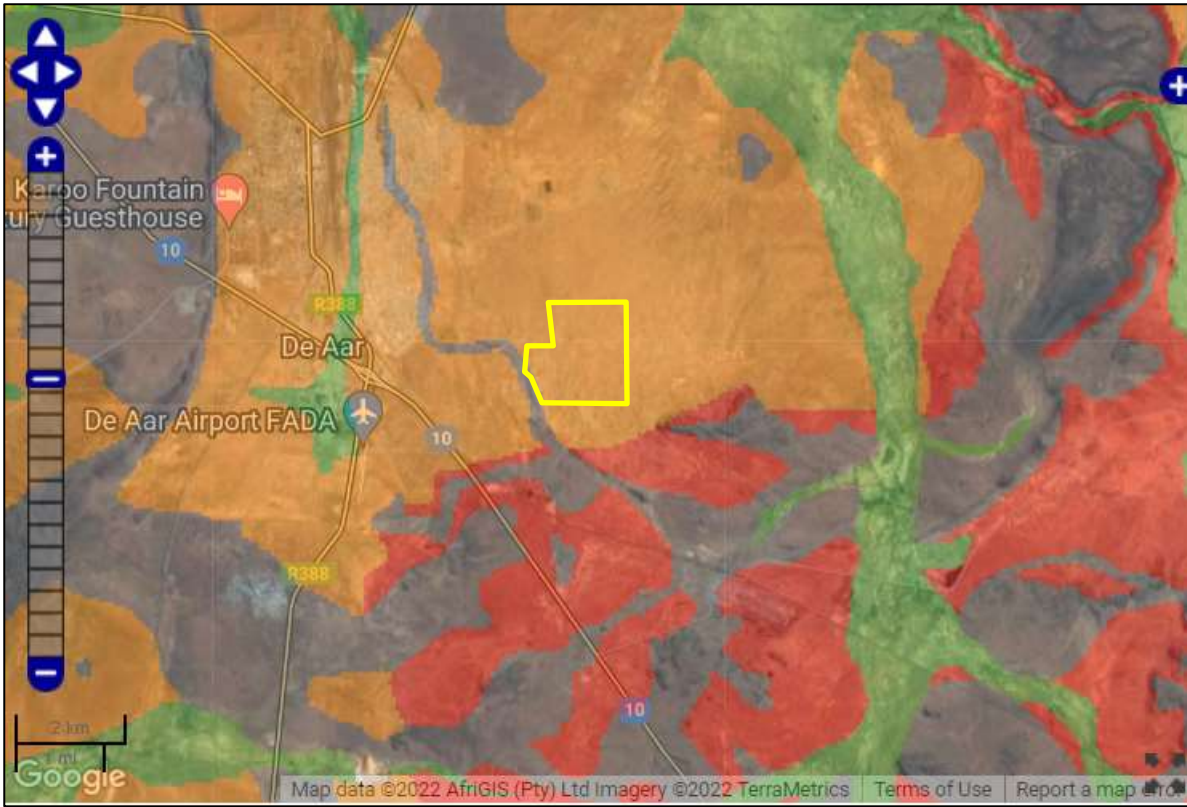
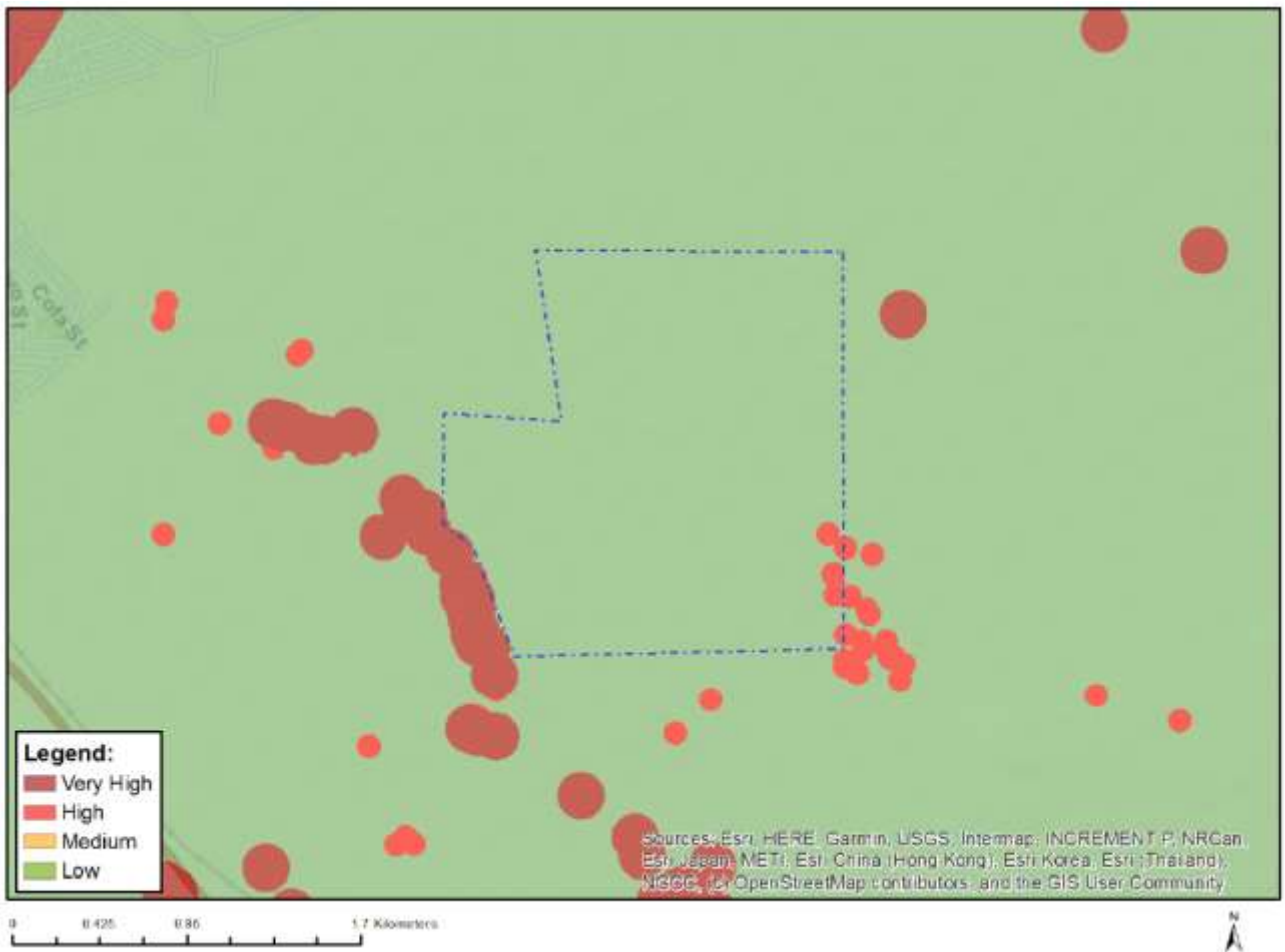


Figure 2: SAHRIS Palaeontological sensitivity map showing the site and much of the surrounding area to be of high palaeontological sensitivity (orange shading). Red = very high, green = moderate, grey = zero.



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