Phase 1 Heritage Impact Assessment for a new 132 kV transmission line between Camel Thorn Solar and the Prieska Power Reserve Industrial Complex, Prieska, NC Province.

Report prepared by
Paleo Field Services
PO Box 38806
Langenhovenpark
9330

January 2023

Summary

A Phase 1 Heritage Impact Assessment was carried out for a proposed new 132kV transmission line connecting the Camel Thorn Solar facility and the Prieska Power Reserve Industrial Complex. The 10 km - long by 80 m wide linear footprint will transect relatively low-lying terrain on Prieska townlands between the latter's industrial area in the west and the western boundary of farm Karabee 50 in the east. The proposed development will primarily impact geologically recent, superficial overburden and underlying Mbizane Formation outcrop, the latter not considered to be highly fossiliferous. The geologically recent overburden is not considered to be conducive for the preservation of Quaternary fossils. Calcretes and alluvium can be locally fossiliferous, especially those that are directly related to major river courses, spring areas or pans lunettes, which is not the case here. While the development is located within a region that has previously yielded ample archaeological evidence of prehistoric human occupation, the sporadic evidence of Stone Age/Prehistoric presence is considered minor in terms of overall impact given the nature of the proposed development. The low-density, *ex situ* stone tool component observed in both footprints has been mapped and recorded. The footprint is assigned an archaeological site rating of Generally Protected C (Low significance). Chance Find protocol included.

Contents

Introduction

A Phase 1 Heritage Impact Assessment was carried out for a proposed new 132kV transmission line connecting the Camel Thorn Solar facility and the Prieska Power Reserve Industrial Complex (**Fig 1**). The region's unique and non-renewable archaeological and palaeontological heritage sites are 'Generally' protected in terms of the National Heritage Resources Act (Act No 25 of 1999, section 35) and may not be disturbed at all without a permit from the relevant heritage resources authority. As many such heritage sites are threatened daily by development, both the environmental and heritage legislation require impact assessment reports that identify all heritage resources including archaeological and palaeontological sites in the area to be developed, and that make recommendations for protection or mitigation of the impact of the sites.

Legislative framework

The Act identifies what is defined as a heritage resource, the criteria for establishing its significance and lists specific activities for which a heritage specialist study may be required. In this regard, categories of development listed in Section 38 (1) of the NHR Act are:

- The construction of a road, wall, **power line**, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;
- The construction of a bridge or similar structure exceeding 50m in length;
- Any development or other activity which will change the character of the site;
- Exceeding 5000 m² in extent;
- Involving three or more existing erven or subdivisions thereof;
- Involving three or more subdivisions thereof which have been consolidated within the past five years;
- Costs of which will exceed a sum set in terms of regulations by the South African Heritage Resources Agency (SAHRA).
- The rezoning of a site exceeding 10 000 m².
- Any other category of development provided for in regulations by the South African Heritage Resources Agency (SAHRA).

The significance or sensitivity of heritage resources within a particular area or region can inform the EIA process on potential impacts and whether or not the expertise of a heritage specialist is required. A range of contexts can be identified which typically have high or potential cultural significance and which would require some form of heritage specialist involvement. This may include formally protected heritage sites or unprotected, but potentially significant sites or landscapes. The involvement of the heritage specialist in such a process is usually necessary when a proposed development may affect a heritage resource, whether it is formally protected or unprotected, known or unknown. In many cases, the nature and degree of heritage significance is largely unknown pending further investigation (e.g. capped sites, assemblages or subsurface fossil remains). On the other hand, it is also possible that a site may contain heritage resources (e.g. structures older than 60 years), with little or no conservation value.

Methodology

The significance of the affected area was evaluated using existing field data, database information and published literature. This was followed by a field assessment (site visit) of the affected areas. A Garmin Etrex Vista GPS hand model (set to the WGS 84 map datum) and a digital camera were used for recording purposes. Relevant archaeological and palaeontological information, maps, Google Earth images and site records were integrated with data acquired during the on-site inspection.

Terms of reference:

- Identify and map possible heritage sites and occurrences using available resources.
- Determine and assess the potential impacts of the proposed development on potential heritage resources;
- Recommend mitigation measures to minimize potential impacts associated with the proposed development.

Potential impacts on heritage resources are summarized in **Table 1** and archaeological site ratings are listed in **Table 2**.

Locality Data

1 : 50 000 scale topographic maps 2922 DB Prieska Oos

1 : 250 000 scale geological map 2922 Prieska

The 10 km - long by 80 m wide linear footprint will transect relatively low-lying terrain on Prieska townlands between the latter's industrial area in the west and the western boundary of farm Karabee 50 in the east (**Fig. 2 - 5**). Individual GPS coordinates of the survey areas (**Fig. 2**):

GPS coordinates (**Fig. 2**)**::**

A) 29

Background

Geology

According to the 1: 250 000 scale geological map 2922 Prieska, the area south of the Orange River between Prieska and Karabee 50 is underlain by glacially-related sediments of the Mbizane Formation (Dwyka Group, *C-Pd*), a largely heterolithic unit recognized in the upper part of the Dwyka Group of the Karoo Supergroup (**Fig 6**). The mudstone and sandstone successions, tillites and conglomerates of the Mbizane Formation represents valley and inlet fill deposits that were laid down when Dwyka glaciers scoured out valleys and depressions in pre-Karoo rocks during the Permo-Carboniferous, *c*. 300 Ma years ago. Small, isolated exposures of palaeontologically significant platform carbonates (stromatolites) are located to the northeast and well outside the boundary of the proposed development footprint. Superficial deposits are primarily represented by late Tertiary surface limestones (*T-Qc*), and windblown Kalahari Group sand (*Qg*).

Palaeontology

Potential occurrences: Ichnofossil assemblages and remnant plant fossils associated with Dwyka Group sediments; Late Neogene vertebrate fossils associated with intact river terrace gravels and surface limestones; Quaternary vertebrate fossils associated with Pleistocene alluvial, pan or spring deposits.

Low diversity, non-marine ichnofossil assemblages have been recorded in the Mbizane Formation as well as scarce vascular plant remains associated with Glossopteris Flora, while palynomorphs are also likely to be present within finer-grained mudrock facies (**Fig 7 & 8**). The Middle and Lower Gariep basin cuts through a series of post-Karoo fluvial remnants. To the west of Prieska the landscape is dissected by the ancient Koa Valley, a Miocene relic with remnants of Cenozoic fluvial deposits that has produced

fossil vertebrate bone as well as fossil wood. Southwards, the Koa Valley joins an extensive system of pans fossil where several Palaeogene and Neogene vertebrate fossil remains have been identified. Florisian-type fossil remains of Equids, Alcelaphines and Bovines are known to have come from old calcrete quarries and pan sediments in the region (**Fig. 9**).

Archaeology

Potential occurrences: Intact Stone Age open sites; burial cairns, unmarked graves, pastoralist kraals, rock art.

The archaeological footprint in the region are primarily represented by Stone Age archaeology, rock art localities, structural remnants dating back to the Anglo Boer War and its aftermath, as well as graveyards and other historical structures dating more than 60 years ago. The Stone Age archaeological footprint in the region is represented by Early, Middle and Later Stone Age sites associated with pans and alluvial contexts (see **Fig. 10**), while the landscape in general is characterized by low-density surface scatters. Rock engravings have been recorded in the younger valley fills along the steeper slopes located near the eastern and south-eastern margins of the Asbesberge north of Prieska (van Riet Low 1949). In addition, rock art sites have been recorded on a number of farms between Prieska and Douglas. Historical ruins and graveyards associated with the asbestos mining industry during the first half of the 20th century are located at various localities north and south of Prieska. Before the town of Prieska was founded in 1882, early travelers frequently encountered Koranna and Bushmen groups in the region. The principal Khoikhoi inhabitants of the Middle Orange River were the Einiqua who belonged to the same language group as the Namaqua and Korana, namely the Orange River Khoikhoi (Penn 2005). The Einiqua occupied the area around and east of the Augrabies Falls while the Korana occupied the Middle-Upper Orange River further to the east between Prieska and the Vaal-Orange confluence (**Fig. 11 & 12**). Prior to the end of 18th century, Iron Age occupation *sensu lato* was absent from the region with the most southerly distribution of Sotho-Tswana Iron Age settlement in the northern Cape limited to north of the Orange River. This changed during the first half of the 19th century when a small number of Xhosa-speaking communities settled in the region. The Xhosa leader Danster arrived at the Orange River from the Eastern Cape, along with his followers, in 1795 and from as early as 1800 to 1805 Xhosa – speaking groups along the Middle Orange River raided and traded with San, Korana and Sotho-

Tswana Tlhaping groups to the north east. By the end of the first decade of the 19th century, Xhosa speakers intentionally settled in the Pramberg and Karreeberg regions to the south of Prieska (**Fig. 13**).

Field Assessment

The transmission line traverses locally – derived surface gravels and sandy soils (*Qg*), surface limestones (*T-Qc*), and shallow alluvium associated with ephemeral drainage lines, all resting on Mbizane Formation outcrop. (**Fig. 14**). No fossils or potential fossil exposures were observed within superficial sediments, including exposures from an old borrow pit situated next to the highway. There is no evidence of *in situ* Stone Age archaeological material, either as capped assemblages or distributed as intact surface scatters on the landscape within the boundaries of the proposed development footprints. Low density (< 1 / 100 m) isolated finds were observed as locally derived surface scatters (**Fig 15**). There are no indications of rock art (engravings), stonewalled structures or historically significant buildings older than 60 years, or aboveground evidence of graves within the boundary of the site.

Impact Statement and Recommendation

The proposed development will primarily impact geologically recent, superficial overburden resting on Mbizane Formation outcrop (**Table 1**). The Mbizane Formation is not considered to be highly fossiliferous, while surface limestones and geologically recent regolith within the proposed footprint area lies outside the boundary of intact (Neogene) terrace gravels, pans, springs, and well-developed pre-Holocene alluvial exposures. The geologically recent overburden is not considered to be conducive for the preservation of Quaternary fossils. Calcretes and alluvium can be locally fossiliferous, especially those that are directly related to major river courses, spring areas or pans lunettes, which is not the case here.

While the development is located within a region that has previously yielded ample archaeological evidence of prehistoric human occupation, the sporadic evidence of Stone Age/Prehistoric presence is considered minor in terms of overall impact. The low-density, *ex situ* stone tool component observed in both footprints has been mapped and recorded. The footprint is assigned an archaeological site rating of Generally Protected C (Low significance, **Table 2**).

References

Almond, J.E. & Pether, J. 2008. *Palaeontological heritage of the Northern Cap*e. Interim SAHRA technical report, 124 pp. Natura Viva cc, Cape Town.

Anderson, E. 1985. A History of the Xhosa of the Northern Cape 1795-1879. Masters Thesis. Cape Town: University of Cape Town.

Beaumont, P.B., Smith, A.B. & Vogel, J.C. 1995. Before the Einiqua: the archaeology of the frontier zone. In: Smith, A.B. (ed.) Einiqualand: studies of the Orange River frontier: 236-264. Cape Town: University of Cape Town Press.

Beukes, N.J. 1979. Litostratigrafiese onderverdeling van die Schmidtsdrif-Subgroep van die Ghaap Groep in Noord Kaapland. *Transactions of the Royal Society of South Africa* 82: 313 – 327.

Burchell W.J. 1824. *Travels in the interior of southern Africa*. Vol II. Longman and Green. London.

Humphreys, A.J.B. 1976 Note on the Southern Limits of Iron Age Settlement in the Northern Cape. *South African Archaeological Bulletin*, Vol. 31 (121/122): 54-57.

Johnson M.R. et al 2006. Sedimentary rocks of the Karoo Supergroup. **In**: Johnson, M.R, Anhaeusser, C.R. and Thomas, R.J. (Eds.) *The geology of South Africa*, pp. 461 - 500. Geological Society of South Africa, Johannesburg & the Council for Geoscience, Pretoria.

Kallaway, P. 1982. Danster and the Xhosa Of the Gariep: Towards a Political Economy of the Cape Frontier 1790-1820. *African Studies* 41:143-160.

Kiberd, P. 2006. Bundu Farm: a report on archaeological and palaeoenvironmental assemblages from a pan site in Bushmanland, Northern Cape, South Africa. *South African Archaeological Bulletin* 61: 189-201.

Maglio, V.J. and Cooke, H.B.S. 1978. Evolution of African Mammals. Cambridge, Mass. Harvard University Press.

Morris, A.G. 1995. The Einiqua: an analysis of the Kakamas skeletons. In: Smith, A.B. (ed.) *Einiqualand: studies of the Orange River frontier*. pp. 110 - 164. Cape Town: University of Cape Town Press.

Penn, N. 2005. *The Forgotten Frontier: Colonist and Khoisan on the Cape's Northern Frontier in the 18th Century*. Athens, Ohio and Cape Town: Ohio University Press and Double Storey Books.

Smith, R. M. H. 1988. Palaeoenvironmental reconstruction of a Cretaceous crater-lake deposit in Bushmanland, South Africa. *Palaeoecology of Africa and Surrounding Islands* 19:27–41.

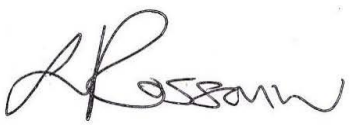
Visser, J.N.J., Loock, J.C. *et al*. 1977-78. The Dwyka Formation and Ecca Group, Karoo sequence in the northern Karoo Basin, Kimberley-Britstown area. *Annals of the Geographical Survey of South Africa* 12: 143 – 176.

Von Brunn, V. & Visser, J.N.J. 1999. Lithostratigraphy of the Mbizane Formation (Dwyka group). *South African Committee for Stratigraphy, Lithostratigraphic Series No. 32*, 10 pp. Council for Geoscience, Pretoria.

DECLARATION OF INDEPENDENCE

Paleo Field Services act as an independent specialist consultant and do not or will not have any financial interest in the undertaking of the activity other than remuneration for work as stipulated in the terms of reference. Paleo Field Services has no interest in secondary or downstream developments as a result of the authorization of this project.

Yours truly,



27 / 01 / 2023

Tables and Figures

Table 1. Summary of impacts within the proposed study area.

Impact	Extent of Development	Duration	Probability of adverse impact	Confidence	Mitigation	Rating Post-Site Visit
Impact of proposed development on palaeontological heritage	Local	Permanent	Low; Superficial deposits (T-Qc, Qs, alluvium) Dwyka tillites & mudstones	High	Phase 1 Evaluation Protocol for finds	C (GP.C)
Impact of proposed development on archaeological heritage	Local	Permanent	Low: No *aboveground* evidence of *in situ* archaeological features, graves or historically significant structures older than 60 years	High	Phase 1 Evaluation Protocol for finds	C (GP.C)

Table 2. Field rating categories as prescribed by SAHRA.

Field Rating	**Grade**	**Significance**	**Mitigation**
National Significance (NS)	Grade 1	-	Conservation; national site nomination
Provincial Significance (PS)	Grade 2	-	Conservation; provincial site nomination
Local Significance (LS)	Grade 3A	High significance	Conservation; mitigation not advised
Local Significance (LS)	Grade 3B	High significance	Mitigation (part of site should be retained)
Generally Protected A (GP.A)	-	High/medium significance	Mitigation before destruction
Generally Protected B (GP.B)	-	Medium significance	Recording before destruction
Generally Protected C (GP.C)	-	Low significance	Destruction

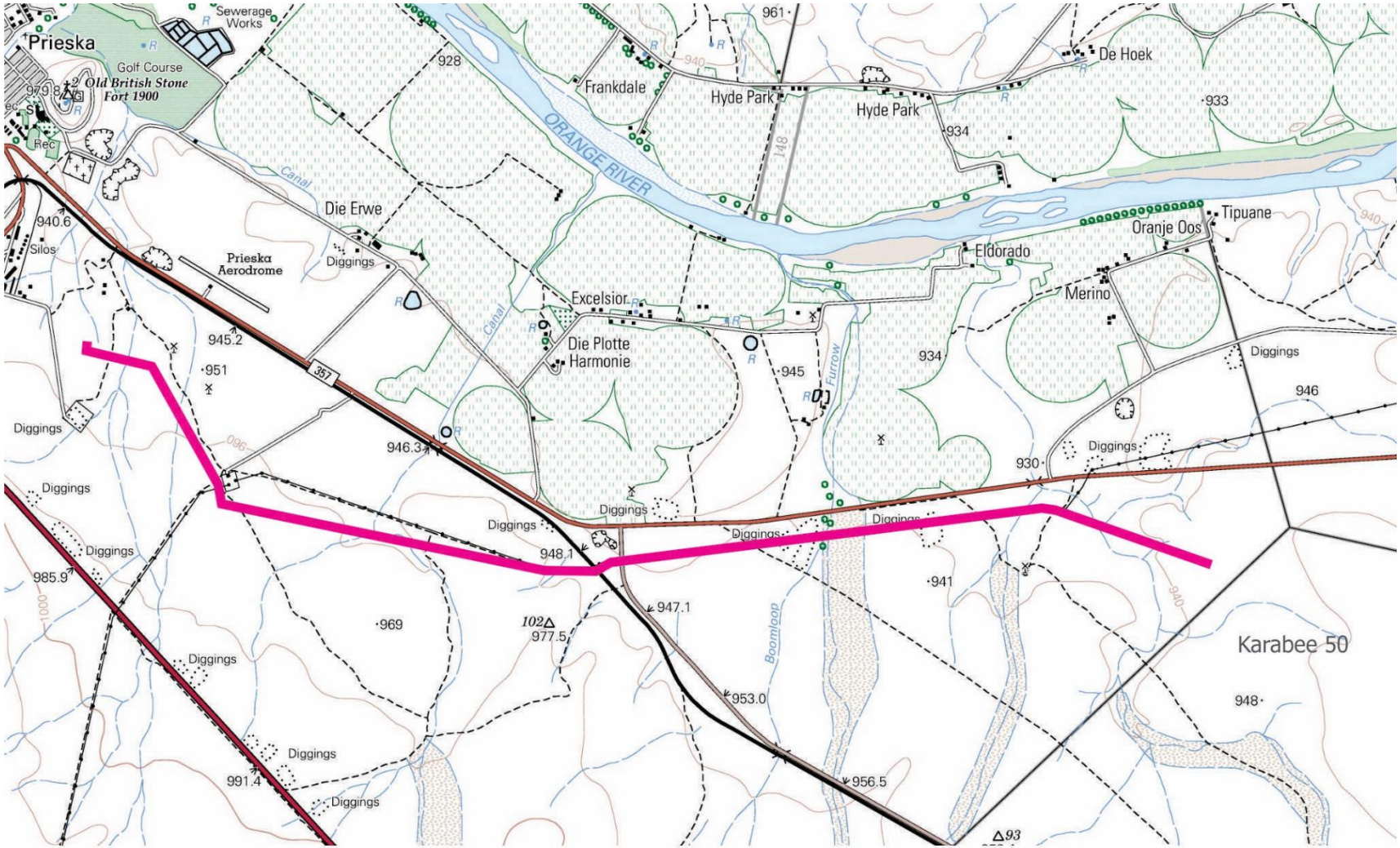


Figure 1. Proposed powerline marked on portion of 1:50 000 topographic map 2922 DB Prieska Oos).

Figure 2. Aerial view of the proposed development (white line).

Figure 3. General view of the footprint along Section A - B.
Scale 1 = 10 cm.

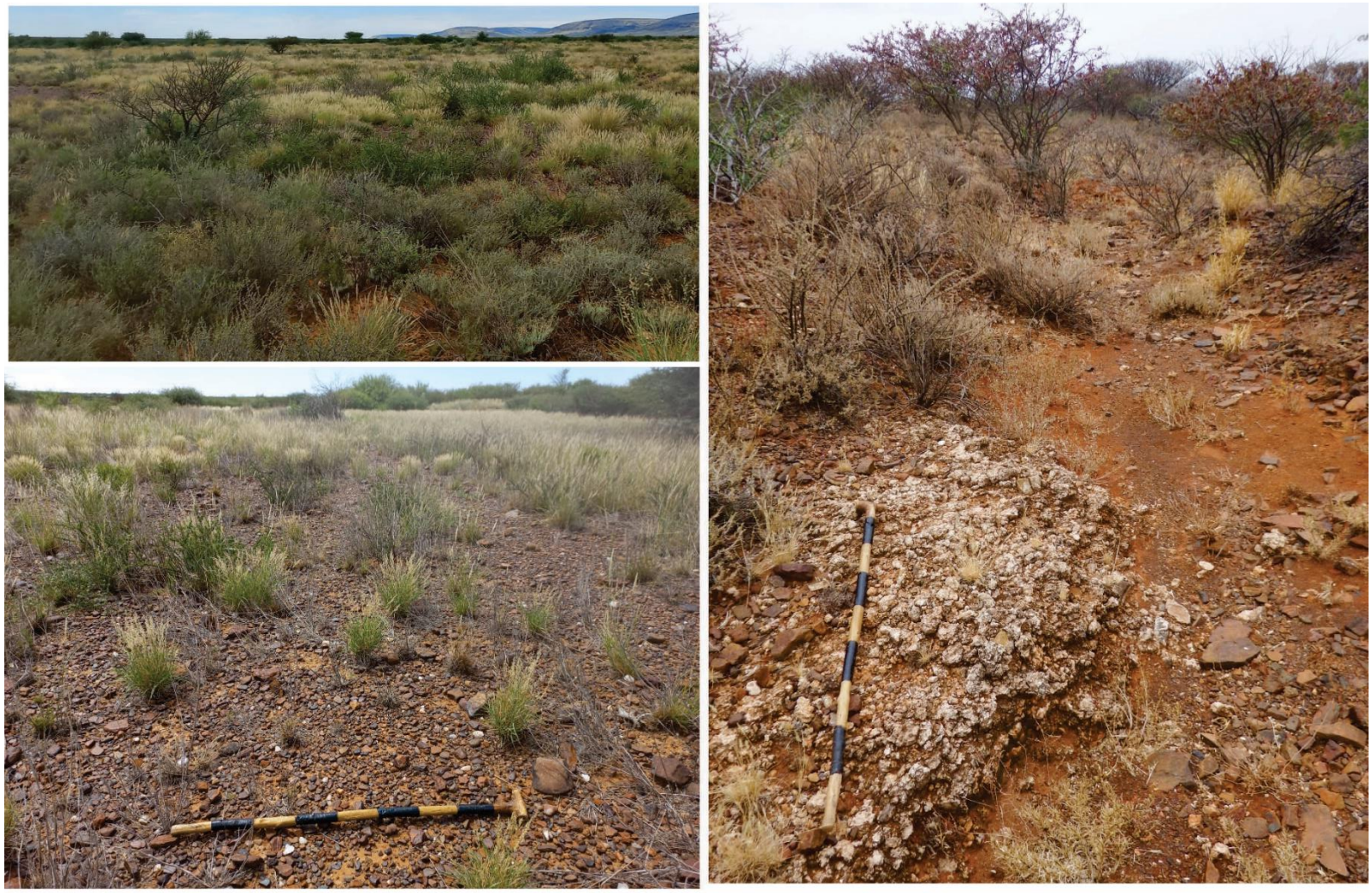


Figure 4. General view of the footprint along Section C - D .
Scale 1 = 10 cm.

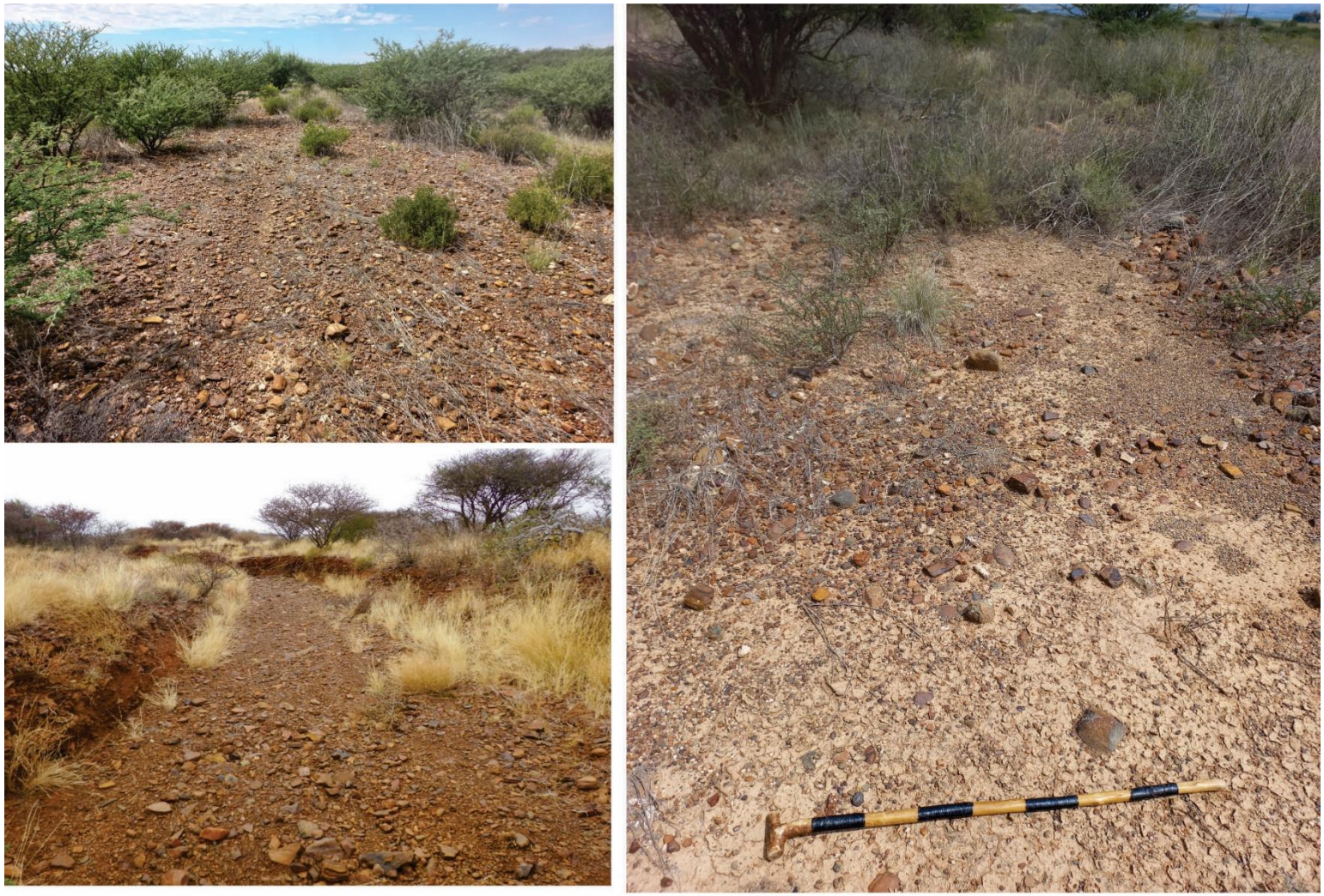


Figure 5. General view of the footprint along Section D - F.
Scale 1 = 10 cm.

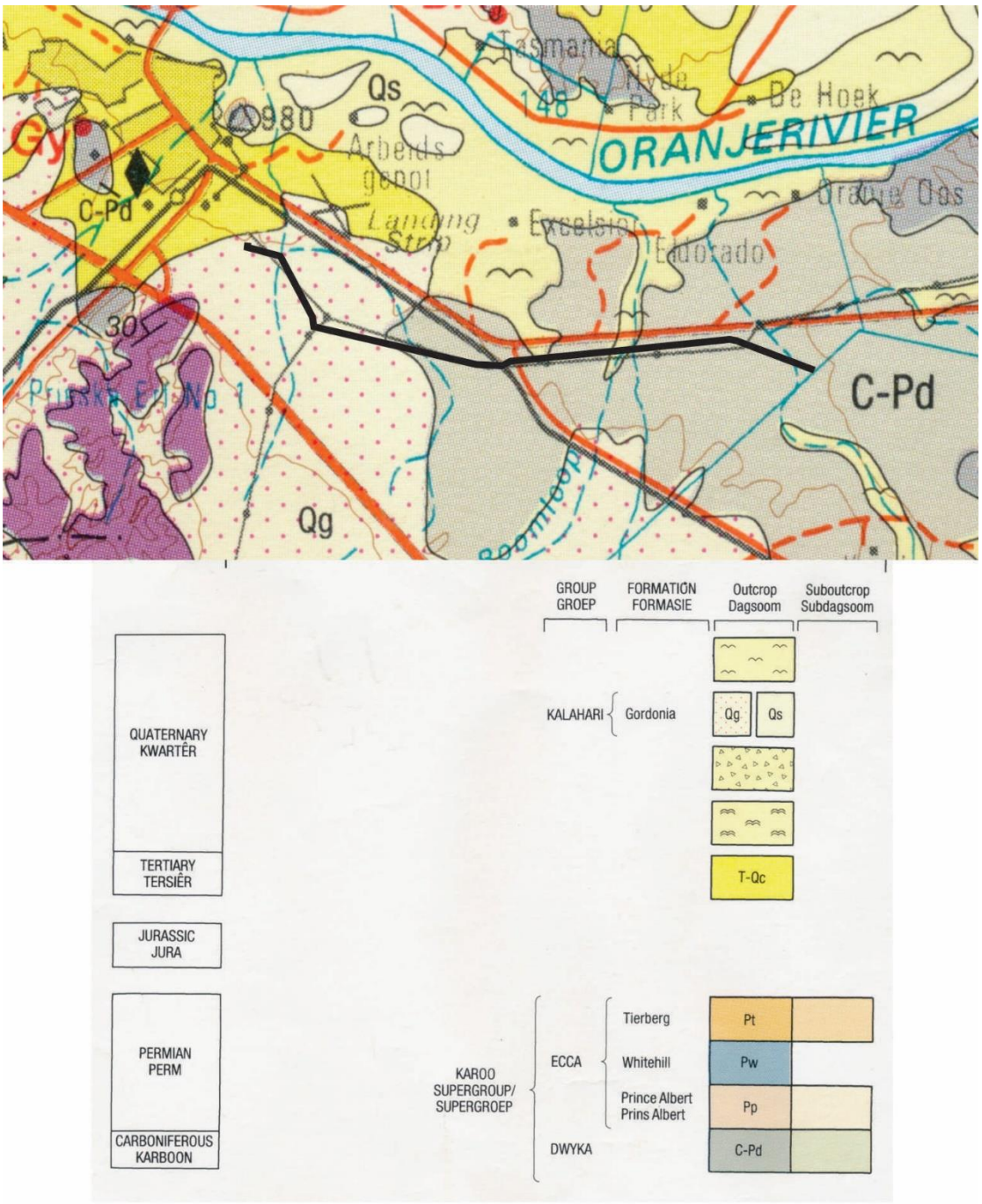


Figure 6. According to the 1: 250 000 scale geological map 2922 Prieska, the footprint (black line) is underlain by glacially-related sediments (Mbizane Formation *C-Pd*; Dwyka Group, Karoo Supergroup) and Quaternary windblown sand (Gordonia Formation, Kalahari Group).

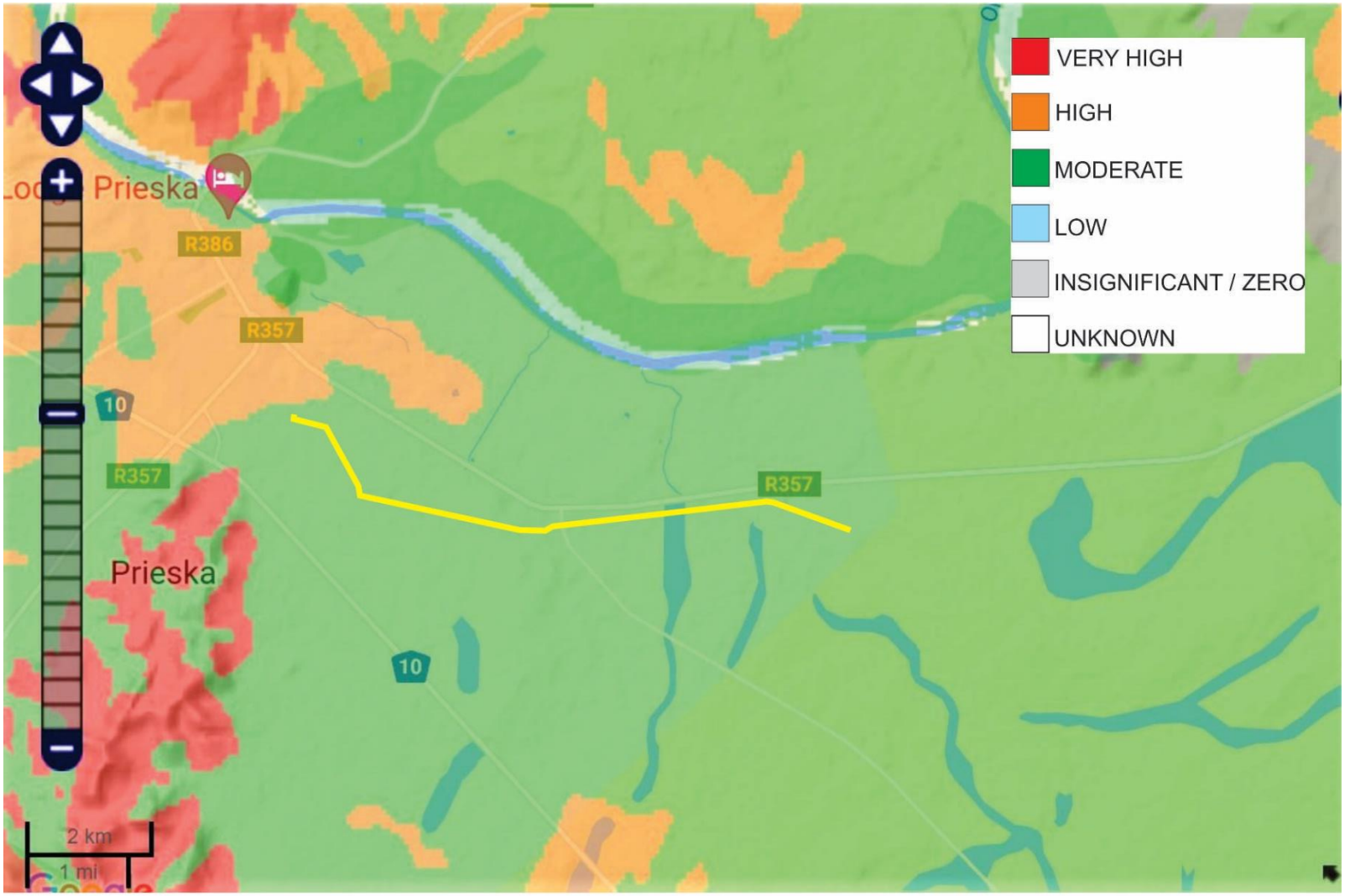


Figure 7. Proposed development footprint (yellow line) marked on SAHRIS palaeosensitivity map (2023).

Figure 8. Examples of exposed Dwyka sediments recorded between Prieska and Douglas: unbedded tillite with concentrated erratics (left), and poorly bedded mudstones exposed by stream incision (right).
Scale 1 = 10 cm.

Figure 9. Examples of Late Quaternary ungulate fossils retrieved from an old calcrete quarry near Prieska (1). Late Quaternary Florisian markers include (2) *M. priscus* (example upper left M 1 & 2 lingual aspect), (3) *D. niro* (example right h/c medial view), (4) *A. bondi* (example maxilla with upper M/PM row occlusal aspect), *(5) P. antiquus* (example skull & h/c), (6) *E. lylei* (example left upper PM 2 & 3 occlusal aspect) and (7) *E. capensis* (example left upper M 2 occlusal aspect).

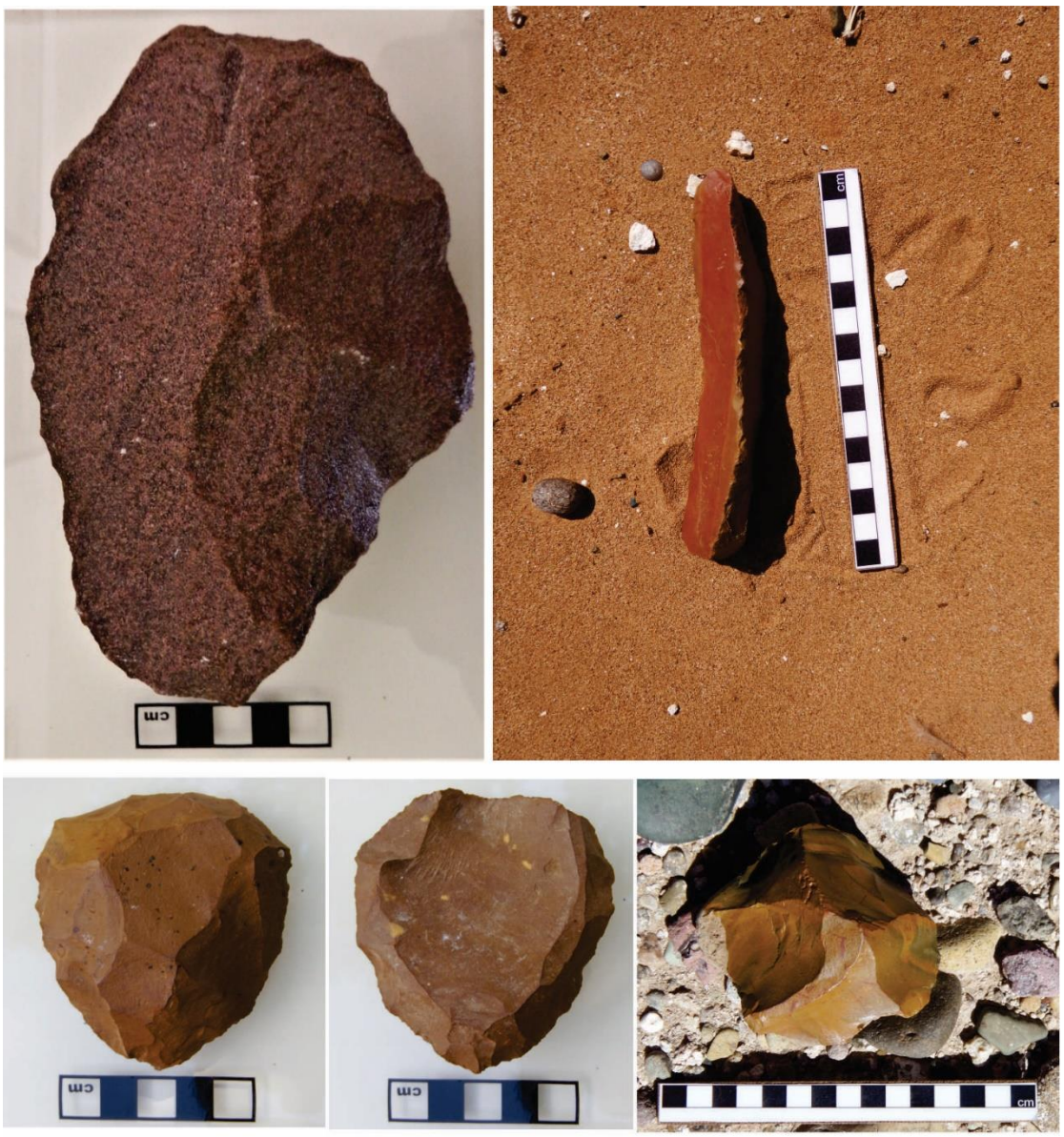


Fig 10. Uncapped Stone Age surface scatters previously recorded along the Orange River between Douglas and Prieska (farms Marksdrift, Brakfontein, Nuwejaarsspruit and Kliphuis). Early Stone Age LCT on diabase (above left), MSA parallel flake blade on banded iron stone (above right), MSA Levallois core on hornfels (below left & center) and LSA radial core on banded iron stone (below right).

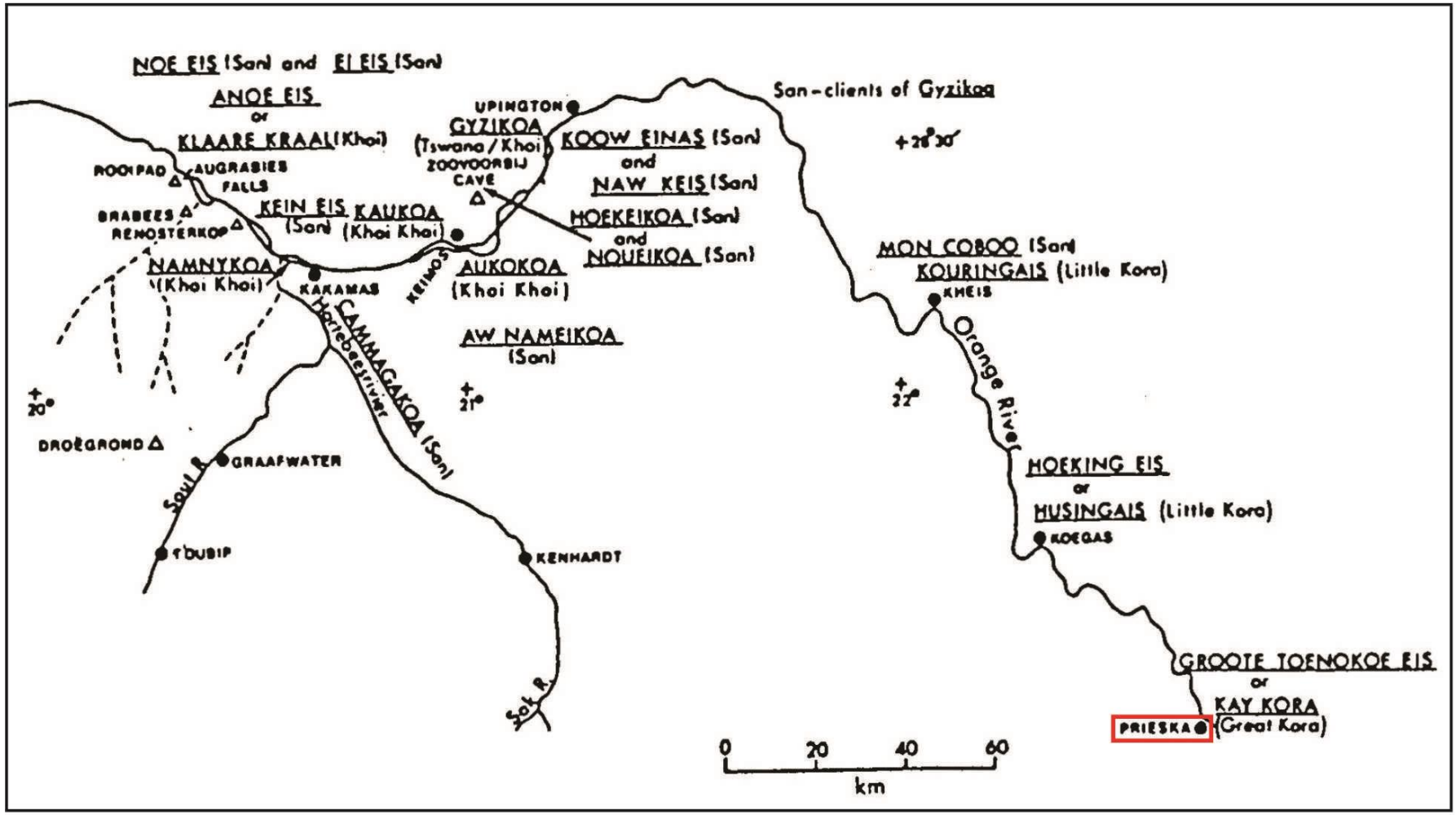


Figure 11. Distribution of Khoisan communities during the 18th century between Prieska and Kakamas (after Penn 1995) and southern limits of Tswana settlement during the 18th and 19th centuries (after Humphreys 1976).

Figure 12. Remains of early 19th century pastoralist kraals previously recorded along the Orange river between Douglas and Prieska.

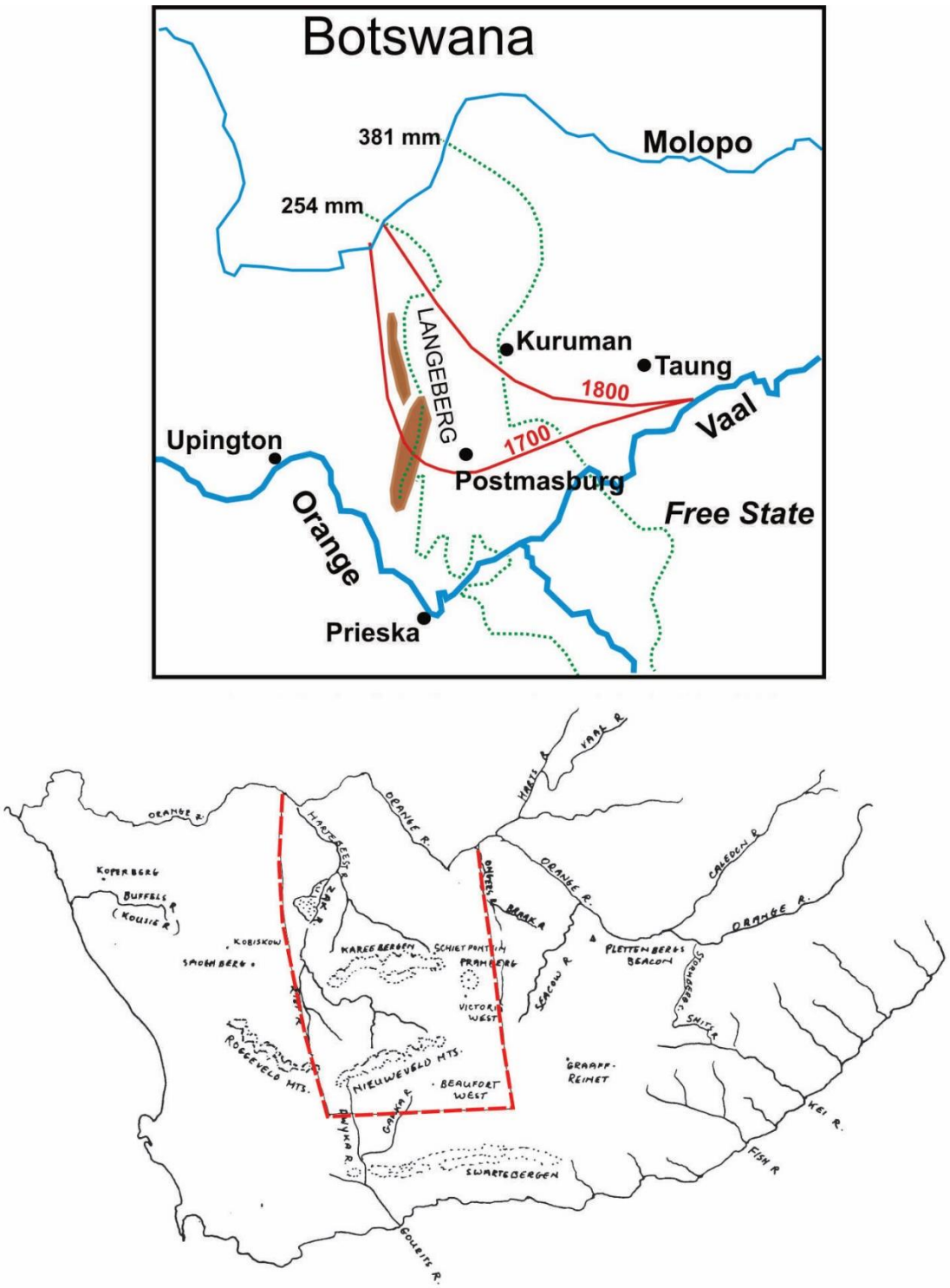


Figure 13. Southern limits of Tswana settlement during the 18th and 19th centuries, above (after Humphreys 1976) and area inhabited by the Xhosa of the northern Cape, below (after Anderson 1985).

Figure 14. The footprint transects Dwyka sediments (above left), occasionally capped by localized surface limestones (above right) and sandy soils in a gravelly matrix (bottom left & right). Scale 1 = 10 cm.

Figure 15. Examples of isolated lithics recorded during survey, all made on banded ironstone.

Appendix 1: Chance Finds Protocol for Developer

Palaeontology

Any subsurface evidence of palaeontological remains - i.e. the remains or traces of plants and animals that has been buried a long time ago – must be reported to the SAHRA APM Unit (Tel. 021 462 5402). In this case well-developed calcretes and alluvium can be locally fossiliferous, and remains will resemble modern- looking, but more or less lithified animal bones and teeth (see **Fig. 9**).

- Freshly exposed fossil remains will require contracting **a professional palaeontologist for appropriate monitoring for fossil remains by** during the construction phase of the project.
- If any newly discovered palaeontological resources prove to be significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA;
- The decision regarding the EA Application must be communicated to SAHRA and uploaded to the SAHRIS Case application.

Archaeology

Any potential signs of subsurface archaeological sites or remains (e.g. stone tool artifacts, bone or ostrich eggshell fragments, charcoal and ash heaps, or remnants of stone-made structures or unmarked graves) found during construction phase of development, must be reported to the SAHRA APM Unit (Tel. 021 462 5402).

- In the meantime, *potential archaeological structures such as stone-build enclosures, buildings or graves* must be avoided by a no-go buffer zone until further confirmation by the archaeologist. Smaller *in situ* material must be kept in place and protected from further damage by covering it with light but rigid object like a box, bucket or metal sheet.
- If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit must be alerted immediately. A professional archaeologist must be contracted as soon as possible to inspect the findings.
- If newly discovered heritage resources prove to be of archaeological significance, a Phase 2 rescue operation may be required, subject to permits issued by SAHRA.

Appendix 2: Track Log

Index	Coordinates	Index	Coordinates
1	S29 41 23.6 E22 46 40.9	18	S29 41 45.3 E22 45 52.2
2	S29 41 27.4 E22 46 34.8	19	S29 42 08.5 E22 47 23.6
3	S29 41 51.9 E22 48 56.9	20	S29 42 08.5 E22 47 23.6
4	S29 41 51.6 E22 49 00.0	21	S29 42 10.2 E22 47 38.9
5	S29 41 52.9 E22 48 59.6	22	S29 42 08.5 E22 47 44.8
6	S29 41 54.0 E22 48 59.8	23	S29 41 54.6 E22 47 54.2
7	S29 41 55.0 E22 48 59.6	24	S29 42 04.0 E22 47 54.9
8	S29 40 56.1 E22 44 55.9	25	S29 42 05.3 E22 47 51.4
9	S29 40 59.0 E22 45 02.1	26	S29 42 05.0 E22 48 00.1
10	S29 41 02.9 E22 45 18.5	27	S29 41 54.6 E22 49 19.3
11	S29 41 05.5 E22 45 18.8	28	S29 41 55.3 E22 49 23.9
12	S29 41 10.6 E22 45 35.5	29	S29 41 52.7 E22 49 31.5
13	S29 41 10.6 E22 45 35.5	30	S29 41 55.0 E22 49 40.2
14	S29 41 40.4 E22 45 52.5	31	S29 41 49.1 E22 49 52.4
15	S29 41 40.4 E22 45 52.5	32	S29 41 56.6 E22 50 13.6
16	S29 41 40.1 E22 45 58.8	33	S29 42 00.1 E22 50 12.2
17	S29 41 40.1 E22 45 58.8	34	S29 42 06.6 E22 50 38.9