PHASE 1 HERITAGE IMPACT ASSESSMENT OF A PROPOSED NEW WIND ENERGY FACILITY ON PARTS OF FARMS PRIESKA A/A, KARABEE 50, PRIESKAS POORT 51 AND KEIKAMS POORT 71 NEAR PRIESKA, NORTHERN CAPE PROVINCE.

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SUMMARY

A phase 1 Heritage Impact Assessment was carried out for a proposed new Wind Energy Facility (WEF) to be established outside Prieska in the NC Province. The proposed development footprint is primarily located on mountainous parts of properties Prieska A/A, Karabee 50, Prieskas Poort 51 and Keikams Poort 71, with its central point situated approximately 14 km due south of the Prieska CBD. Proposed development will primarily affect geologically recent sandy gravels, alluvium and localized surface calcretes covering Precambrian rocks of the Asbestos Hills Subgroup iron formation. The sediments are not considered to be palaeontologically sensitive. Although the SAHRIS palaeosensitivity map shows all of the Ghaap Group as potentially fossiliferous, the Asbestos Hills Subgroup iron formation does not preserve trace fossils and is too old to contain vertebrate or plant fossils. The geologically recent sedimentary overburden within the study area is not considered to be conducive for the preservation of Quaternary fossils. Recorded heritage finds represent Stone Age – related artefacts and historical structures confined to low-lying areas. The Stone Age archaeological footprint is primarily represented by single, isolated finds considered geographically in place, but contextually derived. The valley landscape shows an ephemeral prehistoric human presence, but there are no signs of prehistoric human occupation on the mountain plateaus. In this case, potential for considerable alteration of a culturally significant relic landscape (i.e. mountain plateau) is considered low. Farming-related building structures (Jan se Plaas) will not be negatively affected by the proposed development. A small historical component is represented by building structures related to early 20th century asbestos mining industry. As for overall potential heritage impact, no fatal flaws were identified. Potential for loss of irreplaceable heritage resources resulting from the development is considered low. The development may proceed provided that the identified historical structures are protected by a 5 m no-go buffer zone.

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INTRODUCTION

A phase 1 Heritage Impact Assessment was carried out for a proposed new Wind Energy Facility (WEF) to be established outside Prieska in the NC Province. As part of the Prieska Power Reserve Hub initiative, the development will be located on parts of properties Prieska A/A, Karabee 50, Prieskas Poort 51 and Keikams Poort 71 (**Fig. 1.**) The extent of the affected area (over 5000 m^2 and/or > 300 m - long linear footprint) falls within the requirements for a Heritage Impact Assessment (HIA) as required by Section 38 of the South African National Heritage Resources Act (Act No. 25 of 1999).

LEGISLATION

The primary legal trigger for identifying when heritage specialist involvement is required in the Environmental Impact Assessment process is the National Heritage Resources Act (NHRA) (No 25 of 1999). The NHRA requires that all heritage resources (all places or objects of aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance) are protected. Thus any assessment should make provision for the protection of all these heritage components, including archaeology, shipwrecks, battlefields, graves, and structures over 60 years of age, living heritage and the collection of oral histories, historical settlements, landscapes, geological sites, palaeontological sites and objects (**Table 1**).

The Heritage 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 NHRA are:

- The construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m 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 m^2 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 m^2.
- Any other category of development provided for in regulations by the South African Heritage Resources Agency (SAHRA).

If a heritage resource is likely to be impacted by a development listed in Section 38 (1) of the NHR Act, a heritage assessment will be required either as a separate HIA or as the heritage specialist component (AIA or PIA) of an EIA. 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. In most cases it will be necessary to engage the professional opinion of a heritage specialist in determining whether or not further heritage specialist input in an EIA process is required. This may involve site-significance classification standards as prescribed by SAHRA (**Table 6**).

METHODOLOGY

Site assessment was conducted in accordance with the National Heritage Resources Act (NHRA) (No 25 of 1999) and SAHRA Minimum Standards for Archaeological and Palaeontological components of Impact Assessment Reports. Significance was rated using existing field data, database information and published literature. This was followed by personal observation via foot surveys with access by motor vehicle. A Garmin Etrex Vista GPS hand model (set to the WGS 84 map datum) and a digital camera were used for recording purposes. Geological maps, aerial photographs and site records were integrated with observations made during the on-site inspection. Significant areas or features were evaluated according to site rating categories as prescribed by SAHRA (see **Table 6**). The proposed footprints were investigated by means of foot surveys with access by motor vehicle. A track log of the survey is listed in **Appendix 1**.

Terms of Reference

- Identify and map heritage sites and occurrences using published and database resources;
- Conduct site assessment to determine and assess impacts of the proposed development on heritage resources;
- Recommend mitigation measures to minimize potential impacts associated with the proposed development.

Paleo Field Services identified several heritage resources likely to occur within the proposed development footprint, prior to the site assessment. Potential palaeontological and archaeological impacts include:

- Carbonate rocks containing Precambrian shallow marine / lacustrine stromatolites;
- Geological formations related to the Great Oxidation Event;
- Glacially-related, Permian sediments;
- Late Pleistocene, fossil-bearing calcretes, alluvium and spring deposits;
- Early, Middle, Later Stone Age localities and pastoralist sites;
- Graves, rock art and other historical structures.

A more detailed overview is provided in **Appendix 2**.

LOCALITY DATA AND SITE INFORMATION

The proposed development footprint is primarily located on mountainous parts of properties Prieska A/A, Karabee 50, Prieskas Poort 51 and Keikams Poort 71 (marked on 1:50 000 scale topographic maps 2922 DC Groveput and 2922 DD Redland), with its central point situated approximately 14 km due south of the Prieska CBD (**Fig. 2**).

A site assessment was carried out over specific areas designated for the development of

1) Logistical infrastructure (**Table 2; Fig. 3a, 4 & 5),** to include:
    - two electrical combiner areas,
    - a borrow pit
    - a security corridor
    - a laydown area for turbines
2) Access roads, new and upgrading of existing for access to turbines (**Table 3 & 4; Fig. 3b & 6**) ;
3) A 132/33KV electrical network connecting turbines (**Table 4; Fig. 3c & 7**);
4) Thirty-six turbines to be placed on mountain plateaus in the Doringberg (**Table 5**; **Fig. 3d & 8**)
5)

Logistical infrastructure

Combiner Areas North and South

Given their individual size (≤ 5000 m^2), the Combiner footprints do not trigger any of the listed activities in Section 38 (1) of the NHRA . The sites lie on banded ironstone and a residual soil veneer (**Fig. 9**). There are no indications of *in situ* Stone Age sites, historically significant buildings older than 60 years, or aboveground evidence of graves or rock art.

Borrow pit

The 5 ha footprint partially covers late Quaternary hardpan overlying softer and looser calcified material and irregular carbonate concentrations within a strongly calcareous soil matrix (**Fig. 9**). No fossil were observed in an excavated section and no above ground evidence was found of *in situ* Stone Age archaeological material, stonewalled structures, graves or historically significant buildings older than 60 years.

Given its location, the carbonate accumulations within the study area are not considered conducive for preservation of Quaternary vertebrate fossils (e.g. lack of suitably developed ancient fluvial features in the area). The footprint is assigned a rating of Generally Protected C (Low significance, **Table 6**)

Laydown Area

The 10 ha footprint is located on flat terrain, mantled by a variably sorted gravel and sandy soil matrix on banded ironstone. There is no evidence of *in situ* Stone Age archaeological material, either as capped assemblages or distributed as intact surface scatters on the landscape, historically significant buildings older than 60 years, or aboveground evidence of graves within the boundary of the site. The site is not considered palaeontologically or archaeologically sensitive is assigned a rating of Generally Protected C (Low significance, **Table 6**).

Security Corridor

Given its size (≤ 5000 m^2), the footprint does not trigger any of the listed activities in Section 38 (1) of the NHRA. The site covers an existing road section within a degraded area (**Fig. 9**) and is assigned a rating of Generally Protected C (Low significance, **Table 6**)

Valley Access Roads

Proposed road network section A B E F G follows an existing track, section B C D runs parallel to existing track and section C F more or less transects undisturbed terrain (**Fig. 3b**). Low density distributions of highly weathered and mostly isolated stone tools are primarily confined to ephemeral stream channels and lag deposits along sections B C D and C F. The sections are not considered palaeontologically or archaeologically sensitive are each assigned a rating of Generally Protected C (Low significance, **Table 6**).

132KV Transmission Line

The 4.37 km - long linear footprint transects undisturbed terrain underlain by Kuruman Formation rocks (banded ironstone) along its mountain plateau section and geologically recent alluvium and gravelly residual soils along the valley floor (**Fig. 10**). Low density distributions of highly weathered and mostly isolated stone tools are primarily confined to ephemeral stream channels and lag deposits. The footprint is not considered palaeontologically or archaeologically sensitive. The footprint is assigned a rating of Generally Protected C (Low significance, **Table 6**).

Access roads and 33KV electrical network connecting turbines on the doringberg mountain plateaus

The linear road and electrical networks share a similar geological footprint that is underlain by a variably sorted gravel and sandy soil matrix on banded ironstone (**Fig. 11**). There is no evidence of *in situ* Stone Age archaeological material, either as capped assemblages or distributed as intact surface scatters on the landscape, historically significant buildings older than 60 years, or aboveground evidence of graves within the boundary of the designated areas. The footprints are not considered palaeontologically or archaeologically sensitive is assigned a rating of Generally Protected C (Low significance, **Table 6**).

Turbine localities on the Doringberg mountain plateaus

Although each of the turbine footprints covers less than 5000 m^2 , they were evaluated as an extension of the associated linear road and electrical footprints on the mountain plateaus (**Fig. 11**). As with the latter, all the turbine localities are underlain by a variably sorted gravel and sandy soil matrix on banded ironstone. No fossil remains or localities were observed within surface deposits during the survey. There are no indications of *in situ* Stone Age sites, historically significant buildings older than 60 years, or aboveground evidence of graves or rock art. The turbine localities are not considered palaeontologically or archaeologically sensitive. All the turbine localities are assigned a rating of Generally Protected C (Low significance, **Table 6**).

IMPACT STATEMENT

Palaeontology

Proposed development will primarily affect geologically recent sorted sandy gravels, alluvium and localized surface calcretes covering Precambrian rocks of the Asbestos Hills Subgroup iron formation. The sediments are not considered to be palaeontologically sensitive. The SAHRIS palaeosensitivity map shows all of the Ghaap Group as potentially fossiliferous (**Fig. 12**). However this group is divided into the lower Campbell Rand Subgroup carbonate rocks and upper Asbestos Hills Subgroup iron formation. Only the Campbell Rand dolomites and limestones can preserve trace fossils such as stromatolites. The proposed development footprint is located on Banded Iron Formations in the Asbestos Hills Subgroup that were were formed by massive iron deposition as a result of the build-up of free oxygen in the oceans by cyanobacterial photosynthesis, but these are not trace fossils iron formations are too old to contain vertebrate or plant fossils. The geologically recent sedimentary overburden within the study area are 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 fluvial environments along major river courses, spring areas or pans lunettes, which is not the case here.

Archaeology

Recorded heritage finds (**Table 7; Fig. 13)** largely represent Stone Age – related artefacts and historical structures. The Stone Age archaeological footprint is primarily represented by single, isolated finds considered geographically in place, but contextually derived (**Fig. 14**). The valley landscape shows an ephemeral prehistoric human presence, but there are no signs of prehistoric human occupation on the mountain plateaus. Farming-related building structures (Jan se Plaas) will not be negatively affected by the proposed development (**Fig. 15**). A small historical component is represented by building structures related to the asbestos mining industry that were active in the area during the early part of the 20th century (**Fig. 16**). As for overall potential heritage impact, no fatal flaws were identified (as per **Table 8**) and the development may proceed provided that the identified historical structures are protected by a 5 m no-go buffer zone.

Declaration of Consultant Independence

Paleo Field Services act as an independent specialist consultant. The appointment does not place Paleo Field Services under any obligation to recommend the approval of the proposed project. Paleo Field Services also does not have any financial interest in the undertaking of the activity other than remuneration for work as stipulated in the terms of reference. Every care is taken to ensure the accuracy of any work performed by Paleo Field Services and it accepts information supplied by the client as accurate.

Yours truly,

November 2022

TABLES & FIGURES

Table 1: Examples of different heritage contexts and associated heritage resources.

Heritage Context	Example of Heritage Resources
Palaeontology	Precambrian shallow marine and lacustrine stromatolites, organic-walled microfossils, Ghaap Plateau (Transvaal Supergroup); Palaeozoic and Mesozoic fossil remains, e.g. Karoo Supergroup; Neogene regolith (e.g. Quaternary alluvial deposits)
Archaeology Early Stone Age Middle Stone Age LSA - Herder	Stone Age sites containing cultural artefacts, animal and human remains and found near, *inter alia*, river courses/springs, knapping sites, cave sites and rock shelters, coastal midden sites, kraals and stonewalled complexes, abandoned areas of past human settlement.
History	Historical townscapes, historically significant structures older than 60 years, middens, places associated with social identity/displacement, mission stations, battlefields
Natural and Relic Landscapes	Geological sites of cultural significance, e.g. rock engravings and glacial striations on Ventersdorp andesites (Douglas) or landscapes with unique geological or palaeontological history, e.g. Beaufort Group sedimentary strata; formally proclaimed nature reserves; Evidence of large-scale pre-colonial occupation
Burial grounds and grave sites older than 60 years.	Historical graves (marked or unmarked, known or unknown), human remains (older than 100 years), associated burial goods (older than 100 years, burial architecture (older than 60 years)

Table 2. Site coordinate for Logistical Infrastructure (Fig. 3a).

Development	Centroid Coordinates
Combiner North	29°48'6.28"S 22°45'36.63"E
Combiner South	29°49'15.82"S 22°46'31.30"E
Borrow Pit	29°49'10.99"S 22°44'38.96"E
Security Corridor	29°48'47.13"S 22°43'12.51"E
Laydown Area	29°49'8.95"S 22°45'53.73"E

Table 3. Site coordinates for Valley road network (Fig. 3b)

#	Coordinates
A	29°46'17.34"S 22°41'12.66"E
B	29°48'36.67"S 22°43'2.23"E
C	29°47'55.27"S 22°43'39.52"E
D	29°44'15.90"S 22°45'5.18"E
E	29°49'40.17"S 22°44'15.69"E
F	29°49'34.93"S 22°45'14.02"E
G	29°48'42.63"S 22°46'2.89"E

Table 4. Site Coordinates outlining general extent of mountain plateau electrical grid and road network **(Fig. 3c).**

#	**Coordinates**
A	29°46'4.71"S 22°45'36.00"E
B	29°46'29.81"S 22°44'53.17"E
C	29°47'26.66"S 22°45'11.51"E
D	29°48'4.14"S 22°44'37.75"E
E	29°47'22.82"S 22°46'17.48"E
F	29°48'54.89"S 22°45'36.48"E
G	29°48'15.59"S 22°46'15.10"E
H	29°49'26.16"S 22°46'7.98"E
I	29°47'57.01"S 22°47'1.66"E
J	29°49'3.79"S 22°47'4.66"E
K	29°49'49.43"S 22°47'15.83"E
L	29°49'26.38"S 22°47'45.73"E
M	29°48'22.33"S 22°47'37.46"E

Table 5. Mountain plateau turbine positions as provided by developer (**Fig. 3d**).

#	Coordinates
C05	-29.788273, 22.768276
C03	-29.768369, 22.765551
B01	-29.764776, 22.753993
B07	-29.792893, 22.739723
B02	-29.770638, 22.759032
B03	-29.773639, 22.747698
B05	-29.778057, 22.754756
B08	-29.788916, 22.752359
B09	-29.797916, 22.736999
B10	-29.792791, 22.749323
B11	-29.798217, 22.748383
B12	-29.803004, 22.744587
B13	-29.802583, 22.759322
B14	-29.804020, 22.769951
B15	-29.807455, 22.766132
B16	-29.809359, 22.758665
B18	-29.815215, 22.759285
C07	-29.794458, 22.776507
C08	-29.792980, 22.768981
C09	-29.795322, 22.762557
C10	-29.788789, 22.761925
B22	-29.82369852, 22.76726624
B19	-29.81636447, 22.77456619
B17	-29.81091740, 22.77705654
D01	-29.79889024, 22.78387447
D02	-29.80406859, 22.78295275
D03	-29.81011401, 22.78410344
B20	-29.81800334, 22.78420828
B21	-29.82175694, 22.77906598
B23	-29.82501290, 22.78592229
F03	-29.83377903, 22.78867399
F02	-29.83099751, 22.79455581
F01	-29.82444930, 22.79469203
D06	-29.81925210, 22.79590110
D05	-29.81231924, 22.79278880
D04	-29.80646782, 22.79366371

Table 6. Site 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

Table 7. List of diagnostic finds recorded during the field assessment (see map **Fig. 13).**

#	Feature	Area	GPS Coordinates		Site Rating
1	Artefact	Road section C-F	29°48'56.78"S	22°44'42.56"E	GP C
2	Artefact	Road section C-F	29°48'52.57"S	22°44'39.69"E	GP C
3	Artefact	Road section C-F	29°48'45.64"S	22°44'31.72"E	GP C
4	Artefact	132KV TL	29°48'42.61"S	22°44'48.22"E	GP C
5	Artefact	132KV TL	29°48'31.02"S	22°45'6.76"E	GP C
6	Artefact	Road section C-F	29°48'31.22"S	22°44'17.13"E	GP C
7	Artefact	Road section C-F	29°48'4.20"S	22°43'48.76"E	GP C
8	Artefact	Road section B-C	29°48'0.97"S	22°43'34.86"E	GP C
9	Artefact	Road section C-D	29°47'19.59"S	22°43'58.03"E	GP C
10	Artefact	Road section C-D	29°46'15.44"S	22°44'23.10"E	GP C
11	Artefact	Road section C-D	29°45'56.24"S	22°44'52.24"E	GP C
12	Historical Structure 1	Road section F-G	29°48'44.63"S	22°45'58.79"E	LS Grade A

13	Historical Structures 2	Road section F-G	29°48'53.10"S	22°45'59.07"E	LS Grade A
14	Historical Structure 3	Road section F-G	29°49'11.13"S	22°46'0.62"E	LS Grade A
15	Farm Structures 1	Road section F-G	29°49'18.66"S	22°45'46.15"E	GP C
16	Building Structure 1	Road section B-E (Jan se Plaas)	29°48'43.49"S	22°43'6.53"E	GP A
17	Building Structure 2	Road section B-E (Jan se Plaas)	29°48'42.82"S	22°43'0.52"E	GP C
18	Building Structure 3	Road section B-E (Jan se Plaas)	29°48'36.94"S	22°43'3.32"E	GP A
19	Farm Structures 2	Mountain Plateau	29°47'39.55"S	22°45'3.24"E	GP C
20	Farm Structures 3	Mountain Plateau	29°49'14.42"S	22°46'35.35"E	GP C

Table 8. Summary of potential impacts following site assessment.

DURATION OF IMPACT	Permanent (except for Laydown Area)
EXTENT OF IMPACT (or spatial scale/influence of impact)	Local: Within 5 km of the proposed development.
IRREPLACEABLE loss of resources	Low potential for loss of irreplaceable resources.
REVERSIBILITY of impact	Impact cannot be reversed, but lessened with mitigation.
MAGNITUDE of negative impact (at the indicated spatial scale)	Low: Heritage resources incl. relic landscape will not be considerably altered.
PROBABILITY (of occurrence)	Low
CUMULATIVE impacts	Low: The activity is one of several similar past, present or future activities in the same geographical area, but will not contribute to a very significant combined impact on the cultural resources of local, regional or national concern.

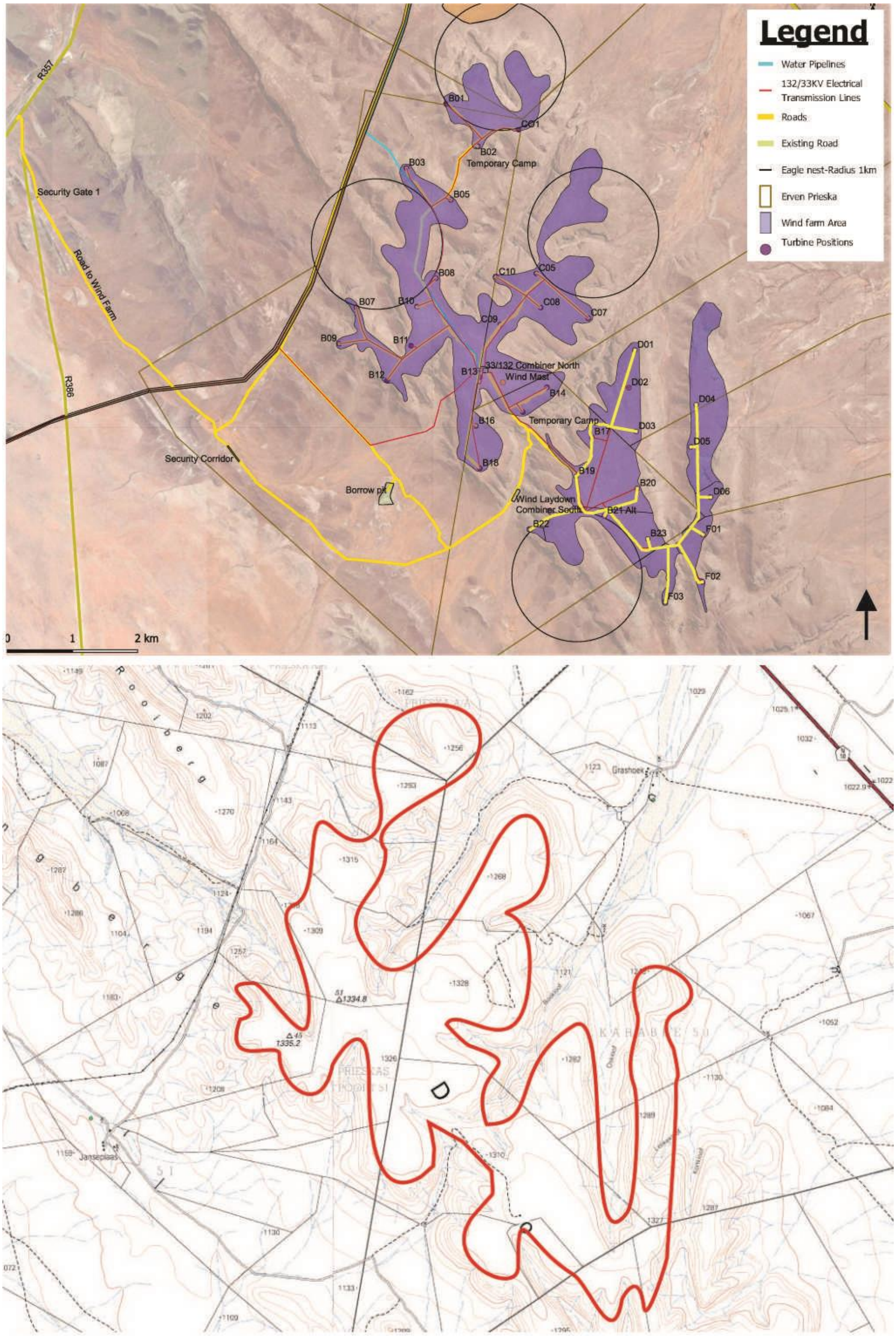


Figure 1. Map and layout of the proposed wind energy facility development marked on 1:50 000 scale topographic maps 2922 DC Groveput and 2922 DD Redland (below).

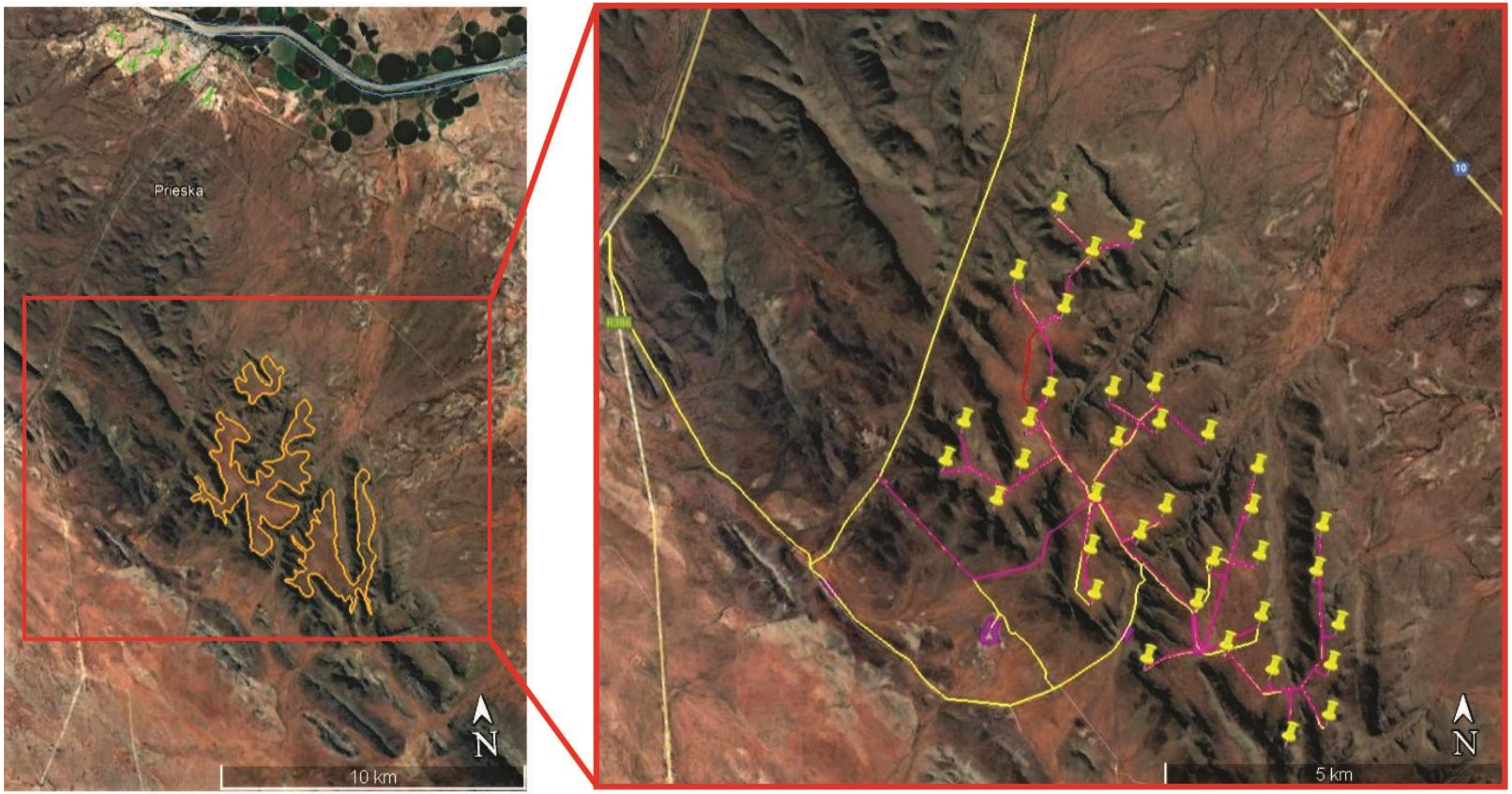


Figure 2. Aerial view of the proposed WEF

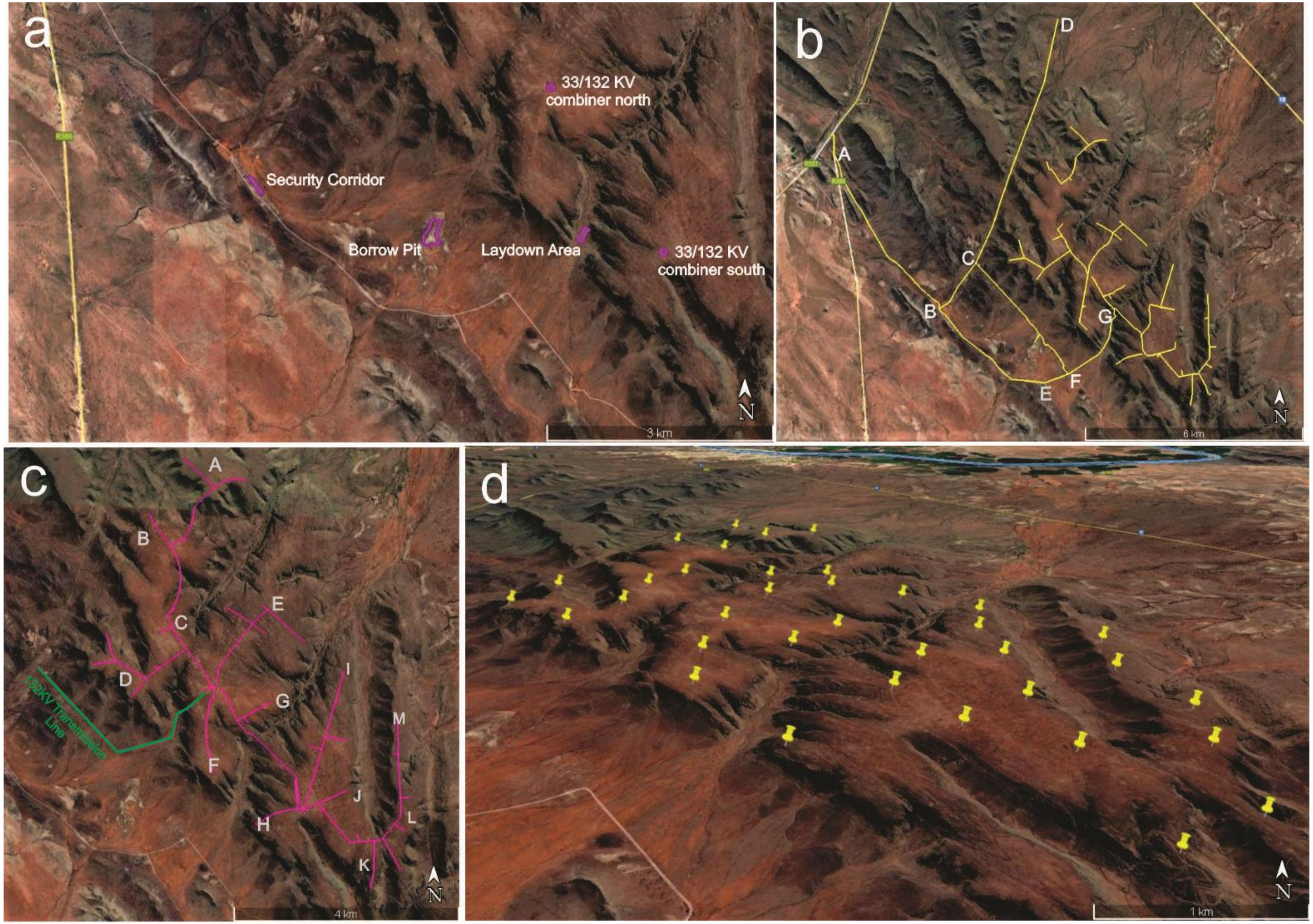


Figure 3. Layout of the proposed logistical infrastructure (a), road network (b) 132/33 electrical grid © and turbine positions (d).

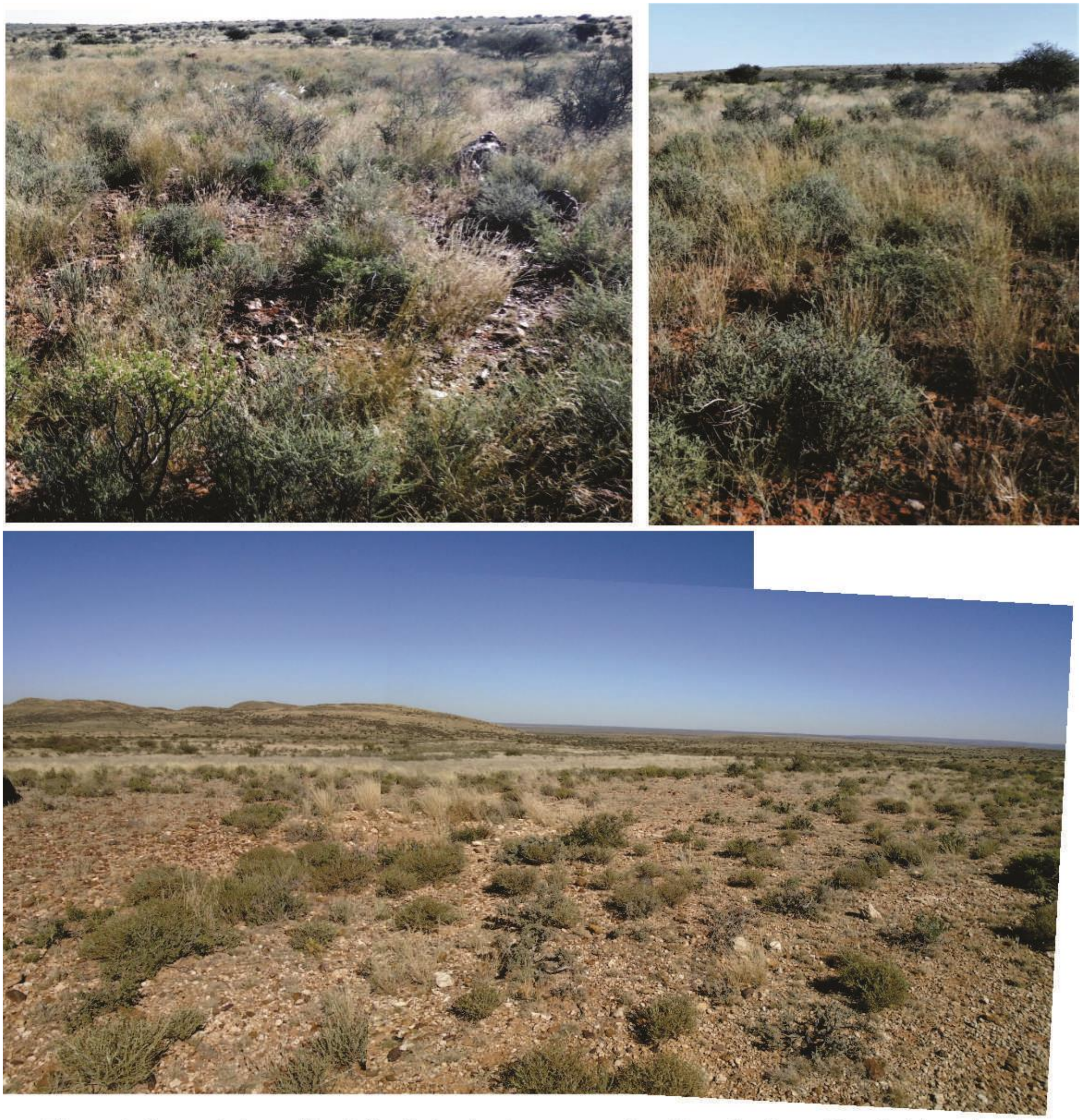


Figure 4. General view of Logistical Infrastructure areas Combiner North and South (above) and Borrow Pit (below).

Figure 5. Genera view of Logistical Infrastructure areas Security Corridor (looking west, left) and Laydown Are (looking north, right)

Figure 6. General view of the existing access roads and tracks along the valley floor (top & centre) and mountain plateaus (bottom).

Figure 7. General view of the valley landscape covered by the 132KV Transmission Line footprint looking northwest (top), west (centre) and south (bottom).

Figure 8. General view of the flat-topped mountain plateau footprints on Doringberg

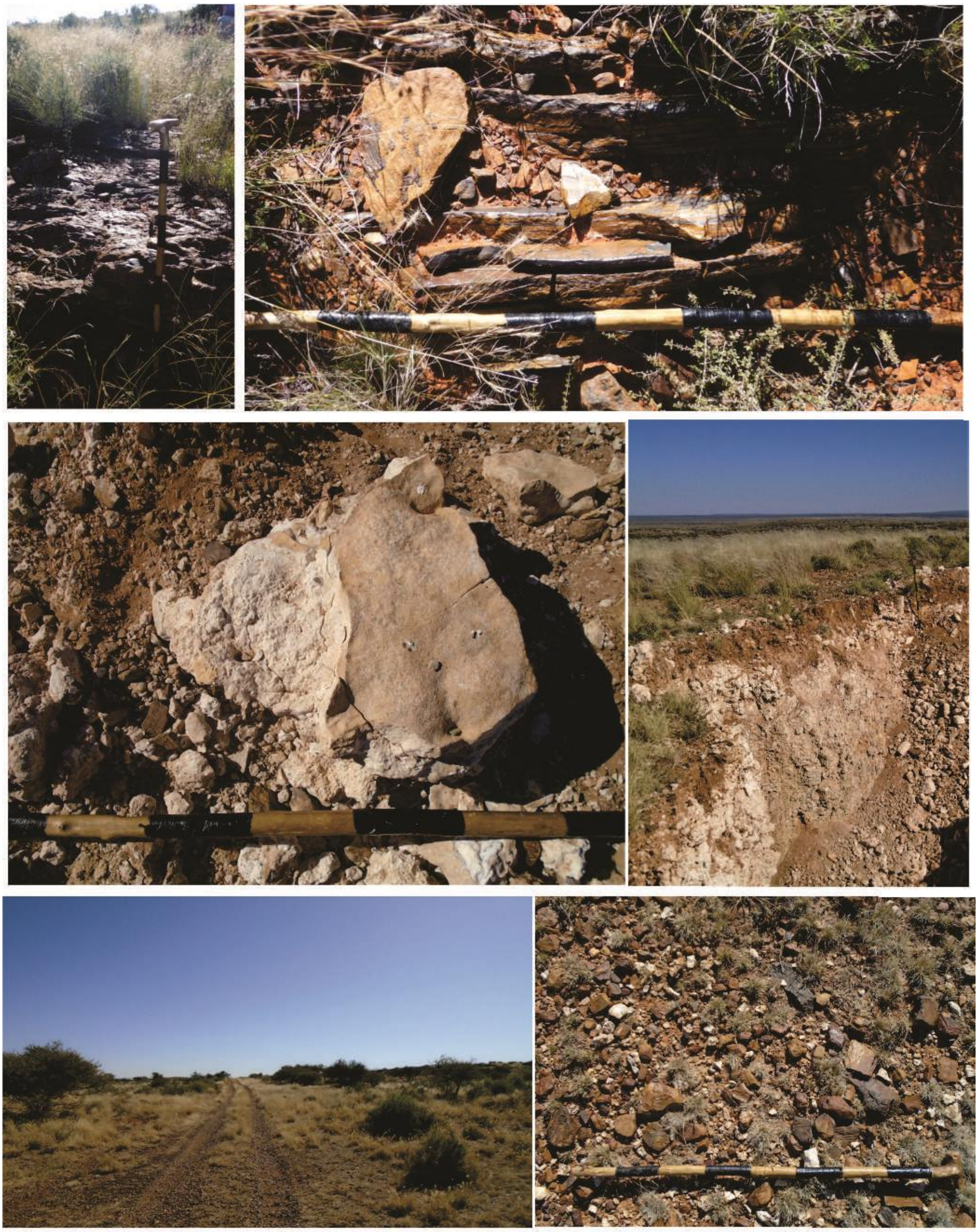


Figure 9. Banded ironstone bedrock at Combiner locations (top, left & right), Quaternary hardpan overlying irregular carbonate concentrations within a strongly calcareous soil matrix at the Borrow Pit site (centre, left & right) and degraded road section area with surface gravels in Security Corridor, looking west (below left & right). Scale 1 = 10 cm.

Figure 10. The 4.37 km - long linear footprint transects Kuruman Formation rocks (banded ironstone) along its mountain plateau section and geologically recent alluvium (top), localized calcretes (centre) and gravelly residual soils (bottom) along the valley floor. Scale 1 = 10 cm.

Figure 11. The linear road and electrical networks and turbine positions on the Doringberg mountain plateaus share a similar geological footprint which is made up of a variably sorted gravel and sandy soil matrix on banded ironstone. Scale 1 = 10 cm.

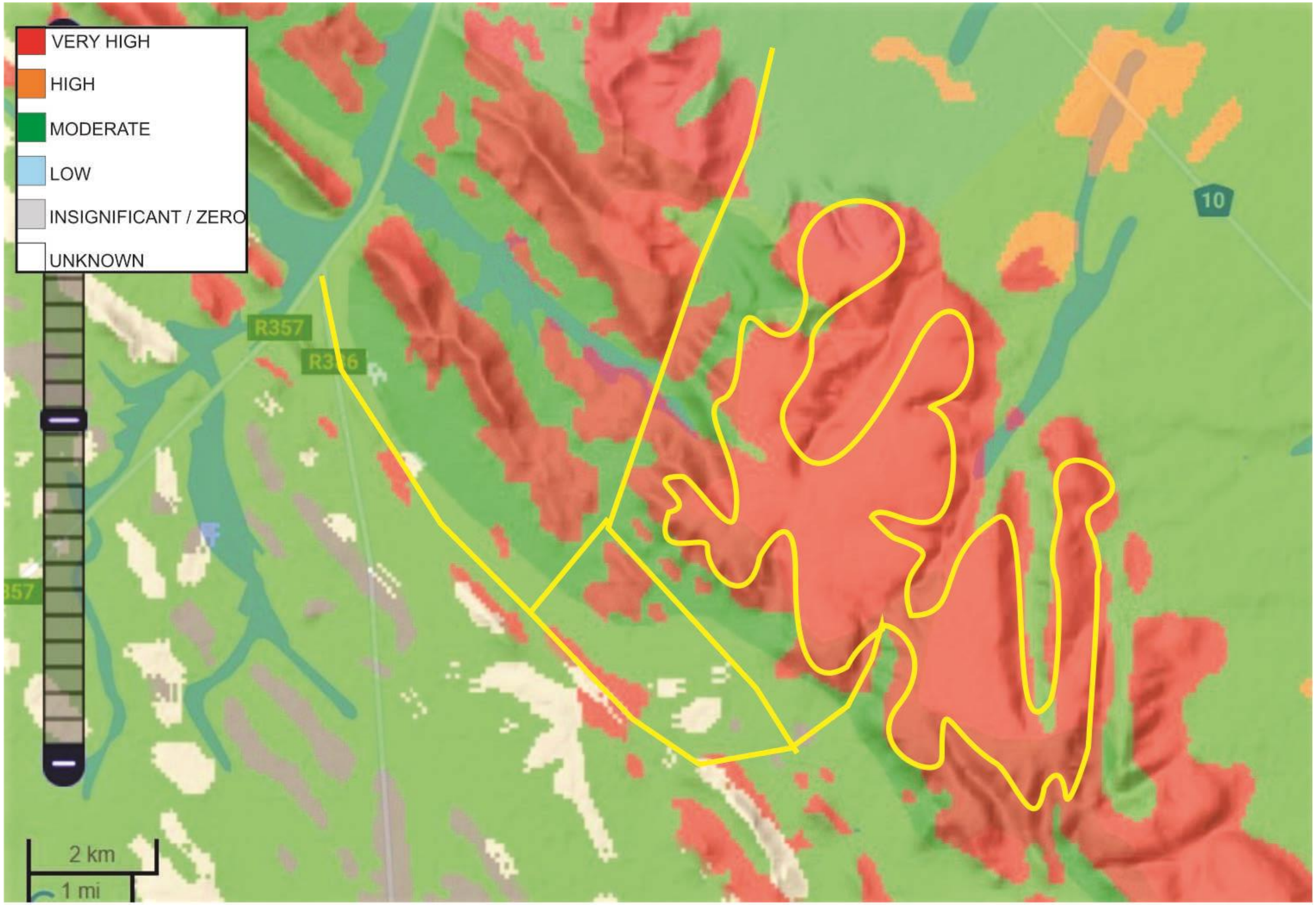


Figure 12. The SAHRIS palaeosensitivity map shows all of the Ghaap Group as potentially fossiliferous but the proposed development footprint is located on Banded Iron Formations in the Asbestos Hills Subgroup which do not preseve trace fossils.

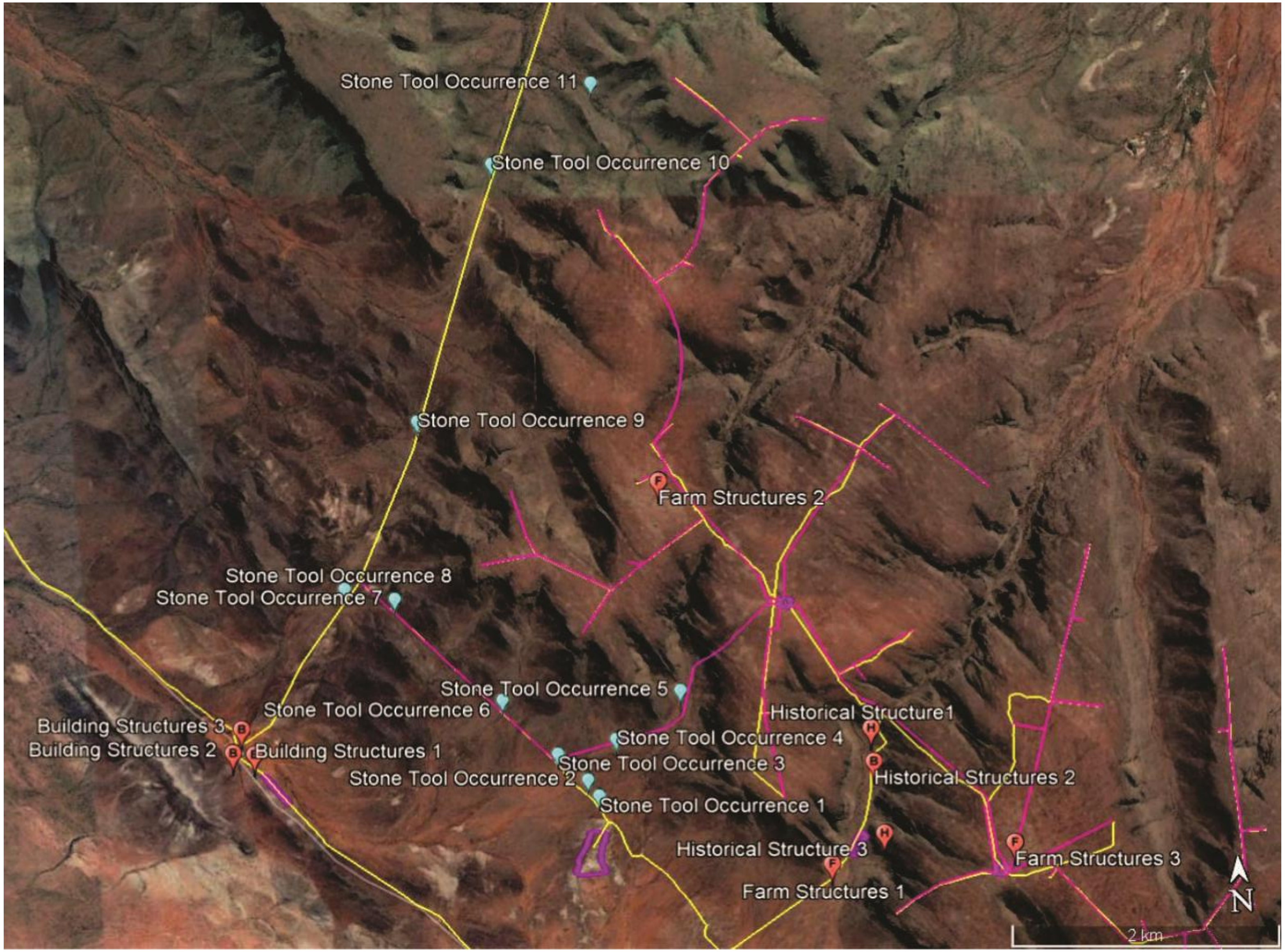


Figure 13 Map of Recorded heritage finds and other modern features.

Figure 14. Most common stone tool types found in the study area are based on prepared core technologies to produce flakes primarily made on banded ironstone and characterised by having one or more midridges on the dorsal surface (above centre & right), a striking platform, as well as a bulb of percussion and flaking scar on the ventral surface (below centre & right).

Figure 15. Residential building located at Jan se Plaas along Road Section B-E.

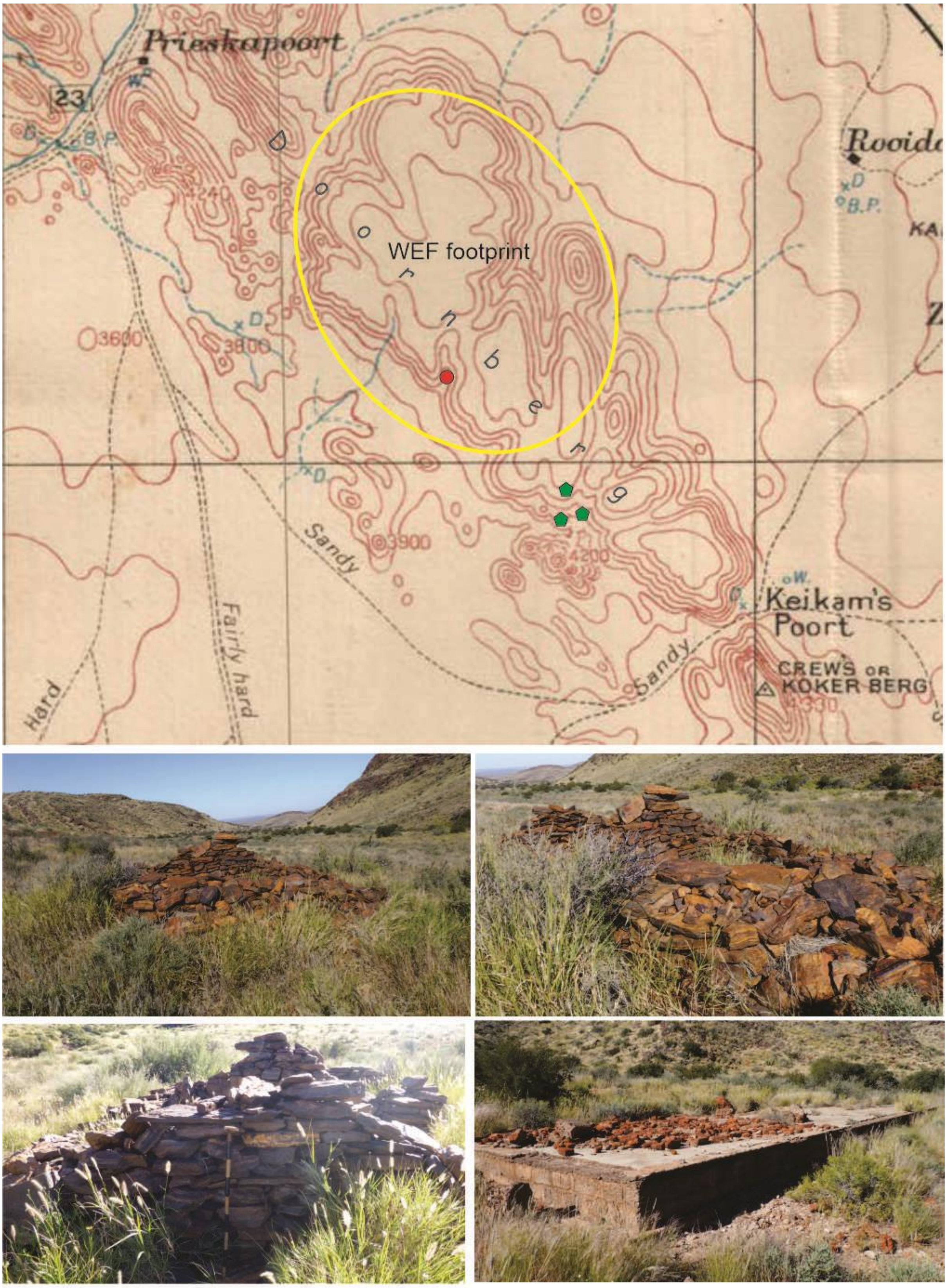
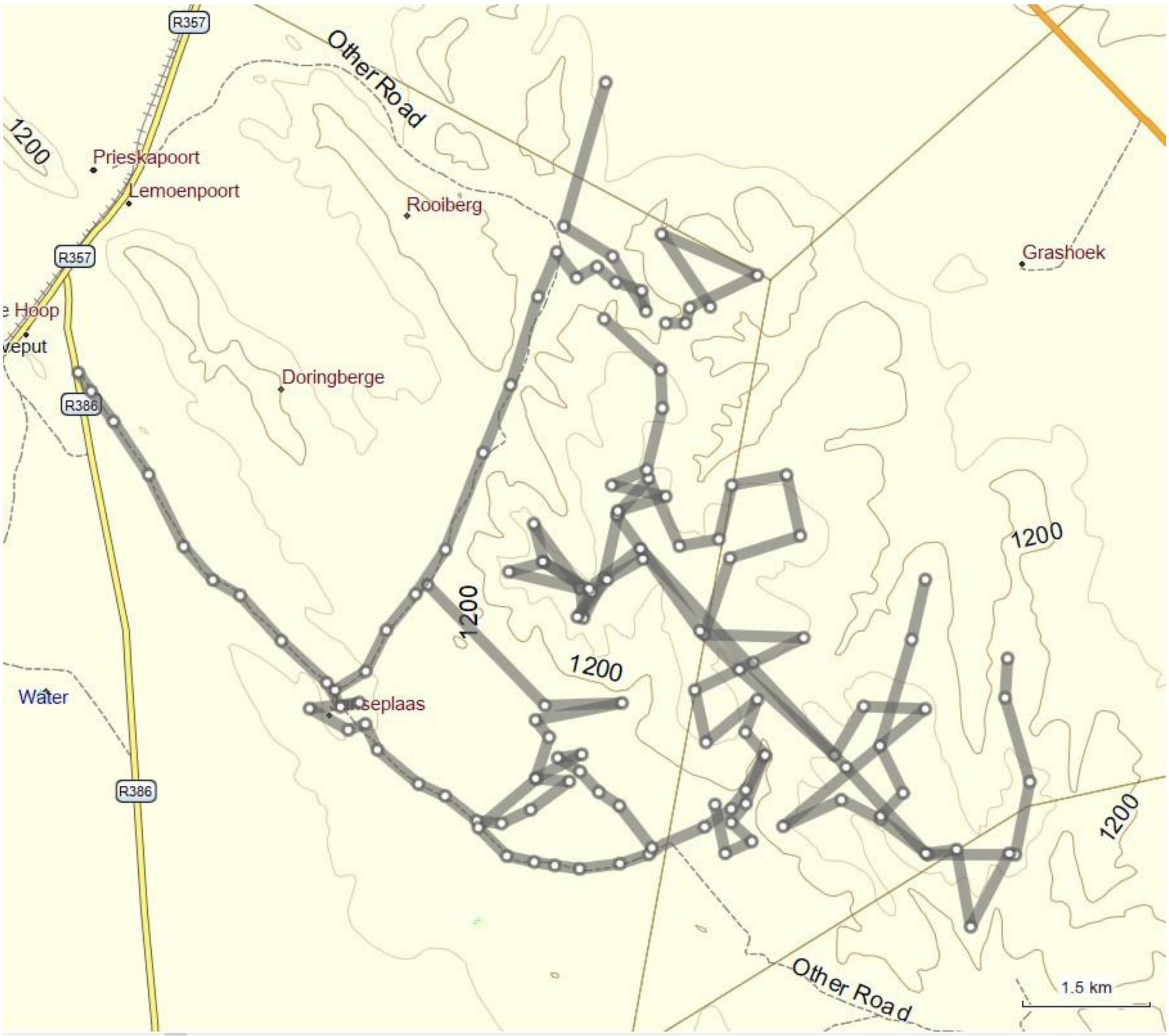


Figure 16. Historical ruins associated with early 20th century asbestos mining operations by the Cape Asbestos Company, which mined crocodilite at Keikams Poort and surrounding areas. Position of historical ruins indicated in red, Keikams Poort operations in green on British Military map ca 1909 (above).

APPENDIX 1 - SURVEY TRACK LOG

Index	Coordinates	Index	Coordinates	Index	Coordinates
1	S29 46 36.0 E22 41 17.5	41	S29 48 51.7 E22 45 48.1	81	S29 49 14.6 E22 46 52.0
2	S29 46 43.1 E22 41 22.7	42	S29 48 39.4 E22 45 53.0	82	S29 48 56.8 E22 46 42.7
3	S29 46 54.4 E22 41 31.8	43	S29 48 55.5 E22 45 32.1	83	S29 48 16.7 E22 46 55.5
4	S29 47 14.5 E22 41 46.0	44	S29 48 35.8 E22 45 27.6	84	S29 49 35.3 E22 45 10.2
5	S29 47 41.7 E22 42 00.3	45	S29 48 25.5 E22 45 51.2	85	S29 49 19.5 E22 44 57.0
6	S29 47 54.3 E22 42 12.1	46	S29 48 16.1 E22 46 11.7	86	S29 49 14.3 E22 44 48.7
7	S29 48 00.1 E22 42 23.2	47	S29 48 14.8 E22 45 31.4	87	S29 49 06.5 E22 44 41.0
8	S29 48 17.2 E22 42 39.9	48	S29 47 46.0 E22 45 41.8	88	S29 49 01.4 E22 44 32.0
9	S29 48 33.1 E22 42 58.3	49	S29 47 37.6 E22 46 10.3	89	S29 49 00.1 E22 44 41.7
10	S29 48 42.1 E22 43 03.9	50	S29 47 14.6 E22 46 04.8	90	S29 49 09.1 E22 44 22.9
11	S29 48 40.5 E22 43 11.5	51	S29 47 18.5 E22 45 42.5	91	S29 48 53.6 E22 44 28.5
12	S29 48 42.8 E22 42 51.3	52	S29 47 38.9 E22 45 37.3	92	S29 48 47.1 E22 44 22.9
13	S29 48 50.9 E22 43 07.0	53	S29 47 41.5 E22 45 21.3	93	S29 48 40.7 E22 44 58.0
14	S29 48 48.6 E22 43 13.9	54	S29 47 15.9 E22 45 08.8	94	S29 48 41.6 E22 44 26.8
15	S29 48 58.3 E22 43 18.8	55	S29 47 28.9 E22 44 56.6	95	S29 48 35.8 E22 43 01.6
16	S29 49 11.2 E22 43 35.5	56	S29 47 53.5 E22 44 50.7	96	S29 48 28.7 E22 43 14.1
17	S29 49 15.8 E22 43 46.3	57	S29 48 08.6 E22 44 42.4	97	S29 48 13.2 E22 43 22.4
18	S29 49 25.1 E22 43 59.1	58	S29 47 57.7 E22 44 41.4	98	S29 47 59.6 E22 43 34.3
19	S29 49 26.1 E22 44 09.2	59	S29 47 51.2 E22 44 12.2	99	S29 47 42.8 E22 43 46.4
20	S29 49 20.9 E22 44 21.0	60	S29 47 47.6 E22 44 26.4	100	S29 47 06.3 E22 44 01.7
21	S29 49 10.3 E22 44 36.7	61	S29 47 33.1 E22 44 22.2	101	S29 46 40.7 E22 44 12.8
22	S29 49 09.3 E22 44 23.5	62	S29 47 28.2 E22 44 56.3	102	S29 46 07.4 E22 44 24.0
23	S29 49 27.7 E22 43 59.8	63	S29 47 22.7 E22 45 15.8	103	S29 45 50.6 E22 44 31.6
24	S29 49 38.4 E22 44 11.3	64	S29 47 22.7 E22 45 15.8	104	S29 46 00.3 E22 44 39.6
25	S29 49 40.7 E22 44 22.4	65	S29 47 18.5 E22 44 53.9	105	S29 45 56.1 E22 44 47.9
26	S29 49 42.0 E22 44 30.8	66	S29 47 12.7 E22 45 08.1	106	S29 46 01.9 E22 44 55.6
27	S29 49 43.2 E22 44 40.8	67	S29 46 49.4 E22 45 14.4	107	S29 46 05.1 E22 45 06.0
28	S29 49 41.3 E22 44 57.2	68	S29 46 34.9 E22 45 13.7	108	S29 46 12.9 E22 45 07.8
29	S29 49 37.8 E22 45 09.0	69	S29 47 46.4 E22 45 06.5	109	S29 46 11.3 E22 45 33.8
30	S29 49 34.2 E22 45 14.5	70	S29 47 54.1 E22 44 51.9	110	S29 45 43.8 E22 45 14.0
31	S29 49 27.4 E22 45 31.6	71	S29 48 08.2 E22 44 39.9	111	S29 45 59.3 E22 45 53.0
32	S29 49 20.6 E22 45 42.4	72	S29 47 59.0 E22 44 45.7	112	S29 46 11.6 E22 45 25.5
33	S29 49 13.5 E22 45 48.3	73	S29 47 47.3 E22 44 25.9	113	S29 46 17.4 E22 45 23.8
34	S29 49 00.9 E22 45 55.6	74	S29 47 57.5 E22 44 44.6	114	S29 45 52.2 E22 44 54.2
35	S29 49 00.9 E22 45 55.6	75	S29 47 42.5 E22 45 05.5	115	S29 45 40.9 E22 44 34.4
36	S29 49 18.7 E22 45 48.3	76	S29 49 04.9 E22 46 28.9		
37	S29 49 25.8 E22 45 42.4	77	S29 49 37.4 E22 47 01.2		
38	S29 49 32.9 E22 45 50.7	78	S29 49 36.0 E22 47 13.8		
39	S29 49 37.4 E22 45 39.9	79	S29 50 05.1 E22 47 19.5		
40	S29 49 00.4 E22 45 56.1	80	S29 49 23.4 E22 46 43.0		


R357
Other Road
1200
Prieskapoort
Lemoenpoort
Rooiberg
R357
Grashoek
Hoop
veput
Doringberge
R386
1200
1200
1200
Water
seplaas
R386
1200
Other Road
1.5 km

APPENDIX 2 - HERITAGE REGIONAL CONTEXT

Palaeontology

From oldest to youngest study area is underlain by carbonate rocks (*Vgd*, Campbell Rand Subgroup) and banded iron formations (*Vk*, Asbestos Hills Subgroup) of the Ghaap Group in the Transvaal Supergroup (**Fig. i**). The Ghaap Group has yielded one of world's earliest carbonate platform successions containing stromatolite- and microfossil-bearing dolomite, dolomitic limestone and chert members (Schmidtsdrif and Campbell Rand Subgroups) that were formed by the precipitation of carbonate rocks when colonies of stromatolites thrived in shallow, tropical marine environments towards the end of the Archaean Eon, 2600 Ma ago (**Fig. ii**). Shallow marine and lacustrine stromatolites and organic-walled microfossils preserved within Transvaal Supergroup dolomites of the Ghaap Plateau, provide a record of early microbial dominated life in shallow seas and lakes during the Early / Mid Precambrian. Stromatolites are layered mounds, columns, and sheet-like sedimentary rocks. They were originally formed by the growth of layer upon layer of cyanobacteria, a single-celled photosynthesizing microbe that lives today in a wide range of environments ranging from the shallow shelf to lakes, rivers, and even soils. Bacteria, including the photosynthetic cyanobacteria, were the only form of life on Earth for the first 2 billion years that life existed on Earth. Small carbonate outcrops occur along the south-western margin of the Doornberge south of Prieska. Overlying the Campbell Rand Subgroup (*Vgd*), and presenting as the Doornberg range in the study area, banded iron formations (BIF) of the Kuruman Formation (*Vak*, Asbestos Hills Subgroup) reflect significant early Proterozoic environmental conditions following massive iron deposition as a result of the build-up of free oxygen in the oceans by cyanobacterial photosynthesis around 2450 Ma ago, also known as the Great Oxidation Event (Beukes 1980; Eriksson et al. 2006). Localized outcrops of Early Permian Dwyka sediments represent valley and inlet fill deposits left behind on the Transvaal basement rocks by retreating glaciers about 300 million years ago. These are primarily glacially-related sediments of the Mbizane Formation (Dwyka Group, *C-Pd,* **Fig iii**), a largely heterolithic unit recognized in the upper part of the Dwyka Group of the Karoo Supergroup. Dwyka-aged palaeovalleys bear evidence of glaciated pavements, consisting of well-preserved polished surfaces striations on basement rocks, which are found throughout the region. Ice transport directions vary from southwards initially to south-westward. Dwyka mudrocks have previously yielded trace fossils, including fish and invertebrate trackways and as well as micro-fossil remains (foraminifera, bryozoans, sponge spicules and radiolaria) and a variety of invertebrates. Fossil plants include lycopods, Glossopterids, fossilized wood and plant micro-remains (spores and pollen). Early Cenozoic river terraces (diamond placers) are located several tens of meters above the present level of the Orange River between Douglas and Prieska, where diamondiferous gravel deposits often occupy "potholes" along the banks of the river. However, paleogene fossil assemblages are scarce and localized with the closest locality known from a crater-lake deposit within a volcanic pipe at Stompoor south of Prieska, which include a diversity of fish, frogs, reptiles, insects, and palynological remains. Fluvial deposits from the ancient Koa Valley northwest of Prieska and south of Pofadder, has yielded fossil vertebrate bone as well as fossil wood. Late Neogene surface calcretes (*T-Qc*) are covered by in places by superficial deposits that consisting of variable clasts of surface gravels, reworked calcretes, Quaternary sands and sandy soils (*Qs, Qg*). Florisian-type fossil remains of Equids, Alcelaphines and Bovines are known to have come from old calcrete quarries and pan sediments (e.g. Bundu Pan near Copperton) in the region (**Fig. iv)**.

Archaeology & History

Tangible archaeological heritage found around Prieska includes a Stone Age archaeological footprint, and historical remnants dating back to the late 18th century. The region has yielded numerous Early, Middle and Later Stone Age sites mostly associated with pans settings, while the landscape in general is characterized by low density surface scatters (Beaumont 1995; Kiberd 2006). Isolated ESA and MSA surface scatters are associated with overbank sediments of the Orange River between Douglas and Prieska (e.g. Marksdrift, Kliphuis, Elswater, Brakfontein, Holsloot and Nuwejaarskraal) (**Fig. v**). Rock art sites are found along steep slopes of the Asbes- and Doornberge north and south of Prieska respectively including e.g. Wonderdraai, Omdraaisvlei and Sandfontein.

Archaeological records and historical eyewitness accounts show evidence of Bushman hunter-gatherer and Khoi herder occupation in the region prior to European settlement and early European travellers frequently encountered Koranna, Griqua and Bushmen groups in the region (**Fig. vi**). The name Prieska is derived from the Koranna word meaning "place of the lost she-goat". 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. 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 towards Prieska, as also evidenced by graves, clay pottery and pastoralist kraals found along the Orange River between Douglas and Hopetown (**Fig. vii & viii**). It is noted that while Bushmanland sites in the surrounding area appear to be ephemeral occupations by small hunter-gatherer groups, substantial herder encampments found along the Orange River itself indicate that the banks and floodplains of the river were more intensely exploited. Hinterland sites are mainly restricted rock shelters near mountainous terrain sand dune deposits, or around seasonal pans and springs (Beaumont et al. 1995). Prior to the end of 18th 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. Historical records indicate that 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. ix**). Historical ruins and graveyards associated with the asbestos mining industry operating during the early part of the 20th century, are located at various localities north and south of Prieska, and include sites at Keikams Poort south of the study area and Kliphuis on the Orange River northwest of Prieska (**Fig. x**).

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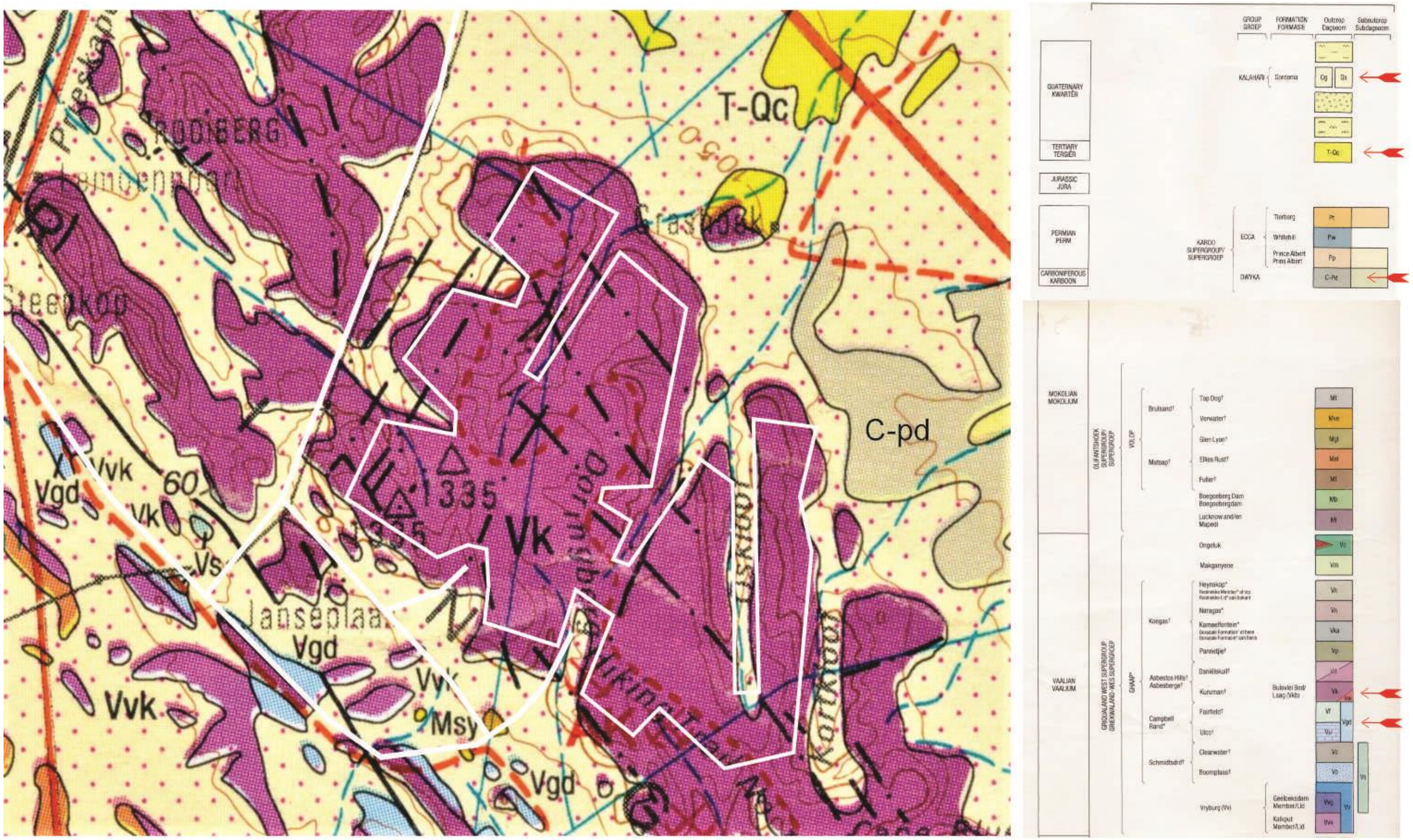


Figure i. Study area marked by white polygon on portion of 1:250 000 scale geological map 2922 Prieska. Oldest bedrock sediments in and around the study area are made up of Precambrian carbonate rocks and banded iron formations (BIF) of the Ghaap Group (*Vgd, Vk,* Transvaal Supergroup), capped by localized outcrops of Early Permian Dwyka sediments (*C-pd,* Karoo Supergroup) and geologically recent superficial deposits (*T-Qc, Qs, Qg*).

Figure ii. Characteristic stromatolitic features preserved in Ghaap Group carbonate rocks.

Figure iii. Dwyka tillites with high erratics content and fine-grained, weakly bedded mudrock, the latter potentially fossiliferous (from various outcrops, middle OR area).

Figure iv. 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).

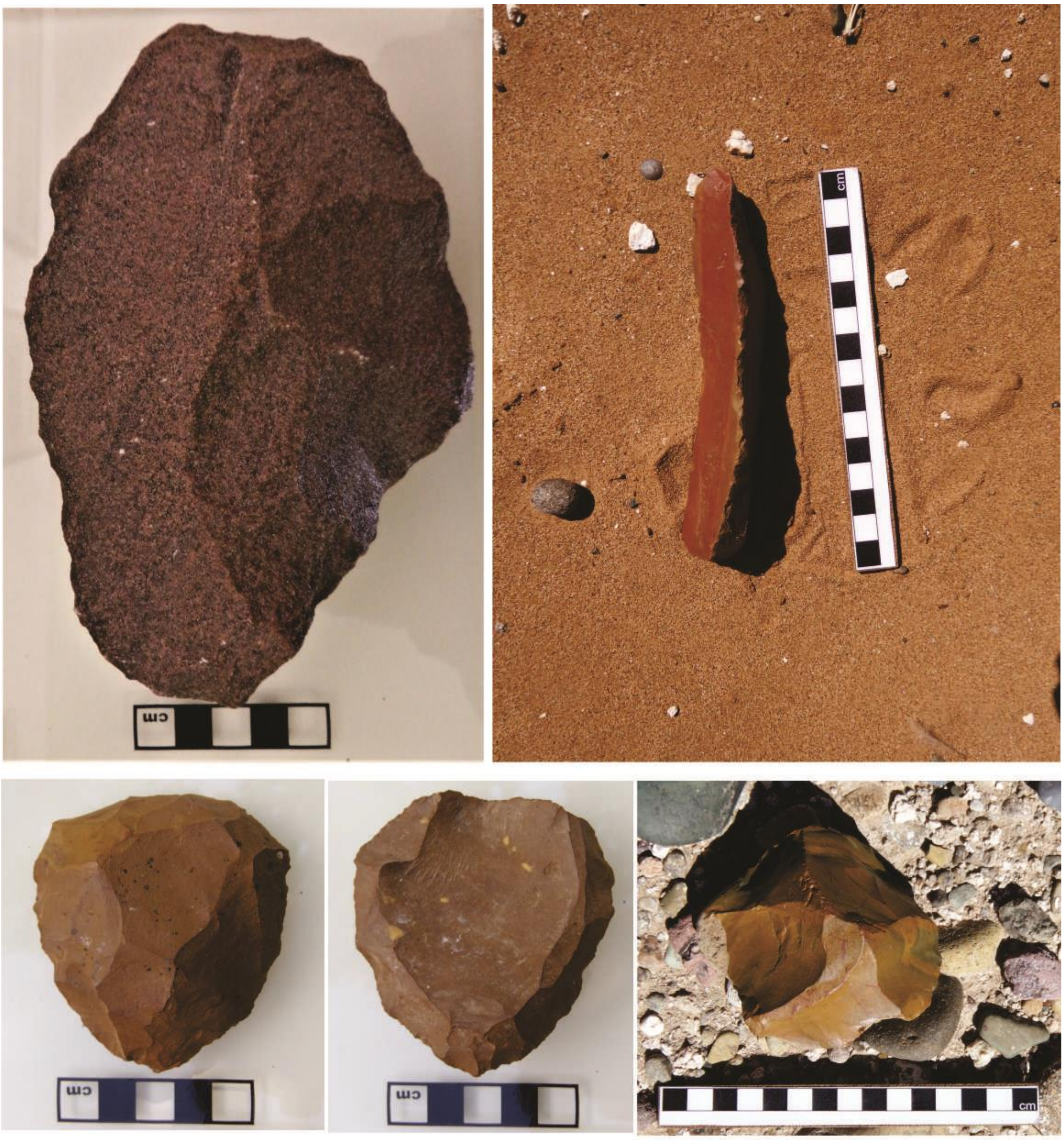
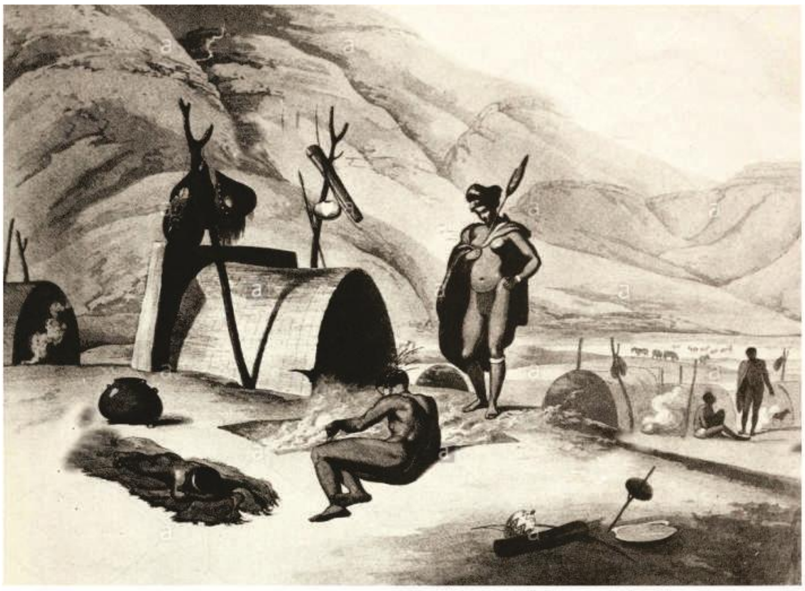


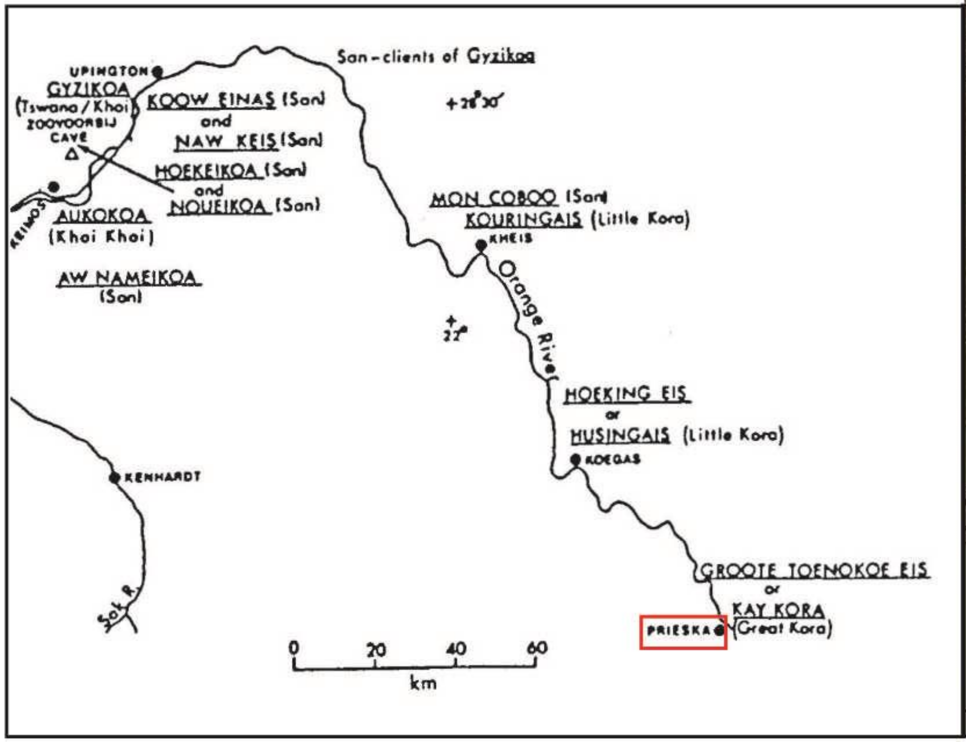
Figure v. Uncapped Stone Age surface scatters previously recorded along the Orange River between Douglas and Prieska: Early Stone Age LCT on diabase (above left), MSA parallel flake blade on banded iron stone (above right), MSA Levallois core on hornfels (below left & center) and LSA radial core on banded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



//k'ãĩ and !kommanan-!a dancing with two sticks. (070)

An unidentified man dancing with one stick. His other stick lies on the ground behind him. (063).

Figure vi. Khoi settlement south of the Orange River near Prieska (from sketch by Burchell 1822) and photographs of San descendants from Prieska, Northern Cape, - part of the Bleek Collection, Oppenheimer Library, University of Cape Town. They show some of the Prieska San performing a dance and were taken by Dorothea Bleek in late 1910, or possibly early 1911 (Jolly 2006).



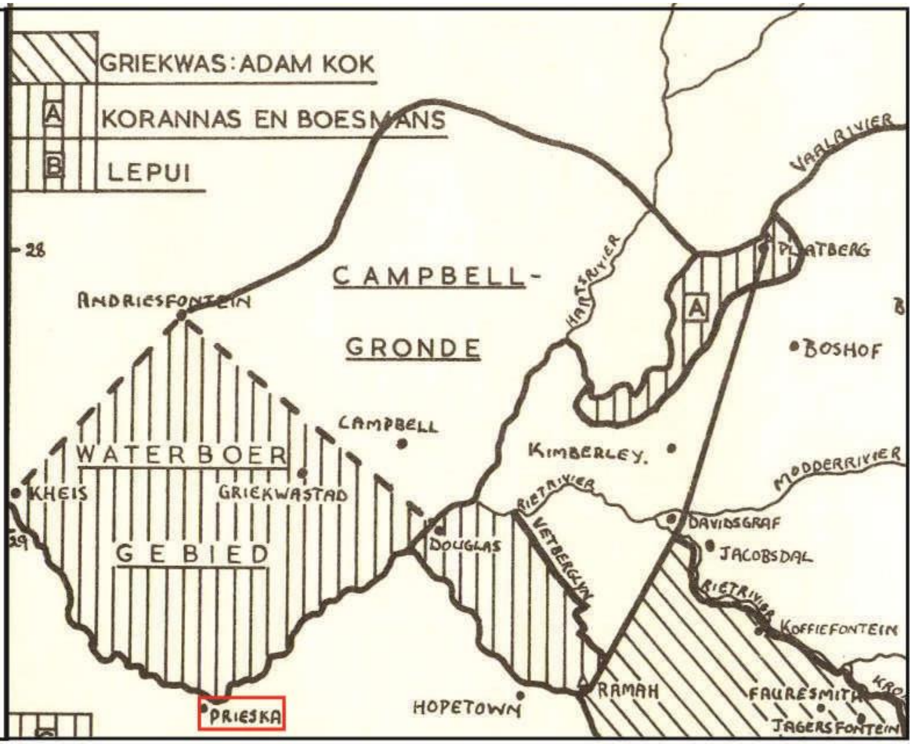
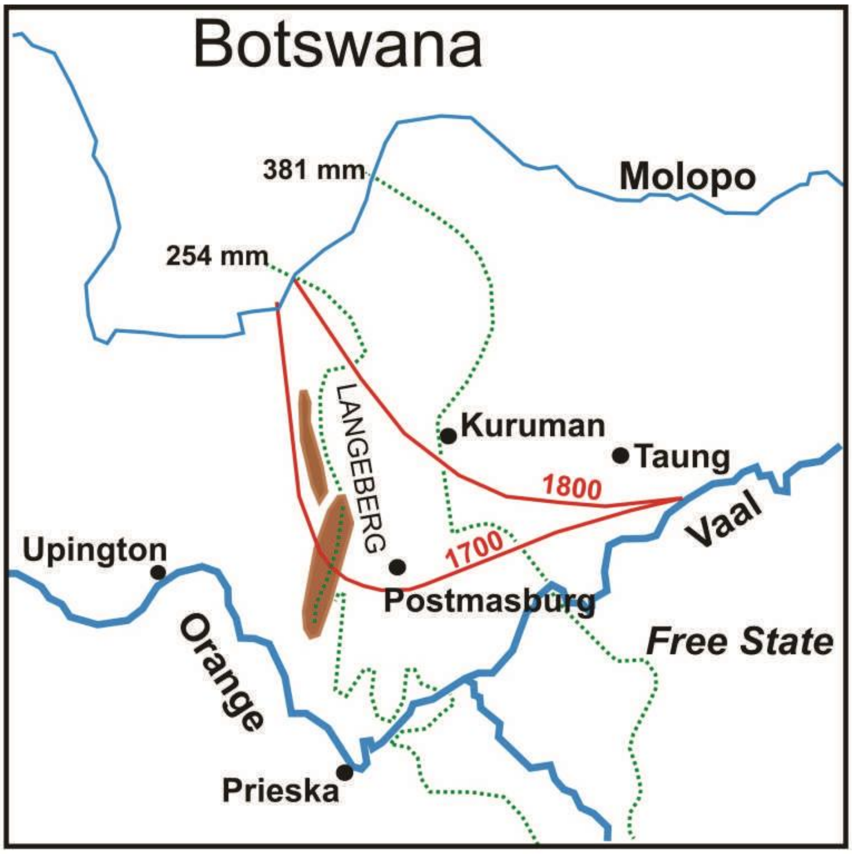


Figure vii. Historical maps based on eyewitness accounts show Bushman hunter-gatherer and Khoi herder occupation in the region west of Douglas prior to European settlement, e.g. Khoisan societies along the Orange River between Upington and Prieska c. 1779 (left), while early travelers frequently encountered permanently settled Koranna, Griqua and Bushmen groups around Prieska c. 1850's (right).

Figure viii. Example of human burial remains (cranium) eroding from overbank deposit (above left), coarse-grained and ochre-stained pottery fragments (above right) and 19th century stone-walled kraal, middle OR area .



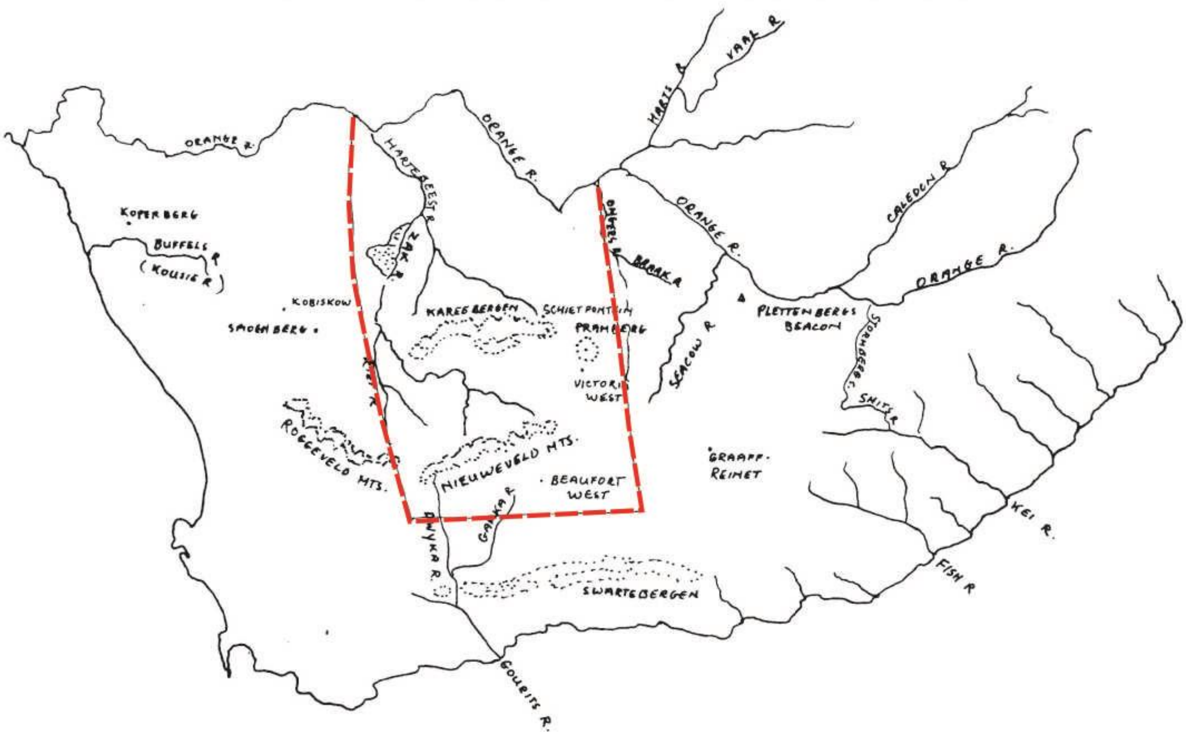


Figure ix. Southern limits of Tswana settlement during the 18th and 19th centuries, above (after Humphreys1976) and area inhabited by the Xhosa during early 19th century, below (after Anderson 1985).

Figure x. Historical stone-walled ruins at Kliphuis on the Orange northwest of Prieska