

Archaeological Impact Assessment

Proposed Kwartelspan PV Power Station I and Associated Infrastructure, Pixley ka Seme District Municipality, Northern Cape Province

prepared for

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by



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2 July 2012

1. Executive Summary

As part of the Basic Environmental Impact Assessment Report undertaken by Van Zyl Environmental Consultants cc, an Archaeological Impact Assessment was conducted for the above-named project in June 2012. The proposed activity involves the development of a photovoltaic power station and associated infrastructure. The study area is situated roughly half way between Prieska and Douglas in the Northern Cape Province.

Previous archaeological and heritage studies in the surrounding environment indicate that, in general, the area does not contain significant archaeological sites. Although numerous Stone Age artefacts were identified in the studied area, they occur in low frequencies, are temporally mixed and are found in derived and unstratified contexts. As a result, the archaeological record in the study area is considered to be of low significance. Nevertheless, because artefacts at certain localities are considered to be representative of the local archaeological record, and in order to mitigate against potential future cumulative impacts, recommendations are made to conserve some of these occurrences.

From an archaeological perspective, and provided that the recommended mitigation measures are considered and/or implemented, there are no objections to the authorization of the proposed activity.

Recommended Mitigation Measures;

- Apart from localities mentioned below, archaeological resources identified during this study do not require further recording/studies and because they are considered to be of low to no heritage value, they can be damaged and/or destroyed without a permit from SAHRA.*
- Because archaeological resources at waypoints 251, 286, 363 and 367 are considered to be representative of the archaeological record of the area, and in order to mitigate against potential future cumulative impacts, it is recommended that these localities be conserved by utilizing the access road "Option 2" rather than the other access road alternatives.*

Required Mitigation Measures;

- In the event that excavations and earthmoving activities expose significant archaeological or heritage resources, such activities must stop and SAHRA must be notified immediately.*
- If significant archaeological or heritage resources are exposed during construction activities, then they must be dealt with in accordance with the National Heritage Resources Act (No. 25 of 1999) and at the expense of the developer.*
- In the event of exposing human remains during construction, the matter will fall into the domain of the South African Heritage Resources Agency (Mrs Colette Scheermeyer) and will require a professional archaeologist to undertake mitigation if needed.*

2. Name, Expertise and Declaration

I, Peter Nilssen (PhD in archaeology), herewith confirm that I am a Professional member - in good standing - of the Association of South African Professional Archaeologists (ASAPA), including the Cultural Resource Management section of the same association.

As the appointed independent specialist (archaeologist) for this project hereby declare that I:

- act as an independent specialist in this application;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct;
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2010 and any specific environmental management Act;
- have and will not have no vested interest in the proposed activity proceeding;
- have disclosed, to the applicant, EAP and competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the NEMA, the Environmental Impact Assessment Regulations, 2010 and any specific environmental management Act;
- am fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations, 2010 (specifically in terms of regulation 17 of GN No. R. 543) and any specific environmental management Act, and that failure to comply with these requirements may constitute and result in disqualification;
- am aware that a false declaration is an offence in terms of regulation 71 of GN No. R. 543.



Signature of the specialist:

Date: **2 July 2012**

Table of Contents

Content	Page
1. Executive Summary _____	2
2. Name, Expertise and Declaration _____	3
3. Introduction _____	5
3.1. Background _____	5
3.2. Purpose and Scope of the Study _____	5
3.3. Study Area _____	7
3.4. Approach to the Study _____	7
4. Results _____	8
4.1. Overview of Previous Studies _____	8
4.2. Results from the Archaeological Impact Assessment _____	10
5. Sources of Risk, Impact Identification and Assessment _____	11
6. Recommended and Required Mitigation Measures _____	14
7. References _____	14
8. Figures and Plates _____	16

3. Introduction

3.1. Background

Activities associated with the proposed development trigger the National Heritage Resources Act (Act 25 of 1999) and therefore the author was appointed to conduct an Archaeological Impact Assessment (AIA) of the affected area. Construction and installation activities may have a permanent negative impact on archaeological resources in the affected area.

Van Zyl Environmental Consultants cc, who is compiling the Basic Environmental Impact Assessment Report, provided the following information. Suntrace Africa (Pty) Ltd intends to develop a PV power station on the Remaining Extent of Farm Kwartelspan Nr. 25, near Douglas, Northern Cape. An application for authorisation for the development of a new PV power station in the vicinity of Eskom's Greefspan Substation has been submitted to the National Department of Environmental Affairs (DEA). The application is for a development with a generation capacity of up to 15 MW and a size of less than 20 ha.

Associated infrastructure will include:

- Perimeter fencing,
- Security systems,
- Administrative, control and security buildings,
- Hangars (storage),
- Workshops,
- Ablution facilities,
- Area lighting (movement activated),
- Lightning protection systems, including masts,
- Access road and internal service roads, and
- Any equipment and upgrades or expansions required to the substation.

3.2. Scope and Purpose of the Study

The AIA did not cover the entire property, but rather, focused on areas proposed as development options according to information provided by Van Zyl Environmental Consultants cc. The assessment focused on the following areas that are shown in Figure 2 and coordinate data are given in Table 1;

1. 21 Suntrace Study Area
2. Option A Transmission Line 22kV - to evacuate electricity from the PV power plant to the substation or electricity network (32m wide corridor).
3. Option B to existing 22kV line - to evacuate electricity from the PV power plant to the substation or electricity network (32m wide corridor).
4. Access Road Option 1 (10m wide corridor).
5. Access Road Option 2 (10m wide corridor).
6. Access Road Option – existing farm road (10m wide corridor).
7. Kwartelspan PV 1 - possible construction and operational lay down areas as well as offices and related infrastructure

Objectives of the Archaeological Impact Assessment:

- To assess the study area for traces of archaeological and heritage related resources to determine the suitability of the proposed development areas;
- To identify options for archaeological mitigation in order to avoid or minimize potential negative impacts;
- To make recommendations for archaeological mitigation where necessary.

Terms of Reference (ToR):

- Locate boundaries and extent of the study area.
- Conduct a survey to identify and record archaeological resources.
- Assess the impact of the proposed development on above-named resources.
- Recommend mitigation measures where necessary.
- Prepare and submit a report to the client that meets standards required by the South African Heritage Resources Agency (SAHRA) in terms of the National Heritage Resources Act, No. 25 of 1999

Table 1. Coordinate data for study areas. See Figure 2.

Name	Description	Datum: WGS 84 Lat/Lon dec.degrees	Datum: WGS 84 SA National	Grid:
1A	21 Suntrance Study Area - main development study area	S29.38852 E23.29685	23 Y-028816	X3252369
1B	21 Suntrance Study Area - main development study area	S29.38059 E23.29849	23 Y-028977	X3251491
1C	21 Suntrance Study Area - main development study area	S29.36991 E23.32074	23 Y-031141	X3250313
1D	21 Suntrance Study Area - main development study area	S29.37461 E23.32390	23 Y-031446	X3250835
2A	Option A Transmission Line 22kV	S29.38086 E23.31098	23 Y-030190	X3251524
2B	Option A Transmission Line 22kV	S29.38530 E23.31472	23 Y-030552	X3252017
2C	Option A Transmission Line 22kV	S29.38661 E23.31266	23 Y-030352	X3252162
3A	Option B to existing 22kV line	S29.38100 E23.30643	23 Y-029748	X3251538
3B	Option B to existing 22kV line	S29.38448 E23.30461	23 Y-029570	X3251923
4A	Access Road Option 1	S29.34496 E23.30903	23 Y-030011	X3247544
4B	Access Road Option 1	S29.37762 E23.30901	23 Y-029999	X3251164
5A	Access Road Option 2	S29.37945 E23.31096	23 Y-030189	X3251368
5B	Access Road Option 2	S29.36954 E23.33364	23 Y-032394	X3250275
7A	Kwartelspan PV 1 - possible construction and operational lay down areas as well as offices and related infrastructure	S29.37777 E23.30636	23 Y-029742	X3251180
7B	Kwartelspan PV 1 - possible construction and operational lay down areas as well as offices and related infrastructure	S29.37766 E23.31102	23 Y-030195	X3251169
7C	Kwartelspan PV 1 - possible construction and operational lay down areas as well as offices and related infrastructure	S29.38098 E23.31088	23 Y-030180	X3251537
7D	Kwartelspan PV 1 - possible construction and operational lay down areas as well as offices and related infrastructure	S29.38103 E23.30636	23 Y-029741	X3251541
farm road	waypoint along existing farm road	S29.37437 E23.31795	23 Y-030868	X3250806
farm road	waypoint along existing farm road	S29.36710 E23.31831	23 Y-030906	X3250000
farm road	waypoint along existing farm road	S29.36208 E23.31797	23 Y-030874	X3249444
farm road	waypoint along existing farm road	S29.36055 E23.31807	23 Y-030885	X3249275
farm road	waypoint along existing farm road	S29.36008 E23.31810	23 Y-030887	X3249222
farm road	waypoint along existing farm road	S29.35776 E23.31874	23 Y-030950	X3248966
farm road	waypoint along existing farm road	S29.35307 E23.32013	23 Y-031087	X3248445
farm road	waypoint along existing farm road	S29.35255 E23.32061	23 Y-031133	X3248388
farm road	waypoint along existing farm road	S29.35206 E23.32078	23 Y-031150	X3248334
farm road	waypoint along existing farm road	S29.35133 E23.32131	23 Y-031202	X3248253
farm road	waypoint along existing farm road	S29.34929 E23.32252	23 Y-031319	X3248027
farm road	waypoint along existing farm road	S29.34931 E23.32252	23 Y-031319	X3248030
farm road	waypoint along existing farm road	S29.34931 E23.32252	23 Y-031319	X3248030
farm road	waypoint along existing farm road	S29.34841 E23.32288	23 Y-031355	X3247930
farm road	waypoint along existing farm road	S29.34708 E23.32359	23 Y-031424	X3247783
farm road	waypoint along existing farm road	S29.34611 E23.32391	23 Y-031456	X3247676
farm road	waypoint along existing farm road	S29.34453 E23.32462	23 Y-031525	X3247500
farm road	waypoint along existing farm road	S29.34350 E23.32518	23 Y-031580	X3247386
farm road	waypoint along existing farm road	S29.34300 E23.32623	23 Y-031682	X3247331
farm road	waypoint along existing farm road	S29.34285 E23.32715	23 Y-031772	X3247315
farm road	waypoint along existing farm road	S29.34253 E23.32822	23 Y-031876	X3247280
farm road	waypoint along existing farm road	S29.34189 E23.32927	23 Y-031978	X3247209
farm road	waypoint along existing farm road	S29.34148 E23.32970	23 Y-032020	X3247163

3.3 Study Area

The proposed development is situated on the Farm Kwartelspan 25, which is roughly 70km ENE of Prieska in the Northern Cape Province (Figures 1 & 2). The E-W flowing Orange River lies approximately 10 to 15km to the north and east of the affected property (Figure 1). The study area includes only those portions of the farm that are provisionally earmarked for development (Figure 2 and see section 3.2 above). Although the development footprint will not exceed 20ha, an area of around 220ha was studied to establish the most appropriate sites for the different components of the proposed activity.

The land use of the area is rural and agricultural with sheep and cattle farming being dominant. Apart from slightly undulating land in the northern part of the studied area, the landscape is essentially a flat plain. A small, shallow and presently dry pan/dam was noted at roughly the middle of the main development area (Figure 2, waypoint 132 in Figure 3 and Plate 2 [132]). Vegetation is open and sparse, and dominated by Karoo shrubs, grasses – including “Bushman” grass - and small/short trees of mostly *Acacia* species. Numerous termite hills and burrows of Aardvark and porcupine were also noted. Examples of the latter and surrounding environment including topography, vegetation cover, exposures and so on are shown in Plates 1, 2 and 3. Evidence for modern human related activities include single vehicle tracks, fencing, wind mills and associated pipes, free-standing dams and animal feeding and watering troughs.

The bulk of surface sediments consist of orange-red, wind blown Hutton Sands that are moderately disturbed by human related activities, animal trampling, Aardvark and porcupine burrowing and termite activity (Plates 1, 2 & 3). Underlying the Hutton Sands, and also exposed in places is a calcrete deposit/surface that sometimes includes clasts and stone artefacts (Plates 2 & 7[80]). Also exposed in places are pebble to boulder sized sub-angular to rounded gravels including mostly quartzite - but also andesite - clasts and these alluvial deposits are referred to as Older Gravels (see examples in Plates 3, 5, 6, 10, 13, 15 & 16). These Older Gravels accrued prior to the arrival of stone tool making hominins (see Beaumont 2006 and references therein). The gravel-derived clasts seen in the study area are like those with distinct reddish-brown patination as described by Beaumont (2006).

The study area was accessed by vehicle by taking the Paal Se Werf turnoff (about 76km from Prieska) from the R357 between Prieska and Douglas and then by turning left onto an existing, gated farm road (Figures 1 & 2). The alternative vehicle access is from the Eskom Greefspan Substation (Figure 2).

3.4 Approach to the Study

A literature review of previous archaeological and heritage-related work in the surrounding area was conducted using information from the Report Mapping Project of the SAHRA-APM Unit. The latter includes reports up to and including 2009 that were provided by Mr. Phillip Hine of SAHRA at the request of the author.

On behalf of the applicant, Suntrance Africa (Pty) Ltd, Van Zyl Environmental Consultants cc provided background information, development locality information via a kmz file as well as contact details for the person leasing Kwartelspan 25 (Figure 2). Coordinate data for the various study areas was extracted from Google Earth and transposed to a hand held GPS.

Permission to access the study area was obtained from Mr Frans Wiid who is currently leasing the affected property and the survey was conducted independently over three days from 14 to 16 June 2012. All areas as detailed in section 3.2 above were assessed during the foot survey. Due to the open nature of vegetation cover and the essentially flat terrain, the entire study area was accessible on foot and archaeological visibility was excellent. There were no limitations or restrictions to the study.

Transects were walked across the entire study area and where gravels were exposed transects were closely spaced, but where ground surfaces consisted of Hutton Sands transects were further apart. This strategy was used because archaeological remains occurred more commonly and in higher numbers in areas containing exposed calcrete and gravels than in areas where surface sediments consist of sands. Due to the relatively high numbers of isolated stone artefacts occurring in the study area it was decided to map all identified archaeological occurrences, but to photograph and describe only a representative sample of the recorded specimens. Stone artefact scatters of medium to low density were mapped, described and photographed.

Survey tracks were fixed with a hand held Garmin Camo GPS to record the search area (Figure 3, gpx tracking file is available from author). The position of identified archaeological occurrences and photo localities were fixed by GPS (Figures 4 & 5, Plates 1 through 16 and Table 2). Digital audio notes and a comprehensive, high quality digital photographic record were also made (full data set available from author). In this report, localities of archaeological occurrences and photographs are established by matching the numbers on photographs with those of waypoints in Figures 4 and 5. All coordinate data associated with the study is available from the author. Bearing names on the panoramic view in Plate 1 indicate the compass bearing at the position of the label on the photograph.

4. Results

4.1. Overview of Previous Studies

The following is a brief discussion of heritage and archaeological resources identified in the surrounding environment and includes the historic and prehistoric record.

Evidence for the Anglo-Boer Wars that occurred between around 1880 and 1902 comes in the form of stone wall ruins and associated tin cans (Dreyer 2005). More evidence of this phase of South African history is likely to be identified in future studies in the area. Prior to this, and of significance to the national economy, was

the discovery of diamonds in the area in 1866. This event is commemorated by a National Heritage Site where the “Eureka” diamond was discovered by a young boy on the farm De Kalk 37 (Van Ryneveld 2005). Rocky piles from early diamond diggings were recorded on the property immediately east of the study area (Beaumont 2005). Other remains from these early diamond mining activities that were undertaken between the latter part of the 19th century and the early 1900s include graves, glass, tins and calcrete foundations for tents (Beaumont 2006). Although no structures of historic significance have been recorded in the surroundings of the study area, several historic and more recent graves were identified (e.g. Beaumont 2006 & 2007 and Rossouw 2007).

The Stone Age record contains material spanning the Early, Middle and Later Stone Age periods and rock engravings are relatively common and were also recorded in the surroundings of Prieska (Morris 2005 and Rossouw 2007). Acheulian and LSA collections from Douglas and Hopetown are housed in the Iziko and McGregor Museums (see Beaumont 2006 and references therein). Stone artefacts are made in a variety of raw materials including banded ironstone, andesite, quartzite, dolerite and hornfels, but banded ironstone is notably the most common (Beaumont 2005, 2006, 2007 & 2008 and Rossouw 2007).

Although Early Stone Age (ESA) artefacts have been recorded, these mainly consist of flakes and cores commonly based on quartzite cobbles, but formal ESA tools such as hand axes and cleavers are absent (Beaumont 2005, 2006 & 2007). An extensive surface scatter of small hand axes is supposed to occur some 10km upstream from Prieska (Beaumont 2007). It is possible that this is Fauresmith material, which is a transitional stone tool industry between the ESA and Middle Stone Age (MSA). The presence of stone artefacts representing this transitional Fauresmith industry and/or late phase of the Acheulian is frequently identified in the surrounding environment (Beaumont 2005 & 2008 and Rossouw 2007). Stone artefacts of MSA origin appear to be the most commonly occurring archaeological materials in the surrounding landscape (Beaumont 2005 & 2008, Dreyer 2005, Rossouw 2007 and Van Ryneveld 2005 & 2006). Typically the MSA material consists of isolated stone artefacts and low density artefact scatters that include Llevant cores, flakes and blades with faceted or prepared platforms, and the dominant formal tools are irregular scrapers (Van Ryneveld 2006). Banded ironstone is the most commonly used raw material. Although stone artefacts of Later Stone Age (LSA) origin are reported to occur in the surrounding area, these seem to be less common than specimens of MSA age (Rossouw 2007 and Van Ryneveld 2005).

Overall, Stone Age materials are scattered thinly over the modern land surface and to date, the Stone Age finds are considered to be of low to no archaeological significance (see all references below). This is due to the low frequencies of occurrences, temporally mixed assemblages, and the fact that artefacts are found in disturbed, derived and unstratified contexts.

Fossil bearing geological deposits occur in the region, but none of the earlier studies reviewed here reported palaeontological resources.

4.2. Results from the Archaeological Impact Assessment

On 14, 15 and 16 June 2012 a distance of 53km was walked across the areas of the proposed development options, covering an area of about 60ha of which an average of some 90% provided excellent archaeological visibility (Figures 3, 4 & 5 and Plates 1 through 16).

Scattered sparsely across the bulk of the studied area are Stone Age artefacts occurring mostly as isolated finds. As is evident from the green dots in Figures 4 and 5, numerous stone artefacts were identified during the study. No faunal remains or other cultural materials were seen. Stone artefacts are generally less common where surface sediments consist of Hutton Sands while higher numbers of artefacts are associated with exposed gravels. Although banded ironstone is the most commonly used raw material, stone artefacts in quartzite, dolerite, hornfels, andesite and quartz were also recorded, and several pieces of flaked calcrete were seen (see Plates 3 through 16). No flakes or artefacts in calcrete were identified (Plates 15 & 16).

Specimens from the entire span of the Stone Age were identified, but those of MSA origin are more common than ESA and LSA artefacts. ESA materials are usually heavily weathered with reddish-brown patination and include flakes and cores, but no formal tools were observed (Plates 5, 10, 11 & 16). A few specimens of the transitional – ESA-MSA - Fauresmith industry were identified including the typical small hand axes (Plates 12 & 15). Artefacts of MSA origin are generally fresh to lightly abraded and include hammer stones, a variety of cores and flakes, convergent flakes or points and blades. Flakes and blades commonly display prepared or faceted platforms. Overall, there is a high percentage of retouch and formal tools are dominated by a variety of scrapers though notched pieces and/or adzes are also fairly common (Plates 3 through 16). Stone artefacts of LSA age are more numerous than those of the ESA, but less common than MSA specimens and include microlithic and bladelet cores, flakes, small – thumbnail – scrapers and adzes or notched pieces (Plates 4, 5, 6, 8, 11, 14 & 16). As with MSA pieces, there is a relatively high number of retouched pieces and in some cases it is not possible to distinguish between LSA and MSA artefacts.

Significance and Recommendation

The nearly ubiquitous scatter of isolated stone artefacts, or low density artefact scatters, are in a temporally mixed and secondary or derived context and therefore, are considered to be of low to no archaeological significance. These materials are designated a field rating of General Protected C, and because they were adequately documented during this study they do not require further recording before destruction.

In addition to the above, five localities with medium to low density stone artefact scatters were recorded at **waypoints 48, 251, 286, 363 and 367** (Figures 4 & 5, Plates 5, 6, 13, 14, 15 & 16 and Table 2). The extents of these scatters vary from about 100m² to 400m² and are all associated with exposed gravel deposits. Their archaeological contents include a mix of ESA, MSA and LSA materials with raw materials and artefact types like those described above for the isolated stone artefacts, or low density artefact scatters. In effect, these occurrences are representative of the archaeological record seen in the studied area.

Significance and Recommendation

Due to their temporally mixed and contextually derived nature, these archaeological occurrences are also considered to be of low significance and are given a field rating of General Protected C. Nevertheless, because they are considered to be representative of the archaeological record of the immediate surroundings, and to compensate for potential future cumulative impacts, it is recommended that **waypoints 251, 286, 363 and 367** should be avoided by the proposed development. This can be accomplished by avoiding access road “Option 1” and the existing farm road (Figure 2 [4A-4B]). By using access road “Option 2” these localities can be preserved from further negative impact (Figure 2 [5A-5B]).

Apart from the above-mentioned archaeological materials, no other heritage related resources or issues were identified during the study. No palaeontological resources were seen, but Van Zyl Environmental Consultants cc has liaised with Dr John Almond in this regard.

Table 1. Coordinate and descriptive data for archaeological occurrences and photo localities. See Figures 3, 4 & 5 and Plates 1 through 16).

Point Name	Description img=image snd=sound	Datum: WGS 84 Lat/Lon dec.degrees	Datum: WGS 84 SA National	Grid:	meters above sea level
2	img5748-51 snd5751	S29.36895 E23.31821	23 Y-030895	X3250206	1044 m
19	img5787 snd5787	S29.37992 E23.30010	23 Y-029134	X3251417	1029 m
34	img5818 snd5818	S29.38575 E23.29747	23 Y-028877	X3252062	1028 m
	stone artefact scatter - med-low density - mixed ESA.				
48	MSA-LSA - img5828-43 snd5843	S29.38726 E23.29708	23 Y-028839	X3252229	1030 m
63	img5863 snd5863	S29.37973 E23.31360	23 Y-030444	X3251400	1029 m
96	img5881 snd5881	S29.37313 E23.32222	23 Y-031284	X3250670	1030 m
101	img5882 snd5882	S29.37180 E23.32114	23 Y-031179	X3250522	1028 m
106	img5883 snd5883	S29.37098 E23.32075	23 Y-031141	X3250431	1034 m
111	img5884 snd5884	S29.38642 E23.31318	23 Y-030402	X3252141	1032 m
112	img5885 snd5885	S29.38412 E23.31385	23 Y-030468	X3251885	1027 m
126	img5921-2 snd5922	S29.38385 E23.30121	23 Y-029240	X3251853	1025 m
132	img5941 snd5941	S29.37697 E23.31445	23 Y-030528	X3251094	1028 m
191	img6037 snd6037	S29.37289 E23.31578	23 Y-030658	X3250641	1034 m
219	img6068 snd6068	S29.38584 E23.31381	23 Y-030463	X3252077	1029 m
220	img6069 snd6069	S29.34151 E23.32968	23 Y-032018	X3247167	1049 m
228	img6081 snd6081	S29.34855 E23.32289	23 Y-031356	X3247946	1056 m
	stone artefact scatter - low density - gravels in road -				
251	mixed ESA-MSA-LSA - img6097-6114 snd6114	S29.35973 E23.31819	23 Y-030896	X3249183	1047 m
277	img6140 snd6140	S29.36663 E23.31835	23 Y-030910	X3249949	1046 m
	stone artefact scatter - med-low density - gravels -				
286	mixed ESA-MSA-LSA - img6152-66 snd6166	S29.36459 E23.31813	23 Y-030889	X3249722	1042 m
297	img6167 snd6170	S29.36149 E23.31763	23 Y-030841	X3249378	1039 m
327	img6171 snd6171	S29.35345 E23.31996	23 Y-031070	X3248488	1053 m
	stone artefact scatter - med-low density - mixed ESA.				
363	MSA-LSA - img6179-83 snd6183 & 6184	S29.34514 E23.30894	23 Y-030003	X3247564	1064 m
365	img6185 snd6185	S29.34580 E23.30896	23 Y-030004	X3247637	1061 m
	stone artefact scatter - med-low density - mixed ESA.				
367	MSA-LSA - img6186 snd6190	S29.34705 E23.30896	23 Y-030004	X3247775	1060 m
377	img6191 snd6191	S29.35402 E23.30892	23 Y-029998	X3248548	1054 m
446	img6214 snd6214	S29.37367 E23.32444	23 Y-031499	X3250730	1030 m
457	img6215 snd6215	S29.36958 E23.33373	23 Y-032402	X3250280	1032 m

5. Sources of Risk, Impact Identification and Assessment

As detailed in sections 3.1 and 3.2 above, the proposed development will involve construction and installation activities that will have a permanent negative impact on archaeological resources identified in this study. However, the vast bulk of

archaeological resources are considered to be of low to no significance and their destruction will not have a negative impact on the heritage value of the area. Although also considered to be of low significance, archaeological occurrences at a few localities are considered to be representative of the archaeological record of the immediate surroundings. Because of this, and in consideration of potential future cumulative impacts on these resources, mitigation measures are recommended to retain a selection of these archaeological materials.

Apart from the suggested use of access road “Option 2” instead of “Option 1” or the existing farm road, the remaining areas studied here are suitable for the proposed development. From an archaeological perspective, and provided that the recommended mitigation measures are considered and/or implemented, there are no objections to the authorization of the proposed activity. Table 3 below presents the potential direct and cumulative impact on and loss of archaeological resources without and with mitigation.

Table 3. Potential direct and cumulative impact on and loss of archaeological resources without and with mitigation.

<u>Alternative</u>	<u>Nature of impact</u>	<u>Extent of impact</u>	<u>Duration of impact</u>	<u>Intensity</u>	<u>Probability of occurrence</u>	<u>Status of the impact</u>	<u>Degree of confidence</u>	<u>Level of significance</u>
without mitigation	Construction, Installation & Cumulative impact on archaeological resources	Local and/or Regional	permanent	Medium to Low	definite	Neutral to negative for environment and project	high	Low
with mitigation	Construction, Installation & Cumulative impact on archaeological resources	Local	permanent	Low	improbable	positive for environment and project	high	Low

6. Recommended and Required Mitigation Measures

Recommended Mitigation Measures;

- Apart from localities mentioned below, archaeological resources identified during this study do not require further recording/studies and because they are considered to be of low to no heritage value, they can be damaged and/or destroyed without a permit from SAHRA.
- Because archaeological resources at waypoints 251, 286, 363 and 367 are considered to be representative of the archaeological record of the area, and in order to mitigate against potential future cumulative impacts, it is recommended that these localities be conserved by utilizing the access road "Option 2" rather than the other access road alternatives.

Required Mitigation Measures;

- In the event that excavations and earthmoving activities expose significant archaeological or heritage resources, such activities must stop and SAHRA must be notified immediately.
- If significant archaeological or heritage resources are exposed during construction activities, then they must be dealt with in accordance with the National Heritage Resources Act (No. 25 of 1999) and at the expense of the developer.
- In the event of exposing human remains during construction, the matter will fall into the domain of the South African Heritage Resources Agency (Mrs Colette Scheermeyer) and will require a professional archaeologist to undertake mitigation if needed.

7. References

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Van Ryneveld, K. 2006. Phase 1 Archaeological Impact Assessment - (Nooitverwagt Portion of) Kafir Krants 379, Hay District, Northern Cape, South Africa. An unpublished report by the National Museum Bloemfontein on file at SAHRA as: 2006-SAHRA-0289.

8. Figures and Plates (on following pages)

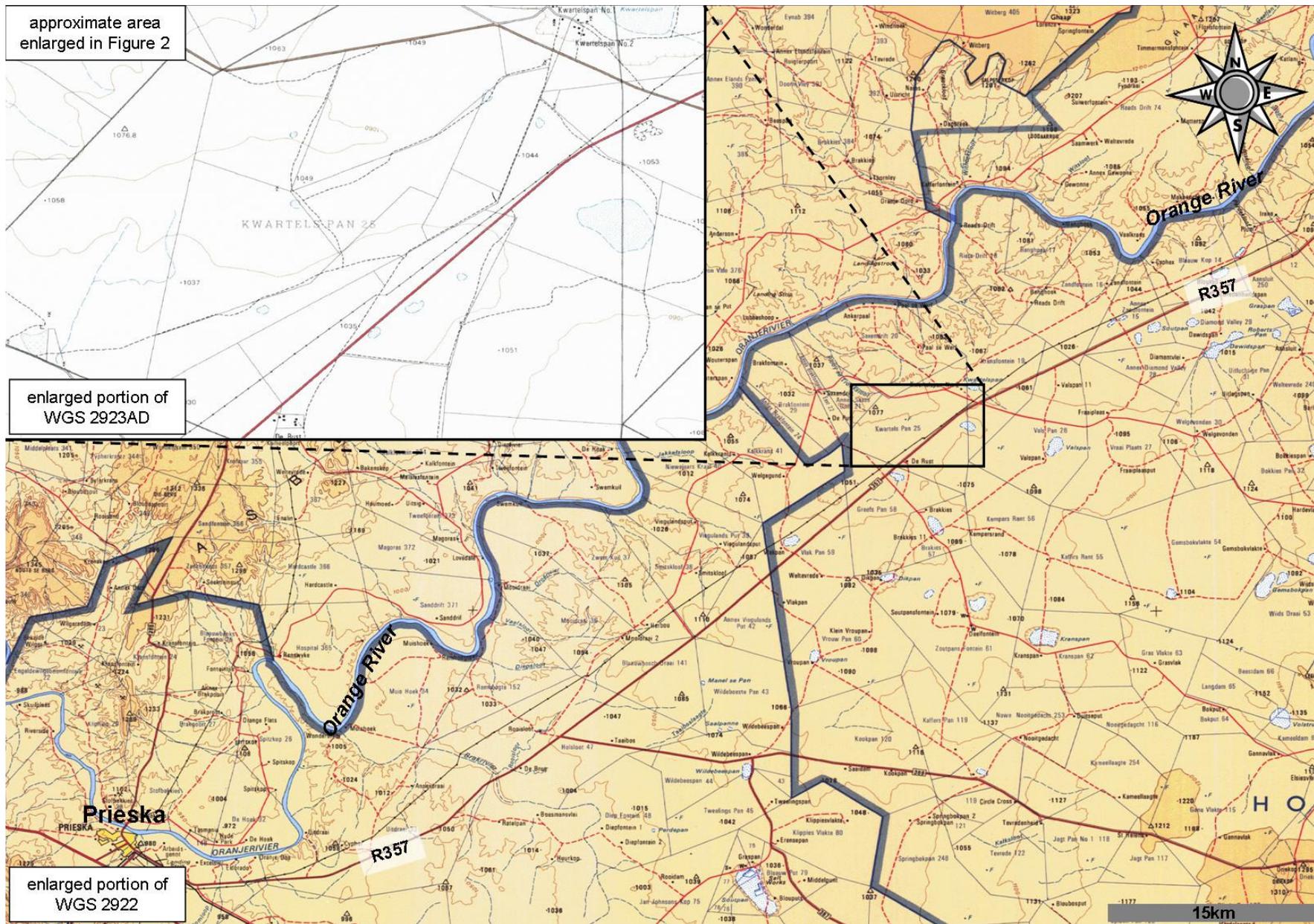


Figure 1. Location of study area relative to Prieska, Northern Cape Province. (Map courtesy of The Chief Directorate, Surveys & Mapping, Mowbray).

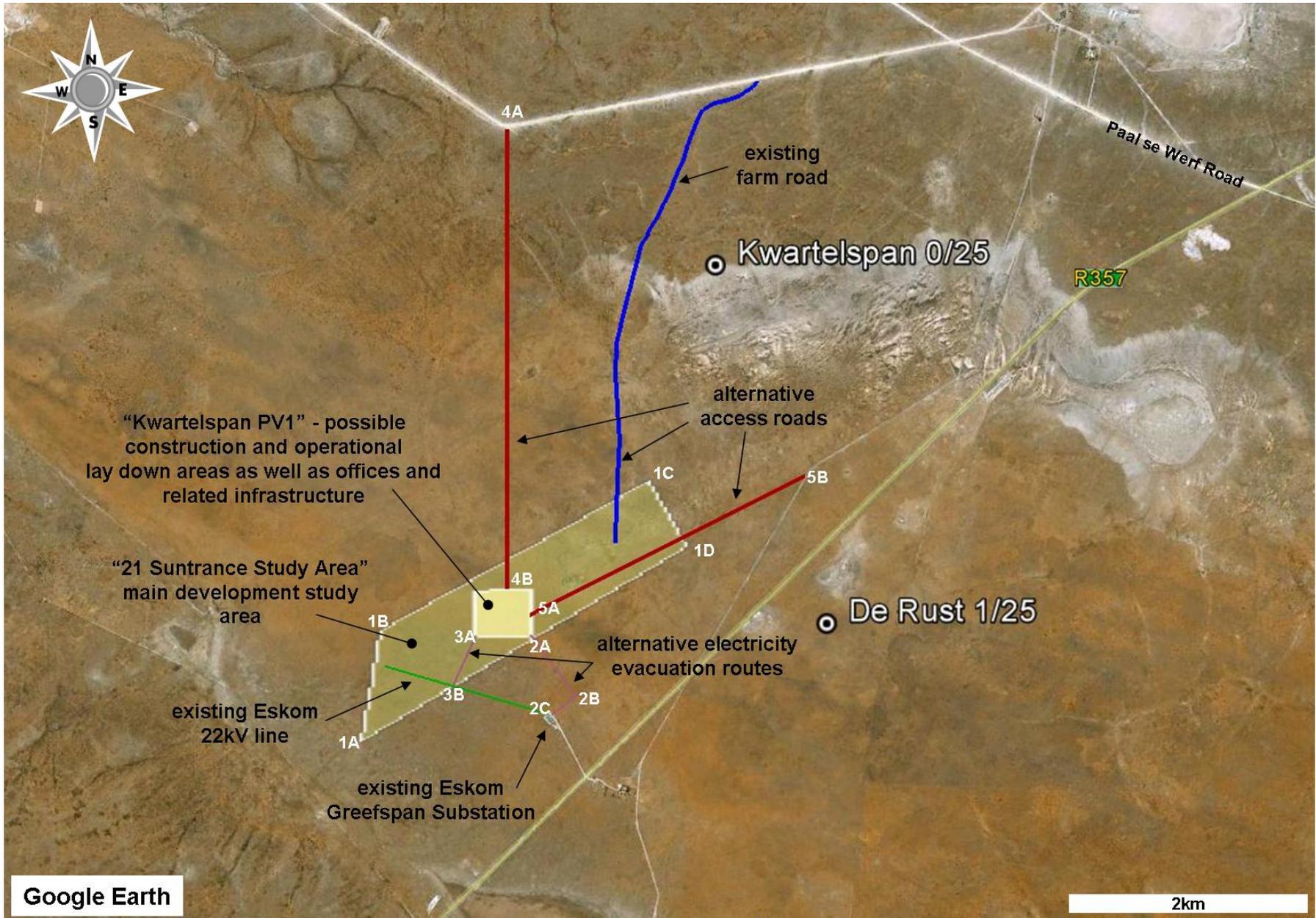


Figure 2. Area enlarged from Figure 1 showing proposed development layout plan (see Table 1). Courtesy of Van Zyl Environmental Consultants cc.

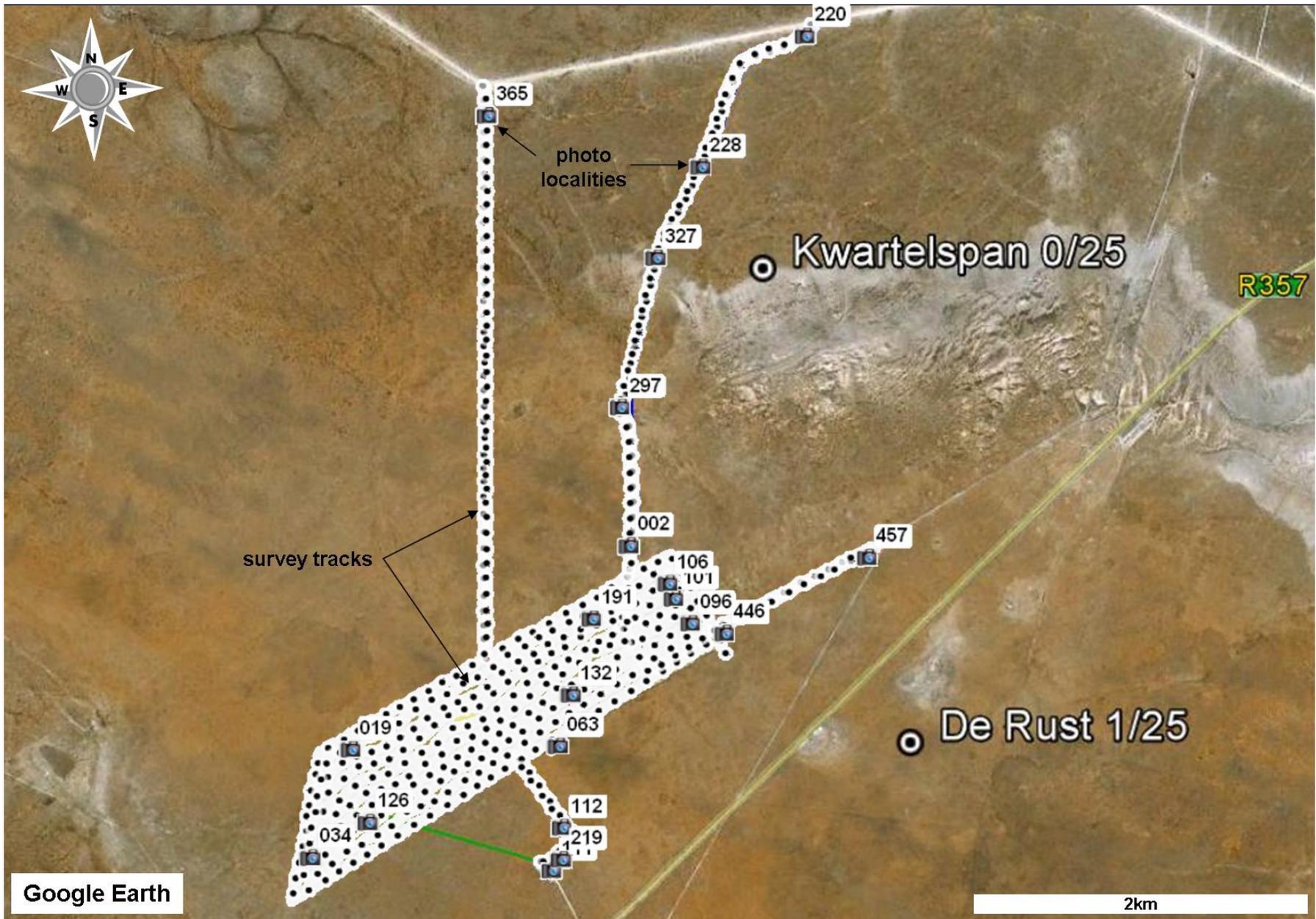


Figure 3. Studied area showing survey walk tracks and photo localities (see Table 2 and Plates 1, 2 & 3).

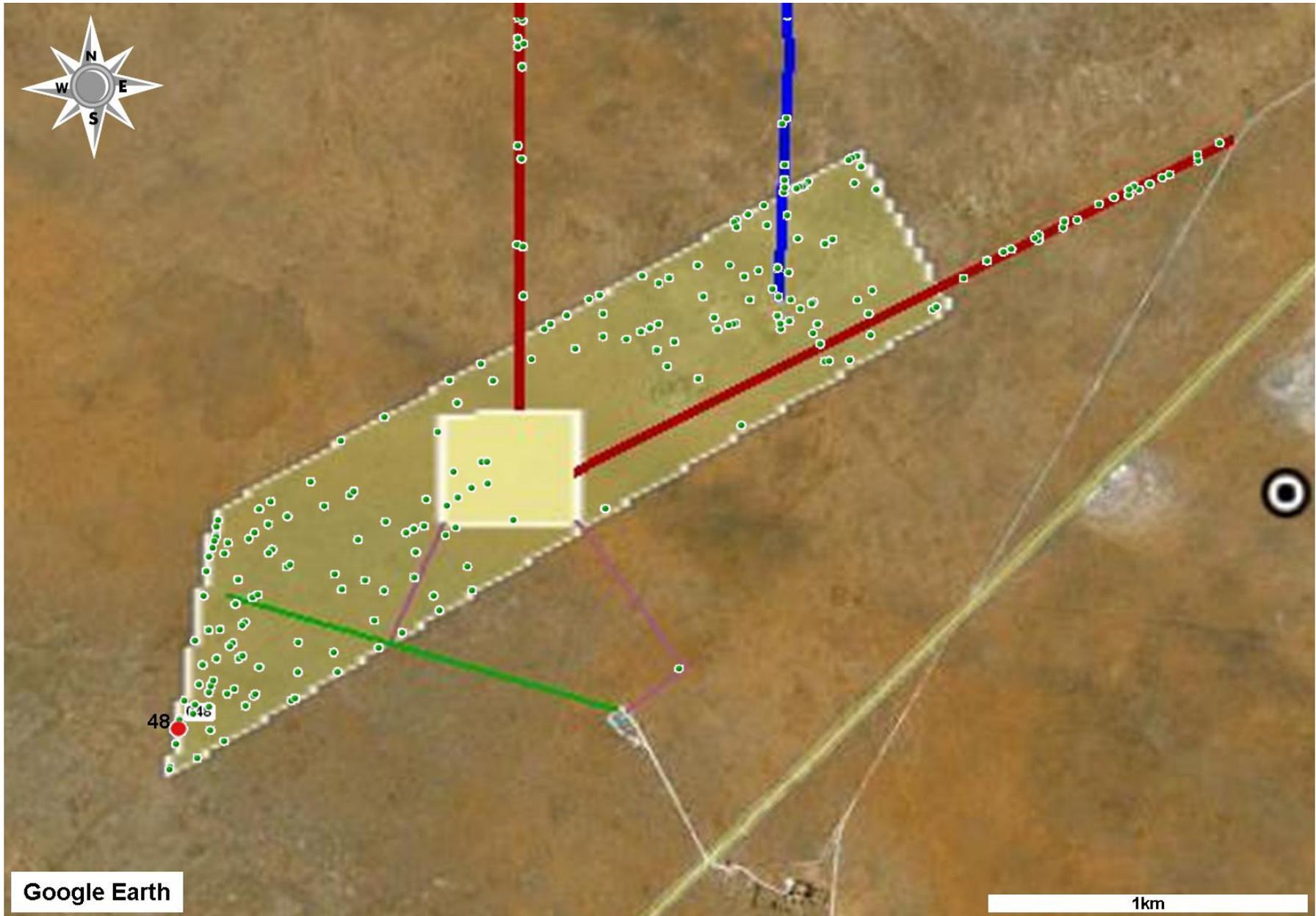


Figure 4. Studied area showing archaeological occurrences (green and red dots; see Table 2 and Plates).

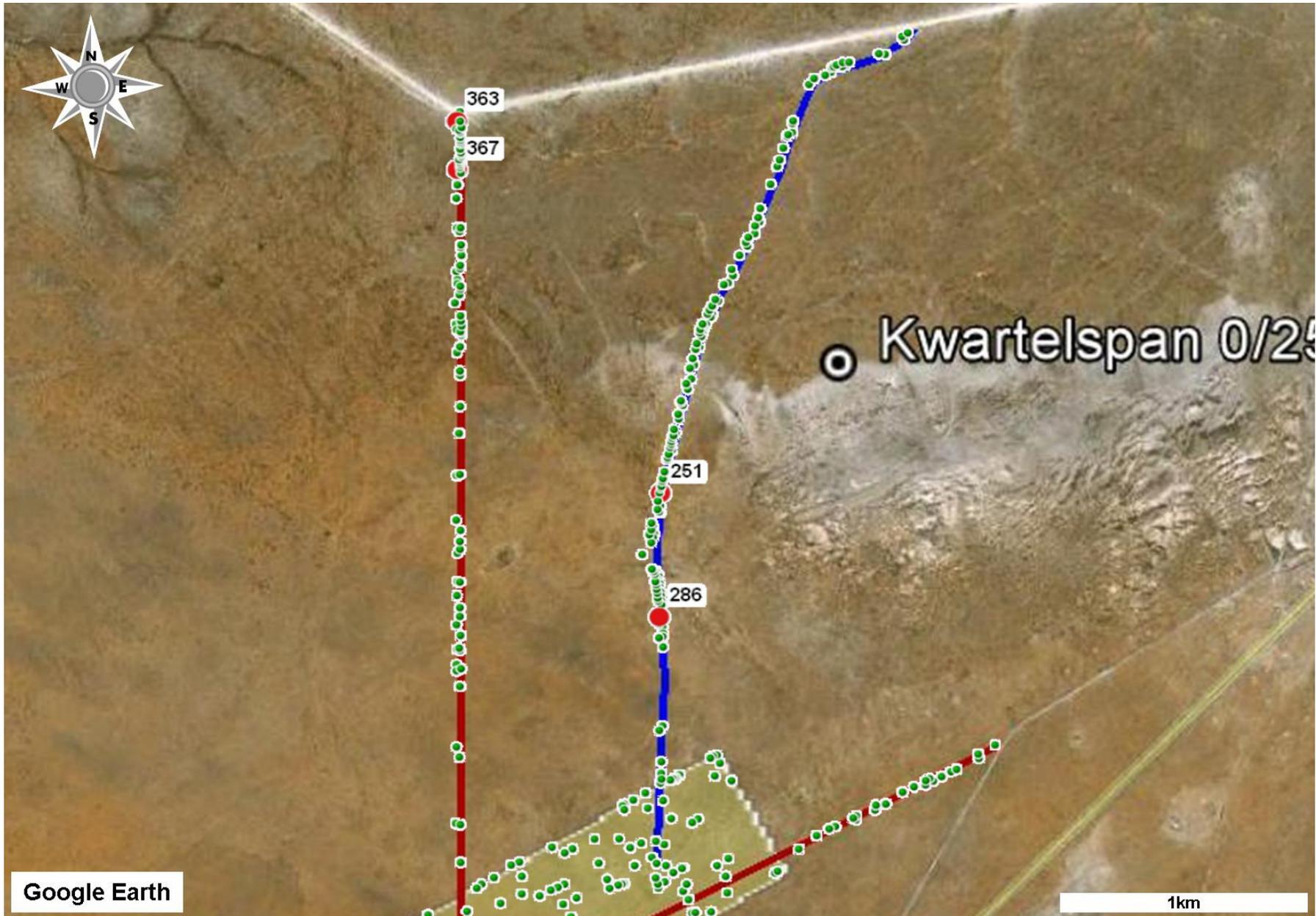


Figure 5. Studied area showing archaeological occurrences (green and red dots; see Table 2 and Plates).

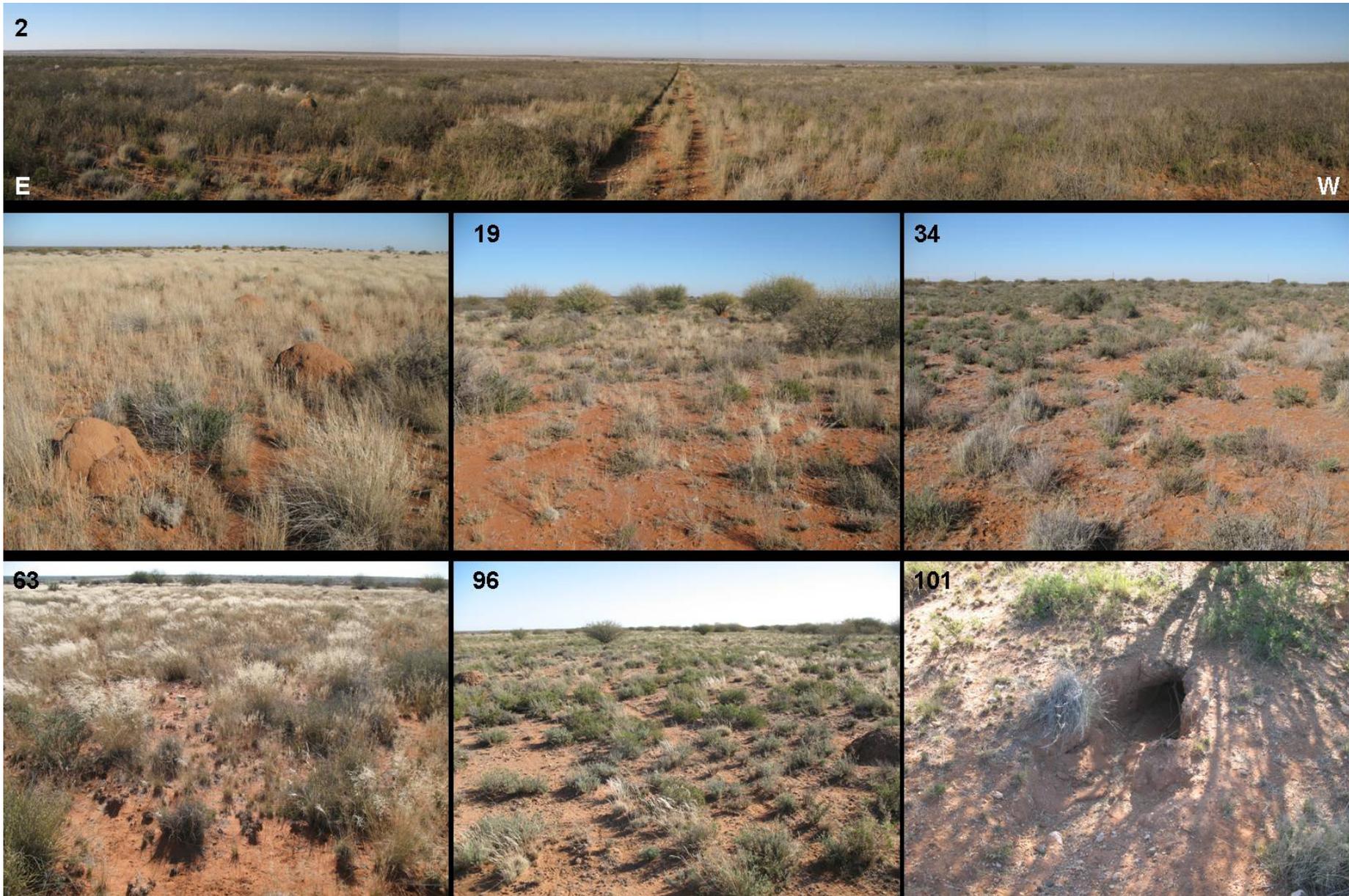


Plate 1. Examples of the surrounding environment, exposures, topography, disturbances and vegetation cover (see Figure 3 and Table 2).

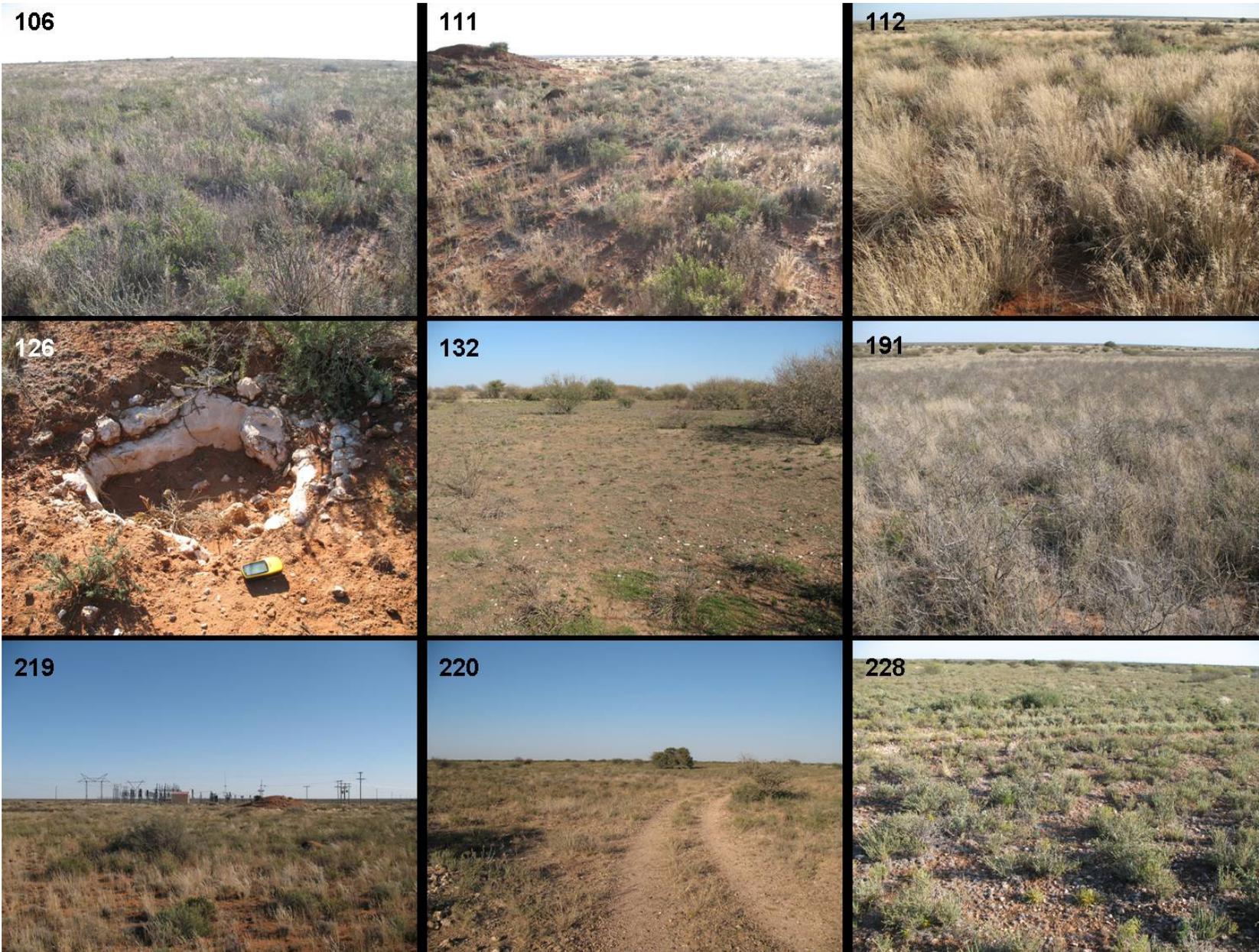


Plate 2. Examples of the surrounding environment, exposures, topography, disturbances and vegetation cover (see Figure 3 and Table 2).

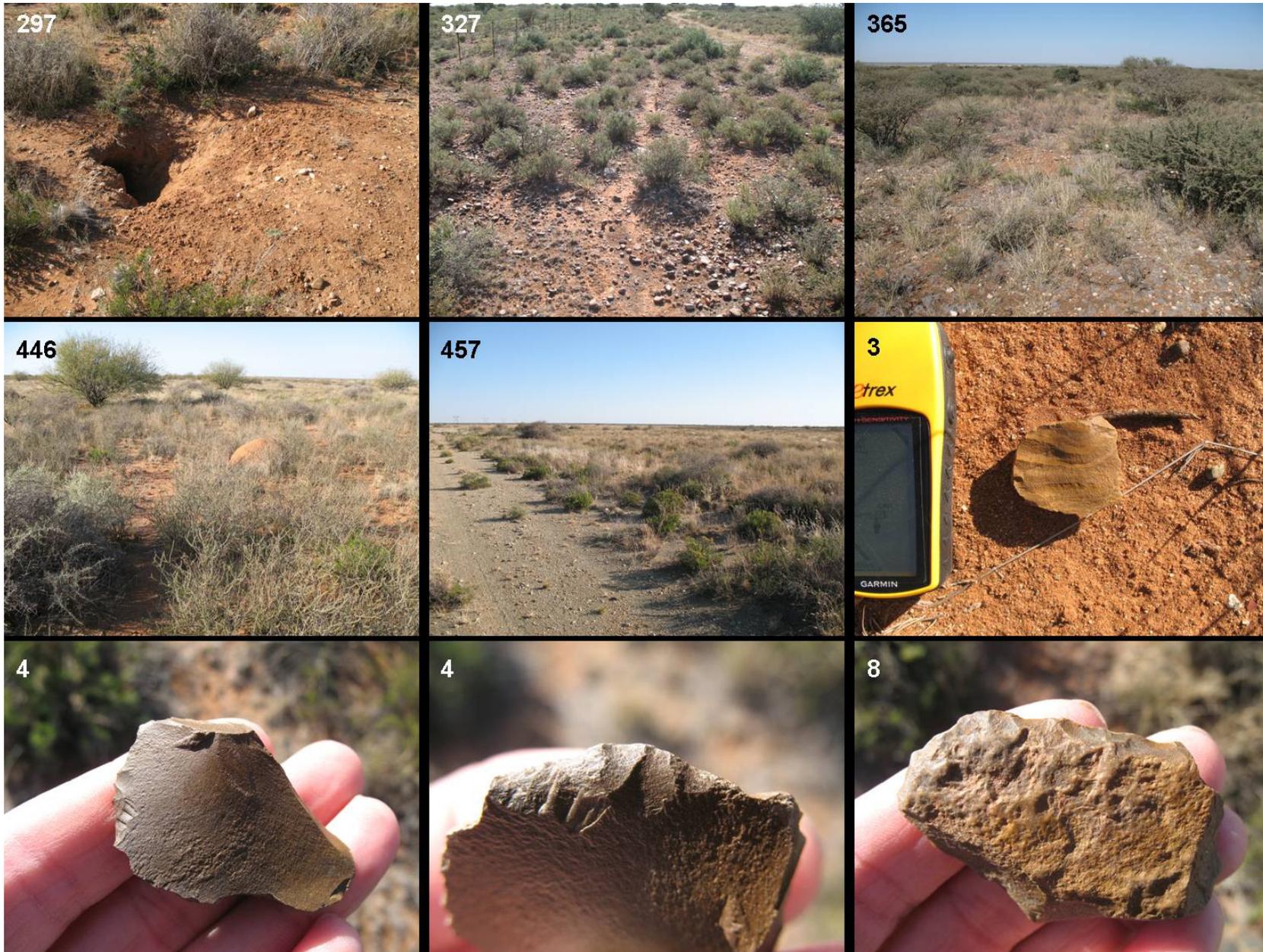


Plate 3. Examples of the surrounding environment and stone artefacts (Figure 3 & Table 2).



Plate 4. Examples of raw materials and stone artefacts.

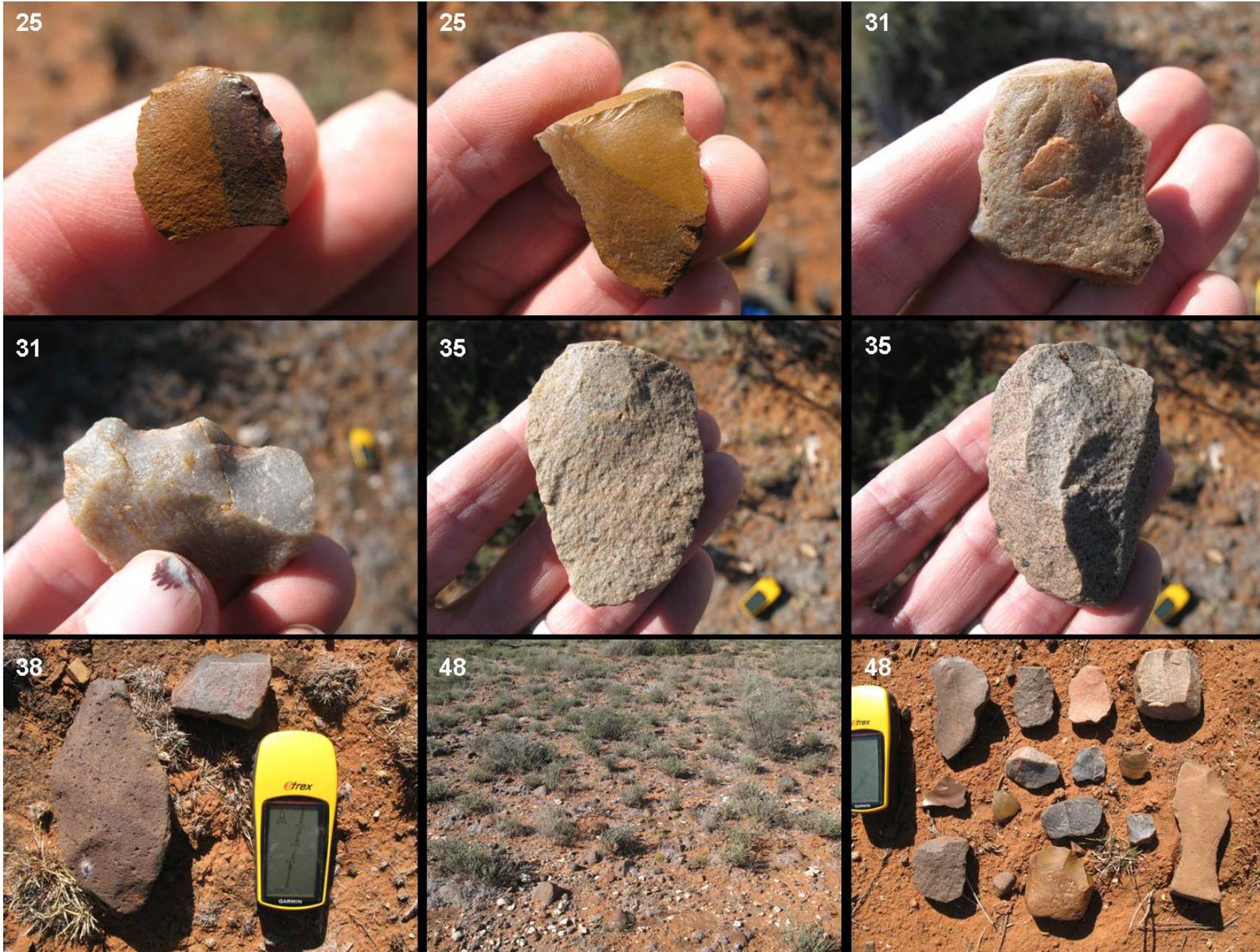


Plate 5. Examples of raw materials, stone artefacts and alluvial gravels (Figure 4 & Table 2).

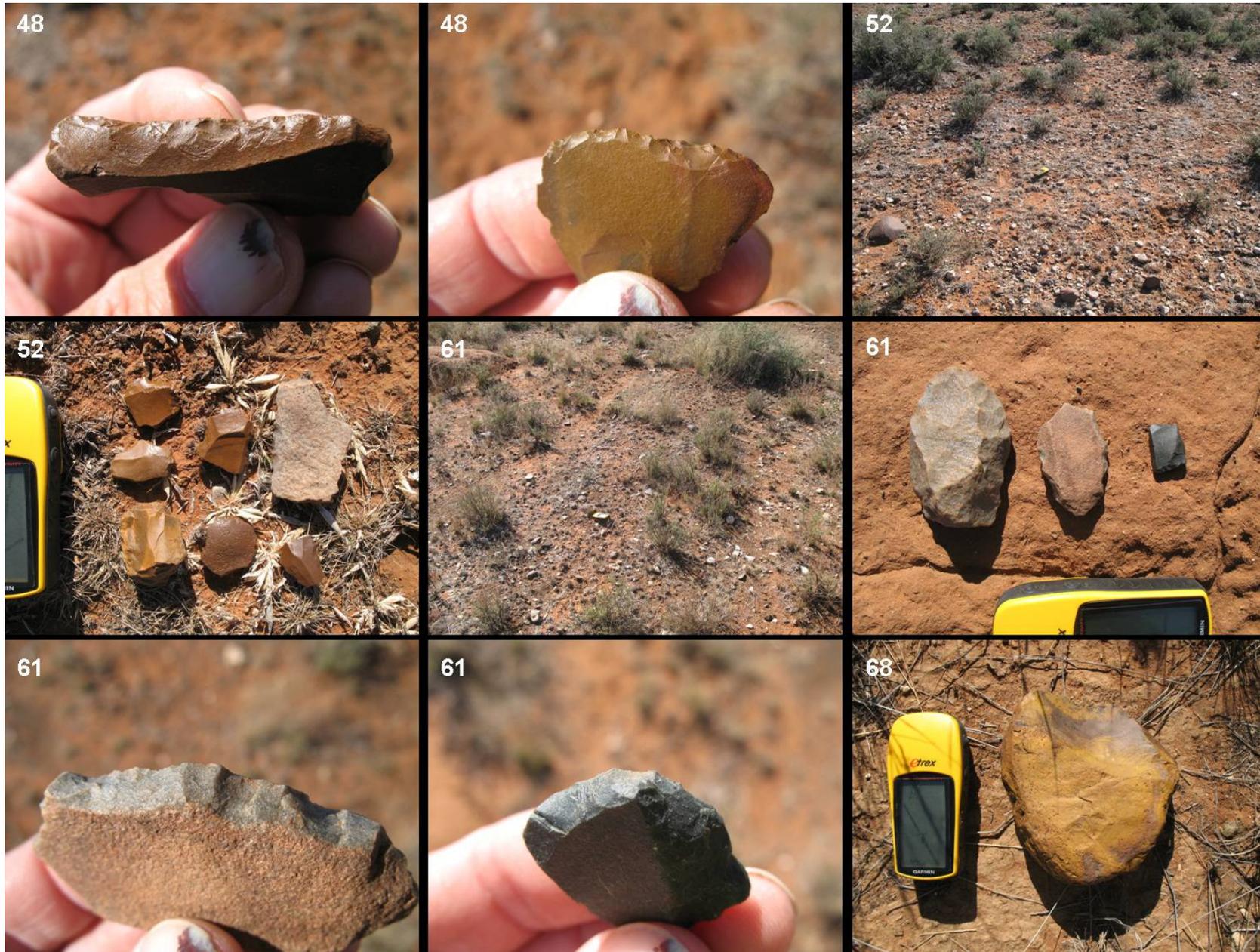


Plate 6. Examples of raw materials, stone artefacts (close-up of scrapers) and alluvial gravels (Figure 4 & Table 2).

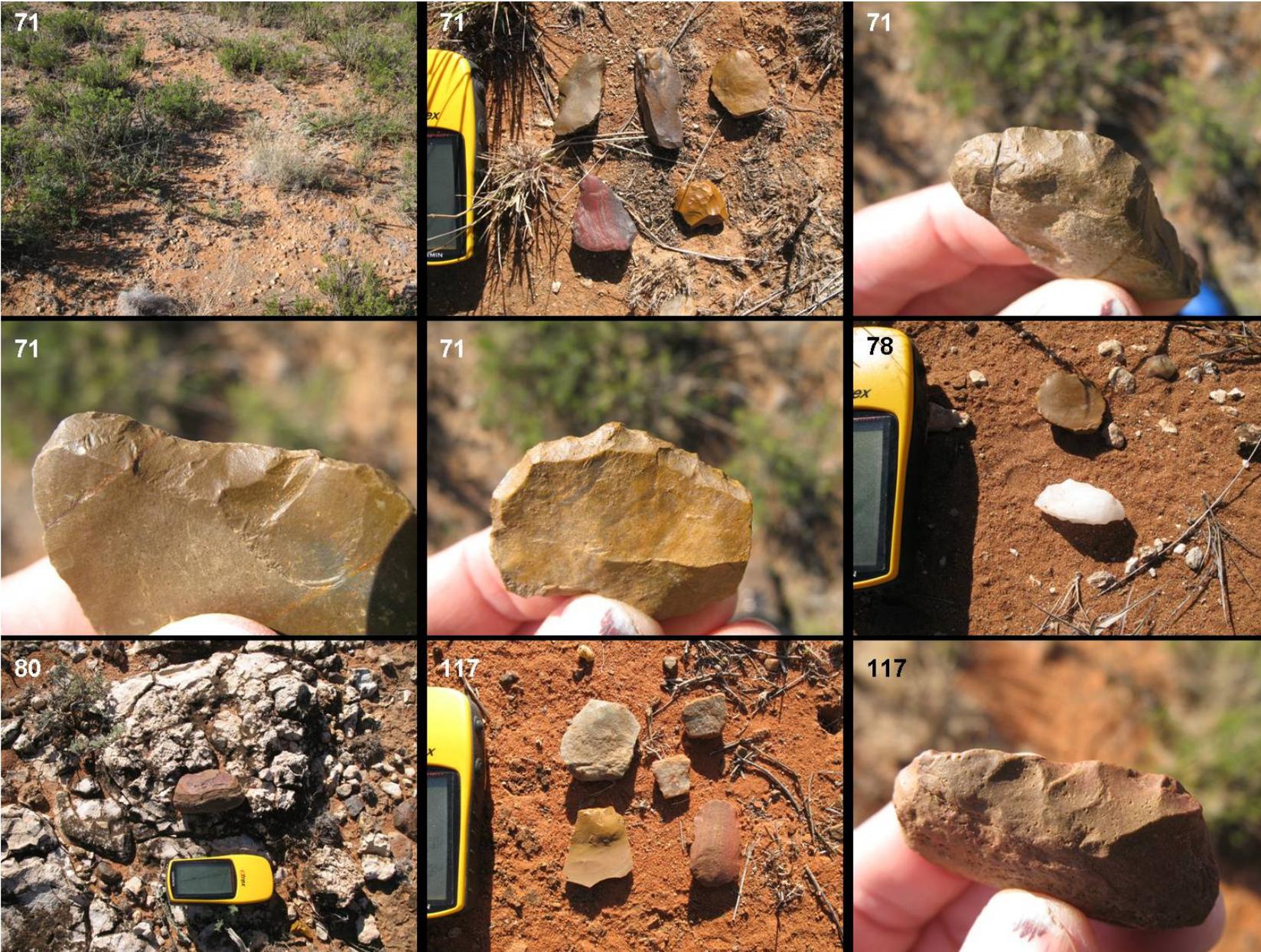


Plate 7. Examples of gravels, raw materials, stone artefacts, a quartzite clast in calcrete and close-up of scrapers.

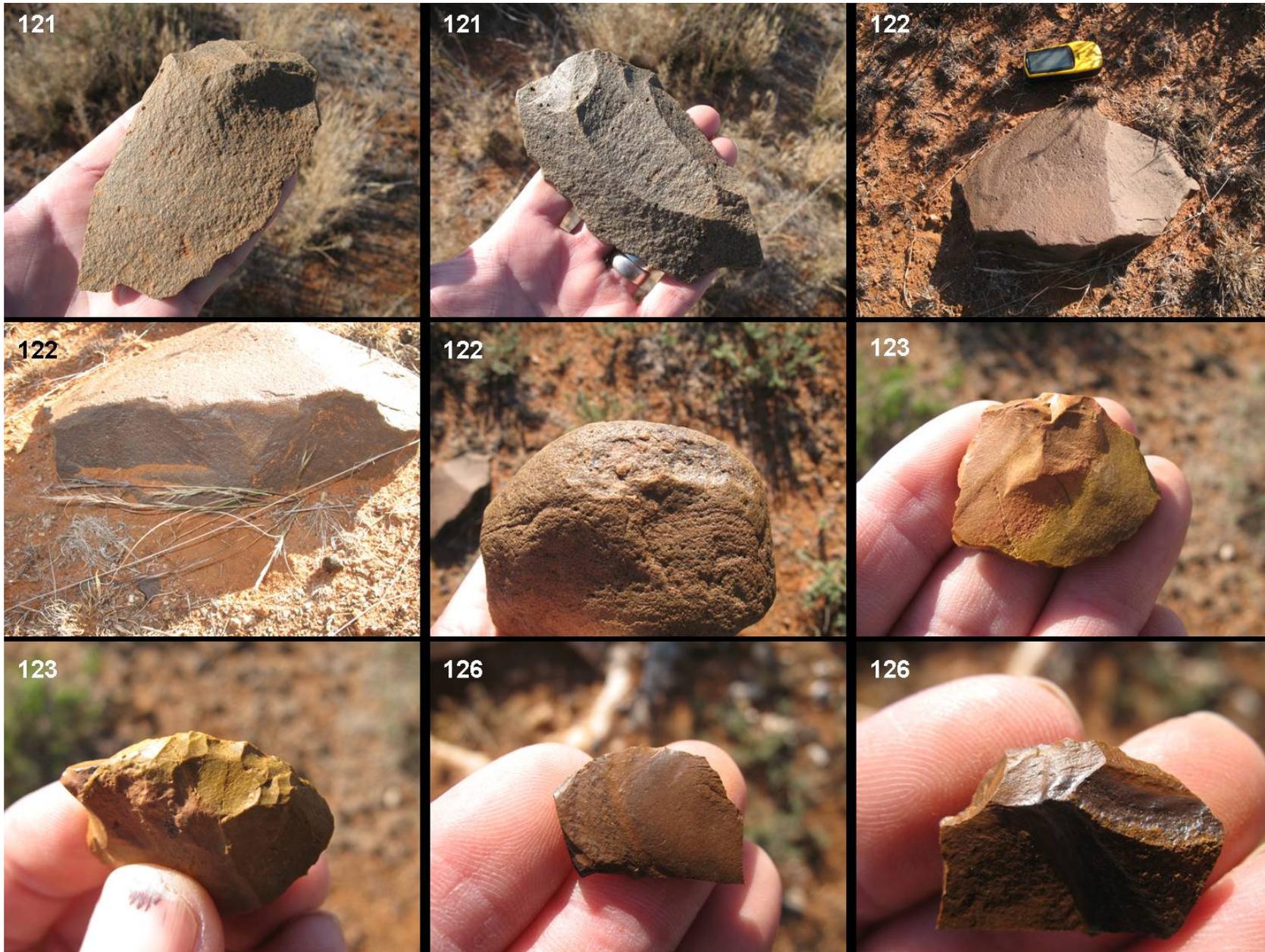


Plate 8. Examples of raw materials, prepared platforms, core, hammer stone and scrapers.



Plate 9. Examples of raw materials, adze/notched piece, disc core, convergent flake, cores and quartz hammer stone.

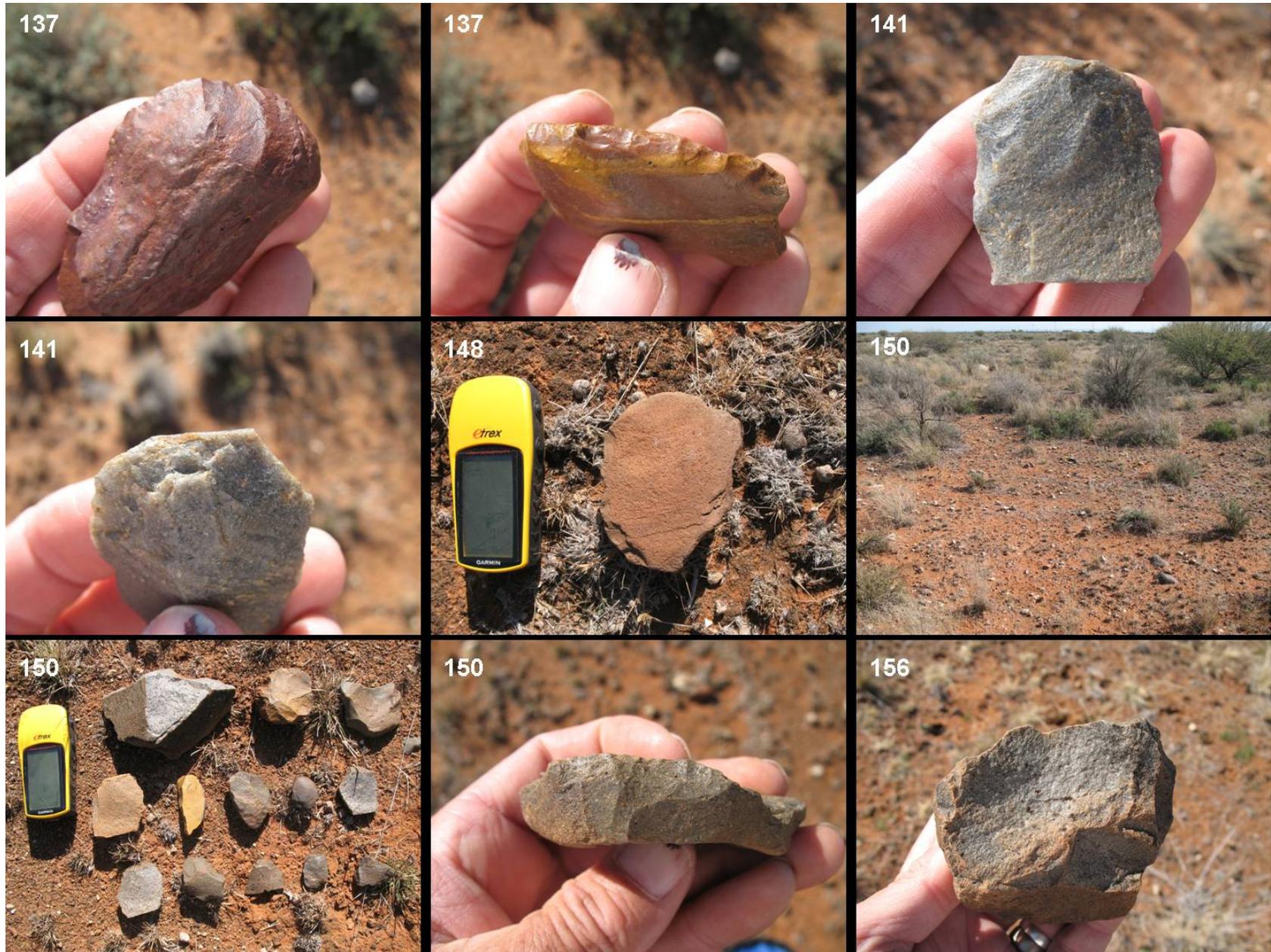


Plate 10. Examples of raw materials, scrapers, prepared/faceted platform, cores, stone artefacts and gravels.



Plate 11. Examples of raw materials, cores, convergent flake/point, hammer stone and scraper.



Plate 12. Examples of raw materials, blade, cores, gravels and Fauresmith hand axe.



Plate 13. Examples of raw materials, stone artefacts, scrapers, cores, gravels and adzes/notched pieces (see Figure 5 and Table 2).



Plate 14. Examples of raw materials, scrapers, adzes and a calcrete encrusted hammer stone (see Figure 5 and Table 2).



Plate 15. Examples of raw materials, adzes, alluvial gravels, scrapes, Fauresmith hand axe and flaked calcrete (see Figure 5 and Table 2).



Plate 16. Examples of raw materials, flaked calcrete, microlithic core, stone artefacts, gravels and cores. Note heavily weathered ESA piece [426].