Phase 1 Heritage Impact Assessment of a proposed new Waste Disposal Site in Luckhof, Free State Province.

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Summary

A Phase 1 Heritage Impact Assessment was carried out for a proposed new waste disposal site outside Luckhof in the Free State Province. The assessment area and a partially overlapping proposed alternative site respectively covers 25 ha of open grassland terrain, with a total footprint of about 40 ha, situated approximately 1.5 km northeast of the town's CBD. The study is located on low relief terrain, underlain by resistant dolerite bedrock and buffered by well-developed aeolian sand and localized calcretes in places. Both sites are underlain by palaeontologically insignificant dolerite capped by a non- fossil-bearing regolith. As far as the palaeontological heritage is concerned development of the primary assessment area can proceed provided that all landfill activities are restricted to within the boundaries of the development footprint. A foot survey of the sites revealed no evidence of Stone Age open sites, prehistoric settlement structures, rock engravings, graves or historically significant buildings older than 60 years within the boundary of both areas. As far as the archaeological heritage is concerned, the proposed footprints are General Protection C. Proposed development of the primary assessment area can proceed if all landfill activities are restricted to within the boundaries of the proposed assessment area.

Introduction

A Phase 1 Heritage Impact Assessment was carried out for a proposed new landfill site outside Luckhof in the Free State Province (**Fig. 1**). The assessment is required as a prerequisite for new development in terms of the National Heritage Resources Act (NHRA) 25 of 1999. 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. The NHRA 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 relevant to the proposed development are listed in Section 34 (1), Section 35 (4), Section 36 (3) and Section 38 (1) of the NHR Act and are as follows:

34. (1) No person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority.

35 (4) No person may, without a permit issued by the responsible heritage resources authority—

- destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;
- *b)* destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;

36 (3) No person may, without a permit issued by SAHRA or a provincial heritage resources authority—

- (a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;
- (b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or

- (c) bring onto or use at a burial ground or grave referred to in paragraph *(a)* or *(b)* any excavation equipment, or any equipment which assists in the detection or recovery of metals.

38 (1) Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as—

- 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

a) exceeding 5000 m² in extent; or

b) involving three or more existing erven or subdivisions thereof; or

c) involving three or more subdivisions thereof which have been consolidated within the past five years;

- The rezoning of a site exceeding 10 000 m²; or
- Any other category of development provided for in regulations by the South African Heritage Resources Agency (SAHRA).

Terms of Reference

The task involved the following:

- 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.

Methodology

The heritage significance of the affected area was evaluated based on existing field data, database information, published literature, maps and aerial photographs (incl. Google Earth). This was followed by a field assessment using a Garmin Etrex Vista GPS hand model (set to the WGS 84 map datum) and a digital camera for recording purposes. Site significance classification standards prescribed by SAHRA (2005) were used to indicate overall significance and mitigation procedures where relevant (**Table 1**).

Locality Data

The assessment area and a partially overlapping proposed alternative site each covers 25 ha of open grassland terrain, with a total footprint of about 40 ha situated approximately 1.5 km northeast of the town's CBD **(Fig. 2 - 5**).

Map Reference:

1:50 000 topographical map 2924DB Luckhof North

1:250 000 geological map 2924 Koffiefontein

Site Coordinates (**Fig. 3**):

Proposed Assessment Area:

A) 29°44'14.78"S 24°47'52.69"E
B) 29°44'6.19"S 24°48'13.30"E
C) 29°44'20.33"S 24°48'16.47"E
D) 29°44'27.04"S 24°47'56.59"E

Proposed Alternative:

1) 29°44'7.40"S 24°47'54.94"E
2) 29°44'2.46"S 24°48'17.17"E
3) 29°44'13.41"S 24°48'25.65"E
4) 29°44'18.89"S 24°48'3.60"E

Geology

Luckhof is for the most part underlain by resistant Jurassic dolerite intrusions (*Jd*), that has intruded argillaceous rocks of the Permian Tierberg Formation (*Pt*) capped by geologically recent aeolian sand (Qs) and alluvium (flying bird symbol) (**Fig. 6**). The doleritic dykes and sills (*Jd***)** determine the relief in the region while the Tierberg formation represents the uppermost unit of the Ecca Group (Karoo Supergroup) and primarily comprises well-laminated, dark shales with abundant carbonate concretions, inter-bedded by siltstones and fine-grained sandstones (Zawada 1992).

Background

Palaeontology

Fossils from the Tierberg Formation are poorly represented and occur mainly as sparsely distributed and generally not diverse assemblages of trace fossils (Anderson 1976; De Beer *et al*. 2002; Viljoen 2005; Johnson *et al.* 2006). These ichno-assemblages include arthropod trackways and associated resting impressions, fish

swimming trails, horizontal epichnial furrows often attributed to gastropods, as well as a variety of different kinds of small burrows. Impressions of *Gondwanidium validum* and pieces of *Dadoxylon* have been discovered between Douglas and Belmont, south of Kimberley (McLaren 1976). Sponge spicules, fish scales and disarticulated microvertebrate remains from calcareous concretions have also been recorded (Zawada 1992).

Overbank deposits and alluvial terraces along the Riet River near Koffiefontein have previously yielded numerous Quaternary vertebrate fossil remains, including the remains of extinct bovids such as *Pelorovis antiquus*, *Megalotragus priscus* and *Antidorcas bondi* (Rossouw 2000). Large mammal fossil localities and Later Stone Age sites have been recorded along the Riet River on the farms Middelfontein Uitdraai, Good Hope Poortjie and Wagenmakersdrift (Rossouw 2000, **Fig.** 7).

Archaeology

Overbank deposits and alluvial terraces along the Riet River north of Luckhof yielded Middle and Later Stone Age open sites and surface occurrences, rock engravings and prehistoric pastoralist settlement sites, as well as structural remnants, and artifacts dating back to the Anglo Boer War (Goodwin and Van Riet Lowe 1929; Van Riet Lowe 1941; Maggs 1971). Stone Age archaeological sites in the region are generally associated with river courses and areas where dolerite outcrop occur especially in the vicinity of Goemansberg and Joostenberg (Goodwin and Van Riet Lowe 1929; L Rossouw pers. obs., **Fig. 7**). Dolerite outcrop can be regarded as archaeologically significant since Stone Age artifacts in the region are mostly made of hornfels, a fine-grained isotropic rock found in the hot-contact zone between the dolerites and shales in the area. As a result, stone tool knapping sites are commonly found near dolerite-shale contact zones. In addition, rock engravings on dolerite are fairly common in the region, with recordings made on several farms between Koffiefontein and Luckhof. A previously reported early Middle Stone Age stone tool knapping site, is found widely distributed as a surface scatter lag deposit, about 800 m south of the proposed assessment area (Rossouw 2018; **Fig. 8**).

Field assessment

Both the proposed assessment area and alternative site are located on low relief terrain, underlain by resistant dolerite bedrock (*Jd*) and buffered by well-developed aeolian sand (*Qs*) and localized calcretes (*Qc*) in places (**Fig. 9)**. Dolerite, in the form of dykes

and sills, is common throughout the region. Regarded as feeders of Drakensberg lavas, dolerites are not palaeontologically significant.

There is no evidence for the accumulation and preservation of intact fossil material within the Quaternary sediments (topsoils) and the likelihood of finding fossil vertebrate fauna within the geologically recent superficial deposits at the site are considered very low to non-existent. A foot survey of the sites revealed no evidence of Stone Age open sites, prehistoric settlement structures, rock engravings, graves or historically significant buildings older than 60 years within the boundary of both areas.

Impact Statement & Recommendation

Both sites are underlain by palaeontologically insignificant dolerite capped by a non-fossil-bearing regolith. As far as the palaeontological heritage is concerned development of the primary assessment area can proceed provided that all landfill activities are restricted to within the boundaries of the development footprint. As far as the archaeological heritage is concerned, the proposed footprints are General Protection C (**Table 1**). Proposed development of the primary assessment area can proceed if all landfill activities are restricted to within the boundaries of the proposed assessment area.

References

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DECLARATION OF INDEPENDENCE

I, Lloyd Rossouw, declare that I act as an independent specialist consultant. I do not have 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. I have no interest in secondary or downstream developments resulting from the authorization of this project and have no conflicting interests in the undertaking of the activity.

Tables & Figures

Table 1. 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

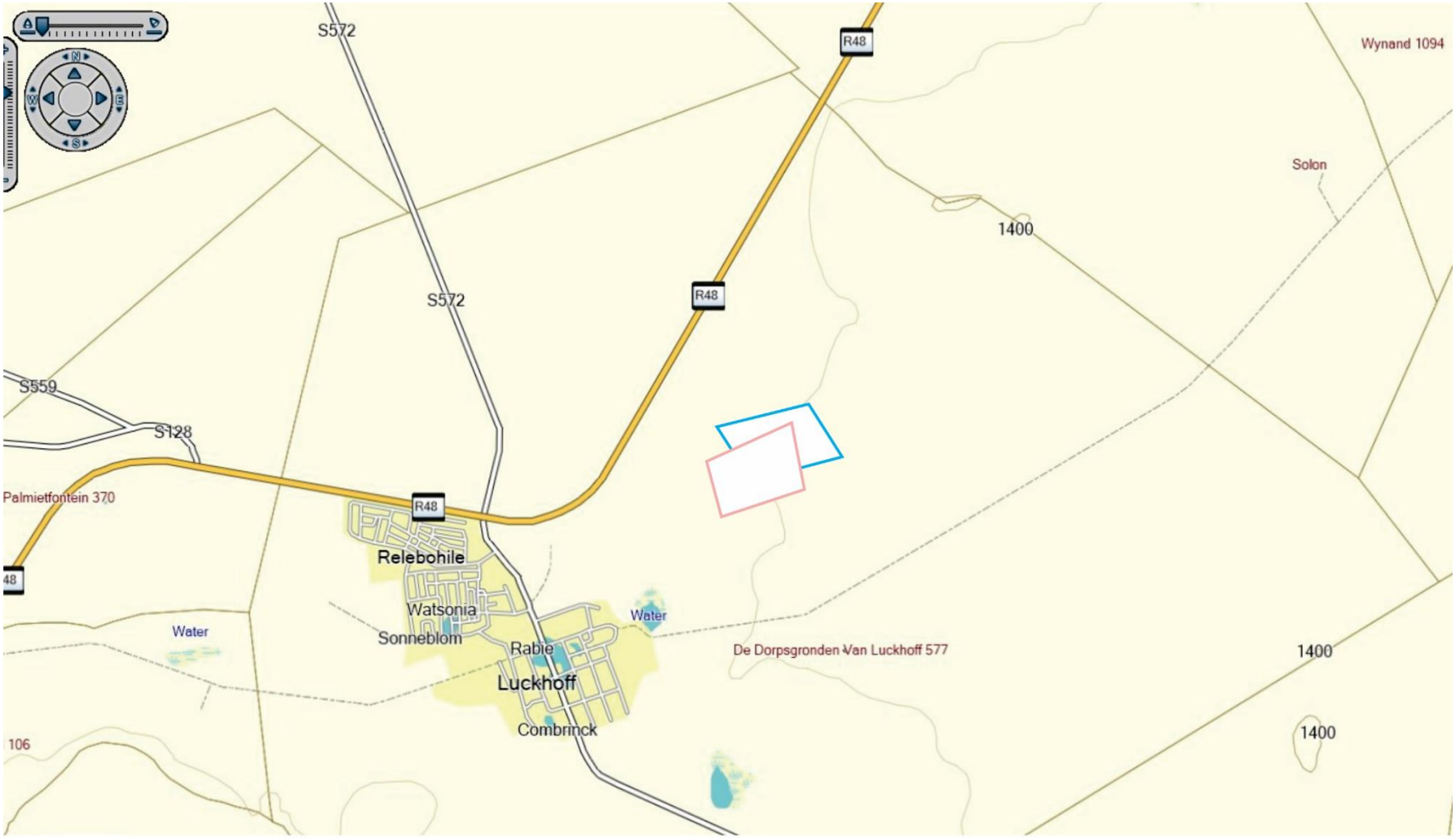

Figure 1. Map of the proposed landfill sites (portion of 1:50 000 scale topographic 2924DB Luckhof North.)

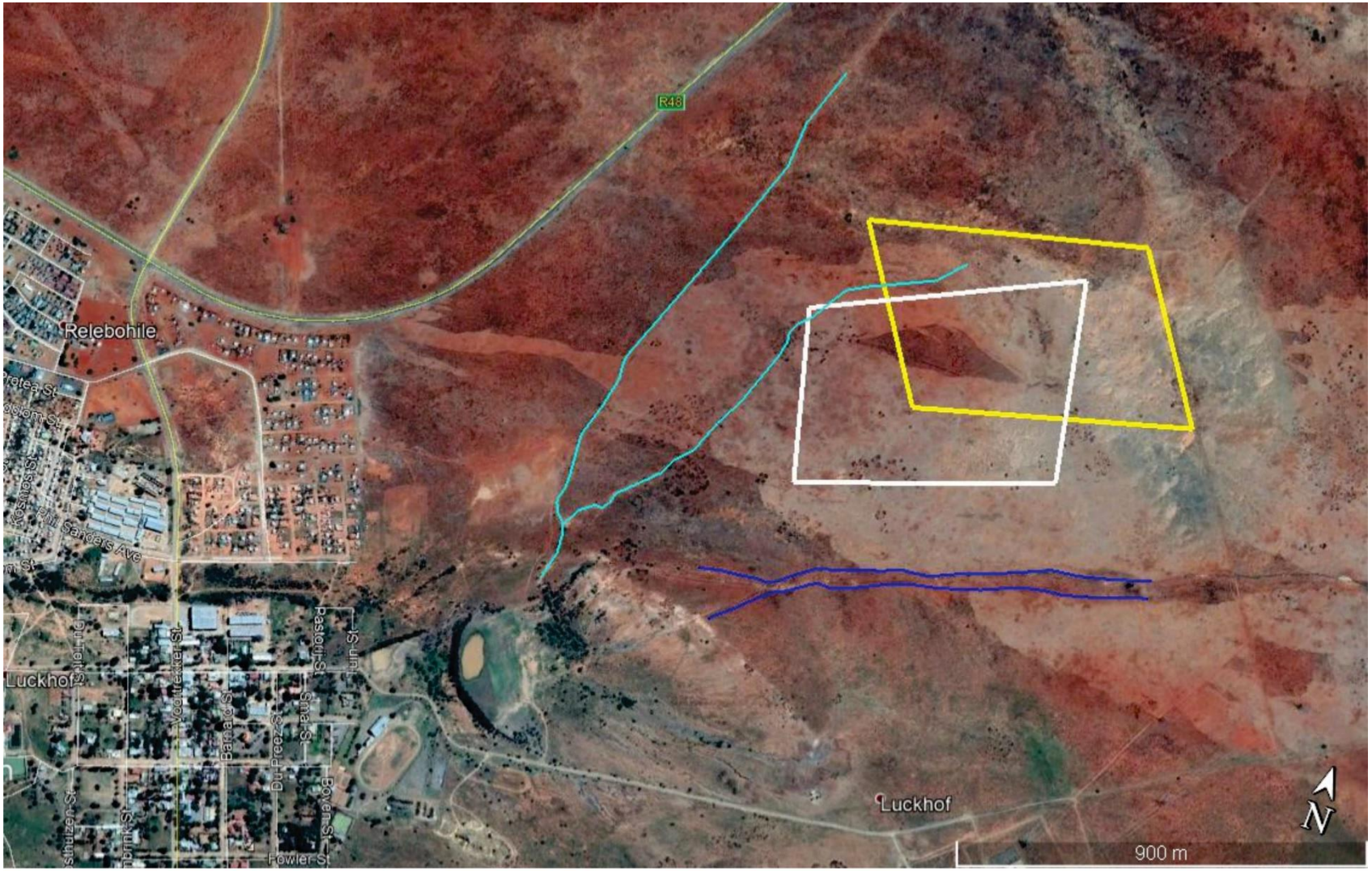

Figure 2. Aerial view of the proposed Assessment area (white polygon) and Alternative site (yellow polygon).

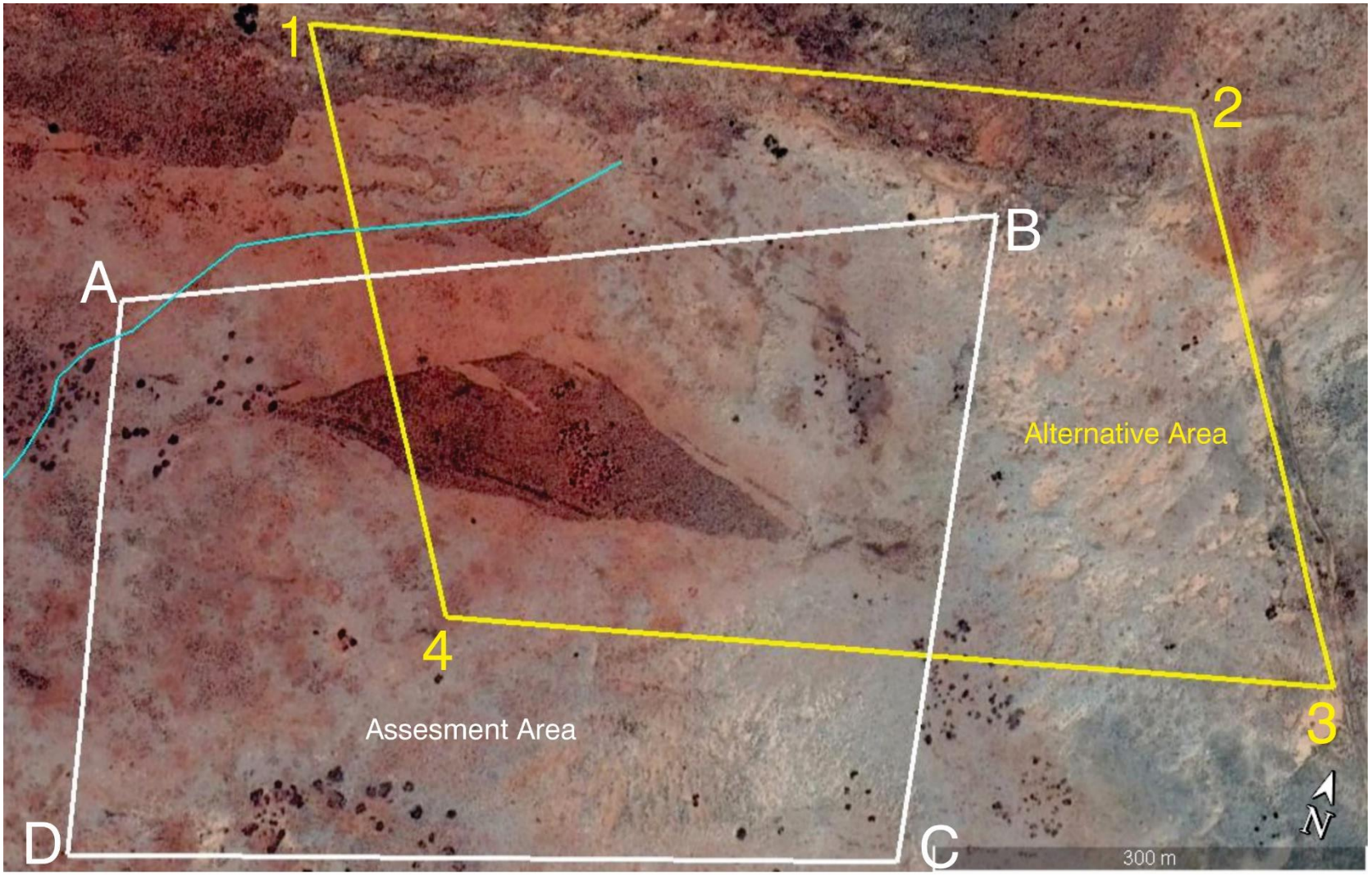

Figure 3. Layout of proposed Assessment area (white polygon) and Alternative site (yellow polygon).

Figure 4. General view of Site Alternative looking west (above) and south (below).

Figure 5. General view of proposed Assessment Area, looking west (above) and south (below).

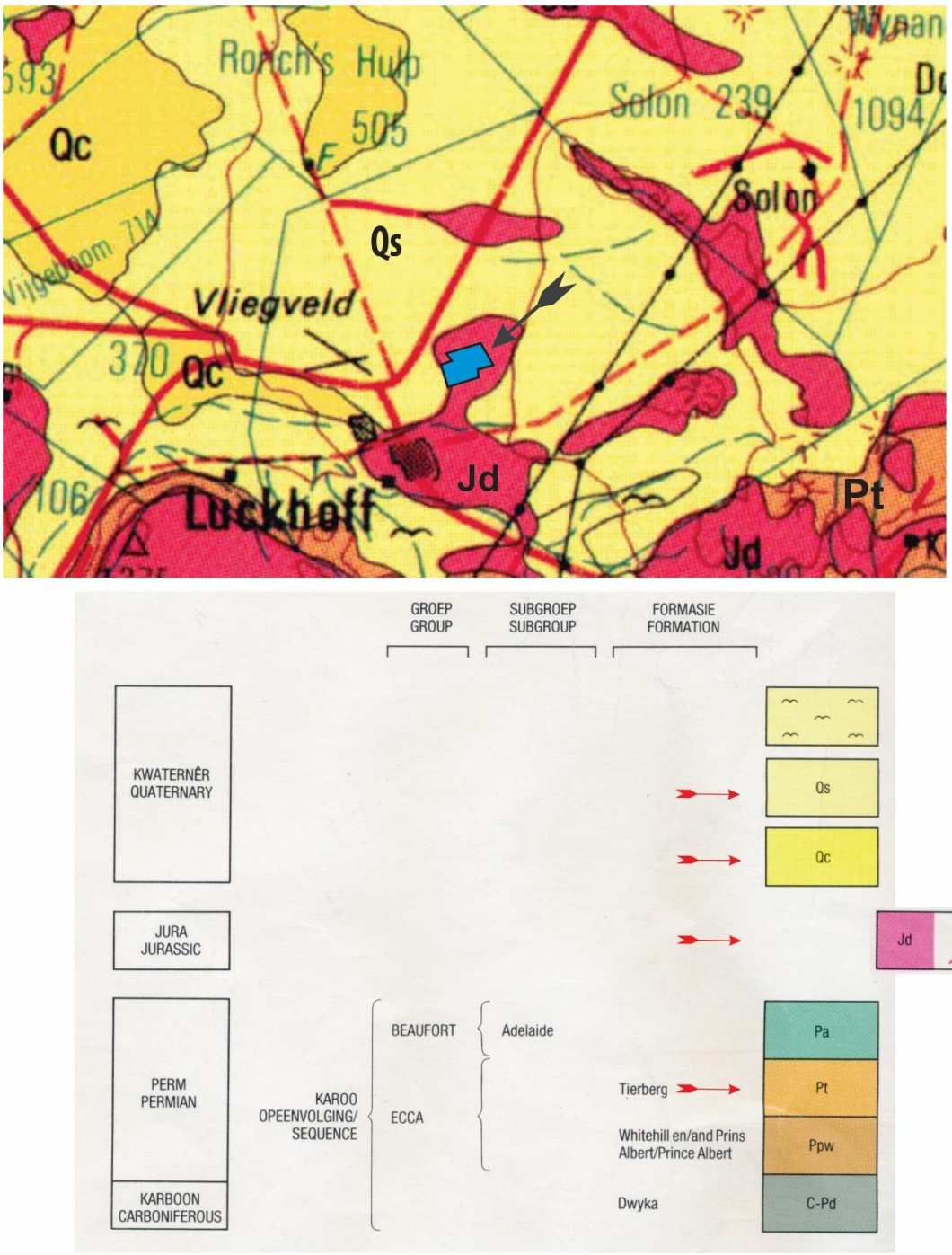

Figure 6. Portion of 1:250 000 scale geological map 2924 Koffiefontein showing relevant underlying geology (marked by arrows in legend) and site positions (blue polygon).

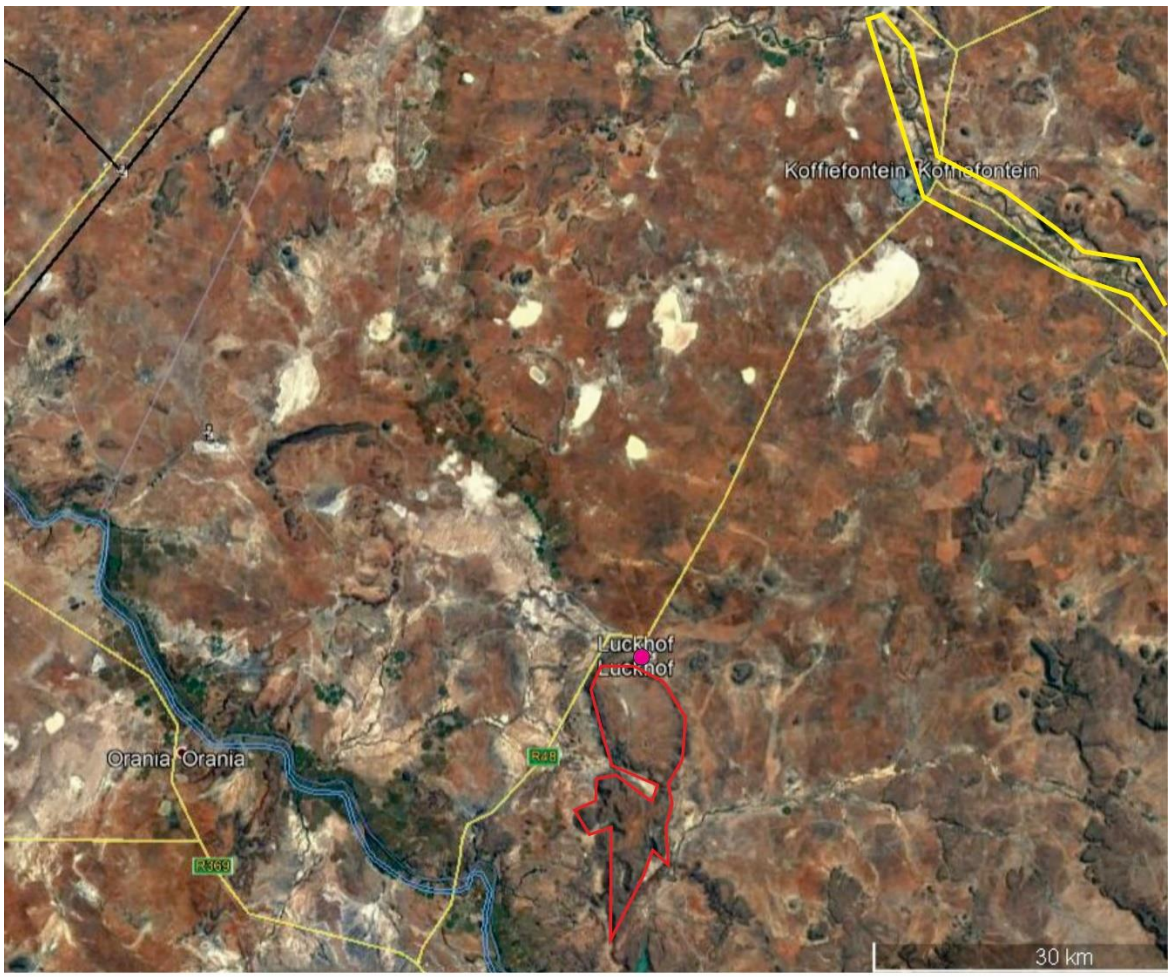

Figure 7 Known archaeologically significant areas in the region including fluvial settings (yellow line) and inselbergs (red line).

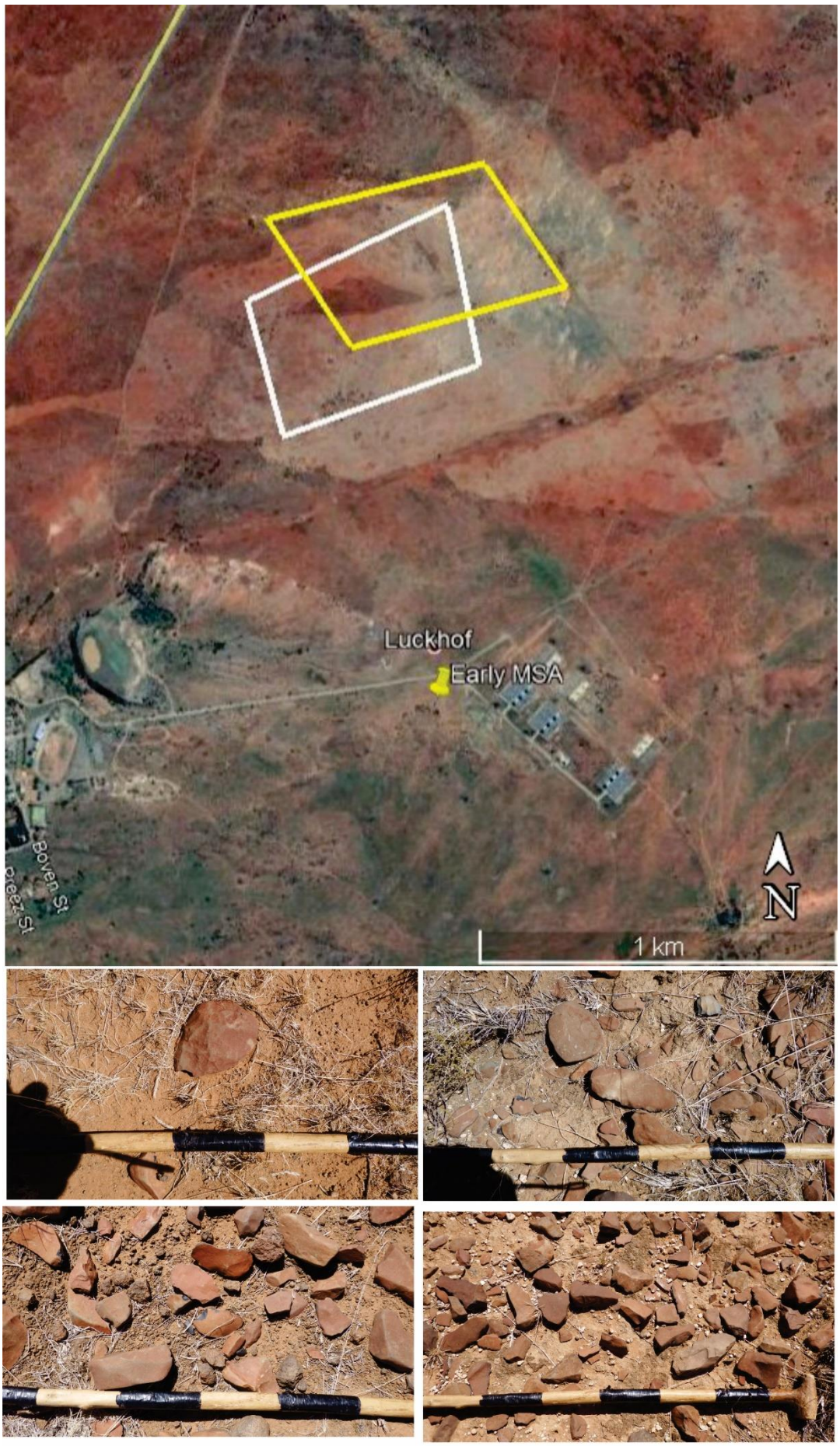

Figure 8. EMSA stone tool concentrations located 800 m south of study area. Photograph scale 1 = 10 cm.

Figure 9 Bedrock dolerite intrusions (*Jd*, left) capped by geologically recent aeolian sand (*Qs*) and localized calcretes (*Qc*, right)
Scale 1 = 10 cm.