

Phase 1 Palaeontological and Archaeological Impact
Assessment of the proposed township extension at
Phahameng, Bultfontein, Free State Province.



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Executive Summary

- At the request of Phethogo Consulting in Bloemfontein, a Phase 1 Palaeontological and Archaeological Impact Assessment was carried out at a 25 ha site demarcated for the development of 426 erven on Portion of the Remainder of the farm Bultfontein 396 in Bultfontein.
- The affected area is made up of disturbed, open veld as well as a disused borrow pit situated south of Bultfontein town and northeast of the Phahameng Township, with Bultfontein Pan forming its eastern boundary.
- The site is primarily underlain by dolerite bedrock capped by a calcified hardpan horizon. Probability of impact on Karoo fossils is considered unlikely.
- There is no evidence of intact or capped Stone Age archaeological material or Quaternary fossil remains within the confines of the affected areas. There are no indications of rock engravings or graves within the affected area.
- Five rectangular stone foundations were recorded during the pedestrian survey. The structures were mapped and recorded in terms of conditions necessary for a Phase 1 archaeological impact assessment.
- The heavily disturbed nature of the overlying regolith in the study area further implies that any Quaternary fossil remains or intact Stone Age archaeological material will have been destroyed, damaged or moved as a result of historical human activities in the area.
- The site is graded General Protection C (Field Rating IV C).

Contents

Executive Summary	2
Introduction	4
Methodology	4
Description of the Affected Area	4
Locality data.....	4
Geology.....	5
Background	5
Karoo Fossils	5
Karoo Dolerites	5
Late Cenozoic Deposits	6
Results of Survey	6
Impact Statement Recommendation	7
References	7
Tables & Figures	9

Introduction

At the request of Phethogo Consulting in Bloemfontein, a Phase 1 Palaeontological and Archaeological Impact Assessment was carried out at a 25 ha site demarcated for the development of 426 erven on Portion of the Remainder of the farm Bultfontein 396 in Bultfontein, Free State Province (**Fig. 1-2**) The extent of the proposed development (over 5000 m²) falls within the requirements for a Heritage Impact Assessment (HIA) as required by Section 38 (Heritage Resources Management) of the South African National Heritage Resources Act (Act No. 25 of 1999). The site visit and subsequent assessment took place during October 2013. The task involved identification of possible archaeological and paleontological sites or occurrences in the proposed zone, an assessment of their significance, possible impact by the proposed development and recommendations for mitigation where relevant.

Methodology

The assessment consists of a desktop study as well as pedestrian survey of the site. The desktop study provides an assessment of known and potential palaeontological and archaeological heritage within the study area. The assessment is based on existing field data and published scientific literature. The geology represented within the study area was determined from published literature and associated geological maps. Relevant archaeological and palaeontological information were assimilated for the report and integrated with data acquired during the on-site inspection.

Description of the Affected Area

Locality data

Maps: 1:50 000 topographical map 2826 AC Bultfontein

1:250 000 geological map 2826 Winburg

The affected area is made up of disturbed, open veld as well as a disused borrow pit situated south of Bultfontein town and northeast of the Phahameng Township, with Bultfontein Pan forming its eastern boundary (**Fig. 3 – 4; Table 1**). A modern graveyard is located at the southern periphery of the study area at 28°18'11.05"S 26° 9'17.16"E. The town of Bultfontein was established on the farm Bultfontein in 1874

following a decision by the Free State government in 1864 to institute a new town between Bloemfontein and Hoopstad.

Geology

The geology of the region has been described by Nolte (1995; 1: 250 000 scale geological map 2826 Winburg, Council for Geoscience, Pretoria, 1995). The area in question is underlain by sediments of widely different geological ages (**Fig. 5, Table 2**). Substantial exposures of Permian Ecca shales (Tierberg Formation., *Pt*) are located about 3 km to the south-east of the study area. The surrounding area is underlain by intrusive Jurassic dolerites (*Jd*, Karoo Dolerite Suite) and covered by late Cenozoic regolith. The regolith is made up of Quaternary calcretes, surface limestones, calcified pandunes (*Qc*) and aeolian sands (*Qs*) (Kalahari Group). The wind-blown sands represent the latest geological phase and are made up of the characteristically red-brown Kalahari sands (Hutton sands).

Background

Karoo Fossils

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 micro-vertebrate remains from calcareous concretions have also been recorded (Zawada 1992, Bosch 1993).

Karoo Dolerites

Dolerite, in the form of dykes and sills, is common throughout the region. Regarded as feeders of Drakensberg lavas, dolerites have no palaeontologically potential. It is however moderately significant from an archaeological point of view as many Stone Age quarry sites (“factory” sites) are found at the foot of dolerite hills where hornfels or other metasediments may be exposed as a result of contact metamorphism.

Late Cenozoic Deposits

Quaternary-age surface deposits in the region can be highly fossiliferous in places, especially those that are directly related to fluvial environments, springs or pans (**Fig. 6**). Fossil assemblages are frequently made up of an assortment of mammalian bones and teeth and associated stone tools. Intrusive features such as fossilized hyena lairs are sometimes located outside the present river valleys along calcified pan dunes (Scott & Brink 1991). Spring deposits, such as the archaeologically rich spring mound sediments at Florisbad northwest of Bloemfontein and Baden Baden north of Dealesville, may contain late Pleistocene mammal vertebrate remains, coprolites, plant microfossils (pollen and phytoliths) and *in situ* stone tool artefacts (Brink 1988; Scott & Rossouw 2005) (**Fig. 7**).

Fluvially derived overbank sediments of the Vet River and Modder Rivers east and south of Bultfontein respectively, contain fossil remains of a variety of extinct mammals, and associated coprolites (Churchill *et al.* 2000) (**Fig. 8**). In addition, the alluvial sediments are also valuable sources of open-site Stone Age archaeological assemblages. The Stone Age archaeological footprint in the region is largely represented by the occurrence of open-site, Middle Stone Age (MSA) and Later Stone Age (LSA) assemblages eroding out of dongas in the overbank sediments (Rossouw 2006; De Ruiter *et al.* 2011) (**Fig. 9**).

There are no records of rock engravings in the vicinity of the survey area. Bultfontein is situated outside the periphery of distribution of Late Iron Age settlements in the Free State. Ruins of Late Iron Age settlements are found on several farms between 80 km and 100 km to the east and northeast of Bultfontein, such as the stone kraal settlements at Doornpoort near Winburg and the large settlement complex at Strydfontein between Hennenman and Ventersburg (Maggs 1976; **Fig.10**).

Results of Survey

The site is primarily underlain by dolerite bedrock capped by a calcified hardpan horizon (**Fig. 11 - 12**). Superficial deposits consist of Quaternary-age aeolian sands and residual soils (topsoils) (**Fig. 13**). The terrain is extensively disturbed and is currently being used as a grazing area for cattle (**Fig. 14 - 15**). There is no evidence of intact or capped Stone Age or Iron Age archaeological material or Quaternary fossils within the confines of the footprint. There are no indications of prehistoric structures

or rock engravings within the footprint area. There is also no evidence of graves, graveyards within the confines of the footprint.

The remains of five rectangular stone foundations have been recorded and mapped, but there is no indication of ash heaps / rubbish dumps associated with these structures. (**Table 3; Fig. 16**). Given their localities, the foundations are in all likelihood associated with the remains of an earlier township development (**Fig. 17**).

Impact Statement Recommendation

Probability of impact on Karoo fossils is considered unlikely. The heavily disturbed nature of the overlying regolith in the study area further implies that any Quaternary fossil remains or intact Stone Age archaeological material will have been destroyed, damaged or moved as a result of historical human activities in the area.

The likelihood of negative impact on palaeontological or Stone Age archaeological heritage on the superficial sediments during the construction phase of the development is considered to be negligible.

The site is graded General Protection C (Field Rating IV C).

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Tables & Figures

Table 1. Site coordinates.

Waypoint	Coordinates
A	28°17'43.34"S 26° 9'6.52"E
B	28°17'34.15"S 26° 9'22.36"E
C	28°17'28.54"S 26° 9'31.89"E
D	28°17'30.27"S 26° 9'46.22"E
E	28°17'57.05"S 26° 9'32.43"E
F	28°17'52.59"S 26° 9'10.57"E
G	28°18'7.15"S 26° 9'12.25"E

Table 2. Summary of potential impacts at the site.

Rock type / Age	Duration of Development	Palaeontological Significance of rock type	Archaeological Significance of rock type	Palaeontological Impact at site	Archaeological Impact at site
Residual soils (Quaternary)	Permanent	Low	High	Low	Low
Dolerite Karoo Dolerite Suite, <i>Jd</i> (Jurassic)	Permanent	None	Moderate (factory sites)	None	Low
Shales, Tierberg Formation (Permian)	Permanent	Moderate -Low	None	Low	Low

Table 3. Position of rectangular stone foundations.

GPS #	Coordinates
509	S28 17 50.4 E26 09 27.6
510	S28 17 51.5 E26 09 27.9
511	S28 17 48.9 E26 09 19.9
512	S28 17 48.3 E26 0 9 30.3
513	S28 17 48.0 E26 09 24.1

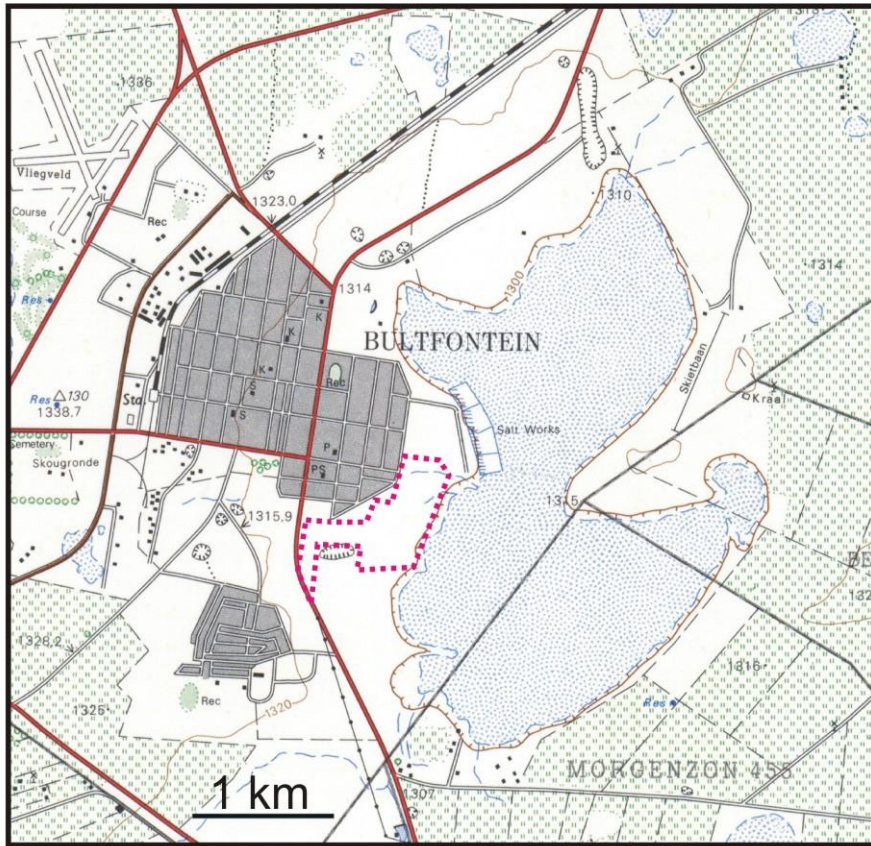


Figure 1. Portion of 1:50 000 scale topographic map of Bultfontein (2826 AC Bultfontein).



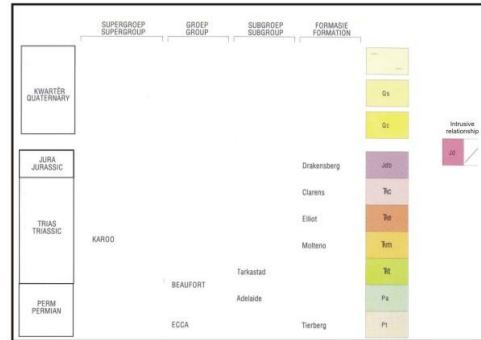
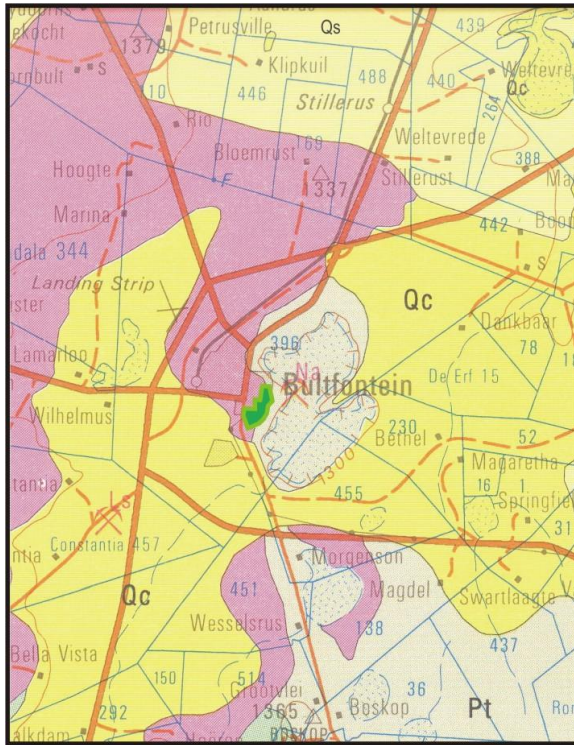
Figure 2. Layout of proposed development.



Figure 3. Aerial view of the study area.



Figure 4. The study area looking north (top), northeast (middle) and southwest (bottom) towards Bulfontein Pan.



 Study area

Figure 5. Portion of 250 000 scale geological map 2826 Winburg. Substantial exposures of Permian Ecca shales (Tierberg Formation., *Pt*) are located about 3 km to the south-east of the study area. The study area itself is underlain by intrusive Jurassic dolerites (*Jd*, Karoo Dolerite Suite) and covered by late Cenozoic regolith.

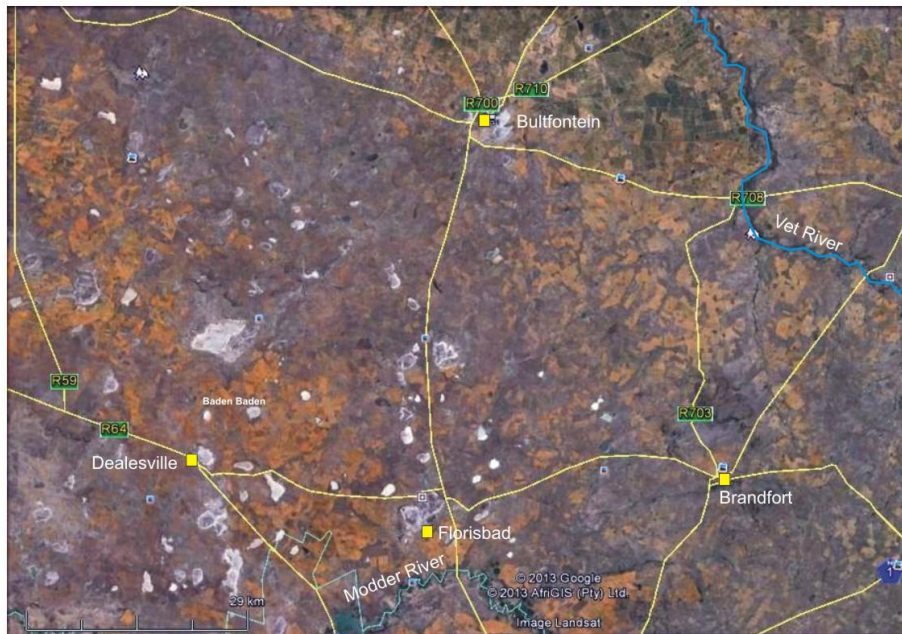


Figure 6. Major rivers pans and spring sites in the region of Bultfontein.



Figure 7. The palaeontological and archaeological exposures at Florisbad (left) and Baden Baden (right).



Figure 8. Late Pleistocene alluvial deposits along the Modder River (A) containing lower molar of extinct giant wildebeest *Megalotragus priscus* (B) and giant buffalo *Homoioceras antiquus* (C) and fossilized carnivore coprolite (D).



Figure 9.A Middle Stone age flake blade (left) and Later Stone Age core (right) eroding from dongas along the Modder River.



Figure 10. Large settlement complex between Hennenman and Ventersburg (Maggs' Type Z type site OXF1).



Figure 11. Dolerite outcrop blanketed by superficial Quaternary deposits.



Figure 12. Calcified hardpan exposures



Figure 13. Superficial deposits consist of Quaternary-age aeolian sands and residual soils (topsoils).



Figure 14. Modern structures recorded during the foot survey include a culvert (top), a 2m x 5m concrete slab (middle) and assorted pieces of concrete rubble (below).



Figure 15. Informal dwelling and cattle kraal (28°17'52.73"S 26° 9'27.51"E)

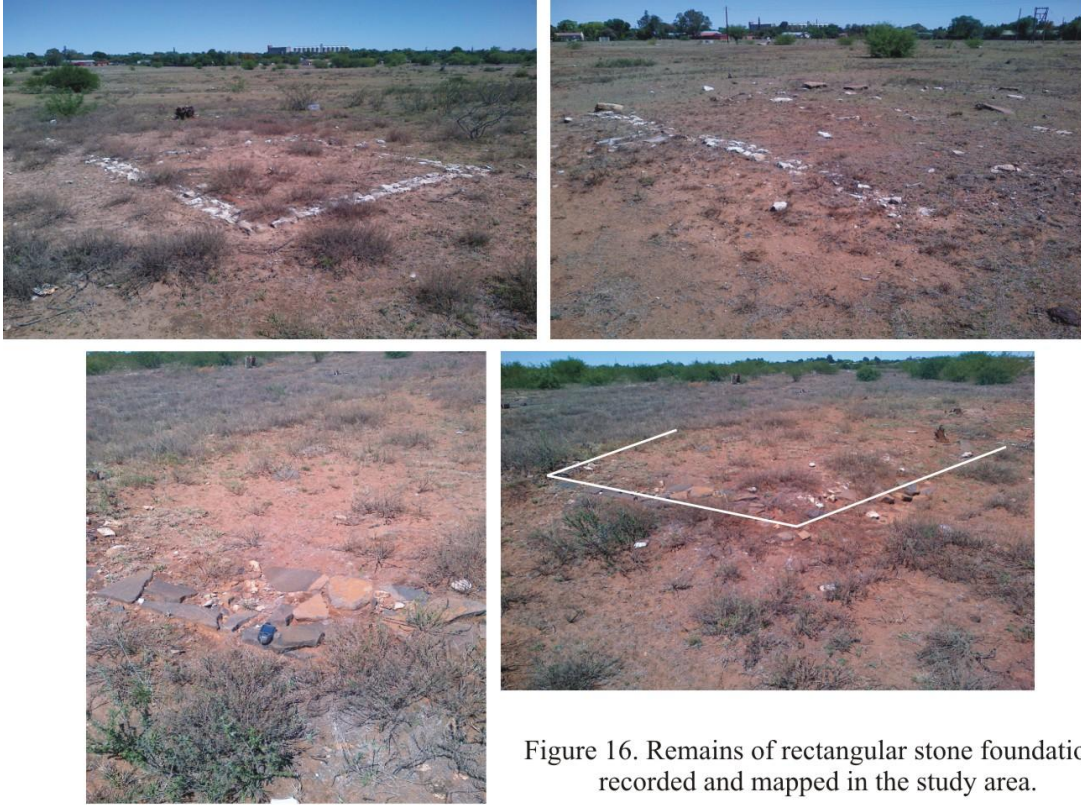


Figure 16. Remains of rectangular stone foundations recorded and mapped in the study area.

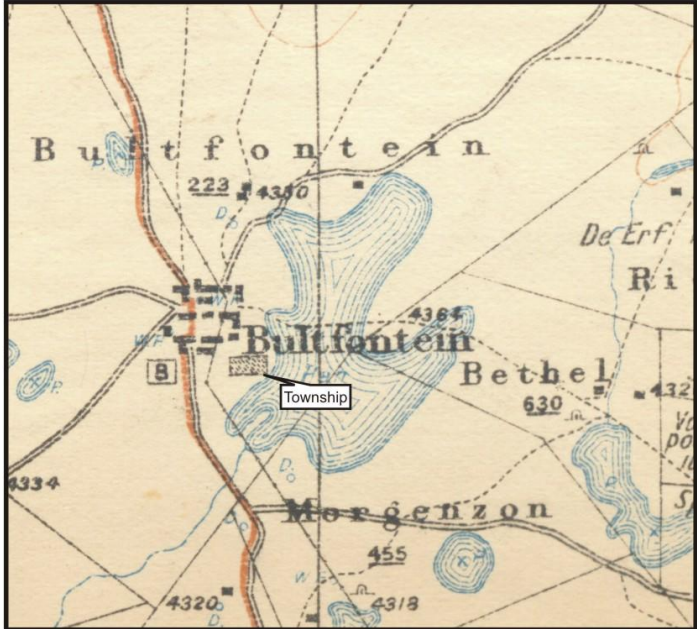


Figure 17. Portion of 1:125 000 scale topographic map of Bultfontein ca. 1922.