

HERITAGE IMPACT ASSESSMENT FOR FOUR PROPOSED BORROW PITS ON REMAINDER OF FARM VOGELSTRUISBULT 104/1, PRIESKA MAGISTERIAL DISTRICT, NORTHERN CAPE

Required under Section 38 (8) of the National Heritage Resources Act (No. 25 of 1999).

Report for:

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02 February 2015

EXECUTIVE SUMMARY

ASHA Consulting (Pty) Ltd was appointed by EnviroSci Africa cc to conduct an assessment of the potential impacts to heritage resources that might occur through the proposed development of four borrow pits on the remainder of Portion 1 of the farm Vogelstruisbult 104 near Copperton, in the Prieska Magisterial District. The excavated materials will be to supply the renewable energy industry. The four pits are known as the Blue Rock Quarry, Borrow Pit 1, Borrow Pit 2 and the Red Sand quarry.

The Red Sand Quarry had a sandy substrate with exposed hardpan, while the other three sites tended to have calcrete gravel on their surfaces. The latter three had background scatter artefacts within their footprints, but the Red Sand Quarry had a number of exposed areas of Middle Stone Age artefact scatter within its area. This scatter is potentially very informative on the local MSA sequence and would be destroyed by the proposed mining. Because the site is located within an old water course, there is a chance that further buried artefact horizons may be present beneath the surface and that fossil bones might even be associated with such horizons. A desktop study has shown that the most significant archaeological and palaeontological resources in the area are generally associated with pans and water courses. In general, palaeontological resources are expected to be of low significance and likely very sparsely present.

It is concluded that the Blue Rock Quarry, Borrow Pit 1 and Borrow Pit 2 will all experience impacts of very low significance and may proceed with no further actions required. At the red Sand Quarry the impacts are likely to be of medium significance with no mitigation, but with mitigation the impacts would be reduced to very low significance because, although the site would be destroyed, the scientific data represented by the archaeological artefacts would have been rescued and curated for future study.

It is recommended that the proposed mining be allowed to continue at the Blue Rock Quarry, Borrow Pit 1 and Borrow Pit 2 with no further heritage work required. The Red Sand Quarry, however, should have archaeological mitigation carried out prior to excavation expanding beyond the current mining area. The following recommendations are proposed:

- Archaeological mitigation (collection of artefacts) and test excavations must be carried out within the Red Sand Quarry area;
- Staff should be instructed to be alert for any obvious fossil occurrences and to protect and report these as soon as possible; and
- If any fossils, archaeological material or human burials are uncovered during the course of development then work in the immediate area should be halted and the material protected *in situ* as far as is possible. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist or palaeontologist as appropriate. Such heritage is the property of the state and may require excavation and curation in an approved institution.

Glossary

Background scatter: Artefacts whose spatial position is conditioned more by natural forces than by human agency

Early Stone Age: Period of the Stone Age extending approximately between 2 million and 20 000 years ago.

Later Stone Age: Period of the Stone Age extending over the last approximately 20 000 years.

Middle Stone Age: Period of the Stone Age extending approximately between 200 000 and 20 000 years ago.

Pleistocene: The geological period beginning approximately 2.5 million years ago and ending about 12 000 years ago.

Abbreviations

ASAPA: Association of Southern African Professional Archaeologists

BAR: Basic Assessment Report

CRM: Cultural Resources Management

DMR: Department of Mineral Resources

EIA: Environmental Impact Assessment

ESA: Early Stone Age

GPS: global positioning system

HIA: Heritage Impact Assessment

LSA: Later Stone Age

MPRDA: Minerals and Petroleum Resources Development Act (No. 28) of 2002.

MSA: Middle Stone Age

NHRA: National Heritage Resources Act (No. 25) of 1999

SAHRA: South African Heritage Resources Agency

SAHRIS: South African Heritage Resources Information System

Contents

1. INTRODUCTION	1
1.1. Project descriptions	2
1.1.1. Blue Rock Quarry	2
1.1.2. Borrow Pit 1	2
1.1.3. Borrow Pit 2	2
1.1.4. Red Sand Quarry	2
1.2. Terms of reference	2
1.3. Scope and purpose of the report	2
1.4. The author	3
1.5. Declaration of independence	3
2. HERITAGE LEGISLATION	3
3. METHODS	4
3.1. Literature survey	4
3.2. Field survey	4
3.3. Grading	5
3.4. Assumptions and limitations	5
4. PHYSICAL ENVIRONMENTAL CONTEXT	5
4.1. Site context	5
4.2. Site description	5
4.2.1. Blue Rock Quarry	5
4.2.2. Borrow Pit 1	6
4.2.3. Borrow Pit 2	7
4.2.4. Red Sand Quarry	8
5. CULTURAL HERITAGE CONTEXT	9
5.1. Archaeological aspects	9
5.2. Historical aspects and the built environment	10
6. FINDINGS OF THE HERITAGE STUDY	11
6.1. Palaeontology	12
6.1.1. Statement of significance	12
6.2. Archaeology	12
6.2.1. Blue Rock Quarry	12
6.2.2. Borrow Pit 1	13
6.2.3. Borrow Pit 2	13
6.2.4. Red Sand Quarry	14
6.2.5. Statement of significance	16
6.3. Other heritage resources	16
6.4. Summary of heritage indicators and provisional grading	16
7. ASSESSMENT OF IMPACTS	17
7.1. Palaeontology	17
7.2. Archaeology	17
8. CONCLUSIONS	18

9. RECOMMENDATIONS 18
10. REFERENCES 18
APPENDIX 1: Mapping 22
APPENDIX 2: Palaeontological study 26

1. INTRODUCTION

ASHA Consulting (Pty) Ltd was appointed by EnviroSci Africa cc to conduct an assessment of the potential impacts to heritage resources that might occur through the proposed development of four borrow pits on the remainder of Portion 1 of the farm Vogelstruisbult 104 near Copperton, in the Prieska Magisterial District (Figure 1). The four borrow pits are required to supply building materials (sand and stone) to the renewable energy industry. Several renewable energy facilities have been proposed in the vicinity and some have commenced with construction.

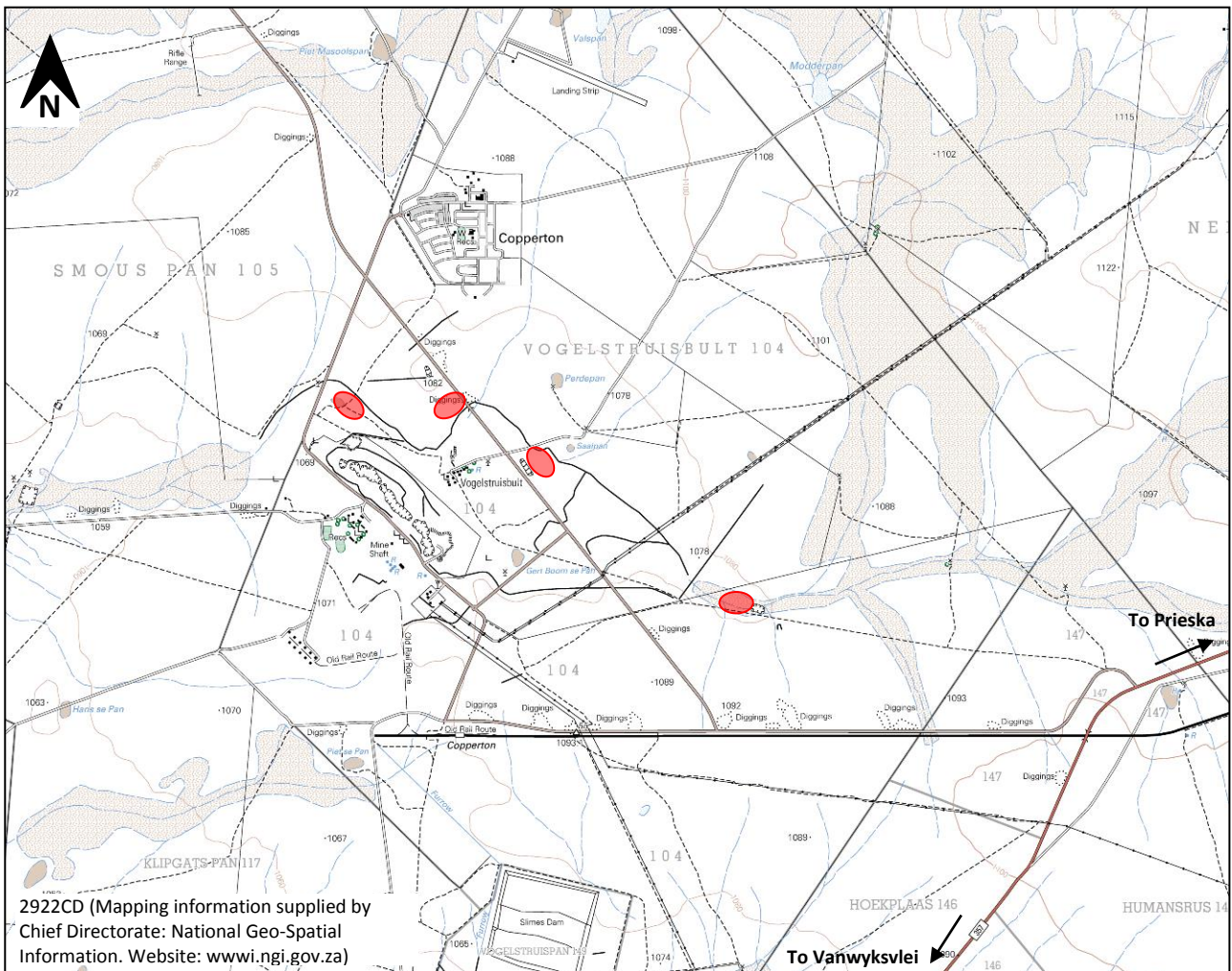


Figure 1: Map showing the location of the four proposed borrow pit sites (red ovals). The town of Copperton is to the north, while the southwest of the proposed sites is the old copper mine.

From northwest to southeast the four borrow pits are known as:

- Blue Rock Quarry;
- Borrow Pit 1;
- Borrow Pit 2; and
- Red Sand Quarry.

These four borrow pits will be described and assessed in this order throughout the report. The appended aerial images show the spatial extent of the proposed pits, the walk paths created during the surveys, and the locations of archaeological heritage resources recorded.

1.1. Project descriptions

1.1.1. Blue Rock Quarry

This pit will be 5 ha in extent, this being the maximum allowable size for a mining permit. The quarry will be for the mining of hard rock (gneiss). The rock will be blasted, the fragments collected and crushed on site and then transported by truck to the relevant construction sites.

1.1.2. Borrow Pit 1

This pit will be 5 ha in extent and will be for the mining of calcrete. The material will be excavated from the pit, loaded into trucks and transported to the relevant construction sites.

1.1.3. Borrow Pit 2

This pit will be 5 ha in extent and will be for the mining of calcrete. The material will be excavated from the pit, loaded into trucks and transported to the relevant construction sites.

1.1.4. Red Sand Quarry

This pit will be 5 ha in extent and will be for the mining of building sand and gravel. The material will be excavated from the pit, loaded into trucks and transported to the relevant construction sites.

1.2. Terms of reference

In a letter to the developer from the Department Mineral Resources (DMR) dated 29th November 2014, a request was made to commission and submit a Heritage Impact Assessment. Archaeological and palaeontological sites were specifically mentioned as a potential concern. ASHA Consulting was commissioned by EnviroSci Africa cc to fulfil this requirement.

Although archaeological and palaeontological resources were specifically identified in the letter, it should be noted that, following S.38(3) of the National Heritage Resources Act (No. 25 of 1999), all heritage resources should be identified and assessed. The palaeontological component, however, is being carried out by John Almond. The SAHRIS Palaeomap indicates that a desktop study should be carried out in this area and Dr Almond's study is attached to this report as Appendix 2. A brief summary of his findings is, however, contained in the present report.

1.3. Scope and purpose of the report

A heritage impact assessment (HIA) is a means of identifying any significant heritage resources before development begins so that these can be managed in such a way as to allow the development to proceed (if appropriate) without undue impacts to the fragile heritage of South Africa. This HIA report aims to fulfil the requirements of the heritage authorities such that a

comment can be issued for consideration by DMR who will review the Environmental Management Plan (EMP). The HIA report will outline any mitigation requirements that will need to be complied with from a heritage point of view and that should be included in the conditions of approval of the EMP should this be granted.

1.4. The author

Dr Jayson Orton has an MA (UCT, 2004) and a D.Phil (Oxford, UK, 2013), both in archaeology, and has been conducting Heritage Impact Assessments and archaeological specialist studies in the Western Cape and Northern Cape provinces of South Africa since 2004. He has also conducted research on aspects of the Later Stone Age in these provinces and published widely on the topic. He is accredited with the Association of Southern African Professional Archaeologists (ASAPA) CRM section (Member #233) as follows:

- Principal Investigator: Stone Age, Shell Middens & Grave Relocation; and
- Field Director: Colonial Period & Rock Art.

1.5. Declaration of independence

ASHA Consulting (Pty) Ltd and its consultants have no financial or other interest in the proposed development and will derive no benefits other than fair remuneration for consulting services provided.

2. HERITAGE LEGISLATION

The National Heritage Resources Act (NHRA) No. 25 of 1999 protects a variety of heritage resources as follows:

- Section 34: structures older than 60 years;
- Section 35: palaeontological, prehistoric and historical material (including ruins) more than 100 years old;
- Section 36: graves and human remains older than 60 years and located outside of a formal cemetery administered by a local authority; and
- Section 37: public monuments and memorials.

Following Section 2, the definitions applicable to the above protections are as follows:

- Structures: “any building, works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith”;
- Palaeontological material: “any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace”;
- Archaeological material: a) “material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures”; b) “rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation”; c) “wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the

Republic, as defined respectively in sections 3, 4 and 6 of the Maritime Zones Act, 1994 (Act No. 15 of 1994), and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation”; and d) “features, structures and artefacts associated with military history which are older than 75 years and the sites on which they are found”;

- Grave: “means a place of interment and includes the contents, headstone or other marker of such a place and any other structure on or associated with such place”; and
- Public monuments and memorials: “all monuments and memorials a) “erected on land belonging to any branch of central, provincial or local government, or on land belonging to any organisation funded by or established in terms of the legislation of such a branch of government”; or b) “which were paid for by public subscription, government funds, or a public-spirited or military organisation, and are on land belonging to any private individual.”

While landscapes with cultural significance do not have a dedicated Section in the NHRA, they are protected under the definition of the National Estate (Section 3). Section 3(2)(c) and (d) list “historical settlements and townscapes” and “landscapes and natural features of cultural significance” as part of the National Estate. Furthermore, Section 3(3) describes the reasons a place or object may have cultural heritage value.

Section 38 (2a) states that if there is reason to believe that heritage resources will be affected then an impact assessment report must be submitted. This report fulfils that requirement.

Under the Mineral and Petroleum Resources Development Act (No. 28 of 2002; MPRDA), the project requires that an EMP be compiled. The HIA is required within this framework and under the NHRA. Ngwao-Boswa Ya Kapa Bokoni (Heritage Northern Cape; for built environment and cultural landscapes) and the South African Heritage Resources Agency (SAHRA for archaeology and palaeontology) are required to provide comment on the proposed project in order to facilitate final decision-making by the DMR.

3. METHODS

3.1. Literature survey

A survey of available literature was carried out to assess the general heritage context into which the development would be set. This literature included published material, unpublished commercial reports and online material, including reports sourced from the South African Heritage Resources Information System (SAHRIS).

3.2. Field survey

The four sites were subjected to a detailed foot survey by two archaeologists on 22 January 2015. During the survey the positions of finds were recorded on a hand-held GPS receiver set to the WGS84 datum. Photographs were taken at times in order to capture representative samples of both the affected heritage and the landscape settings of the proposed developments.

3.3. Grading

Section 7 of the NHRA provides for the grading of heritage resources into those of National (Grade 1), Provincial (Grade 2) and Local (Grade 3) significance. Grading is intended to allow for the identification of the appropriate level of management for any given heritage resource. Grade 1 and 2 resources are intended to be managed by the national and provincial heritage resources authorities, while Grade 3 resources would be managed by the relevant local planning authority. These bodies are responsible for grading, but anyone may make recommendations for grading – something that is, at times, required in HIAs.

It is intended that the various provincial authorities formulate a system for the further detailed grading of heritage resources of local significance but this is generally yet to happen. Heritage Western Cape (2012), however, uses a system in which resources of local significance are divided into Grade 3A, 3B and 3C. These approximately equate to high, medium and low local significance, while sites of very low or no significance (and generally not requiring mitigation or other interventions) are considered ungradeable.

3.4. Assumptions and limitations

The study is carried out at the surface only and hence any completely buried archaeological sites will not be readily located. This is a known limitation in the Copperton area, since other surveys have shown archaeological material to be present beneath cover sands; these are typically exposed by erosion or, more often, anthropogenic disturbance (e.g. along the edges of borrow pits).

4. PHYSICAL ENVIRONMENTAL CONTEXT

4.1. Site context

The existence of Copperton is due to the old copper mine that was operational between 1972 and 1991. The abandoned mine lies to the south and west of the four proposed borrow pit sites. Related road and railway infrastructure (with the actual railway lines removed) still occurs in the area. More recent development has focused around renewable energy and a solar PV facility is currently being developed 1.1 km southwest of the red sand quarry. A number of power lines occur in the area with further planned to support the renewable energy sector. The reason that this area has been earmarked for renewable energy is because of the presence of the Kronos and Cuprum Substations which are located 7.1 km south and 3.3 km west of the Red Sand Quarry respectively. All four borrow pit sites adjoin, or in some cases overlap, older open pits.

4.2. Site description

4.2.1. Blue Rock Quarry

This existing old quarry at this site has been illegally used for the dumping of waste and has thus become an unsavoury area. In and around the pit there is much broken glass and litter (Figure 2). The south-eastern part of the study area remains intact, although much litter is present throughout. The surface there is sandy with small bushes scattered across the site (Figure 3).



Figure 2: View towards the northwest of the Blue Rock Quarry study area showing the existing borrow pit to the left and its degraded surroundings.

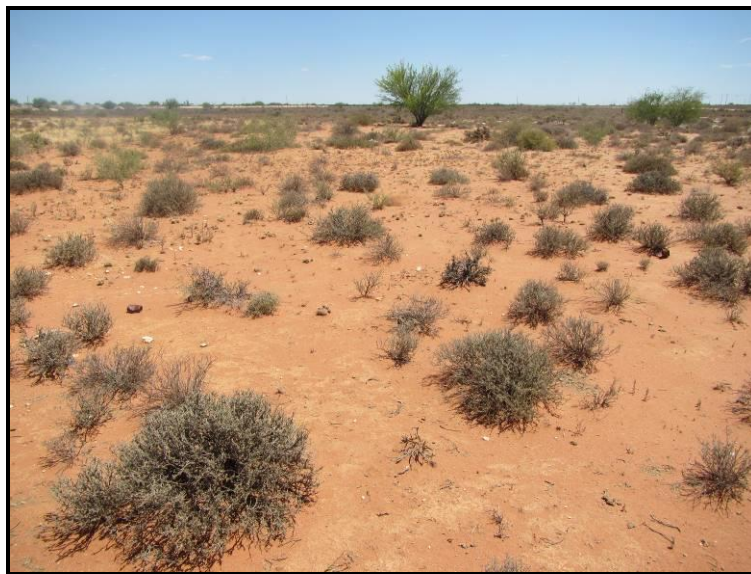


Figure 3: View towards the northeast across the south-eastern portion of the Blue Rock Quarry study area showing the sandy substrate. Copperton town is visible on the skyline in the left hand side of the photograph.

4.2.2. Borrow Pit 1

This site lies adjacent to the tar road leading to Copperton. An old road alignment is visible across the site (Figure 4) but the rest is undisturbed. Many cold drink cans and a few bottles lie along the margins of this road alignment. The remaining surface of the site tends to be coated in sand and gravel (Figure 5).



Figure 4: View towards the south across the Borrow Pit 1 study area showing the old road alignment (to the right) leading towards the abandoned copper mine (tower visible in background is at the mine).

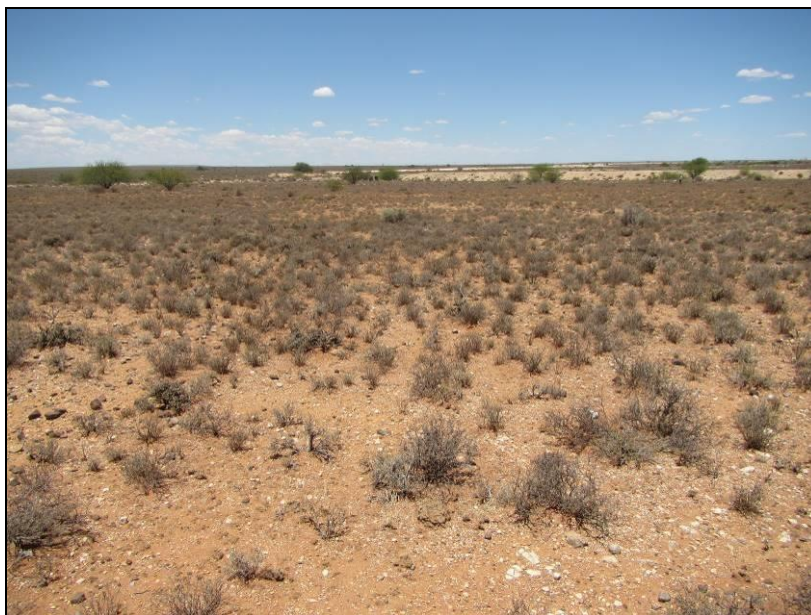


Figure 5: View towards the southeast across the Borrow Pit 1 study area showing the typical natural sand and gravel substrate.

4.2.3. Borrow Pit 2

This site lies along the tar road leading to Copperton but is separated from that road by an adjoining old borrow pit (Figure 6). The western part of the proposed site is coated in red sand with small bushes (Figure 7), while the eastern area has calcrete cropping out at the surface. Small bushes are scattered over the surface of the site.



Figure 6: View towards the southeast across the Borrow Pit 2 study area and showing the edge of the existing borrow pit (right hand side). The tar road is further to the right.



Figure 7: View towards the east across the Borrow Pit 2 study area showing the surface sand cover in the western part of the site.

4.2.4. Red Sand Quarry

This site lies within an ephemeral drainage line (only visible on aerial photography and maps; see figure 1) and has apparently already had sand removed from it in the past to assist with the creation of gardens in Copperton. That sand has been removed is evident on site, since large areas of hardpan have been exposed and loose aeolian sand cover is generally thin. Where sand is present, small bushes have taken root (Figures 8 and 9). In addition, because of the less rocky nature of the substrate and possibly some groundwater, a few large *Acacia* trees are also present.



Figure 8: View towards the north showing the sandy substrate. At far right the stockpiled topsoil from the western part of the study area where mining has already commenced is just visible. The access road is at far left.



Figure 9: View towards the north showing the exposed hardpan deposits where the aeolian sand has been completely removed.

5. CULTURAL HERITAGE CONTEXT

This section of the report establishes what is already known about the archaeological heritage resources in the vicinity of the study area.

5.1. Archaeological aspects

Bushmanland is well known for the background artefact scatter that occurs in so many areas. Beaumont *et al.* (1995: 240) wrote that “thousands of square kilometres of Bushmanland are covered by a low density lithic scatter”. These artefacts are generally very well weathered and

mostly pertain to the Early (ESA) and Middle Stone Age (MSA). They are considered to be background scatter because their distribution is conditioned more strongly by geological actions than human actions. Occasional Later Stone Age (LSA) artefacts are also present within this scatter and these were no doubt dropped there during recent millennia. These kinds of finds have been documented during previous surveys in the area (Kaplan 2010; Kaplan & Wiltshire 2011; Orton 2011, 2014b; Orton & Webley 2013).

A significant aspect of the Northern Cape archaeological record is the presence of pans which frequently display associated archaeological material. The only detailed work in this regard is that of Kiberd (2001, 2005, 2006) who excavated Bundu Pan, some 25 to 30 km northwest of Copperton. The site had initially been identified through excavations to obtain gravel for surfacing local roads with early observations noting MSA artefacts on quartzite eroding from the sections (Beaumont *et al.* 1995). The site was subsequently excavated between 1998 and 2003 and, importantly, found to actually contain stratified deposits ascribable to the ESA, MSA and LSA (Kiberd 2006). The only other site in the Northern Cape Province to contain all three Stone Ages is Wonderwerk Cave near Kuruman with its deep stratified deposits (Humphreys & Thackeray 1983). Such sites are generally rare in South Africa.

While the ESA and MSA tend to be represented largely by background scatter, one does find in situ LSA sites in places. The recent excavation of several such sites to the southwest of the present study area is notable (Orton 2014a). Further afield LSA sites have been investigated by Beaumont and colleagues (1995), Smith (1995a) and Parsons (2003, 2004, 2006, 2007, 2008). Work on these sites led to a distinction between hunter-gatherer and herder sites, based on stone artefact assemblages (Beaumont *et al.* 1995; Beaumont & Vogel 1984, 1989; Parsons 2003), but this has recently been called into question (Parsons 2007). Later Stone Age sites have very few, if any, organic items on them. The only organic find usually present is fragments of ostrich eggshell which originated either from eggs eaten or else whole shells used as flasks. Many such flasks have been found across the Northern Cape (Morris 1994; Morris & Von Bezing 1996), including close to Copperton (F. Ekkert, pers. comm. 2014).

Small, low circular structures constructed of rocks have also been recorded in the Northern Cape. Work further east along the Orange River (Sampson 1968), in the Seacow Valley in the eastern Karoo (Sampson 1986), and also at Bloubos northwest of Upington (Parsons 2004) suggests they may well have been the bases in/on which huts or windbreaks were constructed. A local farmer, Frans Ekkert (pers. comm. 2014), reports that a few such structures were located to the south of Klipgats Pan but have since been destroyed by power line development. He described each as having an opening that faced towards the east.

Indigenous people were present in this area until quite recently with a local farmer commenting that when his grandfather began farming in the area in 1864 there were still many Bushman living there (F. Ekkert, pers. comm. 2014). Smith (1995b) notes that around that time white farmers were making extensive use of Bushmanland for summer grazing and that this led to the extermination of the massive springbok herds on which the indigenous population subsisted. This in turn led to the descendants of indigenous groups turning to the farmers for food (and employment), effectively ending the span of prehistory in the region.

5.2. Historical aspects and the built environment

Because the area is so remote it was only settled by white farmers comparatively recently. The ruins on Klipgats Pan are perhaps the earliest historical archaeological record in the area (Orton 2011). There are generally very few buildings present in the area with the oldest known to the author being the core of the original farmhouse at Nelspoortjie (W. Fourie, pers. comm. 2014). This house was apparently originally built in about 1910, but at least four phases of modifications beginning in the 1920s have left the structure virtually unrecognisable as a heritage resource. The town of Copperton has the appearance of a typical company town but has had most of its buildings demolished after the mine was closed. No historic structures occur in the town.

6. FINDINGS OF THE HERITAGE STUDY

This section describes the heritage resources recorded in the study area during the course of the project. All finds on site were archaeological in nature and these are listed in Table 1.

Table 1: List of archaeological finds made during the field surveys.

GPS point	Co-ordinates	Description	Significance (mitigation)
Blue Rock quarry			
116	S29 56 23.6 E22 17 27.5	Low density MSA background scatter in quartzite in sandy area.	Very low
117	S29 56 26.4 E22 17 32.7	Low density MSA background scatter in quartzite in sandy area.	Very low
118	S29 56 25.3 E22 17 24.1	Low density MSA background scatter in quartzite on calcrete gravel.	Very low
Borrow Pit 1			
114	S29 56 22.8 E22 18 14.2	Widespread ephemeral MSA background scatter in quartzite.	Very low
115	S29 56 22.5 E22 18 07.4	Widespread ephemeral MSA background scatter in quartzite and CCS.	Very low
Borrow Pit 2			
111	S29 56 48.2 E22 18 49.4	Low density background scatter associated with calcrete gravel. Quartzite and CCS.	Very low
112	S29 56 46.8 E22 18 46.9	Low density background scatter associated with calcrete gravel. Quartzite and CCS.	Very low
113	S29 56 43.9 E22 18 44.1	Low density background scatter associated with calcrete gravel. Quartzite.	Very low
Red sand quarry			
102	S29 57 37.8 E22 20 10.4	Artefact scatter on top of the hardpan. Quartzite, quartz, CCS.	Low-medium (1 hour)
103	S29 57 37.7 E22 20 08.9	Artefact scatter on top of the hardpan. Quartzite, quartz, CCS. Includes a long retouched blade	Low-medium (1 hour)
104	S29 57 37.6 E22 20 05.7	Dense artefact scatter on the hardpan. Quartzite, CCS, quartz.	Low-medium (1 hour)
105	S29 57 37.2 E22 20 04.3	Dense artefact scatter on the hardpan. Quartzite, CCS, quartz.	Low-medium (1 hour)
106	S29 57 37.1 E22 20 02.6	Large, dense artefact scatter on the hardpan. Quartzite, CCS, quartz.	Medium (2 hours)
107	S29 57 36.5 E22 20 03.1	Large, dense artefact scatter on the hardpan. Quartzite, CCS, quartz.	Medium (2 hours)
108	S29 57 35.2 E22 20 08.9	Low density artefact scatter on the hardpan. Higher frequency of quartz in this area but also some	Low

		quartzite and CCS.	
109	S29 57 36.7 E22 20 11.3	Moderate density scatter of quartz, quartzite and CCS.	Low-medium (1 hour)
110	S29 57 35.8 E22 20 12.9	Moderate density scatter of quartz, quartzite and CCS.	Low

6.1. Palaeontology

Almond's (2014) desktop palaeontological summary reveals the following key points regarding local geology and palaeontology:

- The bedrock in the area is metamorphic and entirely unfossiliferous;
- Dwyka Group sediments are of low significance and are unlikely to experience direct impacts;
- Kalahari Group sediments usually contain few fossils and their diversity is low. The Gordonia Formation dune sands are expected to contain widespread but sporadic small fossils and are generally of low significance. Fossils could also be associated with the underlying calcretes of the Mokolanen Formation. However, the most important fossils are likely to be found associated with old pans and water courses. These sites would likely be very rare in the landscape and, because of the extensive younger sedimentary cover, difficult to locate.

6.1.1. Statement of significance

In terms of Part 2(ii) (vi) of the NHRA, the palaeontological resources are expected to be of low significance for their scientific value.

6.2. Archaeology

6.2.1. Blue Rock Quarry

Only low density background scatter was observed in this study area. Both the gravel area close to the edge of the existing borrow pit and the sandy area to the southwest contained background scatter, but it was somewhat denser in association with the gravel (Figure 10). The artefacts likely all date to the MSA. They were mostly in quartzite, but occasional artefacts in quartz and CCS were also noted.

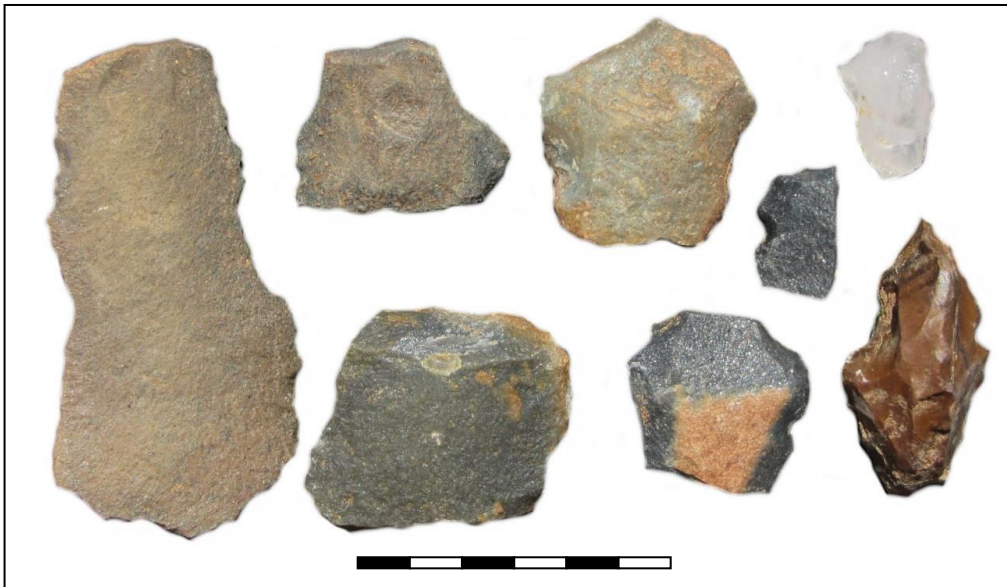


Figure 10: Stone artefacts in quartzite, quartz and CCS from Point 118. Scale bar in 1 cm intervals.

6.2.2. Borrow Pit 1

Aside from modern cans and glass, this study area contained only low density background scatter in quartzite and associated with calcrete gravel. The artefacts were widespread and probably all pertain to the MSA (Figures 11 & 12).



Figures 11 & 12: Stone artefacts made in quartzite from Point 114. Scale bars in 1 cm intervals.

6.2.3. Borrow Pit 2

This study area contained only very ephemeral background scatter associated with calcrete gravel. The artefacts were widespread and probably all pertain to the MSA (Figures 11 & 12). All were made from quartzite.



Figure13: Stone artefacts in quartzite found at Point 113. Scale bar in 1 cm intervals.

6.2.4. Red Sand Quarry

A large number of Pleistocene-aged stone artefacts were located within the study area for the Red Sand Quarry (Figures 14 - 16). They all pertain to the MSA. All the finds were made on the surface of the hard pan deposits that have been exposed through removal of topsoil and subsequent wind deflation (Figure 17). The artefacts were no doubt originally located within the red aeolian cover sands. The artefact density was always greatest in areas with exposed hardpan, while sandy areas displayed almost no artefacts but no doubt concealed some.

The archaeological review above shows that important Stone Age sites are often located alongside water features, be they ephemeral streams or pans. The Red Sand Quarry is located within an ephemeral drainage (Figure 1) and this may well be the reason for the higher density of archaeological material here. The artefacts were obviously buried by aeolian sand since their deposition and then revealed when the topsoil was removed. We will never know what was lost from the overlying sand but it is possible that further material may be revealed beneath the current surface. Such material could take the form of dense artefact accumulations associated with gravel lag deposits and might even have associated animal bone. Should such deposits be present then the significance of the site would be raised considerably.



Figure 14: Stone artefacts in quartzite, quartz and CCS from Point 102. Scale bar in 1 cm intervals.

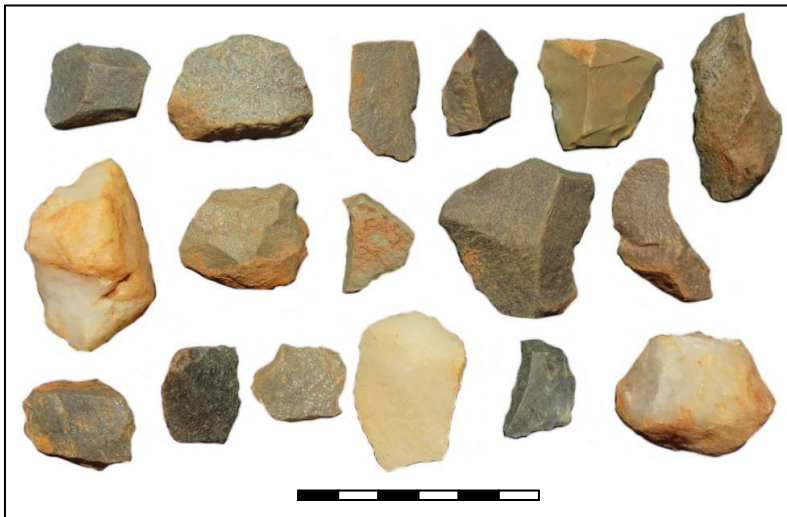


Figure 15: Stone artefacts in quartzite, quartz and CCS from Point 103. Scale bar in 1 cm intervals.



Figure 16: Two long blades in quartzite from Point 103. The right hand one is retouched all along its left edge in this view. Scale bar in 1 cm intervals.



Figure 17: View of the ground surface at Point 106. Most of the stones visible on the surface are stone artefacts.

6.2.5. Statement of significance

In terms of Part 2(ii) (vi) of the NHRA, the archaeological resources in the Red Sand Quarry area have medium significance for their scientific value. Artefacts in the other three study areas are of very low significance.

6.3. Other heritage resources

No other significant heritage resources were noted in or close to the study areas. Burials are highly unlikely to occur since three of the sites have rocky (gravel) substrates and the only sandy one has already had sand removed from its surface in the past. No local roads are considered scenic routes and the proposed land use is consistent with that already present since all four sites adjoin existing borrow pits. Given the Copper Mine and abundant electrical infrastructure in the area, no significant impacts to the landscape are expected.

6.4. Summary of heritage indicators and provisional grading

Since there is no known significant palaeontological resource, it is provisionally suggested that the palaeontological heritage be considered ungradeable. The archaeological resources in the Red Sand Quarry area can be assigned a provisional grading of 3C. All other resources are ungradeable.

7. ASSESSMENT OF IMPACTS

7.1. Palaeontology

Direct impacts to palaeontological resources are expected to be very minor due to the low intensity of impacts. Significance is rated as being low (Table 2). No specific mitigation measures are suggested, but should any substantial fossils be found during excavation of any of the borrow pits then these should be protected and reported for further action as may be necessary.

Table 2: Assessment of palaeontological impacts.

	Before mitigation	After mitigation
Extent	Local	Site
Duration	Permanent	Permanent
Intensity	Low	Negligible
Status	Negative	Negative
Significance	Low	Very low
Probability	Probable	Improbable
Confidence	Medium	
Reversible	No	
Cumulative impacts	Significant palaeontological material is rare in the area so if anything important were impacted then cumulative impacts could be of high significance. However, the expectation is that this will not occur.	

7.2. Archaeology

No archaeological impacts over and above damage to occasional background scatter artefacts are expected to occur at the Blue Rock Quarry, Borrow Pit 1 or Borrow Pit 2. Significance at these three sites is expected to be very low and is not formally assessed.

The Red Sand Quarry, however, contains a fairly extensive scatter of MSA artefacts that is regarded as being of medium heritage significance. Because of the relative scarcity of such exposures, impacts will be at a regional scale and are seen as medium to high intensity because the visible exposure will be destroyed (Table 3). The significance of these impacts is likely to be medium. It is strongly recommended that a sample of this material be collected in order to document a component of the local MSA sequence. Because the site lies along an old water course, it is also suggested that a few test excavations be conducted across the site in order to check for significant buried artefact horizons. The chance exists that fossil bone could be associated with any such horizons; this would considerably raise the significance of any impacts. Should anything important be located then this may require further investigation prior to mining proceeding. Suitable mitigation will likely reduce the significance of the impacts to very low.

Table 3: Assessment of archaeological impacts.

	Before mitigation	After mitigation
Extent	Regional	Site
Duration	Permanent	Permanent
Intensity	Medium-High	Low
Status	Negative	Negative
Significance	Medium	Very low

Probability	Definite	Probable
Confidence	High	
Reversible	No	
Cumulative impacts	The archaeological material present in the immediate vicinity is uncommon in this landscape and, because of this scarcity, cumulative impacts to such material would be of fairly high significance.	

The following mitigation is suggested:

- Excavation grids should be established at the locations listed for mitigation in Table 1. When these can be linked then this would be advantageous, otherwise they can be spatially located by means of GPS co-ordinates. Artefacts should be collected in grid squares of 1 m² or 4 m² depending on the density; and
- Several test excavations should be carried out across the study area in order to check for significant concentrations of artefacts at depth which may be revealed during the mining activities. These excavations may inform on whether any further archaeological intervention is likely to be required.

8. CONCLUSIONS

Only one significant heritage resource was located during the survey. This is a scatter of MSA stone artefacts located in the Red Sand Quarry. The other three sites have no significant heritage resources. The stone artefact scatter at the Red Sand Quarry would be destroyed by the proposed mining, but mitigation would reduce the significance of the impacts from medium to very low.

9. RECOMMENDATIONS

It is recommended that the proposed mining be allowed to continue at the Blue Rock Quarry, Borrow Pit 1 and Borrow Pit 2 with no further heritage work required. The Red Sand Quarry, however, should have archaeological mitigation carried out prior to excavation expanding beyond the current mining area. The following recommendations are proposed:

- Archaeological mitigation (collection of artefacts) and test excavations must be carried out within the Red Sand Quarry area;
- Staff should be instructed to be alert for any obvious fossil occurrences and to protect and report these as soon as possible; and
- If any fossils, archaeological material or human burials are uncovered during the course of development then work in the immediate area should be halted and the material protected *in situ* as far as is possible. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist or palaeontologist as appropriate. Such heritage is the property of the state and may require excavation and curation in an approved institution.

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APPENDIX 1: Mapping



Figure A1: Aerial view of the Blue Rock Quarry area showing the proposed new pit (white outline), the walk-paths created on site during the survey and the locations of recorded archaeological heritage resources. The northern part of the study area was heavily degraded due to the existing pit and its subsequent use as a rubbish dump. The dark area to the north of Point 118 is the burnt rubbish heap.



Figure A2: Aerial view of the Borrow Pit 1 area showing the proposed new pit (white outline), the walk-paths created on site during the survey and the locations of recorded archaeological heritage resources. An old, disused road alignment crosses the site from north to south.



Figure A3: Aerial view of the Borrow Pit 2 area showing the proposed new pit (white outline), the walk-paths created on site during the survey and the locations of recorded archaeological heritage resources.



Figure A4: Aerial view of the Red Sand Quarry area showing the proposed new pit (white outline), the walk-paths created on site during the survey and the locations of recorded archaeological heritage resources. It should be noted that in the eastern section of the proposed borrow pit that was not covered during the survey mining has already commenced.

APPENDIX 2: Palaeontological study