McGregor Museum
Department of Archaeology

Heritage Impact Assessment of proposed sand mining in the bed of the Donkerhoekspruit on Jannelsepan, near Louisvale, Northern Cape.

David Morris
McGregor Museum, Kimberley
January 2018

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David Morris, McGregor Museum, Kimberley
P.O. Box 316 Kimberley 8300
Tel 082 2224777 email dmorriskby@gmail.com
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1. INTRODUCTION

Van Zyl's Blasting en Grondwerke CC approached the McGregor Museum archaeology department to conduct a heritage impact assessment on a proposed sand mining site along the Donkerhoekspruit on the farm Jannelsepan, north east of Louisvale, !Kai Garib Municipality, Northern Cape.

The site was visited and inspected on 15 December 2017. This report accounts for findings made.

1.1. Focus and Content of Specialist Report: Heritage

This archaeology and heritage specialist study is focused on a circa 860 m stretch of the dry sandy bed of the Donkerhoekspruit where sand mining ("new permit") is proposed to take place for use in the building industry in the Upington area. Additional observations were made further upstearm that provide broader context on archaeological traces in the landscape.

This study outlines:

- Introduction, explaining the focus of the report (1.1) and introducing the author in terms of qualifications, accreditation and experience to undertake the study (1.2)
- Description of the affected environment (2) providing background to the development and its infrastructural components (2.1); background to the heritage features of the area (2.2); and defining environmental issues and potential impacts (2.3)
- Methodology (3) including an assessment of limitations (3.1); statement of expectations or predictions (3.2) and outline of EIA procedures including criteria for assessing archaeological significance (3.3).
- Observations and assessment of impacts (4), including field observations (4.1); characterizing archaeological significance (4.2); and characterizing the overall significance of impacts (4.3).
- Summary of Significance of Impacts is stated in tabular form (4.3.1).
- Measures for inclusion in a draft Environmental Management Plan for the development are set out in tabular form (5).
- Conclusions (6).

1.2 The author of this report

The author of this report is a qualified archaeologist (PhD, University of the Western Cape) accredited as a Principal Investigator by the Association of Southern African Professional Archaeologists. The author has worked as a museum archaeologist in the Northern Cape since 1985 and has since the late 1980s carried out surveys in the general area of Upington-Kakamas (Morris 2002, 2005, 2006; Morris & Beaumont 1991; Morris & Seliane 2006). In addition, the author has a comprehensive knowledge of Northern Cape history and built environment, and received recent UCT-accredited training at a workshop on Architectural and Urban Conservation: researching and assessing local (built) environments (S. Townsend, UCT). He is also Chairman of the Historical Society of Kimberley and the Northern Cape.

The author is independent of the organization commissioning this specialist input, and provides this Specialist Report within the framework of the National Heritage Resources Act (No 25 of 1999).

The National Heritage Resources Act no. 25 of 1999 (NHRA) protects heritage resources which include archaeological and palaeontological objects/sites older than 100 years, graves older than 60 years, structures older than 60 years, as well as intangible values attached to places. The Act requires that anyone intending to disturb, destroy or damage such sites, objects and/or structures may not do so without a permit from the relevant heritage resources authority. This means that a Heritage Impact Assessment should be performed, resulting in a specialist report as required by the relevant heritage resources authority/ies to assess whether authorisation may be granted for the disturbance or alteration, or destruction of heritage resources.

2. DESCRIPTION OF THE AFFECTED ENVIRONMENT

The environment in question is within the banks of a narrow spruit on Jannelsepan, some 5.5 km east of the Orange River, and 4.5 km north east of Louisvale near Upington. The surrounding landscape is typical of that occurring generally away from the Orange River in this region, tending to be rocky with shallow sandy soils and relatively to extremely sparse vegetation. This particular stretch of the Donkerhoekspruit has quite marked riverine vegetation, where patches of deeper sediment are preserved. Where archaeological materials might occur on the surface up the bank from the spruit they would often be highly visible, but they may be buried in the sediment immediately alongside the spruit.

It was indicated that the major anticipated impact of sand mining would be directly within the dry sandy bed of the spruit, between its current banks. In the event of archaeological materials occurring here they would clearly be in secondary context. The features noted are plainly visible in the Google Earth image included in Figure 1.

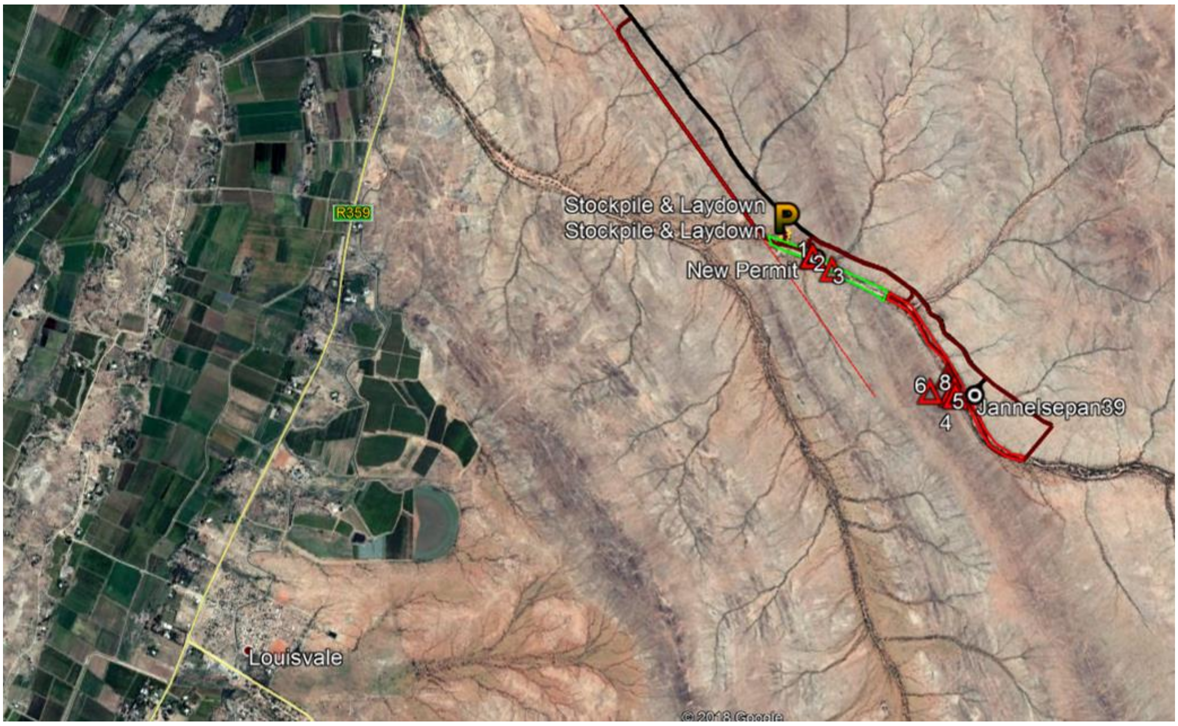

Figure 1. The location of the Jannelsepan sand mining area and 5.5 km east of the Orange River near Louisvale.

Figure 2. Sandy bed of the spruit.

2.1 Background to the development – description of proposed infrastructure

As indicated, sand mining is proposed to take place within the bed of the Donkerhoekspruit (Fig. 2) over a distance of about 860 m (New Permit). Existing farm roads and an existing stockpile and laydown area (Fig 3) would be used. Operations would take place essentially within the dry river bed.

Figure 3. Existing cleared stockpile and laydown area.

2.2. Heritage features of the region

No previous archaeological survey work had been carried out on this particular locality. In the wider landscape studies have been carried out at Steynmond Boerdery on Kakamas North Farm 339 (Beaumont 2007), and at the Cillie cemetery and township extensions (Dreyer 2013; van Schalkwyk 2013). De Jong (2010; see also Morris 2016) and Morris (2017a) assessed areas for intended agricultural development to the north and south of the Orange River on Kakamas North and Kakamas South respectively. At a general level the following summary statements provide pointers to potential heritage sensitivities in the local environment.

2.2.1 Colonial frontier

The eighteenth- and nineteenth-century records for this region (Penn 2005) pertain mainly to the areas south of and along the Orange River. The travellers Wikar and Gordon followed the river as far as and beyond this region in the 1770s, describing communities living along the river (see Morris & Beaumont 1991 for a summary).

Gordon, in 1779, noted a group of Bushmen living in the area whose encampments were on the north bank of the river, and who were known as *Khein eis* (= lean and thin people) (transcription of Gordon's Journal by Fredi Pheiffer nd:41, cf, Mossop 1935). Where the river was rocky, these people would subsist by fishing. There is reference to trapping of hippos (presumably in pits) near what is today Kakamas. Gordon refers to the inhospitable adjacent terrain, with hillocks strewn with irregular chunks of hard loose rocks and smaller sharp pieces so that "one walks one's shoes through very quickly in this veld" (transcription of Gordon's Journal by Fredi Pheiffer nd:34). This would be an accurate description of the wider study area reported on in this report.

Dunn and others describe the situation a century later (Robinson 1978). Frontiersmen such as the colourful Stephanos can be linked with particular places in the landscape – nearer to Keimoes (Morris 2002).

The region was caught up in the Koranna War of 1879-1880, while further military activity in the area included the risings of 'rebels' during the Anglo-Boer War and again in January-February 1915 when there was also an incursion of German troops some of whom were killed in the area (Hopkins 1978:128-129).

One of the most significant historical watersheds for the particular vicinity under consideration was the establishment of the agricultural settlement at Kakamas in 1898. The irrigation scheme set up by this community included canal construction, beginning at the upper end of Neus Island (Hopkins 1978). The Kakamas settlement is also known for its pioneering development of a hydro-electric power generator, brought into operation in 1924 (Hopkins 1978). The building which housed the generator was ear-marked as a museum.

2.2.2 Later Stone Age

Late Holocene Later Stone Age (LSA) sites are frequently noted in surveys south of and west of the region, including along the Orange River (e.g. Morris & Beaumont 1991; Beaumont et al. 1995). These are generally short-duration occupations by small groups of hunter-gatherers. In contrast, there are substantial herder encampments along the Orange River floodplain itself (Morris & Beaumont 1991) and in the hills north of Kakamas (Parsons 2003). In a range of hills north east of Keimoes, on Zovoorby, a rock shelter and specularite working (a sparkling mineral with known cosmetic and ritual use in the precolonial past) has been excavated (Smith 1995). LSA sites are usually focused on a particular feature in the landscape such as a hill or rocky outcrop and in relation to resources like water and associated habitats richer in animals and plant foods. Gordon's account of 1779 seems to suggest that particular locales were inhabited with inhospitable terrain separating such favoured spots.

2.2.3 Pleistocene: Middle and Earlier Stone Age

Beaumont et al. (1995:240-1) note a widespread low-density stone artefact scatter of Pleistocene age across areas of Bushmanland to the south where raw materials, mainly quartzite cobbles, were derived from the Dwyka glacial till. Similar occurrences have been noted north of Upington in situations where raw materials are abundant.

Systematic collections of this material at Olyvenkolk south west of Kenhardt and Maans Pannen east of Gamoep could be separated out by abrasion state into a fresh component of Middle Stone Age (MSA) with prepared cores, blades and points, and a large aggregate of moderately to heavily weathered Earlier Stone Age (ESA) (Beaumont et al. 1995).

The ESA included Victoria West cores on dolerite and quartzite (a fine example has been found at Hondeblaf north of Upington), long blades, and a very low incidence of handaxes and cleavers. The Middle (and perhaps in some instances Lower) Pleistocene occupation of the region that these artefacts reflect must have occurred at times when the environment was more hospitable than today. This is suggested by the known greater reliance of people in Acheulean times on quite restricted ecological ranges, with proximity to water being a recurrent factor in the distribution of sites.

2.3 Description and evaluation of environmental issues and potential impacts

Heritage resources including archaeological sites are in each instance unique and non-renewable resources. Area and linear developments can have a permanent destructive impact on these resources. The objective of an HIA would be to assess the sensitivity of such resources where present, to evaluate the significance of potential impacts on these resources and, if and where appropriate, to recommend no-go areas and/or measures to mitigate or manage said impacts.
In relation to the proposed sand mining on Jannelsepan, principally a linear impact between the banks of the dry Donkerhoekspruit over a distance of about 860 m is anticipated.

2.3.1 Direct, indirect and cumulative impacts (in terms of nature, magnitude and extent)

The destructive impacts that are possible in terms of heritage resources would tend to be direct, once-off events occurring during the sand mining phase. In the long term, the proximity of such mining operations in a given area could result in secondary indirect impacts resulting from the movement of people or vehicles in the immediate or surrounding vicinity.

3. METHODOLOGY

A site visit was carried out on 15 December 2017, with Mr Piet Louw, to inspect the proposed sand mining area on Jannelsepan on foot. The greater extent of the sand mining area further upstream was also inspected, and an adjacent hill was included in the survey to broaden the context of archaeological observations made. Heritage traces would be evaluated in terms of their archaeological and heritage significance (see tables below). A set of predictions was made which the study would test with observations made in the field. The McGregor Museum head of archaeology (D. Morris) was assisted by Abenicia Henderson with archaeology intern Jani Louw.

3.1 Assumptions and limitations

It was assumed that, by and large in this landscape, with its sparse vegetation and often shallow soil profiles, some sense of the archaeological traces to be found in the area would be readily apparent from surface observations (including assessment of places of erosion or past excavations that expose erstwhile below-surface features).

A proviso is routinely given, that should sites or features of significance be encountered during mining on the site (this could include an unmarked burial, an ostrich eggshell water flask cache, or a high density of stone tools, for instance), specified steps are necessary (beginning with immediate suspension of work, and reporting to the heritage authority).

3.2 Predictions

It may be predicted that:
In the broader landscape the local environment and topographic features close to the spruit may have provided places favoured for Stone Age encampments.

The adjacent terrain is strikingly inhospitable in terms of arid, rocky ground. Gordon encountered no encampments in these latter kinds of settings when moving through the area in October 1779.

A ridge on the south side of the spruit has rocky outcrops at its crest which suggested a possible locale for archaeological traces – and hence this was investigated to gain, potentially, a sense of broader landscape use in Stone Age times.

3.2.1 Potentially significant impacts to be assessed in the HIA process

Any area or linear, primary and secondary, disturbance of surfaces in the proposed mining locale could have a destructive impact on heritage resources, where present. In the event that such resources are found, they are likely to be of a nature that potential impacts could be mitigated by documentation and/or salvage following approval and permitting by the South African Heritage Resources Agency and, in the case of any built environment features, by the Northern Cape Heritage Resources Authority. Although unlikely, there may be some that could require preservation in situ and hence modification of intended mining.
Disturbance of surfaces includes any mining, construction or agricultural farming (quarries, pits, roads, pipelines, pylons, sub-stations or plants, buildings), or any other clearance of, or excavation into, a land surface. In the event of archaeological materials being present such activity would alter or destroy their context (even if the artefacts themselves are not destroyed, which is also obviously possible). Without context, archaeological traces are of much reduced significance. It is the contexts as much as the individual items that are protected by the heritage legislation.

3.3 Determining archaeological significance

In addition to guidelines provided by the National Heritage Resources Act (Act No. 25 of 1999), a set of criteria based on Deacon (nd) and Whitelaw (1997) for assessing archaeological significance has been developed for Northern Cape settings (Morris 2000a). These criteria include estimation of landform potential (in terms of its capacity to contain archaeological traces) and assessing the value to any archaeological traces (in terms of their attributes or their capacity to be construed as evidence, given that evidence is not given but constructed by the investigator).

Estimating site potential

Table 1 (below) is a classification of landforms and visible archaeological traces used for estimating the potential of archaeological sites (after J. Deacon nd, National Monuments Council). Type 3 sites tend to be those with higher archaeological potential, but there are notable exceptions to this rule, for example the renowned rock engravings site Driekopseiland near Kimberley which is on landform L1 Type 1 – normally a setting of lowest expected potential. It should also be noted that, generally, the older a site the poorer the preservation, so that sometimes any trace, even of only Type 1 quality, can be of exceptional significance. In light of this, estimation of potential will always be a matter for archaeological observation and interpretation.

Assessing site value by attribute

Table 2 is adapted from Whitelaw (1997), who developed an approach for selecting sites meriting heritage recognition status in KwaZulu-Natal. It is a means of judging a site's archaeological value by ranking the relative strengths of a range of attributes (given in the second column of the table). While aspects of this matrix remain qualitative, attribute assessment is a good indicator of the general archaeological significance of a site, with Type 3 attributes being those of highest significance.

Table 1. Classification of landforms and visible archaeological traces for estimating the potential for archaeological sites (after J. Deacon, National Monuments Council).

Class	Landform	Type 1	Type 2	Type 3
L1	Rocky surface	Bedrock exposed	Some soil patches	Sandy/grassy patches
L2	Ploughed land	Far from water	In floodplain	On old river terrace
L3	Sandy ground, inland	Far from water	In floodplain or near feature such as hill	On old river terrace
L4	Sandy ground, Coastal	>1 km from sea	Inland of dune cordon	Near rocky shore
L5	Water-logged deposit	Heavily vegetated	Running water	Sedimentary basin
L6	Developed urban	Heavily built-up with no known record of early settlement	Known early settlement, but buildings have basements	Buildings without extensive basements over known historical sites
L7	Lime/dolomite	>5 myrs	<5000 yrs	Between 5000 yrs and 5 myrs
L8	Rock shelter	Rocky floor	Sloping floor or small area	Flat floor, high ceiling

Class	Archaeo-logical traces	Type 1	Type 2	Type 3
A1	Area previously excavated	Little deposit remaining	More than half deposit remaining	High profile site
A2	Shell or bones visible	Dispersed scatter	Deposit <0.5 m thick	Deposit >0.5 m thick; shell and bone dense
A3	Stone artefacts or stone walling or other feature visible	Dispersed scatter	Deposit <0.5 m thick	Deposit >0.5 m thick

Table 2. Site attributes and value assessment (adapted from Whitelaw 1997)

Class	Attribute	Type 1	Type 2	Type 3
1	Length of sequence/context	No sequence Poor context Dispersed distribution	Limited sequence	Long sequence Favourable context High density of arte/ecofacts
2	Presence of exceptional items (incl regional rarity)	Absent	Present	Major element
3	Organic preservation	Absent	Present	Major element
4	Potential for future archaeological investigation	Low	Medium	High
5	Potential for public display	Low	Medium	High
6	Aesthetic appeal	Low	Medium	High
7	Potential for implementation of a long-term management plan	Low	Medium	High

4. OBSERVATIONS AND ASSESSMENT OF IMPACTS

The manner in which archaeological and other heritage traces or values might be affected by proposed sand mining at Jannelsepan may be summed up in the following terms: it would be any act or activity that would result immediately or in the future in the destruction, damage, excavation, alteration, removal or collection from its original position, any archaeological material or object (as indicated in the National Heritage Resources Act (No 25 of 1999)). The obvious impact in this case would be land surface disturbance associated with any proposed mining, which was expected to be essentially limited to the dry sand-filled bed of the spruit.

4.1 Fieldwork observations

The site was visited on 15 December 2017. Mr Piet Louw had been delegated to guide us to the stretch of the dry bed of the Donkerhoekspruit on Jannelsepan which is to be mined for sand. He indicated that mining impacts would essentially be limited to the area between the banks of the spruit. The length of proposed mining area (about 860 m for the new permit application plus the further extent to the farm boundary) was examined (Fig. 6). A few archaeological materials were observed in the sandy sediment in the bed of the spruit (Fig 4), but these are of no particular significance, occurring in secondary context.

Figure 4. Bed of the Donkerhoekspruit near its north-western end.

Figure 5. Sections in the banks of the spruit were examined and while pebble-rich lenses were noticed, none of these was found to be bearing artefacts.

Summary findings in relation to predictions made in section 3.2 above can be reported as follows:

4.1.1 Occurrence of Stone Age traces:

The thick soft river sand between the banks of the spruit – the resource to be mined (Fig. 4) – yielded a few artefacts but these are all in secondary context. A few isolated artefacts were noted at various places on the sand sediments alongside the spruit bed. Previous studies had mentioned similar landscapes in the surrounding area as being virtually entirely bereft of Stone Age traces (Beaumont 2007; de Jong 2010; Dreyer 2013; van Schalkwyk 2013), so that the scarcity of finds is not completely surprising.

A ridge rising to the south of the spruit, with rocky outcrop at its crest, was found to provide sheltering rocks and a relatively constrained flat surface that had been a place of concerted artefact production and use in Later Stone Age times. It corroborates other observations (e.g. alongside a sand mining site on Kakamas South – Morris 2017b) that suggest Latter Stone Age hunter gatherer use of higher ground alongside rivers/spruits or leegtes in this environment.

Table 3. Plotted artefact scatters and observations made.

	Lat (S)	Long (E)	Comment	Significance
1	28º32’54.9”	21º14’06.0”	Isolated quartz flake (Fig 7)	LOW
2	28º32’55.0”	21º14’06.2”	Isolated jaspilite flake (Fig 8)	LOW
3	28º32’57.8”	21º14’10.9”	Isolated jaspilite flake (Fig 7, 8)	LOW
4	28º33’25.2”	21º14’40.8”	Few LSA artefacts, quartz	LOW
5	28º33’24.8”	21º14’39.9”	Isolated jaspilite core	LOW
6	28º33’24.2”	21º14’34.6”	LSA surface scatter at crest of ridge, between outcrops	MEDIUM
7	28º33’20.9”	21º14’39.0”	Isolated MSA quartz flake (facetted butt)	LOW
8	28º33’23.6”	21º14’40.6”	Isolated quartz flake	LOW

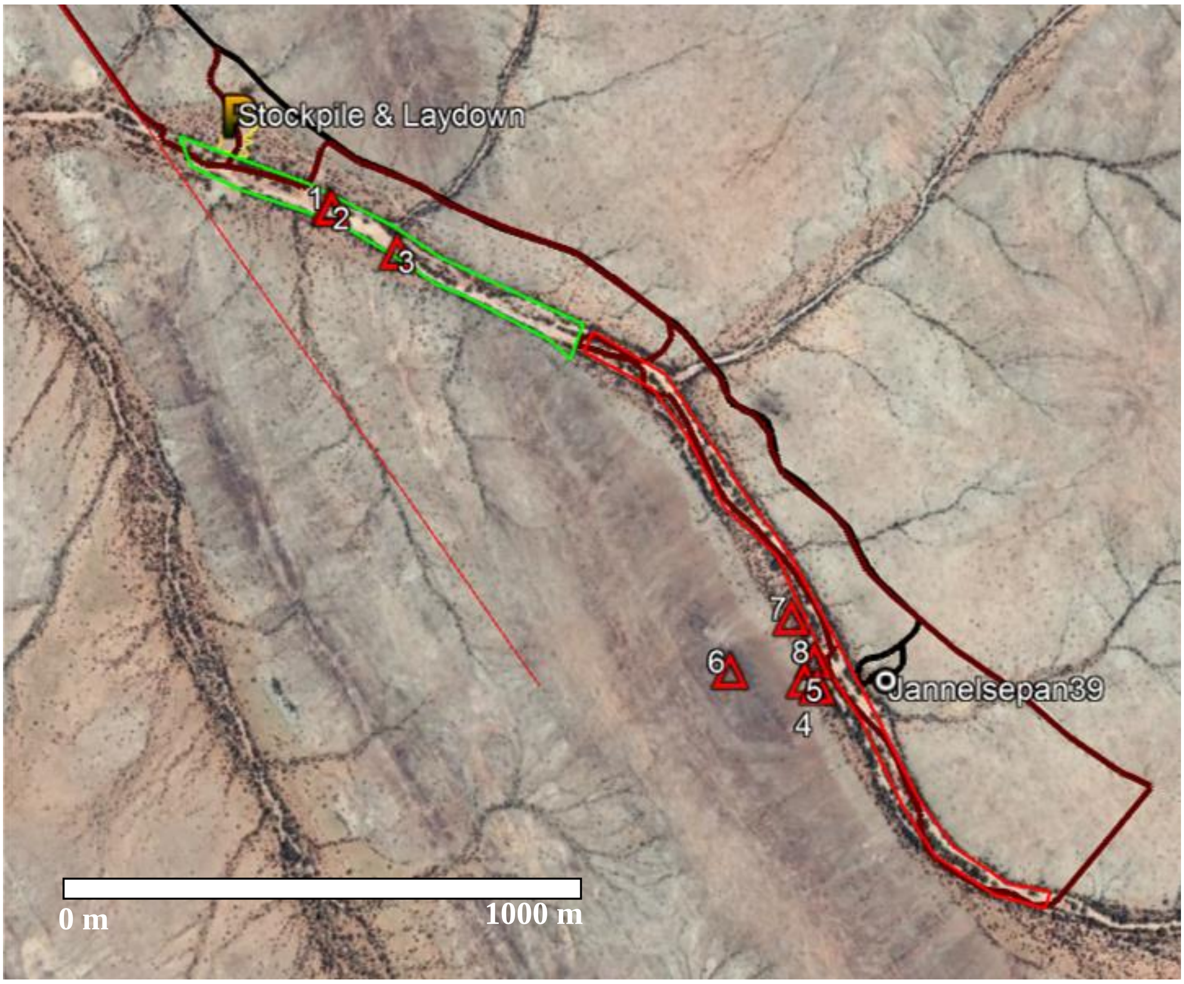

Figure 6. Plotting of archaeological observations as tabulated in Table 3. The green (new permit) and red outlines indicate extent of proposed sand mining.


Figures 7 & 8. Isolated stone artefacts (jaspilite and quartz) found in the bed of the spruit, corresponding with observations 1 and 2 in the map (Table 3).

Figure 9. View of Donkerhoekspruit from the LSA site (No 6 in Fig 6) at the top of the ridge.

Figure 10. Later Stone Age site (No 6 in Fig 6) at the crest of the ridge overlooking the spruit.


Figure 11. Random selection of artefacts at site 6.

4.1.2 Colonial era traces

No colonial era features or artefacts other than farm roads, fences and stock pens were observed in proximity to the section of Donkerhoekspruit scheduled for sand mining.

4.2 Characterising the archaeological significance (Refer to 3.4 above)

In terms of the significance matrices in Tables 1 and 2 under 3.4 above, the archaeological observations fall under Landform L1, generally Type 1 or 2, i.e. of low or very low potential. In terms of archaeological traces they all fall under Class A3 Type 1. These ascriptions (Table 1) reflect low potential for these criteria. For site attribute and value assessment (Table 2), the observations may be characterised as Type 1 for each of the Classes 1-7, again reflecting low significance.

On archaeological grounds, the Stone Age occurrences, extremely sparse, can be said to be of generally low significance, yet instructive about the exploitation of this landscape in Later Stone Age times.

For colonial era context, the site has no particular significance in terms of physical heritage traces.

4.3 Characterising the significance of impacts

The criteria on which significance of impacts is based include **nature**, **extent**, **duration**, **magnitude** and **probability of occurrence**, with quantification of significance being grounded and calculated as follows:

- The **nature**, namely a description of what causes the effect, what will be affected, and how it will be affected.
- The **extent**, indicating the geographic distribution of the impact:
    - local extending only as far as the development site area – assigned a score of 1;

    - limited to the site and its immediate surroundings (up to 10 km) – assigned a score of 2;
    - impact is regional – assigned a score of 3;
    - impact is national – assigned a score of 4; or
    - impact across international borders – assigned a score of 5.
- The **duration**, measuring the lifetime of the impact:
    - very short duration (0–1 years) – assigned a score of 1;
    - short duration (2-5 years) - assigned a score of 2;
    - medium-term (5–15 years) – assigned a score of 3;
    - long term (> 15 years) - assigned a score of 4;
    - or permanent - assigned a score of 5.
- The **magnitude**, quantified on a scale from 0-10:
    - 0 is small and will have no affect on the environment;
    - 2 is minor and will not result in an impact on environmental processes;
    - 4 is low and will cause a slight impact on environmental processes;
    - 6 is moderate and will result in environmental processes continuing but in a modified way;
    - 8 is high (environmental processes are altered to the extent that they temporarily cease); and
    - 10 is very high and results in complete destruction of patterns and permanent cessation of environmental processes.
- The **probability of occurrence**, indicating the likelihood of the impact actually occurring (scale of 1-5)
    - 1 is highly improbable (probably will not happen);
    - 2 is improbable (some possibility, but low likelihood);
    - 3 is probable (distinct possibility);
    - 4 is highly probable (most likely); and
    - 5 is definite (impact will occur regardless of any prevention measures).
- The **significance**, determined by a synthesis of the characteristics described above and expressed as low, medium or high. Significance is determined by the following formula:
  S= (E+D+M) P; where S = Significance weighting; E = Extent; D = Duration; M = Magnitude; P = Probability.
- The **status**, either positive, negative or neutral, reflecting:
    - the degree to which the impact can be reversed.
    - the degree to which the impact may cause irreplaceable loss of resources.
    - the degree to which the impact can be mitigated.
- **The significance weightings for each potential impact are as follows:**
    - < 30 points: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
    - 30-60 points: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
    - > 60 points: High (i.e. where the impact must have an influence on the decision process to develop in the area).

4.3.1 SUMMARY OF THE SIGNIFICANCE OF IMPACTS

Table 4. Significance of Impacts, with and without mitigation – based on the worst-case scenario – for all area investigated.

Nature: Acts or activities resulting in disturbance of surfaces and/or sub-surfaces containing artefacts (causes) resulting in the destruction, damage, excavation, alteration, removal or collection from its original position (consequences), of any archaeological or other heritage material or object (what affected). The following assessment refers to impact on physical archaeological/heritage traces.		
	Without mitigation	**With mitigation**
Extent	1	Not needed
Duration	5	Not needed
Magnitude	2	Not needed
Probability	3	Not needed
Significance	**24**	
Status (positive or negative)	WEAKLY NEGATIVE	
Reversibility	No	
Irreplaceable loss of resources?	Low density and significance and outside area of proposed sand mining.	Loss of context but possible to mitigate.
Can impacts be mitigated?	Not needed	Not needed
Mitigation: Not needed.		
Cumulative impacts: Cumulative Impacts: where any archaeological contexts occur, direct impacts are once-off permanent destructive events. Secondary cumulative impacts may occur with the increase in development and operational activity associated with the life of the proposed sand mining.		
Residual Impacts: -		

5. MEASURES FOR INCLUSION IN THE DRAFT ENVIRONMENTAL MANAGEMENT PLAN

The objective

Archaeological or other heritage materials that may occur in the path of any surface or sub-surface disturbances associated with any aspect of the sand mining are likely to be subject to destruction, damage, excavation, alteration, or removal. The objective is to limit such impacts to the primary activities associated with the mining and hence to limit secondary impacts during the medium and longer term operational life of the operation.

Project component/s	Any road or other infrastructure construction over and above what is outlined in respect of the proposed site development.
Potential Impact	The potential impact if this objective is not met is that wider areas or extended linear developments may result in further destruction, damage, excavation, alteration, removal or collection of heritage objects (minimal as they are) from their current context along the route.
Activity/risk source	Activities which could impact on achieving this objective include deviation from any planned development without taking heritage impacts into consideration.
Mitigation: Target/Objective	An environmental management plan that takes cognizance of heritage resources in the event of any future extensions of infrastructure. Mitigation (based on present observations and mining proposal as communicated) is not considered to be necessary.

Mitigation: Action/control	**Responsibility**	**Timeframe**
Provision for on-going heritage monitoring in an environmental management plan which also provides guidelines on what to do in the event of any major heritage feature being encountered during any phase of mining.	Environmental management provider with on-going monitoring role set up by the mining company for the mining phase and for any instance of periodic or on-going land surface modification thereafter.	Environmental management plan to be in place before commencement of mining.
Should unexpected finds be made (e.g. precolonial burials; ostrich eggshell container cache; or localised Stone Age sites with stone tools, pottery; military remains), the relevant Heritage Authority should be contacted.	Environmental Control Officer should become acquainted at a basic level with the kinds of heritage resources potentially occurring in the area and should report to the Heritage Authority as needed (see next column).	In the event of finding any of the features mentioned in column 1, reporting by the developer to relevant heritage authority should be immediate. Contact: SAHRA Ms N. Higgins 021-4624502 or NC Heritage Resources Authority Mr Andrew Timothy 053-8312537/8074700.

Performance Indicator	Inclusion of further heritage impact consideration in any future extension of mining or any infrastructural elements.
Monitoring	Officials from relevant heritage authorities (National, Provincial or Local) to be permitted to inspect the site at any time in relation to the heritage component of the management plan.

6. CONCLUSIONS

Precolonial/Stone Age material noted at the portion of Jannelsepan investigated in this study was found to be generally of low significance, where present at all. Minimal isolated archaeological finds found in the sand source area within the dry bed of the spruit are in secondary context. Criteria used here for impact significance assessment for archaeological traces rate the impacts as not worthy of further mitigation. Mining should however be limited to the intended zone within the bed of the spruit so as not to disturb possible materials in *in situ* sediments alongside the spruit.

ACKNOWLEDGEMENTS

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