

ARCHAEOLOGICAL ASSESSMENT *of the* HAIB COPPER PROJECT Karas Region, Namibia (REVISED REPORT)

J. & J. Kinahan, Archaeologists
P.O. Box 22407, Windhoek, Namibia



QRS Job 354

Commissioned by Knight Piésold Consulting (Pty) Ltd
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DECLARATION

We hereby declare that we:

- (a) have knowledge of and experience in conducting archaeological assessments, including knowledge of Namibian legislation, specifically the National Heritage Act (27 of 2004), as well as regulations and guidelines that have relevance to the proposed activity;
- (b) perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- (c) comply with the aforementioned Act, relevant regulations, guidelines and other applicable laws.

We also declare that I have no interests or involvement in:

- (i) the financial or other affairs of either the applicant or his consultant
- (ii) the decision-making structures of the National Heritage Council of Namibia.

Note: The purpose of this report is to assist the client in gaining consent under the National Heritage Act (27 of 2004) to proceed with mineral exploration and related activities at specific locations as defined herein. The report must always be quoted in full, and not in part, summary or précis form. The report may not be distributed or used for any other purpose by the client, the National Heritage Council of Namibia or any other party and remains the copyright of the authors.



John Kinahan, Archaeologist (PhD University of the Witwatersrand, 1989)



Jill Kinahan, Archaeologist (PhD Uppsala University, Sweden, 2000)

EXECUTIVE SUMMARY

An archaeological field survey and assessment of the Haib Copper Project (EPL 3140) documented a total of 75 archaeological, historical and other features defined as protected under the National Heritage Act of Namibia (27 of 2004). Most of the sites within the defined lease area were assessed to be of low archaeological significance. However, the study area also contained several burial sites, including a late 19th century cemetery associated with the remains of late pre-colonial Nama settlement. In addition, there were several sites relating to the 1905 anti-colonial Nama rebellion, including a well-preserved ambush site where it is presumed that the Nama attacked a large German colonial force. It is recommended here that specific mitigation measures are adopted to protect significant sites. This revised report considers the proximity and risk of encroachment on archaeological sites by the proposed Haib Minerals (Pty) Ltd project, as well as the conditions required by the National Heritage Council of Namibia for the approval of consent for the issue of the mining licence. Mitigation proposals include excavation of a precolonial burial site (QRS 10/47), no-go status of the Haib battlefield site (QRS 354/8-81, 84-170) and buffer zone implementation plus limited excavation on the late precolonial settlement site (QRS 376/0001 – 0004) associated with the cemetery site (QRS 10/1).

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Table of Acronyms

EPL	Exclusive Prospecting Licence
dGPS	Differential Global Positioning System (two receivers)
DFG	<i>Deutsche Forschungs Gesellschaft</i> = German Research Foundation
ESA	Early Stone Age (early to mid-Pleistocene)
Gef.	<i>Gefreiter</i> = lance corporal
GIS	Geographical Information System
GPS	Global Positioning System (one receiver)
IFC	International Finance Corporation
LSA	Later Stone Age (late Pleistocene to Holocene)
MSA	Middle Stone Age (late Pleistocene)
Oberl.	<i>Oberleutnant</i> = first lieutenant
QRS	Quaternary Research Services
S	<i>Spandau Munitionsfabrik</i> = Spandau munitions factory
UAV	Unmanned Aerial Vehicle (“drone”)
UNAM	University of Namibia
Unteroff.	<i>Unteroffizier</i> = sergeant
WGS	World Geographical System

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1 INTRODUCTION

1.1 Background

Knight Piésold Consulting (Pty) Ltd is carrying out an environmental assessment of the Haib Copper Project located on EPL 3140, near Noordoewer in the Karas Region of southern Namibia for Haib Minerals (Pty) Ltd. The Haib deposit is a low-grade copper ore body associated with a porphyry of disseminated sulphide hosted in rocks of the volcanic-sedimentary Haib Subgroup.¹ The proposed Haib Copper Mine is envisaged as an open cast operation with ore processed by heap leaching. Mining is listed in the Environmental Management Act (2007) as requiring environmental assessment and the issuance of an Environmental Clearance Certificate.

In Namibia, archaeological remains are protected under the National Heritage Act (27 of 2004) and National Heritage Regulations (Government Notice 106 of 2005). The approval of a mining licence application by the Ministry of Mines and Energy requires a letter of consent from the National Heritage Council following a heritage survey and assessment of the area to be affected by the project. Knight Piésold appointed the undersigned, J. Kinahan, to carry out an archaeological assessment of EPL 3140.

A field survey and assessment of the lease area was carried out between 14th and 20th November 2023 against the background of an earlier archaeological assessment of the same area, carried out in 1997. The earlier survey report was entitled *Haib Coppermine project environmental impact study: Archaeological Survey* (J. Kinahan, 1997, QRS 10, commissioned by Parkman Namibia (Pty) Ltd. During the preparation of the present report a letter of support was prepared entitled *Heritage consent: Haib copper mine, Karas Region, Namibia* (J. Kinahan, 2024, to J Mülders, Knight Piésold (Pty) Ltd).

Following the receipt of the National Heritage Council letter of consent and some modifications to the project surface works design, further limited survey was carried out in June 2026. This latest survey included the re-examination of an isolated burial site (QRS 10/47) and a late pre-colonial cemetery site (QRS 10/1) on the Orange River in the vicinity of a proposed water abstraction plant for the Haib project. Mitigation proposals for these sites are presented in this report for consideration by the National Heritage Council.

1.2 Terms of Reference

The primary task of the archaeological assessment reported here was to identify sensitive archaeological sites that could be affected by exploration and mining activities. The archaeological assessment forms the basis of recommended management actions to avoid or reduce negative impacts, as part of the integrated environmental assessment. The study is intended to satisfy the requirements of the relevant legislation and

¹ Haib Copper Project Scoping Study Report, Knight Piésold, 2023.

regulations, in which the process of review and clearance may require further, or different mitigation measures to be adopted.

Specifically, the archaeological assessment addresses the following primary elements:

1. The identification and assessment of potential impacts on archaeological/heritage resources, including historical sites arising from the proposed exploration and mining activities.
2. The identification and demarcation of highly sensitive archaeological/heritage sites requiring special mitigation measures to eliminate, avoid or compensate for possible destructive impacts.
3. Formulation and motivation of specific mitigation measures for the project to be considered by the authorities for the issuance of clearance certificates.
4. Identify permit requirements as related to the removal and/or destruction of heritage resources.

1.3 Assumptions & Limitations

The survey carried out and reported on 5th November 2024 was limited to EPL 3140. The QRS 354 survey report did, however, include observations from two previous surveys covering the adjacent north bank of the Orange River, QRS 10 and QRS 249. These surveys did not cover the proposed linear infrastructure for power and water supply to the Haib Copper Project. These infrastructure elements, including a pump station and water supply pipeline to the mine site were addressed in a subsequent field survey carried out in June 2026 and covered in the present report.

In general, archaeological assessment relies on the indicative value of surface finds recorded in the course of field survey. Field survey results are augmented wherever possible by inference from the results of surveys and excavations carried out in the course of previous work in the same general area as the proposed project, as well as other sources such as historical documentation. Based on these data, it is possible to predict the likely occurrence of further archaeological sites with some accuracy, and to present a general statement (see Archaeological setting, below) of the local archaeological site distribution and its sensitivity. However, since the assessment is limited to surface observations and existing survey data, it is necessary to caution the proponent that hidden or buried archaeological or palaeontological remains might be exposed as the project proceeds.

1.4 Methodology

Field survey and analytical methods have been developed in the last few decades of research in Namibia to obtain the maximum yield of high precision data from the available archaeological sites. Each new field survey and investigation draws from and builds upon previous work, leading thus to an improved understanding of the regional archaeology.² Thus, prior to field survey all available records including both published and unpublished

² Kinahan, J. 2020. *Namib: the archaeology of an African desert*. Windhoek, University of Namibia Press

sources are scrutinized and the field survey itself designed to allow maximum coverage of the survey area, with particular emphasis on types of terrain setting known to be archaeologically significant. Likely routes of movement, sources of water and shelter are selected for close examination. Available topographic maps both modern and historical, aerial photography and satellite imagery are similarly examined and a grid of survey transects established.

On the ground, these survey transects are used to ensure maximum survey reliability. The position of each archaeological occurrence is determined by hand-held GPS. The sites are documented according to standard criteria of terrain setting, extent, density, diagnostic associations, estimated age and state of preservation. The sites are individually assessed for their archaeological Significance and Vulnerability to impacts from the envisaged development project, using parallel 0-5 scales specially developed for Namibian conditions (see Table 1). Additional documentation includes photography of the site and its setting, details of the site where applicable, and mapping by field sketch, tape and compass, Differential Global Positioning System (dGPS) and low-level photogrammetry using a small Unmanned Aerial Vehicle (UAV) or “drone”. Unless authorized by a permit from the National Heritage Council field surveys do not entail surface collection, excavation or the use of any other intrusive techniques.

The presence of numerous early colonial sites in this part of southern Namibia necessitated a slightly different approach to that used on conventional pre-colonial archaeological sites. The present report draws on a range of literature, maps and unpublished resources reflecting the details of the early 20th century German colonial attempts to suppress the revolt lead by Jakob Marenga³. Most important among these resources was *Die Kämpfe der deutschen Truppen in Südwestafrika : Bd. 1* [H. 1-3]. *Der Feldzug gegen die Hottentotten / auf Grund amtlichen Materials bearb. von der Kriegsgeschichtlichen Abteilung I des Großen Generalstabes. Berlin. Berlin: Mittler, 1906. Staats-und Universitätsbibliothek Bremen., 02.g.5995 <https://nbn-resolving.org/urn:nbn:de:gbv:46:1-9067> / Public Domain Mark 1.0.*

The standardized archaeological assessment process used in Namibia is shown in Figure 1. Individual sites are assessed as to archaeological significance and vulnerability following two parallel and independent 0-5 scales. Due to the fact that buried or hidden archaeological remains including human remains may be discovered in the course of site works this report advises that the proponent should adopt the Appendix 1 *Archaeological Chance Finds Procedure* as part of the project environmental management plan. Sites of high significance are protected wherever possible and through the application of the Appendix 2 *Archaeological No-Go Procedure* which sets out measures to exclude encroachment on highly significant or sensitive sites. These processes and measures are explained in more detail in the Appendix 3 *Archaeological Guidelines for Exploration and Mining in the Namib Desert* (J. Kinahan, 2012).

³ Drechsler, H. 1980. *Let us die fighting: The struggle of the Herero and Nama against German imperialism*. London: Zed Press.

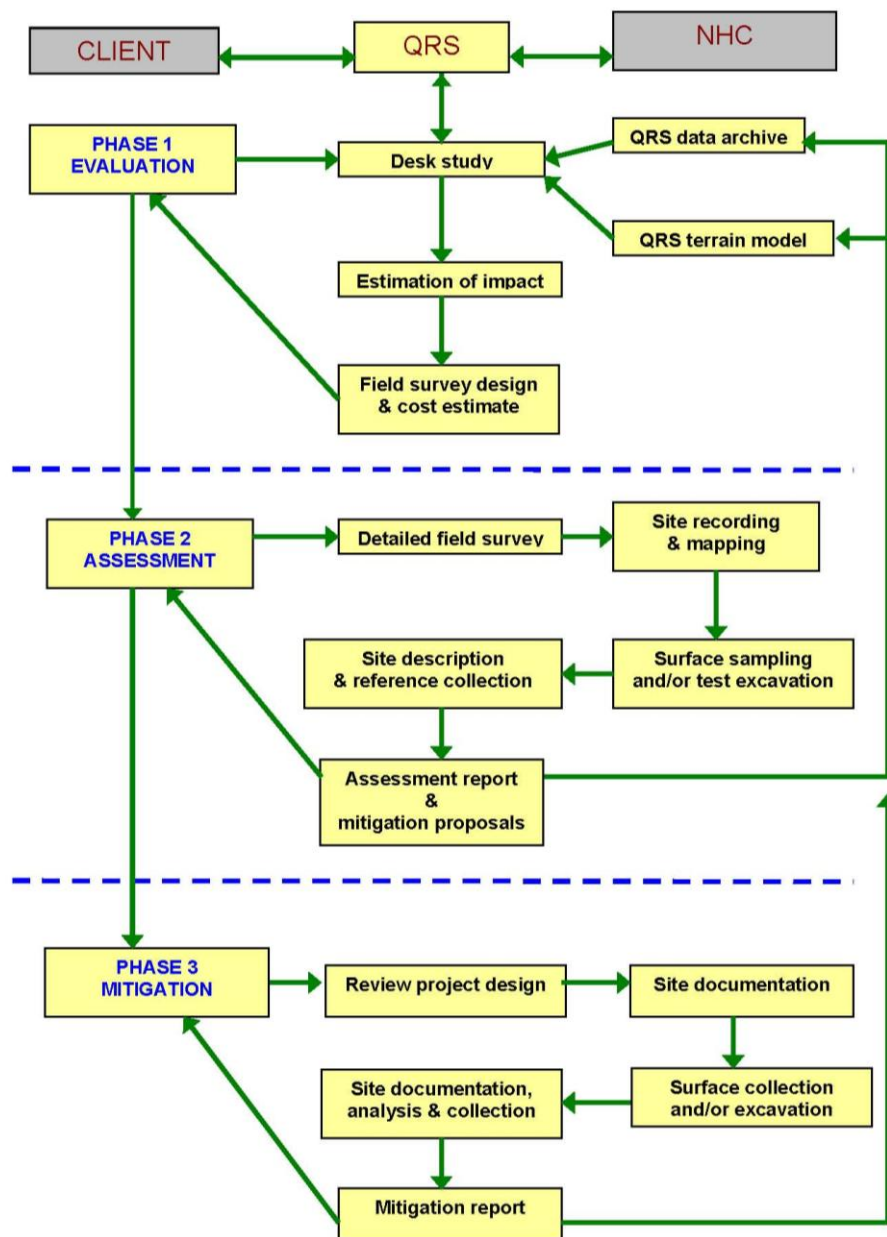


Figure 1: Standardized archaeological assessment process as applied in Namibia

Table 1: Significance and Vulnerability Ranking of archaeological sites

SIGNIFICANCE RANKING		VULNERABILITY RANKING	
0	no significance	0	not vulnerable
1	disturbed or secondary context	1	no threat posed
2	isolated minor find	2	low or indirect threat
3	archaeological site	3	probable threat
4	multi-component site	4	high likelihood of disturbance
5	major archaeological site	5	direct and certain threat

2 LEGAL REQUIREMENTS

The principal instrument of legal protection for archaeological/heritage resources in Namibia is the National Heritage Act (27 of 2004). Part V Section 46 of the Act prohibits removal, damage, alteration or excavation of heritage sites or remains. Section 48 *ff* sets out the procedure for application and granting of permits such as might be required in the event of damage to a protected site occurring as an inevitable result of development. Section 51 (3) sets out the requirements for impact assessment. Heritage sites or remains are defined in Part 1, Definitions 1, as “any remains of human habitation or occupation that are 50 or more years old found on or beneath the surface”.

It is important to be aware that no specific regulations or operating guidelines have been formulated for the implementation of the National Heritage Act in respect of archaeological assessment. However, archaeological impact assessment of large projects has become accepted practice in Namibia during the last 25 years, especially where project proponents need also to consider international guidelines. The document entitled *Archaeological Guidelines for Exploration and Mining in the Namib Desert* is attached as Appendix 3 to this report. In cases where international guidelines are applicable, those of the International Finance Corporation (IFC), specifically Guidance Note 8: Cultural heritage, are most appropriate. Of these guidelines, those relating to project screening, baseline survey and mitigation are the most relevant.

Archaeological impact assessment in Namibia may also take place under the rubric of the Environmental Management Act (7 of 2007) which specifically includes anthropogenic elements in its definition of environment. The list of activities that may not be undertaken without Environmental Clearance Certificate: Environmental Management Act, 2007 (Govt Notice 29 of 2012), and the Environmental Impact Assessment Regulations: Environmental Management Act, 2007 (Govt Notice 30 of 2012) includes activities that may have associated impacts on sites protected under the National Heritage Act (27 of 2004) whether these are considered in detail by the environmental assessment or not.

3 ARCHAEOLOGICAL SETTING

The Orange River valley in southern Namibia is a little studied archaeological region.⁴ However, a series of field surveys carried out along the northern banks of the river and its tributaries documented a large number of important sites with many relating to the early colonial or historical period. The adjacent parts of southern Namibia also contain significant archaeological sites with well-preserved evidence dating to within the last 12,000 years, a period of marked climatic instability that brought significant changes in human settlement and subsistence behaviour.⁵ This period, the Holocene, commenced with the onset of warm, moist conditions following the Last Glacial Maximum, and saw a rapid expansion of human occupation over this region. A sudden onset of arid conditions about 5,000 years ago caused a general contraction of human populations in the desert, with a small number of notable exceptions where refugium conditions existed.

During the last 2,000 years, hunter-gatherer communities in this area acquired domestic sheep, cattle and pottery, establishing a highly productive semi-nomadic pastoral mode of subsistence. The evidence of settlement in the desert by hunter-gatherer and nomadic pastoral communities, as well as more recent historical settler communities tends to be scattered and fragmentary, requiring the recording and investigation of large numbers of small, often insubstantial sites. The expansion of European settlement in the adjacent parts of South Africa had profound consequences for the Orange River valley area. Political instability is reflected in the large number of secluded or defensive sites, and in the establishment of controlled crossing points on the Orange River. Missionary settlement remains are common, as are sites associated with the Namibian resistance to colonial rule, most particularly the German and South African campaigns against Jakob Marenga and Abraham Morris. The abortive first Allied invasion of 1915 is also well represented on the historical landscape.

4 OBSERVATIONS

4.1 Summary

The field survey of EPL 3140 revealed a total of 75 archaeological sites. These ranged from isolated finds of single artefacts to complex sites comprising multiple features such as grave cairns, hunting blinds or historical remains of dwellings, wells, battlefields and other related components. Altogether 33 confirmed graves were located; these ranged from single isolated graves to a cemetery of up to 19 graves. A large proportion of the graves were of Christian tradition, having an oblong shape with an east–west orientation and sometimes with a head- and footstone. Of these graves most bore no inscription and their age was therefore uncertain. An exception were the graves of three German *Schutztruppen* with cast-iron marker plaques all with dates of 1906, suggesting that

⁴ Mitchell, P. 2002. *The archaeology of southern Africa*. Cambridge: Cambridge University Press.

⁵ Deacon, J. & Lancaster, N. 1988. *Late Quaternary palaeoenvironments of southern Africa*. Oxford: Oxford University Press.

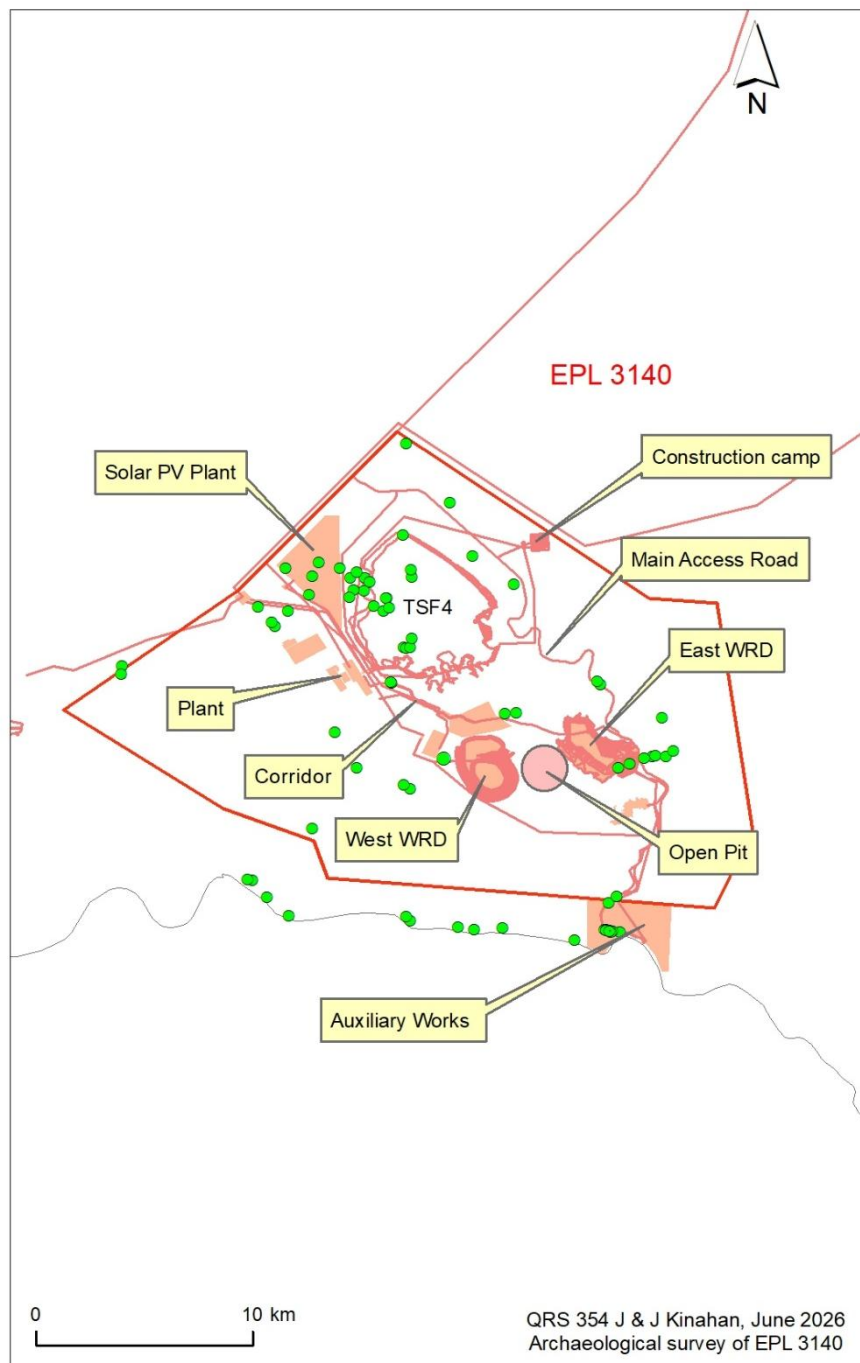


Figure 2: EPL 3140 showing generalized layout of mine surface works in relation to the distribution of archaeological sites recorded during this survey. Details of the sites are presented below in 4.2 Site Gazetteer.

they were associated with the campaigns against Jakob Marenga.⁶ Of the three historical era sites, one comprised the remains of a late 19th century Nama settlement on the northern bank of the Orange River associated with an unusually large concentration of graves. A second historical site within the mining lease area is the remains of a late 19th century wagon route watering point with well-preserved architectural features. The third site comprises the remains of an intense military engagement representing an ambush attack by Nama rebels on a large German patrol armed with rifles, a heavy machinegun and a light artillery piece. These three historical sites are highly significant and worthy of special protection.

Altogether 26 sites comprised surface scatters of stone artefacts and artefact debris. Ten of the sites had artefacts with Mode 2⁷ technology indicating a mid- to late Pleistocene age, while 12 had Mode 3 artefacts of late Pleistocene age and 18 had Mode 4 artefacts indicative of late Pleistocene and Holocene age (see Table 2). The Holocene sites also included 14 sites with pastoral affinities including seven sites with circular arrangements of anchor stones for portable mat houses used by nomadic pastoral communities during the last 2,000 years. Stone hut circles and hunting blinds were found on three sites and a hollow stone storage cairn on one site. The distribution of the archaeological sites on EPL 3140 is shown in Figure 2 and summarized in Table 3. The details of the sites are listed in the Site Gazetteer, below.

⁶ *Die Kämpfe der Deutschen Truppen in Südwestafrika: der Hottentottenkrieg*, Preußen, Großer Generalstab, Berlin, 1907, ex Staats- und Universitätsbibliothek Bremen DFG-Projekt Digitale Sammlung Deutscher Kolonialismus.

⁷ For an explanation of archaeological sequence terminology see Kinahan, J. 2020. *Namib: the archaeology of an African desert*. Windhoek, UNAM Press pp 18–23.

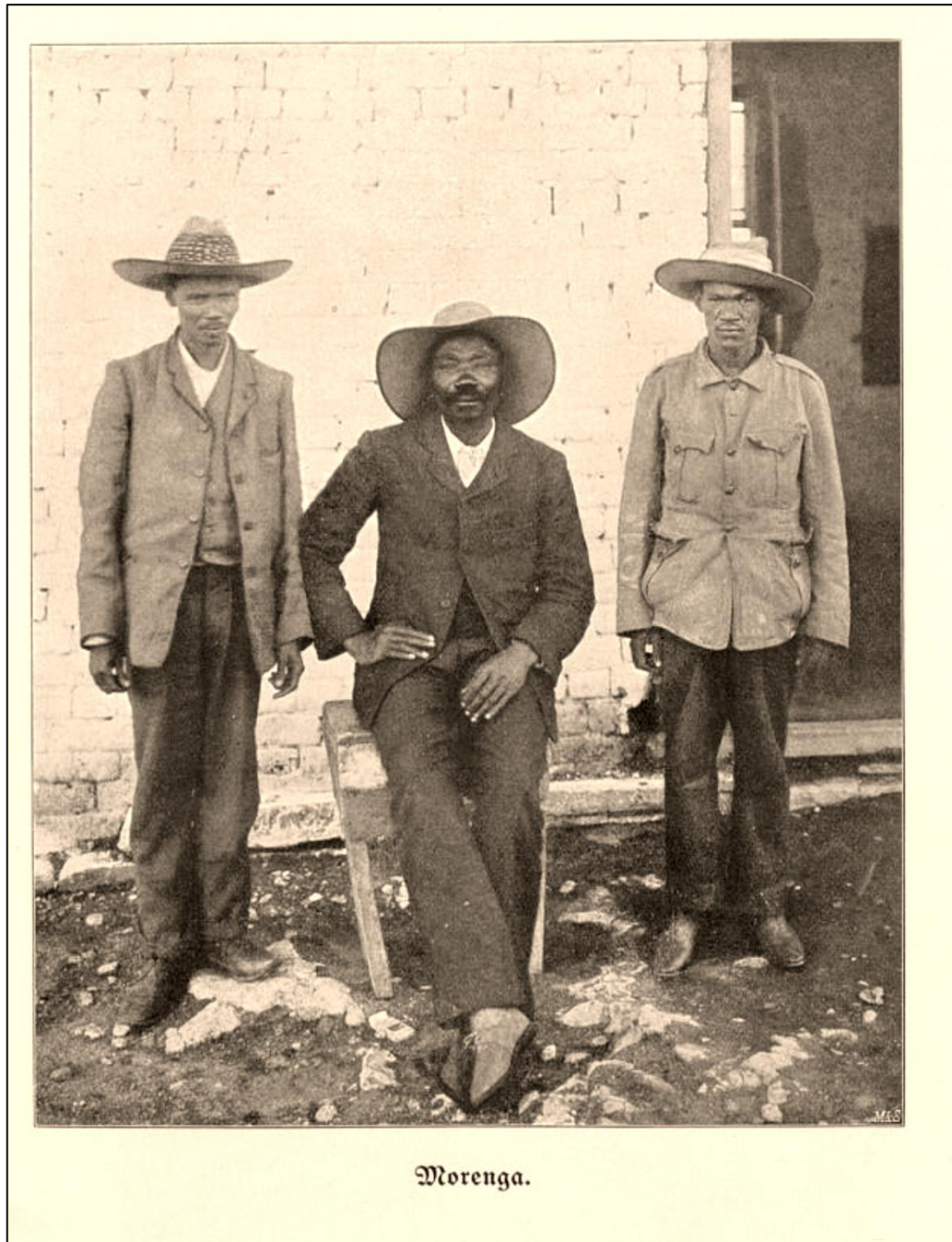


Figure 3: Jakob Marenga (also spelled Morenga) and two of his lieutenants, from *Die Kämpfe der deutschen Truppen in Südwestafrika: Bd. 1* [H. 1-3]. *Der Feldzug gegen die Hottentotten*, Berlin 1906.

Table 2: Modes of stone tool technology and their approximate dating

Mode ⁸	Description	Approximate dating and cultural affinity
Mode 1	Choppers and simple flakes struck off pebbles (pebble tools)	Early to mid-Pleistocene (Earlier Stone Age)
Mode 2	Bifacially worked tools (hand-axes and cleavers) produced from large flakes or cores	Mid-Pleistocene (Earlier Stone Age)
Mode 3	Flake tools produced from prepared cores	Mid- to late Pleistocene (Earlier to Middle Stone Age)
Mode 4	Thin blade flakes that may be retouched into various specialised tool forms	Late Pleistocene (Middle Stone Age)
Mode 5	Microlithic components of composite artefacts, often backed or otherwise retouched	Late Pleistocene to Holocene (Later Stone Age)

Table 3: Summary distribution of archaeological sites on EPL 3140

Setting	Plateau	Montane	Minor drainage	Orange River	
Chronology					Totals
Mode 2	6	1	2	1	10
Mode 3	6	1	4	1	12
Mode 4	7	3	7	1	18
Pastoral	1	0	7	6	14
Historic	3	5	4	9	21
Totals	23	8	24	16	75

⁸ The modal classification used here is based on Clark, J.D. 1969. *Kalambo Falls prehistoric site Volume 1: the geology, palaeoecology and detailed stratigraphy of the excavations*. Cambridge, Cambridge University Press; this approach is generally applied by Barham, L. and Mitchell, P. 2008. *The First Africans: African archaeology from the first toolmakers to most recent foragers*. Cambridge, Cambridge University Press.

MODE 1: Pebble tool (mid- to late Pleistocene, >500 000 years)

This well preserved example made in fine-grained quartzite was loosely cemented in a conglomerate exposed by recent collapse of a stream bank south of the Omaruru River

**MODE 2: Bifacial hand-axe (late Pleistocene, <500 000 years)**

This highly symmetrical tool made in weathered basalt was an isolated surface find on an outwash fan east of Cape Cross. The artefact is 150mm in length.

**MODE 3: Blade flake with terminal retouch (end Pleistocene <100 000 years)**

This punch-struck blade is 60mm in length. Such artefacts form part of complex toolkits including heavy spear points. Dense scatters of debris are found near outcrops and large nodules of chert.

**MODE 4: Bladelet flake with slight edge retouch (mid- to late Holocene <5 000 years)**

This artefact in crystalline quartz is 15mm in length. Flaking debris on recent Holocene sites is characterized by fragments less than 10mm in length but these are often visible in gravel float. These scatters often contain raw material brought from sources up to 50km away.



Figure 4: Summary and illustration of stone tool technology modes and their approximate dating

4.2 Site Gazetteer:⁹**QRS 10/1 (Synonym QRS 249/133)**

Position (WGS 84): -28.7633 17.9088
 Precision: 1
 Setting: Alluvial silt bank abutting hill foot-slope
 Description: c 19 graves in an area 25x25m and adjacent to vehicle track. Seven of the graves have clearly recognizable head- and foot-stones which have an average orientation of 106° (corrected). See QRS 376/0001-3 for details of spongeware, annularware, and painted ware fragments, tobacco pipe fragments and button (mid – late 19th century)
 Records: site notes, locality data, UAV photogrammetry and photographs
 Significance rating: 5
 Vulnerability rating with mitigation: 2
 Vulnerability rating w/o mitigation: 4

QRS 10/2

Position (WGS 84): -28.7623 17.9072
 Precision: 1
 Setting: Rocky spur foot-slope.
 Description: Thin surface scatter MSA artefacts including unifacial points.
 Records: site notes, locality data
 Significance rating: 3
 Vulnerability rating with mitigation: 2
 Vulnerability rating w/o mitigation: 4

QRS 10/3

Position (WGS 84): -28.7512 17.9089
 Precision: 1
 Setting: Thinly mantled pediment overlooking bend in Haib River and associated with exposed hydrothermal vein quartz
 Description: Dispersed surface scatter 30x25m with local densities >500 objects/m²
 Records: site notes, locality data
 Significance rating: 3
 Vulnerability rating with mitigation: 2
 Vulnerability rating w/o mitigation: 3

QRS 10/4

Position (WGS 84): -28.7484 17.9123
 Precision: 1
 Setting: Foot of rubble slope
 Description: Surface scatter ESA artefacts in quartzite.
 Records: site notes, locality data
 Significance rating: 2
 Vulnerability rating with mitigation: 2
 Vulnerability rating w/o mitigation: 3

⁹ See IMPACT ASSESSMENT and CONCLUSIONS & RECOMMENDATIONS below for amendments of Vulnerability ratings in consideration of surface works design and requirements for NHC consent.

QRS 10/5

Position (WGS 84): -28.6908 17.9236
 Precision: 1
 Setting: In shelter of low ridge overlooking bend in lower Haib River
 Description: Anchor stones marking perimeter of portable reed mat house and associated with single quern stone.
 Records: site notes, locality data
 Significance rating: 3
 Vulnerability rating with mitigation: 2
 Vulnerability rating w/o mitigation: 4

QRS 10/6

Position (WGS 84): -28.6901 17.9271
 Precision: 1
 Setting: Adjacent to previous, partly covered with drift sand.
 Description: Circular cairn 0.8m diameter, possible grave.
 Records: site notes, locality data
 Significance rating: 3
 Vulnerability rating with mitigation: 1
 Vulnerability rating w/o mitigation: 3

QRS 10/7

Position (WGS 84): -28.6899 17.9284
 Precision: 1
 Setting: Adjacent to previous, probably an extension of the same site
 Description: Semi-circular arc of river cobbles 4m diameter probably marking perimeter of portable reed mat house
 Records: site notes, locality data
 Significance rating: 3
 Vulnerability rating with mitigation: 1
 Vulnerability rating w/o mitigation: 3

QRS 10/8

Position (WGS 84): -28.6904 17.9326
 Precision: 1
 Setting: Gravel surface
 Description: Isolated find of tin can embossed *München Schweinefleisch 1905*, probably discarded during colonial military operations.
 Records: site notes, locality data
 Significance rating: 2
 Vulnerability rating with mitigation: 1
 Vulnerability rating w/o mitigation: 1

QRS 10/9

Position (WGS 84): -28.6879 17.9356
 Precision: 1

Setting: Near upper slope margin of a wide pediment with large boulders dislodged from higher slopes.
 Description: Possible MSA quarrying site with artefact scatters 50x30m.
 Records: site notes, locality data
 Significance rating: 2
 Vulnerability rating with mitigation: 1
 Vulnerability rating w/o mitigation: 3

QRS 10/10

Position (WGS 84): -28.674 17.9309
 Precision: 1
 Setting: As previous
 Description: As previous
 Records: site notes, locality data
 Significance rating: 2
 Vulnerability rating with mitigation: 1
 Vulnerability rating w/o mitigation: 3

QRS 10/11

Position (WGS 84): -28.6951 17.913
 Precision: 1
 Setting: Near to weak spring in tributary to Haib River
 Description: Surface scatter of artefact debris
 Records: site notes, locality data
 Significance rating: 2
 Vulnerability rating with mitigation:
 Vulnerability rating w/o mitigation:

QRS 10/12

Position (WGS 84): -28.6602 17.9056
 Precision: 1
 Setting: Gravel surface
 Description: Surface scatter of artefact debris
 Records: site notes, locality data
 Significance rating: 2
 Vulnerability rating with mitigation: 1
 Vulnerability rating w/o mitigation: 3

QRS 10/13

Position (WGS 84): -28.659 17.9042
 Precision: 1
 Setting: Foot-slope embayment among large granite boulders
 Description: Surface scatter of artefact debris
 Records: site notes, locality data
 Significance rating: 2
 Vulnerability rating with mitigation:
 Vulnerability rating w/o mitigation:

QRS 10/14

Position (WGS 84): -28.6119 17.7974
 Precision: 1
 Setting: Banks of minor braided streambed
 Description: Isolated find of ESA handaxe
 Records: site notes, locality data
 Significance rating: 2
 Vulnerability rating with mitigation: 1
 Vulnerability rating w/o mitigation: 3

QRS 19/15

Position (WGS 84): -28.6803 17.7953
 Precision: 1
 Setting: Banks of minor braided streambed
 Description: Isolated find of MSA point
 Records: site notes, locality data
 Significance rating: 2
 Vulnerability rating with mitigation: 1
 Vulnerability rating w/o mitigation: 3

QRS 10/16

Position (WGS 84): -28.6095 17.7884
 Precision: 1
 Setting: Dolerite boulders with localized disturbance
 Description: Appears to be a harvester ant seed digging site
 Records: site notes, locality data
 Significance rating: 2
 Vulnerability rating with mitigation: 2
 Vulnerability rating w/o mitigation: 2

QRS 10/17

Position (WGS 84): -28.6153 17.7858
 Precision: 1
 Setting: Banks of minor braided streambed
 Description: Isolated find of LSA flake
 Records: site notes, locality data
 Significance rating: 2
 Vulnerability rating with mitigation: 2
 Vulnerability rating w/o mitigation: 2

QRS 10/18

Position (WGS 84): -28.6161 17.8076
 Precision: 1
 Setting: Eastern foot-slopes of low rocky ridge
 Description: Isolated find of retouched MSA flake in hornfels
 Records: site notes, locality data
 Significance rating: 2
 Vulnerability rating with mitigation: 2

Vulnerability rating w/o mitigation: 2

QRS 10/19

Position (WGS 84): -28.6178 17.8097
 Precision: 1
 Setting: Outcropping quartzite
 Description: Extensive ESA surface scatter 150x500m with local densities of 100 objects/m².
 Records: site notes, locality data
 Significance rating: 3
 Vulnerability rating with mitigation: 1
 Vulnerability rating w/o mitigation: 4

QRS 10/20

Position (WGS 84): -28.6214 17.8073
 Precision: 1
 Setting: Eastern foot-slopes of low rocky ridge
 Description: Surface scatter MSA flakes in hornfels and hydrothermal vein quartz.
 Records: site notes, locality data
 Significance rating: 2
 Vulnerability rating with mitigation: 1
 Vulnerability rating w/o mitigation: 4

QRS 10/21

Position (WGS 84): -28.6211 17.8029
 Precision: 1
 Setting: Low boulder kopje
 Description: Isolated find of MSA polyhedral core in hydrothermal vein quartz.
 Records: site notes, locality data
 Significance rating: 2
 Vulnerability rating with mitigation: 1
 Vulnerability rating w/o mitigation: 2

QRS 10/22

Position (WGS 84): -28.7666 17.8948
 Precision: 1
 Setting: Mountain foot-slope overlooking north bank of Orange River
 Description: Storage cairn built into lee of boulder
 Records: site notes, locality data
 Significance rating: 2
 Vulnerability rating with mitigation:
 Vulnerability rating w/o mitigation:

QRS 10/23

Position (WGS 84): -28.7615 17.8649
 Precision: 1
 Setting: Mountain foot-slope overlooking north bank of Orange River
 Description: Four burial cairns near stockpost homestead, uncertain age

Records: site notes, locality data
 Significance rating: 5
 Vulnerability rating with mitigation: 2
 Vulnerability rating w/o mitigation: 4

QRS 10/24

Position (WGS 84): -28.7622 17.853
 Precision: 1
 Setting: Silt terrace above Orange River
 Description: Stone hut circle with heart and fragments bone and hydrothermal vein quartz
 Records: site notes, locality data
 Significance rating: 4
 Vulnerability rating with mitigation: 2
 Vulnerability rating w/o mitigation: 3

QRS 10/25

Position (WGS 84): -28.7613 17.8464
 Precision: 1
 Setting: Silt terrace above Orange River
 Description: Semi-circular stone enclosure c5m diameter
 Records: site notes, locality data
 Significance rating: 3
 Vulnerability rating with mitigation:
 Vulnerability rating w/o mitigation:

QRS 10/26

Position (WGS 84): -28.7586 17.8266
 Precision: 1
 Setting: Rocky ridge overlooking Orange River silt terrace
 Description: Suspected burial cairn
 Records: site notes, locality data
 Significance rating: 4
 Vulnerability rating with mitigation: 2
 Vulnerability rating w/o mitigation: 4

QRS 10/27

Position (WGS 84): -28.7568 17.8248
 Precision: 1
 Setting: Silt terrace dunefield overlooking Orange River
 Description: Surface scatter artefact debris, bone flakes and quern stones.
 Records: site notes, locality data
 Significance rating: 3
 Vulnerability rating with mitigation:
 Vulnerability rating w/o mitigation:

QRS 10/28

Position (WGS 84): -28.6161 17.8016
 Precision: 1
 Setting: Outcropping granite
 Description: hunting blind
 Records: site notes, locality data
 Significance rating: 3
 Vulnerability rating with mitigation: 2
 Vulnerability rating w/o mitigation: 3

QRS 10/29

Position (WGS 84): -28.6136 17.8044
 Precision: 1
 Setting: As previous
 Description: Isolated LSA flake on hornfels
 Records: site notes, locality data
 Significance rating: 2
 Vulnerability rating with mitigation: 2
 Vulnerability rating w/o mitigation: 2

QRS 10/30

Position (WGS 84): -28.607 17.8524
 Precision: 1
 Setting: between low boulder kopjes
 Description: Surface scatter MSA flakes
 Records: site notes, locality data
 Significance rating: 2
 Vulnerability rating with mitigation: 1
 Vulnerability rating w/o mitigation: 2

QRS 10/31

Position (WGS 84): -28.6185 17.8695
 Precision: 1
 Setting: ridge overlooking Haibpforte
 Description: low density surface scatter LSA hydrothermal and crystal quartz
 Records: site notes, locality data
 Significance rating: 2
 Vulnerability rating with mitigation: 1
 Vulnerability rating w/o mitigation: 2

QRS 10/32

Position (WGS 84): -28.636 17.7703
 Precision: 1
 Setting: Outcropping granite
 Description: hunting blind
 Records: site notes, locality data
 Significance rating: 2
 Vulnerability rating with mitigation: 1
 Vulnerability rating w/o mitigation: 3

QRS 10/33

Position (WGS 84): -28.6343 17.769
 Precision: 1
 Setting: gravel surface
 Description: isolated ESA quartzite flake
 Records: site notes, locality data
 Significance rating: 2
 Vulnerability rating with mitigation:
 Vulnerability rating w/o mitigation:

QRS 10/34

Position (WGS 84): -28.628 17.7634
 Precision: 1
 Setting: low gravel bank
 Description: isolated find of LSA flake
 Records: site notes, locality data
 Significance rating: 2
 Vulnerability rating with mitigation: 1
 Vulnerability rating w/o mitigation: 1

QRS 10/35

Position (WGS 84): -28.6298 17.7756
 Precision: 1
 Setting: gravel surface
 Description: surface scatter ESA basalt flakes
 Records: site notes, locality data
 Significance rating: 2
 Vulnerability rating with mitigation: 2
 Vulnerability rating w/o mitigation: 1

QRS 10/36

Position (WGS 84): -28.623 17.7846
 Precision: 1
 Setting: gravel surface
 Description: isolated MSA hornfels disc core
 Records: site notes, locality data
 Significance rating: 2
 Vulnerability rating with mitigation: 1
 Vulnerability rating w/o mitigation: 1

QRS 10/37

Position (WGS 84): -28.6724 17.8657
 Precision: 1
 Setting: granite boulder outcrop
 Description: small scatter LSA hydrothermal vein quartz flakes
 Records: site notes, locality data
 Significance rating: 2

Vulnerability rating with mitigation: 1
 Vulnerability rating w/o mitigation: 1

QRS 10/38

Position (WGS 84): -28.672 17.8704
 Precision: 1
 Setting: granite boulder outcrop
 Description: small scatter LSA hydrothermal vein quartz flakes
 Records: site notes, locality data
 Significance rating: 2
 Vulnerability rating with mitigation:
 Vulnerability rating w/o mitigation:

QRS 10/39

Position (WGS 84): -28.72 17.7858
 Precision: 1
 Setting: low hill saddle near spring
 Description: small scatter LSA hydrothermal vein quartz flakes
 Records: site notes, locality data
 Significance rating: 2
 Vulnerability rating with mitigation: 1
 Vulnerability rating w/o mitigation: 1

QRS 10/40

Position (WGS 84): -28.7488 17.767
 Precision: 1
 Setting: mountain foot-slope overlooking Orange River
 Description: three German military graves, oriented north-south and placed 1m apart. In 1997, the graves had cast iron markers identifying the deceased from west to east as Gef. Gustav Stückle (died 16.08.1906), Unteroff. Fredrich Ehlers (died 16.08.1906) and Oberl. Richard Barlach (died 23.7.1906). By 2023 the cast iron grave markers had been removed to the military cemetery at Uhabis.
 Records: site notes, locality data
 Significance rating: 5
 Vulnerability rating with mitigation: 2
 Vulnerability rating w/o mitigation: 5

QRS 10/41

Position (WGS 84): -28.7563 17.7762
 Precision: 1
 Setting: rocky pediment above silt terrace.
 Description: dispersed scatter MSA/ESA flakes
 Records: site notes, locality data
 Significance rating: 2
 Vulnerability rating with mitigation: 2
 Vulnerability rating w/o mitigation: 2

QRS 10/42

Position (WGS 84): -28.7415 17.7609
 Precision: 1
 Setting: gravel outwash fan
 Description: 2 stone hut circles conjoined 1.5-2.0m diameter
 Records: site notes, locality data
 Significance rating: 3
 Vulnerability rating with mitigation: 1
 Vulnerability rating w/o mitigation: 1

QRS 10/43

Position (WGS 84): -28.7412 17.7591
 Precision: 1
 Setting: low ridge on outer edge of river pediment
 Description: 7 burials, recent, possibly 1950s/60s
 Records: site notes, locality data
 Significance rating: 5
 Vulnerability rating with mitigation: 2
 Vulnerability rating w/o mitigation: 5

QRS 10/44

Position (WGS 84): -28.6527 17.7069
 Precision: 1
 Setting: Gams, head of rocky streambed leading south to Noordoewer approx. 25km distant.
 Description: foundations of two substantial rectangular drystone structures associated with livestock enclosures and a hand-dug well. The latter indicate that the site was in use as late as the 1940s but would have been abandoned when the main road was constructed approximately 1km to the west. The drystone structures are probably late 19th century as indicated by imported transfer printed and painted earthenware.
 Records: site notes, locality data, UAV photogrammetry, photographs, surface collection of earthenware and stoneware (late 19th century)
 Significance rating: 5
 Vulnerability rating with mitigation: 2
 Vulnerability rating w/o mitigation: 4

QRS 10/45

Position (WGS 84): -28.6558 17.7066
 Precision: 1
 Setting: rock outcrop
 Description: polished surface 2m above ground indicating presence of elephant.
 Records: site notes, locality data
 Significance rating: 1
 Vulnerability rating with mitigation: 1
 Vulnerability rating w/o mitigation: 1

QRS 10/46

Position (WGS 84): -28.6156 17.8272

Precision: 1
 Setting: braided streambed on extensive outwash fan
 Description: isolated basalt ESA polyhedral core
 Records: site notes, locality data
 Significance rating: 2
 Vulnerability rating with mitigation: 1
 Vulnerability rating w/o mitigation: 1

QRS 10/47

Position (WGS 84): -28.6127 17.8269
 Precision: 1
 Setting: extensive outwash fan
 Description: confirmed burial cairn 1m diameter
 Records: site notes, locality data
 Significance rating: 4
 Vulnerability rating with mitigation: 2
 Vulnerability rating w/o mitigation: 5

QRS 10/48

Position (WGS 84): -28.6241 17.8014
 Precision: 1
 Setting: possible extension of QRS 10/19
 Description: moderately dense scatter ESA polyhedrals and flakes
 Records: site notes, locality data
 Significance rating: 2
 Vulnerability rating with mitigation: 2
 Vulnerability rating w/o mitigation: 3

QRS 10/49

Position (WGS 84): -28.598266 17.823435
 Precision: 1
 Setting: sand and gravel
 Description: isolated Mode 3 flake
 Records: site notes, locality data
 Significance rating: 2
 Vulnerability rating with mitigation: 1
 Vulnerability rating w/o mitigation: 1

QRS 10/50

Position (WGS 84): -28.560251 17.82486
 Precision: 1
 Setting: sand and gravel
 Description: isolated Mode 3 blade flake
 Records: site notes, locality data
 Significance rating: 2
 Vulnerability rating with mitigation: 1
 Vulnerability rating w/o mitigation: 1

QRS 10/51

Position (WGS 84): -28.584534 17.84309
 Precision: 1
 Setting: sand and gravel
 Description: isolated Mode 3 utilised flake
 Records: site notes, locality data
 Significance rating: 2
 Vulnerability rating with mitigation: 1
 Vulnerability rating w/o mitigation: 1

QRS 10/52

Position (WGS 84): -28.644749 17.823851
 Precision: 1
 Setting: sandy embayment
 Description: 4 x lower grindstones
 Records: site notes, locality data
 Significance rating: 3
 Vulnerability rating with mitigation: 2
 Vulnerability rating w/o mitigation: 2

QRS 10/53

Position (WGS 84): -28.645118 17.824749
 Precision: 1
 Setting: outcrop on gravel plain
 Description: 2 x fissures closed with packed rocks
 Records: site notes, locality data
 Significance rating: 3
 Vulnerability rating with mitigation: 2
 Vulnerability rating w/o mitigation: 2

QRS 10/54

Position (WGS 84): -28.644971 17.826342
 Precision: 1
 Setting: sand and gravel
 Description: isolated hydrothermal vein quartz core
 Records: site notes, locality data
 Significance rating: 2
 Vulnerability rating with mitigation: 2
 Vulnerability rating w/o mitigation: 2

QRS 10/55

Position (WGS 84): -28.644971 17.826342
 Precision: 1
 Setting: gravel plain
 Description: 3-sided stone structure 1 x 1.2 m
 Records: site notes, locality data
 Significance rating: 3
 Vulnerability rating with mitigation: 2
 Vulnerability rating w/o mitigation: 2

QRS 10/56

Position (WGS 84): -28.62446 17.816871
 Precision: 1
 Setting: gravel plain
 Description: 1 x 1.8 dispersed cairn, suspected burial
 Records: site notes, locality data
 Significance rating: 3
 Vulnerability rating with mitigation: 2
 Vulnerability rating w/o mitigation: 3

QRS 10/57

Position (WGS 84): -28.624307 17.816276
 Precision: 1
 Setting: sand and gravel
 Description: isolated Mode 2 biface
 Records: site notes, locality data
 Significance rating: 2
 Vulnerability rating with mitigation: 2
 Vulnerability rating w/o mitigation: 2

QRS 10/58

Position (WGS 84): -28.627691 17.811515
 Precision: 1
 Setting: gravel plain
 Description: seed digging
 Records: site notes, locality data
 Significance rating: 2
 Vulnerability rating with mitigation: 2
 Vulnerability rating w/o mitigation: 2

QRS 10/59

Position (WGS 84): -28.62968 17.815481
 Precision: 1
 Setting: gravel plain
 Description: isolated upper grindstone
 Records: site notes, locality data
 Significance rating: 2
 Vulnerability rating with mitigation: 2
 Vulnerability rating w/o mitigation: 2

QRS 10/60

Position (WGS 84): -28.628494 17.817783
 Precision: 1
 Setting: low neck on hill
 Description: single hunting blind
 Records: site notes, locality data
 Significance rating: 3
 Vulnerability rating with mitigation:
 Vulnerability rating w/o mitigation:

QRS 10/61

Position (WGS 84): -28.611808 17.774596
 Precision: 1
 Setting: sand and gravel
 Description: isolated Mode 2 utilised flake
 Records: site notes, locality data
 Significance rating: 2
 Vulnerability rating with mitigation: 2
 Vulnerability rating w/o mitigation: 2

QRS 354/1

Position (WGS 84): -28.703583 17.826417
 Precision: 1
 Setting: valley foot-slope
 Description: rectangular cairn (3x1.5m) on exposed bedrock, possible burial
 Records: site notes, locality data, photograph
 Significance rating: 3
 Vulnerability rating with mitigation: 1
 Vulnerability rating w/o mitigation: 1

QRS 354/6

Position (WGS 84): -28.695 17.804167
 Precision: 1
 Setting: deep ravine
 Description: natural seepage/spring on route from Gams (QRS 10/44 & 45) to Haib
 Records: site notes, locality data
 Significance rating: 1
 Vulnerability rating with mitigation: 2
 Vulnerability rating w/o mitigation: 2

QRS 354/8-81

Position (WGS 84): -28.701898 17.823645
 Precision: 1
 Setting: exposed rocky ridgeline
 Description: The site comprises approximately 75 stone sangar shooting positions with large amounts of discarded M98 cartridge cases (all head-stamped 1902). There are also ten discarded 60mm cannon shells with the most recent head-stamp date of 1905. The evidence suggests this was the site of a 1906 battle between German colonial troops and followers of the Nama rebel leader Jakob Marenga.
 Records: site notes, locality data, photographs, site mapped by hand-held GPS.
 Significance rating: 5
 Vulnerability rating with mitigation: 3
 Vulnerability rating w/o mitigation: 5

QRS 354/82

Position (WGS 84): -28.659717 17.818855
 Precision: 1
 Setting: rocky outcrop on banks of stream course.
 Description: stone circle c3m diameter
 Records: site notes, locality data

Significance rating: 3
 Vulnerability rating with mitigation: 2
 Vulnerability rating w/o mitigation: 2

QRS 354/83

Position (WGS 84): -28.659171 17.818372
 Precision: 1
 Setting: rocky slope above stream course
 Description: 2 suspected hunting blinds
 Records: site notes, locality data
 Significance rating: 3
 Vulnerability rating with mitigation: 2
 Vulnerability rating w/o mitigation: 2

QRS 354/85

Position (WGS 84): -28.693429 17.887482
 Precision: 1
 Setting: foot of rocky slope above streambed in mine pit area
 Description: Swanson adit 2
 Records: site notes, locality data, photograph
 Significance rating: 3
 Vulnerability rating with mitigation: 2
 Vulnerability rating w/o mitigation: 2

QRS 354/86

Position (WGS 84): -28.693429 17.887482
 Precision: 1
 Setting: at entrance to side valley of the Haib River (Corasib River) near farmhouse
 Description: Eibeb mound, 6 x 5m cairn
 Records: site notes, locality data, photograph
 Significance rating: 3
 Vulnerability rating with mitigation: 2
 Vulnerability rating w/o mitigation: 2

QRS 354/88

Position (WGS 84): -28.763251 17.913534
 Precision: 1
 Setting: hill foot-slope on north bank of the Orange River near water abstraction point B
 Description: start of section of visible wagon road, track cleared and with rock revetment
 Records: site notes, locality data, photographs
 Significance rating: 3
 Vulnerability rating with mitigation: 3
 Vulnerability rating w/o mitigation: 4

QRS 354/89

Position (WGS 84): -28.76299 17.910392
 Precision: 1

Setting: hill foot-slope on north bank of the Orange River near water abstraction point B
 Description: end of section of visible wagon road, track cleared and with rock revetment
 Records: site notes, locality data, photographs
 Significance rating: 3
 Vulnerability rating with mitigation: 3
 Vulnerability rating w/o mitigation: 4

QRS 376/0001

Position (WGS 84): -28.763105 17.909364
 Precision: 1
 Setting: north bank of the Orange River downslope of track near water abstraction point
 Description: 25 x 25 m dispersed scatter of cultural material on compacted ash, charcoal and fragmented bone (density of the latter up to 1000/m²). Upper and lower grindstones, smoking pipe stems, ostrich eggshell, earthenware, buttons, glass beads.
 Records: site notes, locality data, photograph, surface collection of pipe stems, beads earthenware
 Significance rating: 4
 Vulnerability rating with mitigation: 3
 Vulnerability rating w/o mitigation: 5

QRS 376/0002

Position (WGS 84): -28.762247 17.907674
 Precision: 1
 Setting:
 Description: circular stone structure 3 m diameter incorporating fragments of lower grindstones, 4 lower and 1 upper grindstone in the near vicinity. Spongeware and annularware, green glass, possible flake on white glass bottle rim. Fragments of cast iron pot and barrel hoop.
 Records: site notes, locality data, photograph, collection
 Significance rating: 4
 Vulnerability rating with mitigation: 3
 Vulnerability rating w/o mitigation: 5

QRS 376/0003

Position (WGS 84): -28.762343 17.907899
 Precision: 1
 Setting: mixed sand and gravel on hill foot slope
 Description: suspected burial dispersed cairn without head or foot stone and no associations.
 Records: site notes, locality data
 Significance rating: 4
 Vulnerability rating with mitigation: 3
 Vulnerability rating w/o mitigation: 5

QRS 376/0004

Position (WGS 84): -28.76301 17.909999
 Precision: 1

Setting: mixed sand and gravel on hill foot slope
 Description: base of small white earthenware bowl
 Records: site notes, locality data, collection
 Significance rating: 2
 Vulnerability rating with mitigation: 3
 Vulnerability rating w/o mitigation: 5

QRS 376/0017

Position (WGS 84): -28.762781 17.909179
 Precision: 1
 Setting: mixed sand and gravel on hill foot slope
 Description: partially exposed hearth, probably part of QRS 376/0001
 Records: site notes, locality data, collection
 Significance rating: 4
 Vulnerability rating with mitigation: 3
 Vulnerability rating w/o mitigation: 5



Figure 5: Stone hut circle, site QRS 354/82.

4.3 Burial sites

Burial sites are relatively common in the Orange River valley and adjacent tributary valleys. While some are of unknown pre-colonial date, many have diagnostic features of Christian burial traditions and are therefore of late 18th to early 20th century date. The survey located 9 sites with burials, ranging from single graves to a cemetery of up to 19 graves. Four are suspected but unconfirmed burial sites. The distribution of burial sites recorded during the EPL 3140 field survey (including immediately adjacent ground) is shown in Figure 7. The map indicates

that most of the sites lie outside and adjacent to the boundaries of the lease. However, because the Haib Copper Project may require access to the river, with vehicles occasionally travelling along the north bank it is considered prudent to include the sites here. Three of the burial sites are located within the area to be affected by the Haib project. These are QRS 10/1 and QRS 10/47. Two important burial sites located adjacent to the project area are QRS 10/40 and QRS 10/43. A Haitse-eibeb mound Site QRS 354/86 is a symbolic burial and would not contain human remains.



Figure 6: Burial cairn, site QRS 10/47.

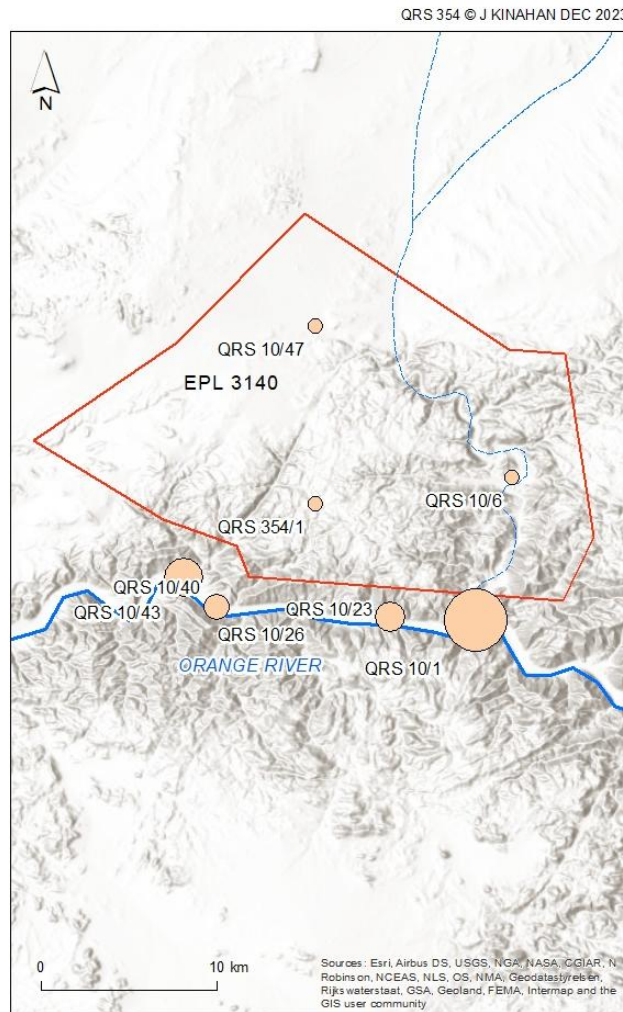


Figure 7: The distribution of burial sites on EPL 3140, showing the preferred location of burials along the Orange River, outside the boundaries of the lease. The map symbols indicate three classes of burial sites: 1/>; 5-10; <20 individual burial features.

QRS 10/1: As summarized in the Site Gazetteer, this site is a cemetery comprising approximately 19 graves located on an alluvial silt bank abutting the southern foot-slope of a prominent rocky hill overlooking the north bank of the Orange River. The graves lie within an area of approximately 25x25m which is immediately adjacent to an established vehicle track. Seven of the graves have clearly recognizable head- and footstones; these have a clear east–west alignment (average orientation of 106°, corrected) which, together with curbing of some graves and a filling of white quartz pebbles, are of clearly Christian tradition. The cemetery may represent a long period of settlement in the near vicinity or an unusual mass mortality event following one of the cholera or smallpox epidemics that spread northwards from the Cape Colony during the late 19th century. During this period intensive work was carried out from the Silesian mission station at Pella in the Cape Colony. Figure 8 shows an

example of two graves from this site and Figure 9 is an orthophoto map of the cemetery. Also included among this group of features are the previously documented sites of QRS 249/132 and 133.



Figure 8: Two burial features at QRS 10/1 (synonym QRS 249/133) seen from the south, with the grave in the foreground showing a head- and footstone as well as rough curbing of the edges. The rather informal grave cairn in the background could be the burial of an unbaptized person, possibly a child.



Figure 9: Orthophoto image of the cemetery at QRS 10/1 (synonym QRS 249/133). The graves circled at the top right are those shown in Figure 8. The vehicle track mentioned in the text is just visible in the lower left corner.

Adjacent to **QRS 10/1** are **QRS 376/0001 – 0004**, comprising stone features (including a suspected burial QRS 376/0003) and dense surface and near surface occupation remains. These remains include decorated European earthenware, glass trade beads and other items indicating a mid- to late 19th century date. The Christian characteristics of the **QRS 10/1** graves is consistent with this date. In the same vicinity as these sites are the remains of a roadway **QRS 354/88 and 89**, extending over a little less than one kilometre along the footslopes above the Orange River, with well-constructed revetments comprising sizeable boulders in excess of 50kg mass. The construction of the roadway is more elaborate than would be expected of a jeep track and may represent an historical wagon road.

QRS 10/40: The site comprises three German military graves located on a mountain foot-slope overlooking the Orange River. The graves are oriented north–south (in contrast to the conventional east–west orientation of Christian graves) and placed 1m apart. When first located during the 1997 survey, the graves had cast iron markers identifying the deceased from west to east as *Gefreiter* Gustav Stücker (died 16.08.1906), *Unteroffizier* Friedrich Ehlers (died 16.08.1906) and *Oberleutnant* Richard Barlach (died 23.7.1906). By 2023 the cast iron grave markers had been removed to the military cemetery at Uhabis (see Figure 18 for location).

According to the official campaign history *Die Kämpfe der Deutschen Truppen in Südwestafrika* (Vol 2. 1907: 313, 311), these three servicemen were lost in one of the campaigns against Jakob Marenga. Barlach was reported lost in a skirmish at the mouth of the Gams Ravine.¹⁰ History provides few further details but it does seem that the German troops remained in the area until 16th August 1906 when Stücker and Ehlers (both signalmen) were lost. The bodies were recovered and buried at the same spot. It is likely that these losses occurred at about the same time as the skirmish that took place on Site QRS 354/8-81, 84-170, which is described in the next section. Other evidence of the German presence in the area is from Site QRS 10/8, in the form of a corned meat tin bearing the embossed label *München Schweinefleisch 1905*. Other evidence described in the next section in the form of ammunition headstamp dates from QRS 354/8-81 also points to a 1906 date for the German military activity in this area.

QRS 10/43: The site comprises a group of seven burials on a low ridge on the outer edge of the valley pediment. The condition of the graves suggests that they probably date from the 1950s and 1960s and formed part of a small farming settlement that seems now to have disappeared.

¹⁰ This is probably a cartographic error. The confluence of the Gams and the Orange River lies approximately 20km west of the site.

4.4 Historical sites

Of the three historical era sites, one comprised the remains of a late 19th century Nama settlement on the northern bank of the Orange River **QRS 10/1** and **QRS 376/0001 – 0004**, associated with the cemetery described in the previous section. It is plausible that the cemetery represents a mass mortality event associated with outbreaks of disease¹¹, in this instance probably one of the deadly 19th century cholera and smallpox epidemics spreading northwards from the Cape Colony.¹² A second historical site within the mining lease area is the remains of a late 19th century wagon transport staging post at Gams **QRS 10/44**. A third site comprises the remains of an intense military engagement **QRS 354/8-81** representing an ambush attack by Nama rebels on a large German patrol armed with rifles, a heavy machinegun and a light artillery piece. These three historical sites are highly significant and worthy of special protection. In addition to these three sites, a suspected historical wagon track **QRS 357/87-88** leads towards **QRS 10/1** and **QRS 376/0001 – 0004** from the east. However, the age of this feature is uncertain, and it may not be protected under the definitions of the National Heritage Act.

Site complex QRS 10/1 and QRS 376/0001 – 0004: This group of sites is located at the confluence of the Korabib and Orange Rivers and extends over an area of approximately 100x250m along the foot of a rocky outcrop. The central feature of the site is the group of approximately 19 burials (QRS 10/1) shown in Figures 8 and 9. At the foot of the rocky outcrop on a level surface of mixed aeolian and colluvial sand with cobbles are several localized concentrations of comminuted bone and other cultural material including imported European earthenware, buttons, glass trade beads, 19th century bottle glass, ostrich eggshell beads and fragments of tobacco smoking pipes in the indigenous style and one bisque trade pipe. These materials suggest that the site was occupied in the second half of the 19th century, a period of intensive missionary activity on the Orange River. Consistent with this is the clearly Christian tradition of the graves which are oriented east–west and mostly incorporate head- and footstones.

Analysis of imported ceramics

Finds of European earthenware fragments from the historical sites listed above include types which were common household or trade items, sought after by both settlers and indigenous people like the Nama. The most widespread were English transfer-printed crockery, hand painted and/or sponged bowls, and annular bowls. Transferware was more prestigious and less common, decorated by transferring a complex design from an inked engraved copper plate onto paper, and then pressing the inked paper onto the bisque or unglazed earthenware, which was then glazed and fired a second time. Until 1820, only cobalt blue was used as it withstood the heat of the kiln without blurring. From 1835, green, sepia and mulberry became popular colours and can be archaeological time markers. Spongeware, a cheap line of earthenware for the underclass market, was developed in Scotland around 1835 to 1845. Brightly coloured pigment was applied to bisque bowls from the

¹¹ See Kinahan, J. 2020: 334.

¹² See Pedersen RK, Ingholt MM, Van Wijhe M, Andreassen V, Simonsen L. Identifying signature features of epidemic diseases from 19th century all-cause mortality data. *Am J Epidemiol.* 2025 Feb 5;194(2):460-468.

open head of a sponge or designs cut into the denser stem of the sponge stamped onto the bowls. Often these rather crude designs were complemented with hand-painted bands, stripes or more delicate leaves and petals which show the strokes of the brush. Annular ware, also known as industrial slipware, consisted mostly of bowls decorated with bands or stripes of varying widths and colours. Spongeware and annular ware were popular among the peasantry from Great Britain and Europe to colonists and indigenes in the colonies. These earthenware types occur on other historical sites in the country, notably in the vicinity of Walvis Bay, the most important 19th century trading entrepot. This summary¹³ indicates the social and chronological significance of the form, kind of decoration, colour, and proportion in which the types occur on a historical site.



Figure 10: Typical 19th century sponged and annular bowls.
Left: spongeware bowl (diameter c. 165mm, height 83mm) and right: annular bowl (diameter 150mm, height 75 mm), both from the !Khuseb Delta at Walvis Bay.



Figure 11: Annular, hand-painted and sponged earthenware, QRS 10/1.
Top left: Annular rim sherd with white band intersected by 3 raised beige stripes above a blue band; top right: hand-painted white body sherd with 5 mm wide painted red band and purple petals showing brush strokes; bottom left: bowl sherd with sponged green floral motif; bottom right: curved white body sherd with 12 mm painted brown band and sponge-stamped red flower motif.

¹³ Kinahan, JHA. 2000. *Cattle for beads. The archaeology of historical contact and trade on the Namib Coast*. Studies in African Archaeology 17. Uppsala: Department of Archaeology and Ancient History, pp 72 – 92.



Figure 12: Annular and transfer-printed earthenware, QRS 10/44.

Top left: annular rim sherd with 2 external black stripes; Right: green transfer landscape pattern on white background.



Figure 13: Stoneware from QRS 10/44.

Left: Half sherd from neck of flask with brown glaze; Right: rim sherd from jar with glaze over rim inside and out, body of the jar unglazed.

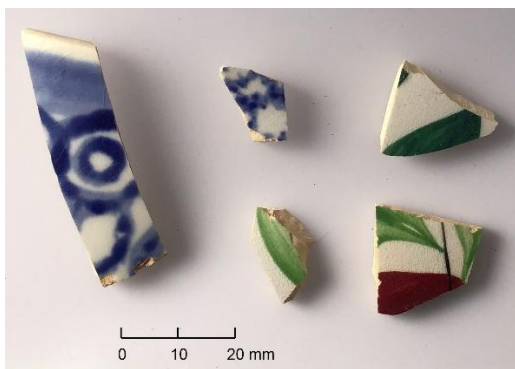


Figure 14: Hand-painted and sponged earthenware, QRS 376/0001.

Left: rim sherd with blue hand-painted band below rim and blue sponged flower motif; top centre: body sherd with sponged blue motif; bottom centre: body sherd with hand-painted green leaf; top right: body sherd with hand-painted green leaf; bottom right: body sherd with hand-painted red, black and green floral design.

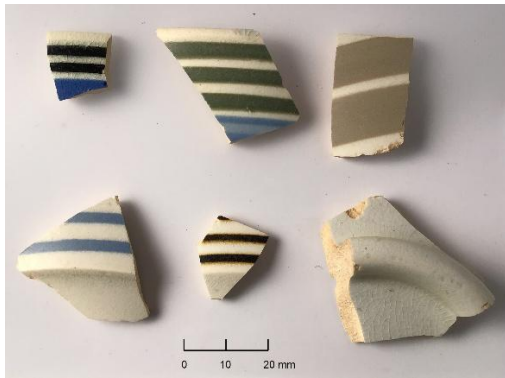


Figure 15: Annular bowl sherds, QRS 376/0001.

Top row: stripes and bands of black, green and grey. Bottom row: sherds from juncture of body and base; base sherd with typical foot.

Table 4 presents the type, form and decoration of the earthenware finds from the historical sites. Annular, hand-painted and sponged, or sponged earthenware bowl fragments occurred on the indigenous sites in a limited range of colours and patterns, consistent with the profile of an indigenous assemblage from the second half of the 19th century¹⁴. Table 5 presents a chronology for the introduction of European trade items which inform dating of the sites. Two small glass trade beads, one of red translucent glass on a white opaque core, and a translucent red barrel-shaped bead from QRS 376/0001 are diagnostic of this period, providing a *terminus post quem* of 1880¹⁵. A green transfer-printed dish fragment, a stoneware flask and a stoneware jar occurring on the staging post Gams probably indicate the presence of a variety of travellers, including colonists from the Cape. The earthenware found on the indigenous cemetery was probably derived from QRS 376/1 (see Figure 16 below showing the proximity of the sites). Excavation of the camp would undoubtedly yield more material for analysis.

¹⁴ Kinahan 2000: 83

¹⁵ Kinahan 2000: 67; Sprague, R. 1985. Glass trade beads: a progress report. *Historical Archaeology* 19:87–105, p 94

Table 4: Classification of imported earthenware and stoneware on historical sites

Site	Form	Decoration	Technique	Colour (on white)	Pattern
QRS 10/1 Cemetery	bowl	patterned	annular	beige, blue	striped/banded
	bowl	patterned	annular	blue	striped/banded
	bowl	patterned	annular	blue	striped/banded
	bowl	patterned	hand-painted	red, purple	floral with stripes
	bowl	patterned	hand-painted & sponged	brown, red	floral with band
	bowl	patterned	sponged	green	floral
QRS10/44 Gams staging post	flask	plain	stoneware	brown	
	jar	plain	stoneware	beige	glazed rim
	bowl	patterned	annular	black	striped
	?dish	patterned	transfer-printed	green	?landscape
	?base	plain		white	
QRS376/1 Nama encampment	bowl	patterned	annular	green, blue	striped/banded
	bowl	patterned	annular	black, blue	striped/banded
	bowl	patterned	annular	blue, white	striped
	bowl	patterned	annular	blue, black	striped
	bowl	patterned	annular	blue	striped
	bowl	patterned	annular	black	striped
	bowl	patterned	annular	grey	banded
	bowl	patterned	hand-painted	red, green, black	floral
	bowl	patterned	hand-painted	green	leaf
	bowl	patterned	hand-painted & sponged	blue	floral with band
	bowl	patterned	sponged	blue	
	?bowl	plain		pale grey blue	
QRS376/2	?	patterned	transfer-printed	blue	?
	bowl	patterned	hand-painted & sponged	red, green	Floral with stripe
	?bowl	patterned	Hand-painted & embossed	green	Embossed squares
QRS376/4	bowl	plain		pale grey blue	

Table 5: Dating of historical sites according to the introduction of European trade items

	1835	Post 1880
CHRONOLOGY FOR THE INTRODUCTION OF EUROPEAN TRADE ITEMS	Invention of spongeware & green transfer printing	Red-on-white beads
DATED FINDS		
Green transferware		
Spongeware		
Stoneware		
Red-on-white glass bead		

Site QRS 10/44: The site comprises several ruined drystone structures (Figure 19), livestock enclosures and a well with a windlass and stone watering trough for livestock (Figure 20). The site is situated approximately 20km north of Vioolsdrift and halfway to the German military post at Uhabis. The site of Gams (literally *water* in Khoekhoegowab) was therefore approximately one day's journey by ox wagon from either of these two points and would have served as a halfway station where the oxen could be watered. Associated with the buildings were fragments of the refined earthenware described above under *Analysis of imported ceramics* as well as a blue-green transfer-printed bowl and a porcelain saucer, evidently from a small coffee cup, with a simple hand-painted dot and line motif in two colours, observed during the previous survey. While it is possible that these items date to the mid-19th century, a later turn of the century date is more likely.



Figure 16: Elevated view from the east of site complex QRS 10/1 and QRS 376/0001 – 0004, looking towards the mouth of the Korabib River. In the foreground is QRS 376/0001, in the middle distance QRS 10/1 and in the far distance QRS 376/0002 and 0003.



Figure 17: Elevated view of suspected historical wagon track QRS 357/87-88, seen from the west with current track on sandy surface to the right.

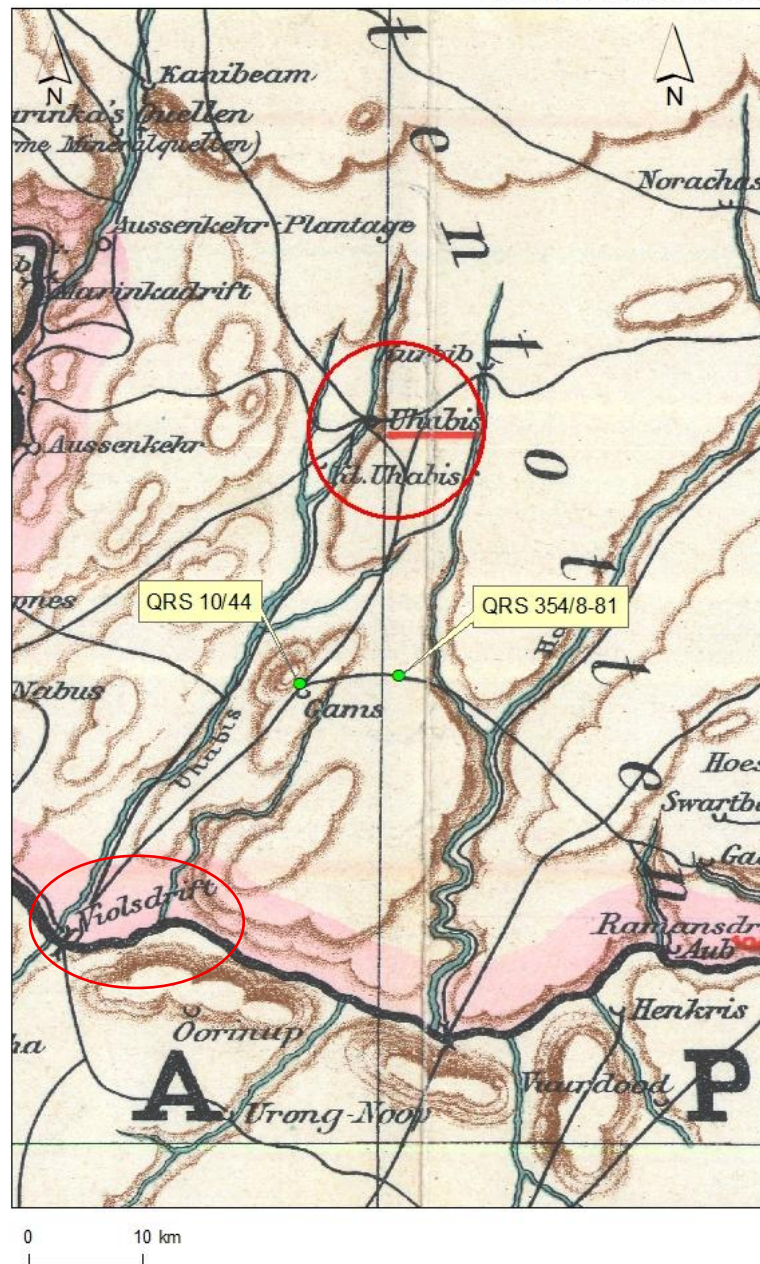


Figure 18: A portion of the German (1905) *Kriegskarten: Blatt Warmbad*, showing the historical sites of Gams (QRS 10/44) and the battlefield site QRS 354/8-81, 84-170. Gams lies approximately halfway between Vioolsdrift (visible near the lower left corner of the map) and Uhabis, a German military post (circled in red). At Gams the transport route branches to the east and it was along this route that the skirmish at QRS 354/8-81, 84-170 occurred.



Figure 19: Orthophoto image of the main drystone structures at QRS 10/44. Note the construction method in the outer rectangular wall employing a single outer and inner course with through-band stones and filled with coarse rubble, a common early colonial drystone building technique.



Figure 20: The well at Gams (QRS 10/44) viewed from the north showing windlass and stone watering crib. Note that the upright frame of the windlass is of relatively recent date having been made from a motorcar chassis and therefore post-dating 1908.

Site complex QRS 354/8-81,84-170: The route from Gams to the east leads ultimately to Ramansdrift and Warmbad. To avoid the narrow confines of the Orange River upstream of Vioolsdrift the historical route crossed to the Haib and descended to the more open Orange River valley at the mouth of the Korabib gorge.¹⁶ Less than 10km east of Gams this route enters a series of deeply incised valleys and one of these has a small, rather fickle seepage. It appears that a party of *Schutztruppen* passed this way in 1906 and ascended to the open mountain terrain to the east where they were attacked from concealed positions with rifle fire initially at a distance of several hundred metres. The *Schutztruppen* were evidently moving in extended file over a distance of about 450m when they came under attack. The narrow ridge along which they were moving did not allow them to form a more compact defensive position and they returned fire from hastily constructed sangars, using whatever rocks were at hand.

¹⁶ There is some confusion in the literature and cartography concerning these rivers. Some maps indicate the Gams River about 10km east of its real position which flows through the site of Gams. Some maps show the gorge below the battlefield site of QRS 354/8-81, 84-170 as alternatively the Gams or the Haib, when it is in fact neither of these. Commonly the broad river valley issuing into the Orange River at QRS 10/1 is referred to as the Haib when it is in fact the Korabib.

From the evidence at the site and shown in Figure 21, the vanguard of the German column had an MG 01 heavy machine gun which could fire about 500 rounds per minute using the standard 7.92mm Mauser ammunition, and the rear had a 60mm S-Bts K L/21 light cannon (marked CANNON in Figure 21). Figure 21 shows that the cannon may have been moved or possibly that two were in use. The cannon and machine gun were used at the site in addition to the G98 standard issue German infantry rifle. The heavy weapons seem to have been used from the position marked MAIN COLUMN in Figure 21. There are indications that a counterattack was mounted; however, this involved riflemen only. The counterattack engaged the enemy on the northeastern side of the ravine, apparently at short range. Several hundred rounds were fired in reply to the attackers who were most likely men under the guerilla leader Jakob Marenga. It is possible that the attackers changed their positions in the course of the engagement, always using slightly higher ground than that occupied by the German column. Table 6 sets out the evidence for a likely 1906 date for the skirmish at QRS 354/8-81, 84-170.

The German Mauser was in general use among anti-colonial guerillas, but a range of ammunition was in circulation around the turn of the century. Thus, at the attacking positions at the Haib battlefield ammunition predating the German campaign in southern Namibia was also in evidence. Examples include 1903 German military issue cartridges as well as 1901 Mauser ammunition from the Anglo Boer War (1899–1902) and 1895 early German colonial Mauser ammunition.

Table 6: Inferred dating of Haib battlefield

Chronology	1895	1901	1902	1903	1904	1905	1906	1907
DATED FINDS						Nama Revolt	Marenga Campaign	Death of Marenga
AMMUNITION HEADSTAMPS								
Nama rebel ammunition								
German mountain gun								
German rifle & machinegun								
OTHER ITEMS								
German military graves								
German food tin								

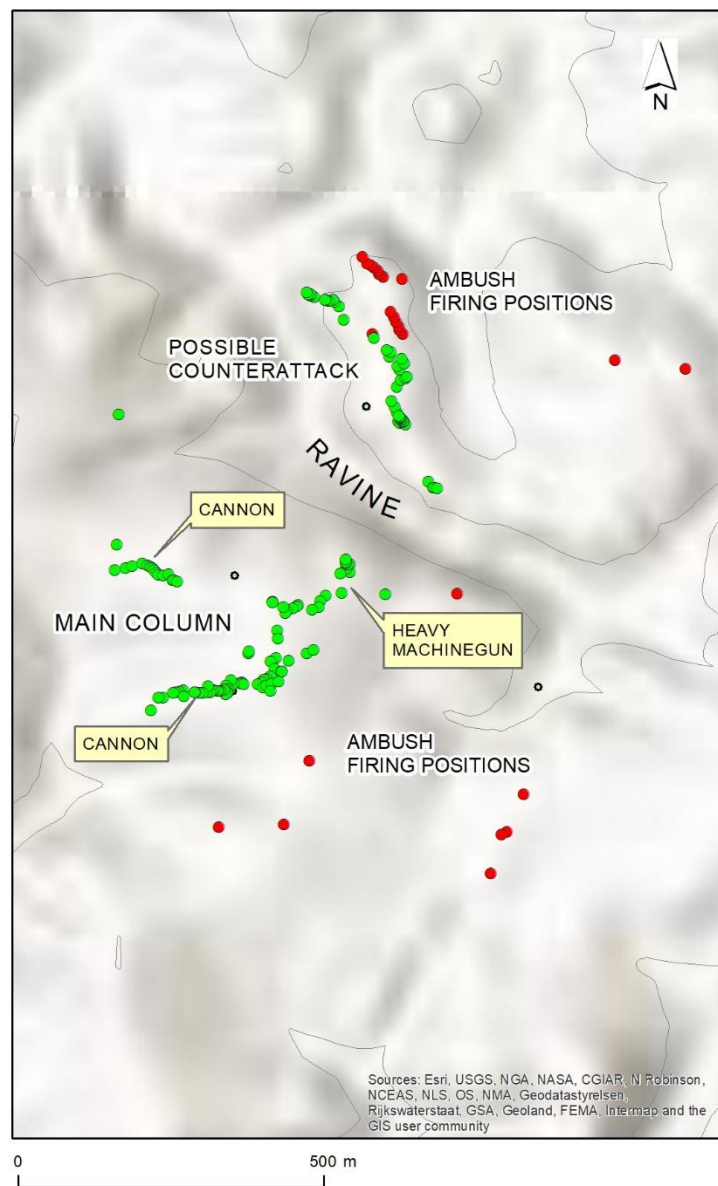


Figure 21: The layout of the battlefield site at QRS 354/8-81, 84-170 with shooting positions in stone sangars indicated. Green dots are individual German *Schutztruppen* sangars, while red dots are firing positions of the attacking force.

Table 6 relates the evidence from this and other sites in the vicinity of EPL 3140 to events in the then German colony between 1901 and 1907, when Jakob Marenga died. The Mauser G98 cartridge cases at the site all bore the headstamp code indicating their manufacture at the *Spandau Munitionsfabrik* in 1902. The cartridge cases at the position occupied by the MG 01 heavy machinegun were all from the *Polte Armaturen* at Magdeburg (also 1902). The headstamps of shell casings at the position of the 60mm S-Bts K L/21 light cannon indicated several

batches of ammunition all manufactured at the *Patronenfabrik Karlsruhe* in 1901, 1904 and 1905 (Figure 22). Thus, on the basis of the ammunition used, the skirmish occurred in or after 1905. The use of miscellaneous 9.72mm Mauser ammunition by the attacking force would reflect their more informal supply arrangements. Other evidence in the form of the German food tin at QRS 10/8 also suggests a date after 1905, while the graves at QRS 10/40 are dated 1906. The year 1906 was the height of the campaign against Jakob Marenga, who died the following year in 1907.

Unfortunately, the German campaign history *Die Kämpfe der deutschen Truppen in Südwestafrika : Bd. 1* [H. 1-3]. *Der Feldzug gegen die Hottentotten* Abteilung I des Großen Generalstabes. Berlin. (1906) contains no direct reference to a battle at this site. This is surprising given the number of combatants involved and the fact that other minor skirmishes in the same area are described. One possible reason might be that there was no formal placename for the site of the battle. In fact there seems to have existed some confusion over the names of places where action between the German and anti-colonial forces took place. The Haib River is hardly mentioned and the Korabib River which is a major route down to the Orange River is not mentioned at all. The three German fatalities (QRS 10/40) are variously placed at Gams or at Gamsmund which is in fact more than 20km further downstream. For the moment therefore there is no certainty as to the precise date of the battle and which elements of the German colonial army were involved.



Figure 22: Shell casing of 60mm S-Bts K L/21 light cannon at QRS 354/8-81, 84-170 made at the *Patronenfabrik Karlsruhe*.



Figure 23: Heavy machinegun position on QRS 354/8-81, 84-170, top image shows sangar walling and firing orientation, lower image shows dense scatter of Mauser G98 cartridge cases within the sangar.

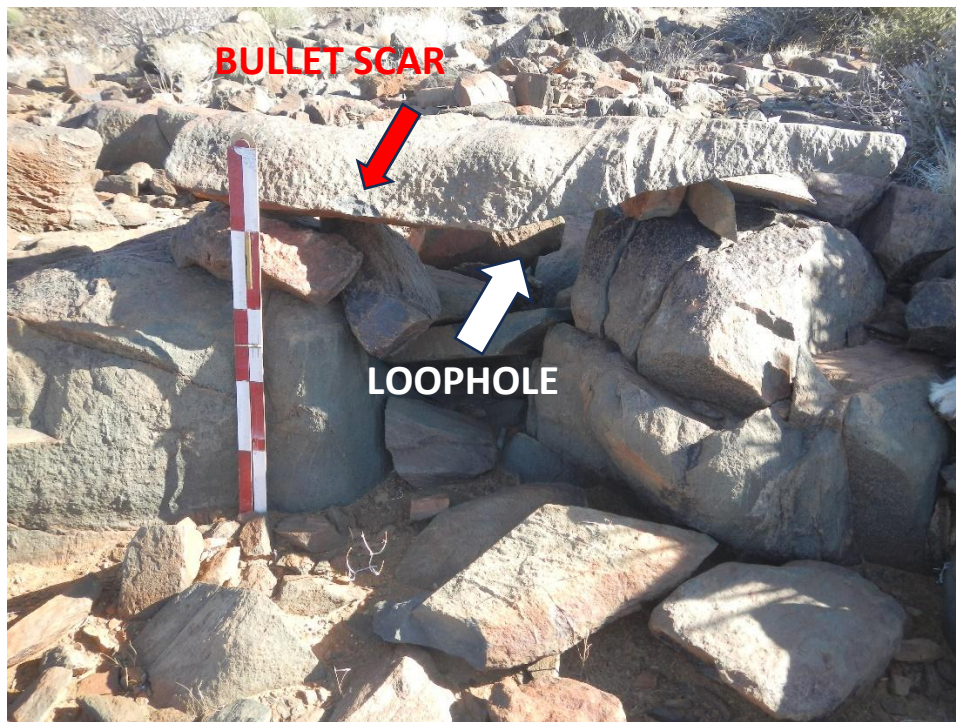


Figure 24: Scar of incoming fire at German sangar on QRS 354/8-81, 84-170, top image shows bullet scar position above firing loophole, lower image shows point of impact.



Figure 25: Impact of incoming German fire at attacking positions on QRS 354/8-81, 84-170. Top image shows bullet hole through stone defence; lower image shows impact scar on the trunk of a kokerboom *Aloe dichotoma* at the same position.

The method of carrying the 60mm S-Bts K L/21 light cannon using two mules is shown in Figure 26, one pack animal carrying the gun itself and the second its tripod. Military operations in southern Namibia were carried out by mounted infantry, sometimes on camels but mainly on horseback. Figure 27 shows a typical *Schutztruppen* patrol traversing terrain similar to that encountered at QRS 354/8-81, 84-170. These patrols had a limited range and depended on finding water for their mounts and pack animals almost every day. Traveling between waterholes via the shortest distance the patrols tended to use the same routes, and these placed them at risk of ambush.

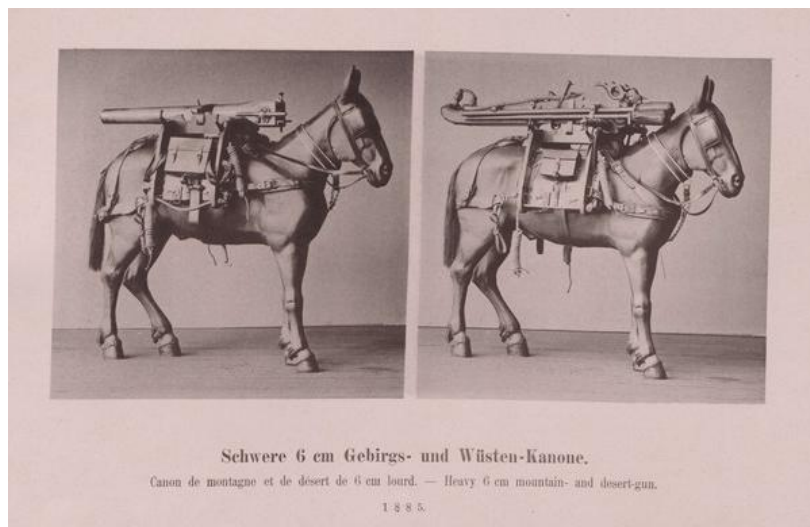


Figure 26: Illustration of pack mule with special harness for the 60mm S-Bts K L/21 gun

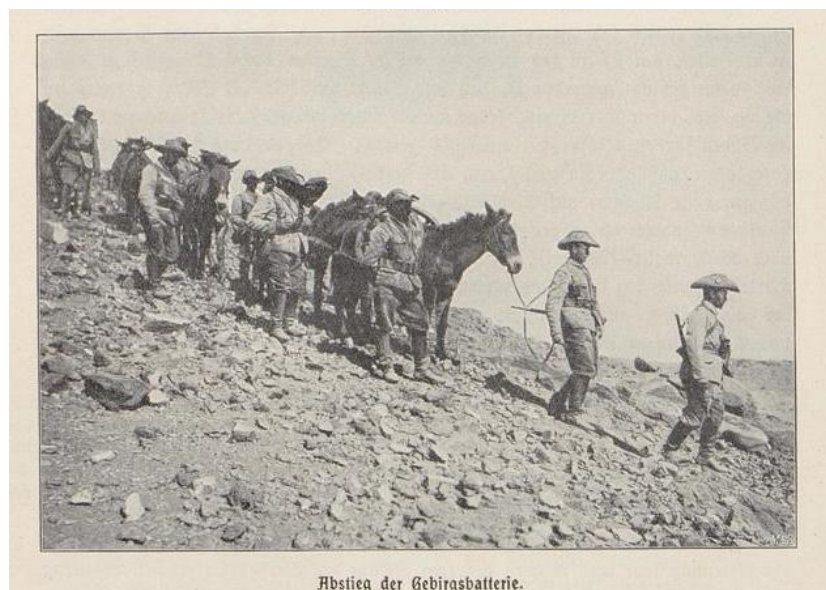


Figure 27: *Gebirgsbatterie* in southern Namibia traversing similar terrain to that of QRS 354/8-81.

Figure 28 shows the general terrain of the battlefield site at QRS 354/8-81, 84-170 looking west towards Gams. Just visible in the middle distance is the dry streambed where the patrol may have stopped to find water. From the streambed, ascending to the site of the battlefield the patrol was in mainly open terrain, but at the battlefield site itself there is a short stretch of the route that offered two distinct advantages to the attackers. One of these was that on every side and at a distance of several hundred metres there was slightly higher ground with good cover; the other advantage was that the attackers were able to approach the *Schutztruppen* positions via narrow defiles in the sides of the area occupied by the *Schutztruppen*. As to the *Schutztruppen*, the low exposed ridge they occupied afforded little or no cover and no possibility to regroup.



Figure 28: A view to the west from the battlefield site at QRS 354/8-81, 84-170. The German military post at Uhabis lay near the centre of the horizon seen here (A). The dry streambed just visible in the middle distance is where the patrol would have stopped on their way from Gams (B) to look for water (C).

5 IMPACT ASSESSMENT

Field assessment of the sites following the ranking criteria set out in Table 1, showed that only 4% of the sites had a Significance value of 1, and 51% had a Significance value of 2, indicating that just over half of the sites were considered “isolated minor finds”, while 25% had a value of 3 as recognizable archaeological sites. Seven sites, or 9% of the total had a value of 4, and six or 8% had a value of 5. The high value sites are seen both as important heritage resources and as potential subjects for future research. In the case of sites linked with the anti-colonial uprising lead by Jakob Marenga, a site such as QRS 354/8-81, 84-170 would also have a high significance due to the heroic status of Marenga. The site of QRS 354/8-81, 84-170 is in fact the only site of armed conflict between Marenga and the colonial forces to have been documented on the ground,¹⁷ although the protagonists met many times on the battlefield. The site has also to be seen in the wider historical setting of the Orange River valley, of Vioolsdrift, Uhabis, Gams (QRS 10/44) and the German military burial site at QRS 10/40.

In terms of their Vulnerability without mitigation, 21% of the sites had a value of 1, indicating a non-vulnerable status in the present or pre-mine development context. The Vulnerability ranking of the sites could change considerably if the mine project were to proceed. Of the 75 sites recorded in the survey area 64% are located close to or within areas designated for surface works. If suitable mitigation measures are adopted only 1% of the sites can be considered as vulnerable in the present or pre-mine development context.

Considering the Haib Minerals (Pty) Ltd surface works design and layout of June 2026 which Knight Piésold Consulting (Pty) Ltd is incorporating in the final Environmental Impact Assessment two site localities documented in this archaeological survey report now have an elevated Vulnerability rating. If appropriate mitigation measures are adopted the Vulnerability rating for the sites in these localities would be reduced to a manageable level. The site localities are as follows¹⁸:

QRS 10/1 combined with QRS 376/001,2,3 and 0017 located within the Auxiliary Works Area adjacent (<50m) to HAIB ROUTE SUPPLY PIPELINE and with implications for siting of PUMP STATION and PROPOSED 33KV POWERLINE¹⁹

QRS 10/47 located within designated TAILINGS STORAGE FACILITY

¹⁷ A recent exception but so far unpublished is the site of Norechab, see Kinahan, J. & J. 2026. *Ghost riders at Norechab: the archaeology of German defensive fortifications in southern Namibia during the Nama Revolt of 1905-1907*, Namib Desert Archaeological Survey.

¹⁸ Infrastructure and surface works components identified according to information supplied by Knight Piésold Consulting (Pty) Ltd.

¹⁹ This site complex falls within the area subject to a separate study: Proposed Water Abstraction, Supply and Storage Infrastructure, Haib: Draft Environmental Impact Assessment, Knight Piésold Consulting (Pty) Ltd Project Number W1301-00906/05-A, 5 May 2026.

The Knight Piésold Impact Assessment Methodology is applied below, with the following caveats:

- a. Nature of the impact: in the case of archaeological, historical and in general heritage sites, **all** impacts are classed as NEGATIVE.
- b. Significance of impact: in the case of archaeological, historical and in general heritage sites, **no** impacts are classed as REVERSIBLE.
- c. Because archaeological sites are protected as national heritage the spatial extent (S) of impacts is always NATIONAL although this needs to be considered in the light of the Archaeological Significance Ranking (see Table 1) of the individual site.
- d. Archaeological assessment in Namibia follows the provisions of the National Heritage Act (27 of 2004) under which the site itself is protected as well as its landscape setting. In the case of sites that can be linked within an integrated cultural landscape this setting may be very extensive.

5.1 Nature of the impact

The archaeological sites on and adjacent to EPL 3140 are at generally low risk of direct disturbance and only three sites are directly affected by the development. These are QRS 10/1 combined with QRS 376/001,2,3 and 0017, and QRS 10/47. However, indirect impacts may occur where the presence of the site is not known to project personnel (including contractors) who may inadvertently damage or disturb the sites. Sites within less than 200m of proposed infrastructure are selectively identified as Vulnerable. Cumulative impacts over the operating life of the mine are expected not only on the lease itself but on the north bank of the Orange River as a result of mine personnel access there.

5.2 Significance of the impact

Where direct, indirect or cumulative impacts do occur these will have a Severity/magnitude (M) of 4 to 5. Such impacts will have a Reversibility (R) of 5, owing to the principle that damage to archaeological sites cannot be repaired, and a Duration (D) of 5, owing to the principle that all such damage is permanent. The Spatial extent (S) of such impacts is considered to be in principle 4, owing to the fact that loss of national heritage is national in scale. The Probability (P) of impacts is at present Low – Medium 2 to 3. Probability of impacts is Medium – High in the case of the 16 sites identified as adjacent to proposed infrastructure or surface works

5.3 Assessing Significance

Using the Knight Piésold formula: Significance = Consequence x Probability

Significance = 19 x 3

Significance = 57

Significance = Moderate (Negative)

5.4 Mitigation

The following proposals for mitigation of possible impacts on sites and materials protected under the National Heritage Act (27 of 2004) are for the consideration of the consultant, Knight Piésold and the client Haib Minerals (Pty) Ltd. These proposals have been reviewed by the National Heritage Council of Namibia who have indicated additional mitigation measures.

- a. The location of archaeological, historical and heritage sites in the area to be affected by the operations of the client are to be clearly indicated in the project EMP using the QRS 354 Site Gazetteer GIS submitted with this report.
- b. All archaeological and other protected sites on EPL 3140 are to be treated as No-Go sites, out of bounds to project personnel and contractors. This would particularly include burial sites and significant historical era sites. Highly significant sites in danger of encroachment are subject to the specific mitigation measures set out below.
- c. Archaeological field survey and assessment should be carried out for proposed infrastructure components outside the area of EPL 3140 covered in the present report. These infrastructure elements would include proposed powerlines to the mine site.

In its Consent 66/2025/48 dated 24th June 2025, the National Heritage Council of Namibia has advised that:

- I. A 100m buffer zone should be created and maintained around all burial sites and suspected burial sites. These are QRS 10/43, 10/23,10/40, 10,1,10/47, 10/26,10/6, 10/56. *Concerning these sites, QRS 10/1 will be subject to a larger buffer, and QRS 10/47 will be excavated to remove the grave contents from the proposed Tailings Storage Facility.*
- II. A 100m buffer zone should be created and maintained around the stone circle, storage cairns, blinds and stone hut features. These include QRS 10/5, 10/6 and 10/7.
- III. A 2km buffer zone should be erected around high significance archaeological sites at QRS 354/8-81 and that the buffer zone should be treated as a No-Go area. Signage (see Appendix 2) should be erected on approach tracks to the site. *In the case of this site the positioning of the proposed mine plant will encroach by about 350m on the northern edge of the buffer zone. This does not pose an unacceptable risk to the preservation of the site.*

In addition to the measures recommended by the National Heritage Council of Namibia in its Consent 66/2025/48 dated 24th June 2025, the following specific mitigation measures are recommended by this report:

- a. Burial site QRS 10/47 located in the Tailings Storage Facility TSF to be excavated and removed to the National Museum of Namibia subject to National Heritage Council Permit requirements.
- b. Site complex QRS 10/1 combined with QRS 376/001,2,3 and 0017, to be protected by:
 - A 50m buffer zone as set out in the accompanying diagram Figure 29
 - The existing track which goes through the site complex is to be closed
 - All development work to be carried out south of the designated buffer

- No access within the buffer zone during construction work
- A responsible person to fulfil a watching brief during construction
- Limited excavation (approximately 20m²) to be carried out on QRS 376/0017 prior to construction of the proposed water abstraction facility.

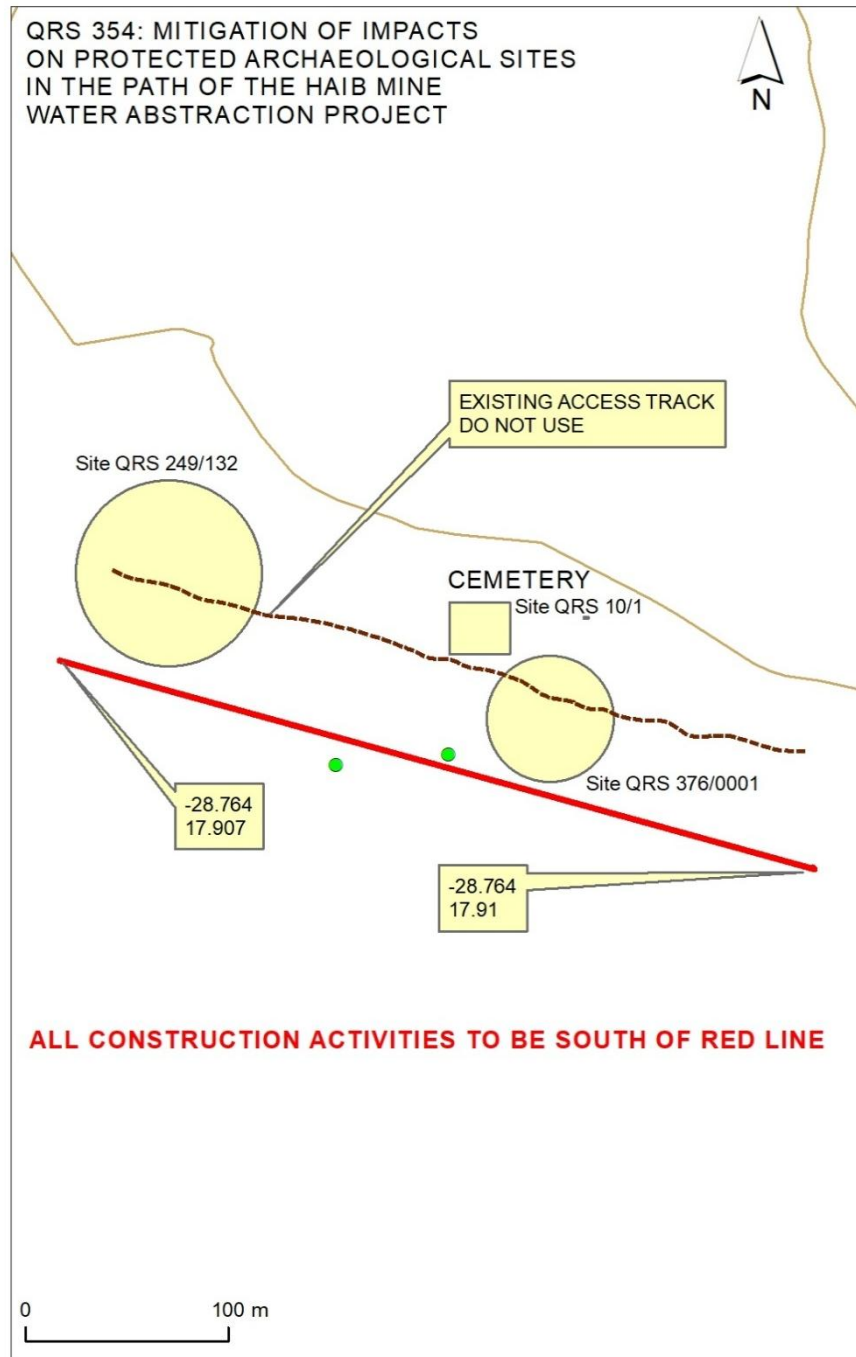


Figure 29: Mitigation of construction activities at site complex QRS 10/1 combined with QRS 376/001,2,3 and 0017

6 CONCLUSIONS & RECOMMENDATIONS

The archaeological survey and assessment of EPL 3140 documented 75 sites representing a history of human occupation over the last 500000 years. These sites are protected in terms of the National Heritage Act (27 of 2004). Mitigation measures are proposed for those sites likely to be damaged or encroached upon during the development and operation of the proposed Haib Copper Project. In view of the possibility that other sites may be found in the course of this project it is recommended that the Haib Mine adopt the Archaeological Chance Finds Procedure in Appendix 1. The Archaeological No-Go Site Procedure in Appendix 2 is recommended for sites identified in this report as meriting special protection.

Most of the sites recorded in the course of the survey were surface artefact scatters of low archaeological significance. The survey documented several burial sites which are to be considered as highly sensitive. Also of high significance are historical sites representing events in the 19th and early 20th century including the anti-colonial rebellion lead in this area by Jakob Marenga. These include three sites within the lease area: QRS 10/1, QRS 10/44 and QRS 354/8-81, 84-170. These sites constitute an historical landscape such as has not previously been documented in Namibia. Development of the Haib Copper Project will potentially disrupt this historical landscape.

The mitigation measures proposed here include excavation of the burial site QRS 10/47, implementation of a buffer zone at the battlefield site QRS 354/8-81, 84-170 and mitigation measures at site QRS 10/1 combined with QRS 376/001,2,3 and 0017 which is to include limited excavation on site QRS 376/0017. These measures, together with the requirements of the National Heritage Council will serve to minimize the risk of damage to the archaeological sites if adopted by the Haib Coppermine Project Environmental Management Plan.

APPENDIX 1: ARCHAEOLOGICAL CHANCE FINDS PROCEDURE

Areas of proposed development activity are subject to heritage survey and assessment at the planning stage. These surveys are based on surface indications alone, and it is therefore possible that sites or items of heritage significance will be found in the course of development work. The procedure set out here covers the reporting and management of such finds.

Scope: The “chance finds” procedure covers the actions to be taken from the discovery of a heritage site or item, to its investigation and assessment by a trained archaeologist or other appropriately qualified person.

Compliance: The “chance finds” procedure is intended to ensure compliance with relevant provisions of the National Heritage Act (27 of 2004), especially Section 55 (4): *“a person who discovers any archaeological object must as soon as practicable report the discovery to the Council”*. The procedure of reporting set out below must be observed so that heritage remains reported to the NHC are correctly identified in the field.

Responsibility:

Operator	To exercise due caution if archaeological remains are found
Foreman	To secure site and advise management timeously
Superintendent	To determine safe working boundary and request inspection
Archaeologist	To inspect, identify, advise management, and recover remains

Procedure:

Action by person identifying archaeological or heritage material

- a) If operating machinery or equipment stop work
- b) Identify the site with flag tape
- c) Determine GPS position if possible
- d) Report findings to foreman

Action by foreman

- a) Report findings, site location and actions taken to superintendent
- b) Cease any works in immediate vicinity

Action by superintendent

- a) Visit site and determine whether work can proceed without damage to findings
- b) Determine and mark exclusion boundary
- c) Site location and details to be added to project GIS for field confirmation by archaeologist

Action by archaeologist

- a) Inspect site and confirm addition to project GIS
- b) Advise NHC and request written permission to remove findings from work area

- c) Recovery, packaging and labelling of findings for transfer to National Museum

In the event of discovering human remains

- a) Actions as above
- b) Field inspection by archaeologist to confirm that remains are human
- c) Advise and liaise with NHC and Police
- d) Recovery of remains and removal to National Museum or National Forensic Laboratory, as directed.

APPENDIX 2: ARCHAEOLOGICAL NO-GO SITE PROCEDURE

Introduction

Areas of proposed mining and related activity are subject to heritage survey and assessment at the planning stage. These surveys may identify heritage sites of such outstanding importance as to merit treatment as “no go” areas, effectively excised from mining operations. A “no go” area is closed to walking, driving, cutting access tracks or ground disturbance of any kind. Project managers should also ensure that an identified “no go” area is not accessed by team members during off-duty hours. A “no go” area may be accessed for purposes of heritage audit, inspection by the National Heritage Council, or legitimate research. The procedure set out here covers the management of “no go” areas located within the boundaries of the Rössing Uranium Limited Mining Licence Area ML-28 and Accessory Works Area.

Scope

In the sense employed here a “no go” denotes a specific management status, with specific management consequences, of a heritage site that has been identified and sufficiently investigated to establish its particular importance. The process of identification and evaluation is carried out by a trained archaeologist or other appropriately qualified person. Conservation of a “no go” site requires integration of heritage management needs with mine management procedures.

Compliance

The “no go” site management procedure is intended to ensure compliance with the CHMP, which is based on the RTZ community standards and related guidelines, and the relevant provisions of the National Heritage Act (27 of 2004), especially Section 58 (1)(b) site management plans; (2)(c) and (3) “...enclosure of the site,...as need to be kept secure” (h) “...considers necessary or expedient for the conservation and management of the site”.

Responsibilities

Foreman	To adequately supervise movement of personnel and/or contractors
Superintendent	To adequately supervise movement of personnel and/or contractors
Management	To endorse special status of “no go” areas in mining operations
Archaeologist	To identify, evaluate and document potential “no go” sites; to advise management, to formulate site management plans, and to perform site inspections or audits of designated “no go” sites.

Procedure

5.1 In the course of field survey heritage sites are assessed as to their significance as heritage assets. This assessment is the basis of any decision regarding the conservation and management of the site. Sites considered to be highly significant are documented in sufficient detail to justify their possible status as “no go” areas.

5.2 A management plan for the “no go” site will be based on this documentation, which serves as a site “condition assessment” baseline. Site management plans are to include detailed assessment of the site sensitivity to both natural (ie weathering and erosion) and man-made threats (ie uncontrolled access). The site management plan must comply with National Heritage Act, Section 58 (1)(b).

5.3 The site management plan will indicate the specific protection measures to be applied, from access controls, to soil erosion control measures, to signage, to permissions procedures, to site inspection and audit procedures, all specific to the site concerned.

5.4 The management plan will indicate the procedure for gaining access to the site and identify the responsible level of management to grant access.

5.5 The boundary of a “no go” site will be identified by GPS position by the archaeologist and a GIS file will be generated for the CHGIS. The boundaries of a “no go” site will include buffer zone appropriate to the circumstances, but sufficient to preserve the local setting of the site.

5.6 The boundary of a “no go” site will be marked by painted fence-posts placed at inter-visible points, set in concrete footings, and protruding 300mm from the ground. “No go” sites are **not** to be fenced as such barriers impede the movement of wildlife.

5.7 Corner points of the “no go” site boundary will have the site number stamped on a metal strip set into the upper surface of the concrete footings.

5.8 Appropriate signage (see below) will be placed at obvious points of access. Signage will be visible regardless of direction of approach to the site.

5.9 A site specific audit of the “no go” site will be carried out annually, or at shorter intervals if specified by the site management plan and the CHMP.

5.10 Site audit records are to be maintained with minimum entries of: Date of audit; names of participants; site integrity including details of any changes and causes; recommendations for changes to the site management plan; incident reports; actions to be taken resulting from incident

Monitoring & Feedback

First Issue	Issue date	Prepared by	Approved by	
Version number	Revision date	Revised by	Approved by	Reason for change

SUGGESTED “NO GO” AREA BOUNDARY SIGNAGE:

NO-GO AREA – DO NOT ENTER

**THIS IS A SENSITIVE HERITAGE SITE AND
YOU MAY NOT PROCEED BEYOND THIS POINT
WITHOUT AUTHORIZATION**

INSERT HERE COMPANY NAME/LOGO AND CONTACT DETAILS FOR SITE MANAGER

Archaeological Guidelines
for
Exploration & Mining
in the
Namib Desert

John Kinahan

SUMMARY

This handbook is intended to help exploration and mining projects to minimize their impact on the archaeology of the Namib Desert, a unique environment of global importance to the understanding of the human past. A short introduction to the National Heritage Act is followed by an overview of the archaeological evidence, and a description of the most sensitive elements of the archaeological landscape. With this background and a few principles of site management, it is possible to avoid inadvertent damage to archaeological sites. Also included is an outline of the basic standards for archaeological field survey and assessment that are most widely applied in the Namib.



An archaeological landscape in the southern Namib Desert: the basin or playa in the middle distance has dense shoreline scatters of late Pleistocene artefact debris, and the inselberge on the margins of the basin have densely clustered mid- to late Holocene settlement remains including hunting blinds, grave cairns, ritual sites and rock shelters with stratified archaeological deposits.

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Preface

Modern humans and their ancestors have lived in the Namib Desert for more than one million years, leaving a rich legacy of archaeological remains which lie scattered over the landscape. This is by far the longest archaeological record in all the deserts of the southern hemisphere, and it contains unique evidence of how humankind learned to cope with one of the most hostile environments on earth²⁰.

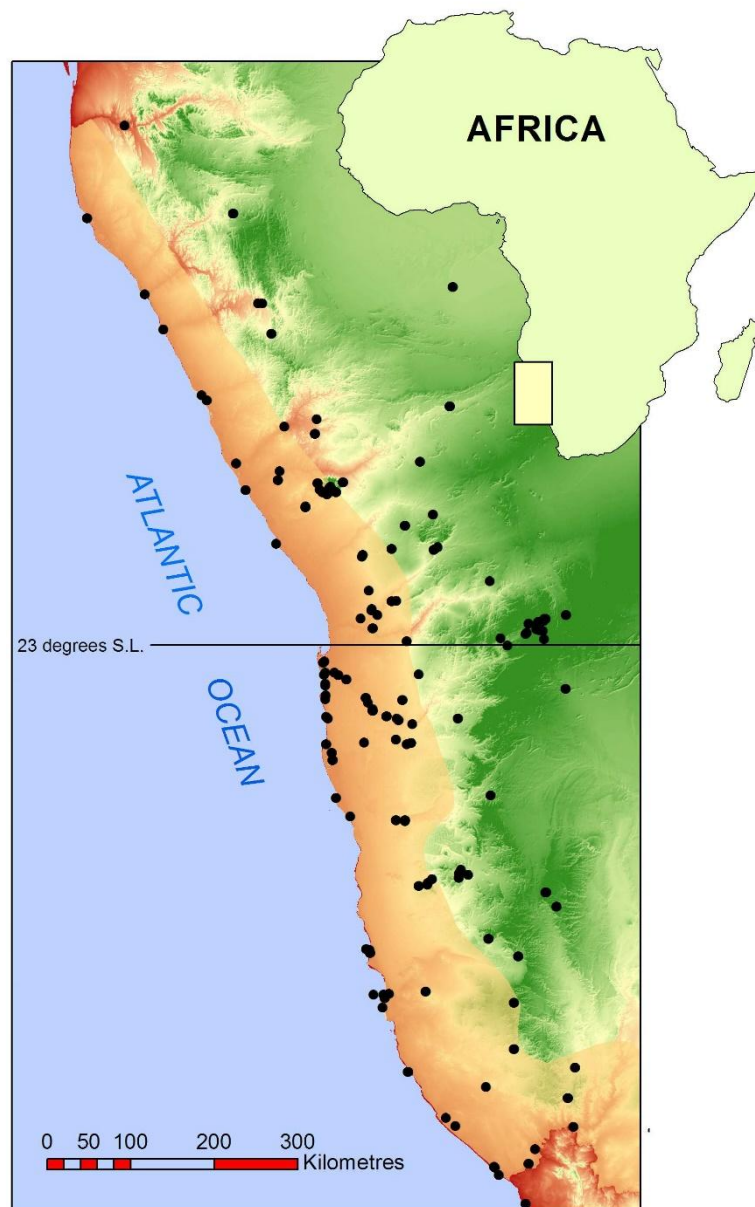
Indigenous communities, the descendants of people who lived in the Namib over thousands of years, still maintain important cultural links with the desert. Much of the Namib is enclosed by national parks and wildlife reserves, but this is no wilderness. Desert plants and animals, and the landscape itself, are an integral part of the cultural heritage of desert communities.

You and I are the most recent visitors to this extraordinary place, but our activities have the potential to cause it irreversible damage. If we do not proceed with caution and consideration, our legacy will be a wasteland of destruction. Of course one cannot build a mine, a road or a power-line without impact, but we can reduce this impact significantly by avoiding unnecessary damage.

It is important to realize that every archaeological site is part of a large and very complex puzzle. Damage to archaeological sites cannot be repaired, and the best way to avoid damaging them is to make sure by means of field survey and assessment, what sites lie in the path of a potential development. Only then is it possible to either conserve the sites or mitigate the impact of development.

This handbook contains simple guidelines for exploration and mining projects, as well as their associated infrastructure. It is based on the premise that we only see what we already know. If this publication helps the geologist, engineer or project manager to see and understand the archaeology of the desert, it may succeed where legislation and policy often fail.

²⁰ See Mitchell, P. 2002. *The archaeology of southern Africa*. Cambridge University Press, for a general introduction.



The Namib Desert forms a continuous strip 100-150km wide between the Atlantic coast and the escarpment. Here, the desert is shown in light brown, with the escarpment zone in shades of green. During the Last Glacial Maximum, ending approximately 10 000 years ago, the coastline lay up to 100km further west and the desert extended at least 400km into the interior. The black dots are dated archaeological sites.

1. First steps: the law and best practice

Almost every country has some sort of legislation to protect its cultural heritage, and compliance with these laws is important for any exploration and mining operation. Most large mining companies also have their own cultural heritage policies and procedures to guide their operations and reduce the risk of damaging their reputation.

The principal instrument of legal protection for archaeological sites or remains in Namibia is the National Heritage Act (27 of 2004). Some incidental but nonetheless important protection is provided by the Environmental Management Act (7 of 2007) which includes man-made features in its definition of the environment. Other guidelines include those of the IFC (International Finance Corporation) and the ICMM (International Council on Mining and Metals).

A short guide to the National Heritage Act

The National Heritage Council of Namibia is a statutory body and its work is administered by a Secretariat, based in Windhoek and assisted by a number of specialist committees. All enquiries and applications for permits should be addressed to:

The Director

National Heritage Council

Private Bag 12043

Ausspannplatz

Windhoek

There are as yet no official regulations or guidelines to the Act for exploration and mining projects to consult. The following précis and commentary is intended to indicate and explain some important provisions of the Act. However, it is strongly recommended that exploration and mining project managers obtain legal advice especially with regard to permits.

PART I: In terms of the Act, “heritage” is restricted to places and objects, including those of archaeological, cultural, historical, scientific and social significance. The legislation does not address what is sometimes known as “intangible heritage”, such as customs, beliefs and oral history.

The Act defines “archaeological” as *any remains of human habitation or occupation that are more than 50 years old found on or beneath the surface on land or in the sea, and especially notes rock art, being any form of painting, engraving or other representation on a fixed rock surface or loose rock or stone which is 50 or more years old.*

It is important to understand that legal protection can extend beyond the archaeological object or site, to include *the natural or existing condition or topography of land*, as well as the *trees, vegetation or topsoil*.

PART IV: The Council has the responsibility of establishing and maintaining the Namibian Heritage Register which records heritage places and objects. The register is defined as a public document, and project managers may inspect it to determine whether any protected sites lie within their exploration or mining lease area.

However, not all archaeological or other heritage sites qualify for listing in the register. Listing is subject to a prolonged process of approval based on the “heritage significance” of the object or site, and this ultimately involves publication of the site in the *Government Gazette*. Unless there is a listed site, or unless a previously unknown site of high significance comes to light, this part of the Act is of limited concern for exploration and mining projects.

PART V: Damage, disturbance and encroachment on protected sites is strictly prohibited. However, a permit may be granted in some circumstances, and the Council is also empowered to suspend protection of a listed site under some circumstances. This means that protected status is not irrevocable.

Before issuing a permit, the Council may require the applicant to *obtain from a person with appropriate professional qualifications or experience, at the applicant’s expense, a statement as to the impact the proposed works and activities may have on the place or object to which the application relates and the risk of damage to the place or object*.

In view of the fact that large areas of Namibia, including much of the Namib Desert, are archaeologically unknown, the precautionary principle dictates that an archaeological survey and assessment should be carried out at an early stage in any large exploration and mining project. Most large mining companies will commission a field survey and assessment as a matter of course.

The Act stipulates that all archaeological assessment, including field surveys, is subject to permits issued by the National Heritage Council. This means that the archaeologist who carries out the survey must be appropriately qualified and in good standing with the authorities.

The appointment of an archaeologist is the prerogative of the project proponent. Best practice requires that the archaeologist should be independent of the National Heritage Council and all other national authorities.

PART VI: All archaeological objects are the property of the State. It is important to note that State ownership extends to all archaeological remains, known or unknown. This means that mining personnel and contractors need to be aware of the legal status of archaeological remains and their legal obligation to report the discovery of any new archaeological remains to the National Heritage Council.

Relevant provisions of the Environmental Management Act

PART I: The definition of the environment employed by the Environmental Management Act (7 of 2007) specifically includes “anthropogenic factors” such as archaeological remains or any other evidence of human activity.

PART II: Environmental impact assessment (EIA) in Namibia is governed by this legislation and usually includes a specialist archaeological survey and assessment, following the stated Principles of Environmental Management which require that *Namibia’s cultural...heritage...must be protected and respected for the benefit of present and future generations.*

In the process of environmental assessment set out in the regulations to the Act there are several stages of consultation, including public participation, preceding the issue of an environmental clearance certificate by the Environmental Commissioner. There is also provision for external review, and an appeal process in the event that environmental clearance is withheld.

Credible environmental assessment must be independent of both the project proponent and the national authority. For this reason environmental assessment, as well as archaeological assessment is not carried out by government institutions and should not include government scientists as specialist consultants.

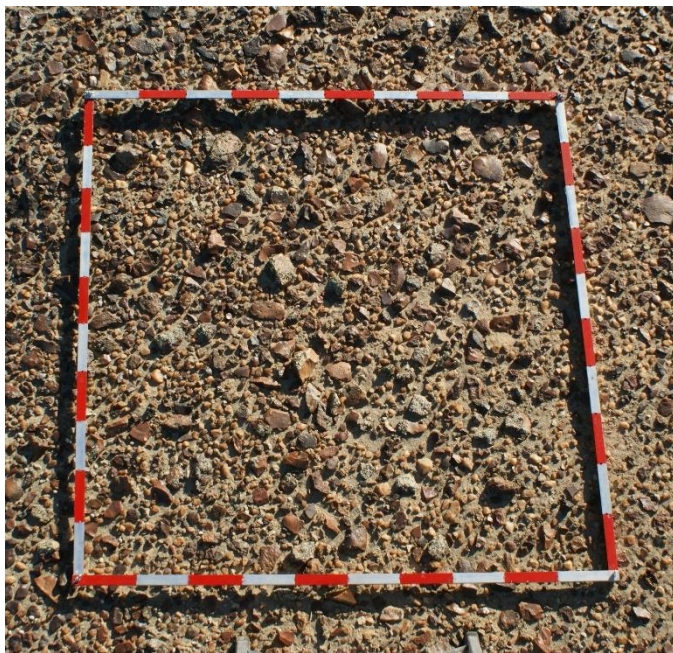
In addition:

The International Finance Corporation (IFC) has specific guidance notes and performance standards applicable to cultural heritage preservation. These standards refer to both tangible forms of cultural heritage, such as archaeological sites and objects, and intangible forms. The standards apply whether or not the archaeological material is protected, and irrespective of whether it may have been previously disturbed. To comply with these standards, a baseline survey and assessment is required.

There are general guidelines issued by the International Council on Mining and Metals (ICMM) and detailed cultural heritage management guidance notes issued by large corporations, for example, Rio Tinto (RT) and Santos. Where such guidelines indicate standards other than the laws of Namibia, their application is subject to group member standards. Best practice in Namibia directly benefits from mining companies with group standards and global experience.

2. Seeing things: what the archaeological evidence looks like

Human occupation of the Namib Desert in the past was entirely dependent on prevailing climatic conditions, and the climate of the last one million years has been consistently arid, with short periods of higher than usual rainfall. Occupation was therefore sporadic, with long periods in which the desert was unoccupied. Evidence of human occupation is widespread, but thinly scattered. Interpretation of this archaeological record relies on piecing together a large number of fragile and subtle clues²¹. Some of these clues will be easily noticed by the observant field geologist, and noted as an indication that the area might have sensitive archaeological sites.



unintentional.

LEFT: A dense scatter of late Pleistocene artefact debris.

The most abundant traces of human occupation in the Namib Desert are stone artefacts. These are easily recognized as isolated finds and as surface scatters on the gravel plains of the Namib. Other less common traces include shell middens (usually within less than 5km of the coast), natural rock shelters with evidence of occupation, including rock art, and stone features such as hut circles, hunting blinds and grave cairns. Historical sites include cemeteries, old mine workings, and important traces of World War I military engagements. While some kinds of archaeological sites are highly visible (such as the larger grave cairns), their significance is not obvious. Most archaeological sites in the Namib are difficult for the untrained eye to recognize and most damage to the sites is therefore

²¹ See Deacon, J. and Lancaster, N. 1988. *Late Quaternary Palaeoenvironments of Southern Africa*. Oxford, Clarendon Press; and Kinahan, J. 2011. From the beginning: the archaeological evidence. In Wallace, M. and Kinahan, J. 2011. *A History of Namibia*. London, Hurst.



ABOVE: A late Pleistocene artefact workshop with chert core flakes and dolerite hammer-stone (pocket-knife for scale). The site is intact and undisturbed after approximately 120 000 years.

Identifying stone artefacts

Stone artefacts were made by removing flakes from a selected core, or block of raw material, using precise blows that leave unmistakeable evidence of human manufacture. Similar breakage patterns very rarely occur in nature. Over time, methods of artefact production became more sophisticated and the different techniques of flaking provide some indication of age²².

MODE 1: Pebble tool (mid- to late Pleistocene, >500 000 years)

This well preserved example made in fine-grained quartzite was loosely cemented in a conglomerate exposed by recent collapse of a stream bank south of the Omaruru River.



MODE 2: Bifacial hand-axe (late Pleistocene, <500 000 years)

This highly symmetrical tool made in weathered basalt was an isolated surface find on an outwash fan east of Cape Cross. The artefact is 150mm in length.

MODE 3: Blade flake with terminal retouch (end Pleistocene <100 000 years)

This punch-struck blade is 60mm in length. Such artefacts form part of complex toolkits including heavy spear points. Dense scatters of debris are found near outcrops and large nodules of chert.



²² The modal classification used here is based on Clark, J.D. 1969. *Kalambo Falls prehistoric site Volume 1: the geology, palaeoecology and detailed stratigraphy of the excavations*. Cambridge, Cambridge University Press; this approach is generally applied by Barham, L. and Mitchell, P. 2008. *The First Africans: African archaeology from the first toolmakers to most recent foragers*. Cambridge, Cambridge University Press.



MODE 4: Bladelet flake with slight edge retouch (mid- to late

Holocene <5 000 years)

This artefact in crystalline quartz is 15mm in length. Flaking debris on recent Holocene sites is characterized by fragments less than 10mm in length but these are often visible in gravel float. These scatters often contain raw material brought from sources up to 50km away.

Typical stone features sites

Settlements and grave sites are significant and often highly visible features of the archaeological landscape in the Namib. Most of these sites are less than 1 000 years old and they often contain important material evidence of desert subsistence strategies. Grave sites may be construed as evidence of traditional land ownership.



ABOVE: Hut circle within hilltop settlement dated 250 years bp, with shallow archaeological trench on left. Significant soil phosphorus concentrations in such features indicate that they supported wooden frameworks plastered with domestic animal dung.

BELOW: Large grave cairn probably dating to within the last few centuries. These features are usually found isolated from settlement sites, on natural routes across the desert.



The recent past

Visible evidence of early links with the outside world has been found in the course of mining operations on the Namib coast, such as the ca1552AD wreck of the *Bom Jesus*, north of Oranjemund. The intensive trade that developed around Walvis Bay in the 1700s has also left abundant traces, and the desert interior has many sites which document early colonial penetration of the country. Such remains



are often overlooked, or mistaken for modern trash. Glass bottles and trade beads are one of the most enduring types of evidence found in the Namib. The characteristic square “case” gin bottles found in the Namib mostly originated from distilleries in the Netherlands. Early bottles were hand blown and exhibit tell-tale imperfections, while more recent bottles show evidence of technological advances in glass production. Such clues make it possible to accurately estimate the age of bottles, trade beads and other items.

ABOVE: Neck and shoulder fragment of a “case” gin bottle from the distillery of Henkes in Delfthaven, Netherlands, found on the 19th century cattle-droveing route or “Bay Road” across the central Namib. Such items help to identify the overnight camps used on this route.



LEFT: One side of an iron ox shoe from the central Namib. These were commonly used in the mid-19th century, before the German colonial period, when oxen, rather than horses, were preferred as riding animals. The oxen were shod to cope with long-distance travel in the rocky terrain in the Namib. These items are valuable indicators of the early colonial presence in some remote parts of the desert.



ABOVE: Well preserved waste rock walling around the edges of adits at the late 19th century Annaberg tin mine, near Trekopje.

3. Sensitive places: where impacts happen

Water was the main limiting factor for human occupation of the Namib, and the distribution of archaeological sites tends to reflect this. However, it is not possible to accurately predict where archaeological sites are likely to occur on this basis alone. The reasons are simple: the availability of water has changed over time and during moist periods people occupied areas that are otherwise dry. In the past, small groups of people could live for many weeks on water trapped in natural rock basins, or by digging for water in drainage lines.

There were other important requirements for human settlement, such as shelter; the availability of edible plants; the movement of game species, and the location of raw material outcrops for stone tool manufacture. Together with all of these considerations people in the Namib had also to deal with competing claims for the same resources: the Namib was a pantry, but it was also a neighbourhood, and archaeologists are interested in trying to understand both the social and the ecological dimensions of life in this environment.

An exploration geologist or project manager who is sensitive to the archaeology of the desert can do a great deal to reduce the impact of exploration and mining because many field surveys have shown that there are particular kinds of terrain that have high concentrations of archaeological sites. Although some kinds of terrain are less sensitive none can be definitively excluded.

Archaeological sites commonly occur in these locations:

OUTCROPS and INSELBERGE: Features ranging in size from minor isolated outcrops to massifs are often associated with archaeological sites because they usually have some surface water and other resources. In most cases, archaeological sites are found only on the foot-slopes of these features, especially where very large boulders provide shelter. These sites may have high concentrations of rock art and stratified occupation deposits.

Archaeological sites usually occur in association with smaller outcrops, often so small that they are not indicated on the regional geological mapping. Important outcrop settings for archaeological sites include: early Cretaceous granites, dolerite ridges and sedimentary formations such as the Twyfelfontein (formerly Etjo) sandstones, and localized occurrences of fine-grained quartzite, crystalline quartz and fine- or crypto-crystalline chert. Marble outcrops have relatively few archaeological sites.

SADDLES: Natural routes between drainage basins often pass over low saddles. These locations sometimes have hut circle sites, grave cairns and, occasionally hunting blinds. Hill saddles with archaeological sites can be very minor terrain features, but the more significant examples are easily identified on topographic maps, aerial photographs and satellite imagery.

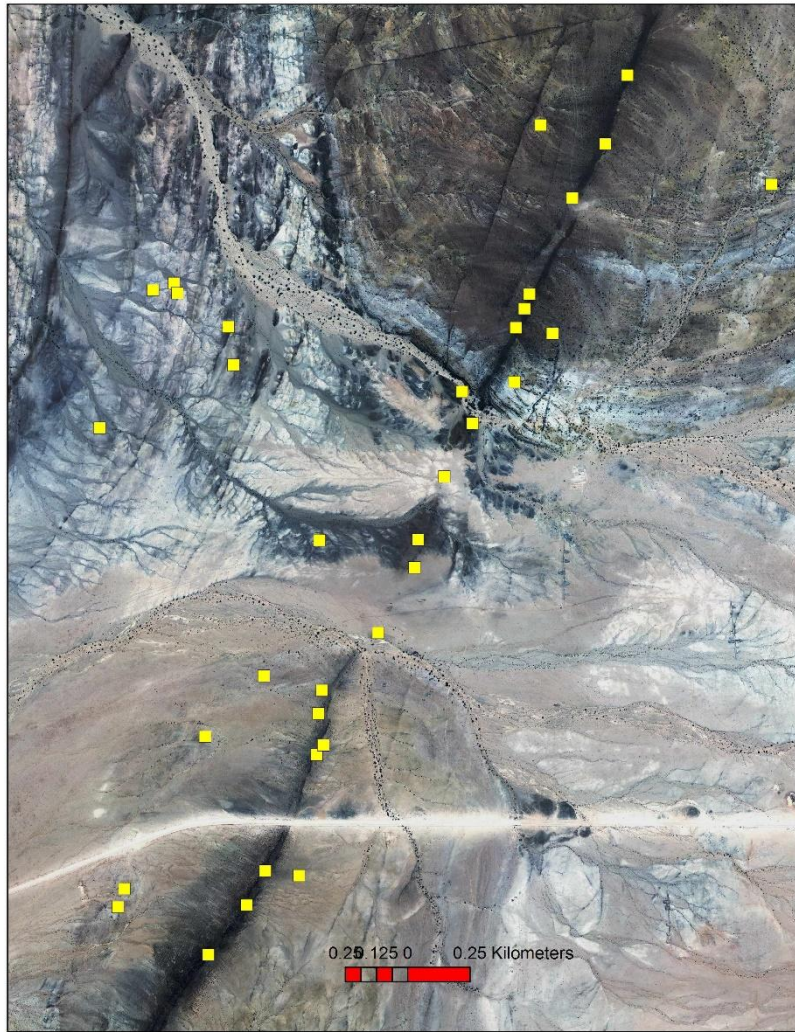
DRAINAGE LINES: River mouths on the Namib coast are invariably associated with shell middens and other archaeological remains. However, because most Namib drainage has a relatively steep gradient, high energy flooding results in extensive reworking of sediments. Outwash fans have

relatively few archaeological sites. Older river terraces and over-bank flood deposits provide level and elevated settings that often have archaeological sites.

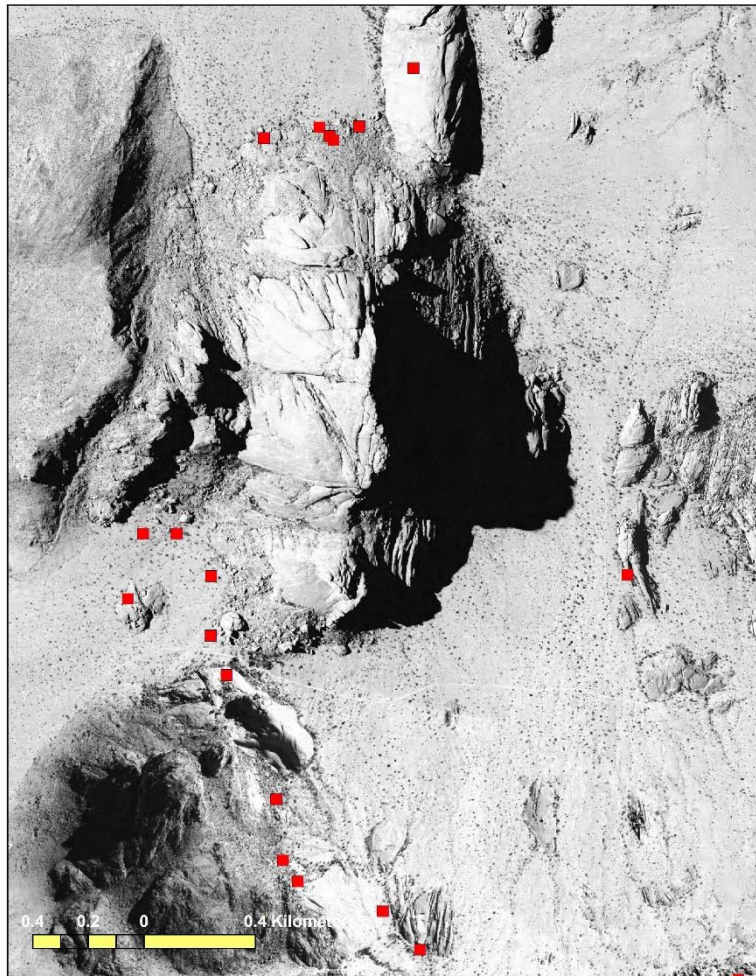
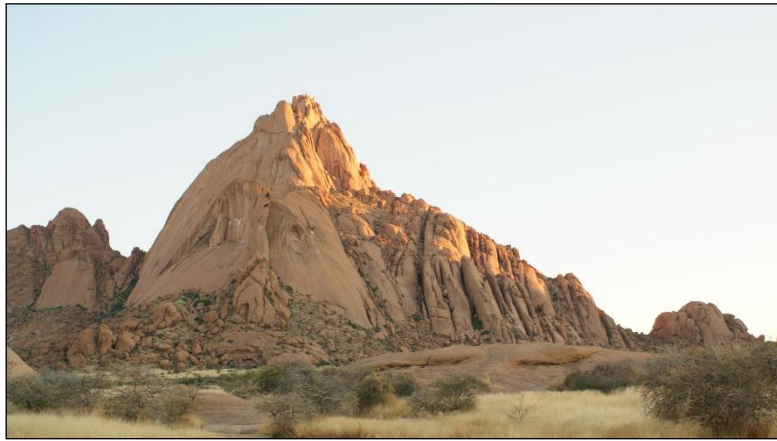
PANS: Pan-like drainage features in the Namib are subject to occasional flooding and may hold standing water for many weeks. Archaeological sites, mainly stone artefact scatters are commonly found on the strandlines of pans and up to 4km away, after which their density quickly declines. The lee-sides of stable dunes and small outcrops near pans have high archaeological concentrations, Saline pans have relatively few archaeological sites.

DUNEFIELDS and GRAVEL PLAINS: Coastal and near-coastal dunefields, especially those associated with exposed silt deposits (such as the Kuiseb) may have very high concentrations of archaeological sites within reach of water and other resources. Gravel plains in the Namib have highly stable features such as desert pavements, with well preserved and undisturbed artefact scatters.





ABOVE: Typical example showing the close association of archaeological sites with a minor dolerite ridge. The high ridge in the background of the photograph (top) has very few sites compared to the low ridge in the foreground and shown in the satellite image.



ABOVE: Archaeological sites associated with the prominent Spitzkuppe inselberg are primarily on the footslopes among large boulders. Most of the sites are within less than one kilometre of water seepages in the sheet joints of the granite, or rock hollows that retain water after rain.

4: Critical steps in exploration & mining

This chapter considers the archaeological impacts associated with mining activity, and how they might be avoided. Some measures are simple and carry no significant costs. Most impacts can be prevented by identifying archaeological sites in advance and avoiding them where possible. Adopting appropriate measures may save costs and delays, and will certainly enhance the reputation of the company as a responsible corporate citizen.

Relatively few exploration projects result in the development of a mine, but as far as destructive impacts on the archaeology of the Namib are concerned, exploration can result in a disproportionate amount of damage. Much of this damage can be avoided, and even if the project leads to the establishment of a mine it is possible to conserve key archaeological sites right through to the final closure of the mine. To achieve this, it is necessary to adopt key measures at each stage of the project.

Exploration

A pre-fieldwork archaeological assessment is a necessary precaution for exploration in the Namib. There is sufficient field survey data available to allow for an estimation of likely archaeological impacts, even if the exploration area itself has not been surveyed in detail. A pre-fieldwork assessment can form part of the environmental impact scoping study, but it can also be carried out independently to assist with practical planning of exploration fieldwork.

Some prior knowledge of likely archaeological impacts will provide valuable guidance for siting of field camps, access roads, lay-downs for contractors, fuel storage tank farms and various other facilities. The pre-fieldwork assessment can also identify high impact risk areas of the exploration tenement, such as the terrain features discussed in Chapter 3. The pre-fieldwork assessment can be a useful aid to exploration planning by helping to schedule field surveys of sensitive areas before exploration begins on the ground.

As soon as areas of likely archaeological impact have been identified, detailed field survey should be carried out. The elements of field survey are set out in Chapter 5, including data collection and the integration of archaeological spatial data into the exploration programme and area mapping. Here it is important to list the practical precautions required at the exploration stage of the project:

- Use existing access tracks as far as possible; signpost as private all tracks turning off from public roads; observe strict track discipline by employing verge markers, passing points, and clear demarcation at track junctions; avoid establishing new tracks parallel to gradient; rehabilitate redundant tracks for at least 100m from their junction with public roads.
- Field camps and other facilities should be established on archaeologically least sensitive surfaces, such as on drainage lines with naturally rehabilitating substrates. Where practical, temporary structures should be placed on pilings to reduce the development of a permanent footprint. All sensible precautions should be adopted for storage, waste disposal etc.
- All terrain features that are suspected to be archaeologically sensitive should be avoided until they have been surveyed in detail. For example, natural outcrop features should not be used to shelter camps or other facilities; terrain such as hill saddles, pan fringes and outcrop footslopes should be inspected on foot before being entered by vehicle. Highly sensitive sites may be designated as No-Go Areas (see Appendix).

- Personnel and contractors should be informed about the specific archaeological sensitivity of the exploration area, and the relevant terms of the National Heritage Act, through the application of a specific project archaeological management plan (AMP). As soon as baseline archaeological survey data are available these should be consulted on a continuous basis when planning access and exploration activities. Where new archaeological finds are located in the course of exploration, field personnel should observe the Chance Finds Procedure (see Appendix).



ABOVE: Drilling in progress on the central Namib gravel plains. This is an archaeologically sensitive surface and detailed survey should precede drilling.

Development and operation

Ideally, archaeological assessment and mitigation should be completed before development of the mine site commences. This is almost never the case, however, because the process of mine development can require multiple changes in design and layout – with possible implications for sensitive sites. Moreover, development requires infrastructure to link the mine with local road networks, as well as power and water supplies – again with possible implications for sensitive sites, both within and adjacent to the mine licence area. Even the most thorough field survey cannot exclude the possibility that new archaeological discoveries will be made in the course of mine development and operation. To accommodate these needs it is advisable for the mine to adopt a formal archaeological management plan at an early stage in the development process.

THE ARCHAEOLOGICAL MANAGEMENT PLAN (AMP): The purpose of an AMP is to ensure appropriate protection and preservation of archaeological sites through informed decision-making, in line with the law and best practice. The AMP should provide a framework in which management procedures are based on consistent standards and linked to expected outcomes. These procedures should serve as practical guidelines with clearly identified steps and responsibilities. To achieve this purpose, the AMP is accompanied by additional documentation including induction material for personnel and contractors, and detailed background information based on the results of the field survey carried out during the exploration phase.

The AMP should include the following elements:

- A baseline record of sites and remains protected in terms of the National Heritage Act
- A baseline record of mining activity (historical impacts) before and during present operations
- A management system with appropriate decision and risk assessment procedures
- Explicit measures to reduce impacts on known archaeological sites
- Procedures to secure approval for unavoidable disturbance of archaeological sites
- Procedures for the reporting of inadvertent disturbance of archaeological sites
- Measures to enlist the involvement of interested and affected parties in site conservation
- Consideration of indigenous communities' cultural rights in respect of archaeological sites

In principle, the AMP applies to all archaeological sites and remains found within the project licence area, and it applies to all personnel and contractors. It provides a practical means to manage site protection, using a functional and accessible database as a platform for risk management. The AMP is

integral to all land disturbance decision-making, and it provides a set of explicit management guidelines to deal with Chance Finds, and management of access to No-Go Areas (see Appendix).

SOME LANDSCAPE PRINCIPLES:

Landscape integrity is often neglected in the planning of mine infrastructure. Coordinated infrastructure planning should aim to minimize fragmentation of the landscape by establishing service corridors (roads, power-lines, pipelines &c), and consolidating infrastructure hubs (pump-stations, pipeline tee-offs, substations, road junctions) wherever possible.

In the Namib Desert surface rehabilitation by raking and other means has become a common practice in the final stages of exploration. This is a largely cosmetic practice, and its long-term benefit to the restoration of desert surfaces has to be weighed against the destructive effect on Pleistocene archaeological sites where raking merely propagates disturbance caused by vehicle tracks. It is therefore essential to integrate archaeological assessment with the rehabilitation programme.

Maintaining areas of archaeological value can provide an important and easily managed offset benefit within the mining licence area. This has obvious advantages: enclosed offset areas are easily managed by the mine because access is controlled; and such areas can provide important archaeological assets to assist the development of alternative land uses (e.g. tourism) after closure of the mine.

The archaeological record in the Namib Desert is a record of highly mobile and temporary settlement. To understand this record, archaeologists adopt a landscape perspective, combining evidence from many sites. Likewise, meaningful conservation of the Namib archaeological record requires a landscape approach, achieved by minimizing fragmentation, especially around areas of especially high significance.

TWO FURTHER POINTS TO REMEMBER: Mining operations, past and present, are part of the archaeological record of human activity in the Namib. It is historical nonsense to attempt to erase this imprint entirely. The remains of mining activity are not only an integral part of the “memory” of the desert landscape, they also provide a valuable physical demonstration of how the desert responds to disturbance and how the scars of human impact persist or vanish over time and under natural conditions. Such demonstration material will become more valuable in future, as impacts and management challenges accumulate. We all know that in physical terms the Namib has a very long memory; it is as well to consider what the legacy of our mining operations will be, and act thoughtfully.

The responsibility of mining companies to the conservation of Namib Desert archaeology extends beyond the mine site, the licence area and related infrastructure. Corporate responsibility and best practice require that mining companies also consider the impact of their personnel in the pursuit of recreation. It makes no sense to scrupulously observe archaeological conservation principles on site and ignore them elsewhere. Archaeological tourism, especially to coastal sites and inland rock art sites is increasingly popular. Mine personnel should consider the impact of uncontrolled archaeological tourism. Recreational use of archaeological sites requires a permit from the National Heritage Council. Tourism operators, both community-based and private should have such permits: *if in doubt ask your tour operator to produce his permit.*



ABOVE: There are many traces of historical exploration and mining enterprises in the Namib Desert. In some cases these may be considered as important cultural heritage assets because there are few written records and few people left to tell us anything about life on small remote mines.

5: Standards for archaeological survey & assessment

In the absence of official regulations under the National Heritage Act, archaeological assessment in Namibia follows appropriate international best practice. The assessment process, set out in the flow diagram overleaf is based on a conventional three phase approach: a Phase 1 evaluation, usually a desk assessment; a Phase 2 site assessment involving detailed field survey, impact assessment and limited testing; and a Phase 3 mitigation programme, if required. Sometimes Phases 1 and 2 are combined, but Phase 3 is generally separate because it requires prior approval of mitigation measures.

The following notes are not intended as a manual of survey and assessment, but as a guide to the mining company or project proponent as to what the archaeological services to the project might include:

Basic survey requirements

The National Heritage Act stipulates that archaeological assessment should be carried out by a person with appropriate qualifications and experience. The mining company, or project proponent, may appoint an archaeologist of their own choosing. All archaeological fieldwork is however subject to permits issued by the Heritage Council.

Since the Phase 1 evaluation is usually based on literature and database sources, it is very important that the consulting archaeologist has a detailed familiarity with current knowledge and research directions in southern African archaeology. Phase 2 field survey and assessment will require a more detailed familiarity with Namibian archaeology although this is not a prerequisite. Phase 3 is based on mitigation measures approved by the Heritage Council and could be carried out by an archaeologist without local experience.

Best practice requires not only that archaeological survey and assessment should observe legal provisions and standards set out by company guidelines and lending institutions: they should also reflect acceptable standards of archaeological research. This means that the investigation should be based on an explicit methodology; employ standard techniques of field documentation; and provide an assessment that is well founded both in the field evidence presented and in the context of available knowledge.

Archaeological survey and assessment should consider the potential research value of a site, or what is sometimes referred to as the “knowledge dividend”. Conserving a particular site may have a high potential dividend for future research, and this should be taken into account, as would be the potential loss of dividend if the site is damaged or destroyed.

Field methods

Mineral exploration tenements (EPLs) are often very extensive, in excess of 500km². Archaeological survey should therefore reflect both the archaeology of the tenement, and place appropriate emphasis on areas of exploration interest. It should therefore be an informed survey in the sense that it considers the terrain context of the archaeology, thus allowing some extrapolation from representative sample

areas, and at the same time provide detailed knowledge of areas likely to be affected by exploration. Effective field survey is designed to be representative, informative, and practically feasible.

Some field reconnaissance is helpful in selecting terrain units for survey. The survey itself may be based on transects, random or stratified quadrats, whichever seems appropriate. Site locations should be established by hand-held GPS and plotted in the field on the standard topographic map scale (1: 50 000). The physical setting of the site must be noted, i.e. terrain type, prevailing geology and soil, vegetation cover; the type of site should be noted, i.e. surface scatter, stone feature, rock shelter; the site dimensions should be measured or estimated.

Field survey should include a provisional estimate of the site age, based on characteristic archaeological associations, and a field inventory of the archaeological evidence observed. Any samples collected for identification or analysis should be properly bagged and labelled. All field collecting is subject to permits issued by the National Heritage Council. The site should be photographed if appropriate, both close-up and in context, noting orientation. Further notes and sketches may be added as an aid to interpretation and as a record of any historical site disturbance.

Assessment

Field experience in Namibia has led to the development of an assessment methodology based on two separate, parallel scales of archaeological *significance* and archaeological *vulnerability*. The two scales consist of interval values from zero to five, and allow the significance of the archaeological site to be considered separately from its vulnerability to disturbance resulting from the project under assessment. Thus sensitivity can be represented as a numerical value based on significance and vulnerability. For example, a site of very high significance that is not vulnerable will have a lower sensitivity value than one that is vulnerable, according to the values assigned on the separate scales. Sensitivity values generated in this way can be adjusted according to project design and brought, through mitigation, to an acceptable level. Note that both significance and vulnerability ranking can change: assessment is subjective and the judgement of the archaeologist may be mistaken or fail to anticipate the future significance of any one find or site.

SIGNIFICANCE RANKING:

- 0 no archaeological significance
- 1 disturbed or secondary context, without diagnostic material
- 2 isolated minor find in undisturbed primary context, with diagnostic material
- 3 archaeological site forming part of an identifiable local distribution or group
- 4 multi-component site, or central site with high research potential
- 5 major archaeological site containing unique evidence of high regional significance

VULNERABILITY RANKING:

- 0 not vulnerable
- 1 no threat posed by current or proposed development activities

- 2 low or indirect threat from possible consequences of development (e.g. soil erosion)
- 3 probable threat from inadvertent disturbance due to proximity of development
- 4 high likelihood of partial disturbance or destruction due to close proximity of development
- 5 direct and certain threat of major disturbance or total destruction

Mitigation

Archaeological mitigation consists in the reduction of a potential threat of destruction, either by timely intervention in the planning and execution of exploration and mining work, to avoid needless impacts, or by investigation or documentation of the site to a sufficient level of detail that its loss or destruction is in some way compensated by the existence of adequate records.

Archaeological survey and assessment will identify the sites and risks of impact that form the basis of a mitigation plan. The mitigation plan submitted to the National Heritage Council must provide sufficient detail for the Council to independently assess the significance of the site and the adequacy of the proposed mitigation measures.

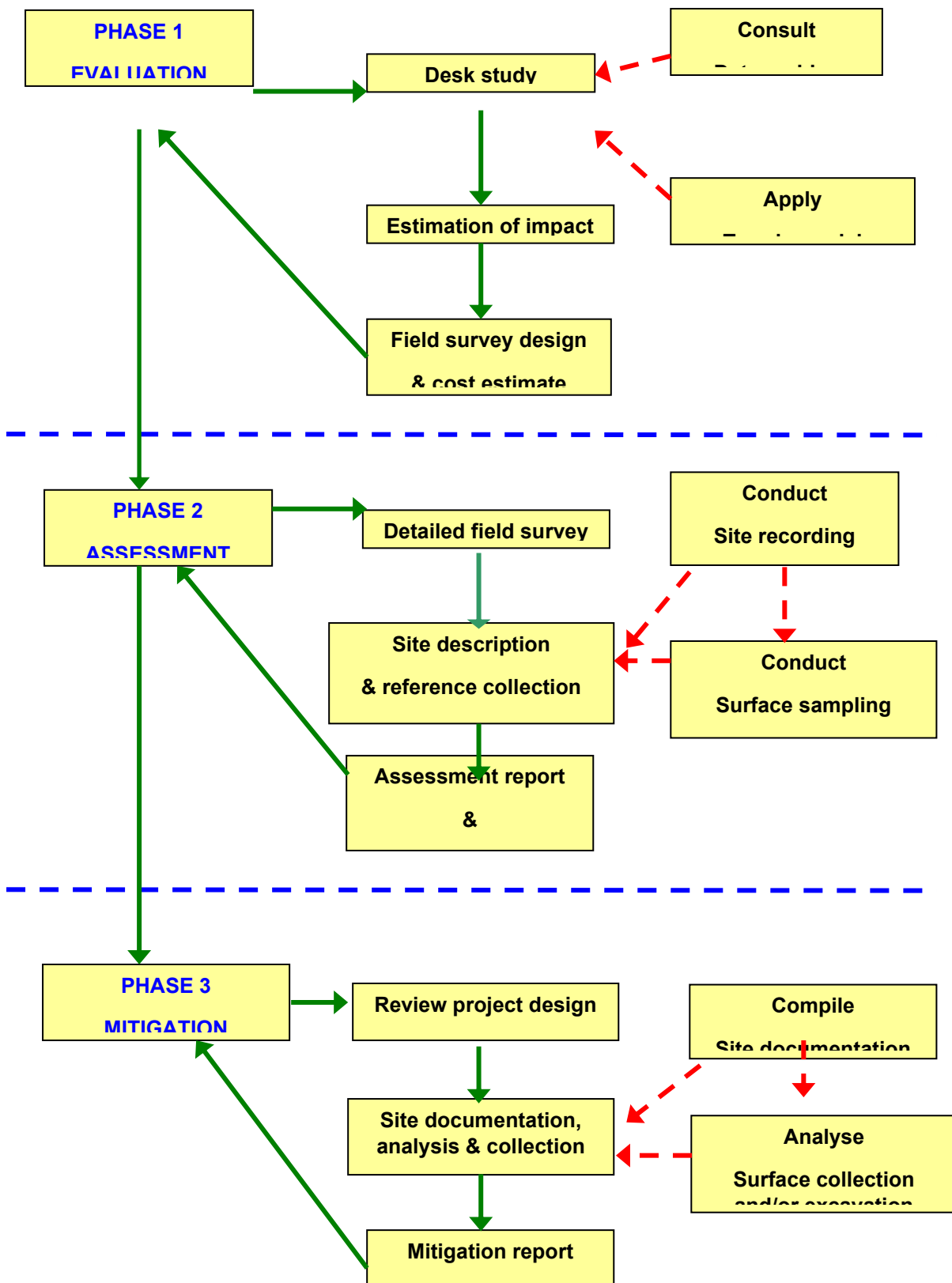
Damage or destruction of an archaeological site is subject to a permit issued by the National Heritage Council. The archaeological survey and assessment process can minimize or even avoid such impacts. In the form of an Archaeological Management Plan (AMP) the results of the survey and assessment will help to minimize or avoid destructive impacts during the operational life of the mine.

Reporting

The structure and layout of archaeological reports may be subject to standard company report templates, but the report should provide a detailed and systematic account of the investigation, with the evidential basis of all inferences clearly set out. The report should be accompanied by digital GIS files including field GPS data, spatial files with attribute tables for the sites, and other files such as sensitivity maps generated from the field survey data.

All reporting of archaeological survey, assessment and mitigation work is the confidential property of the project proponent. In some circumstances, such as mitigation, the National Heritage Council may request part of the investigation results. It is important to note that the project or mine will be the effective custodian of archaeological sites on its lease or licence area. It is therefore very important to consider the vulnerability of archaeological sites and strictly control the distribution of survey data. Site location data should be degraded to a maximum precision of 2.5km before being made available to other parties.

BELOW: Flow diagram illustrating the three phase process of archaeological assessment and mitigation in Namibia. The sequence of steps is indicated with green arrows, and the flow of information from the investigation is shown with dashed red arrows.

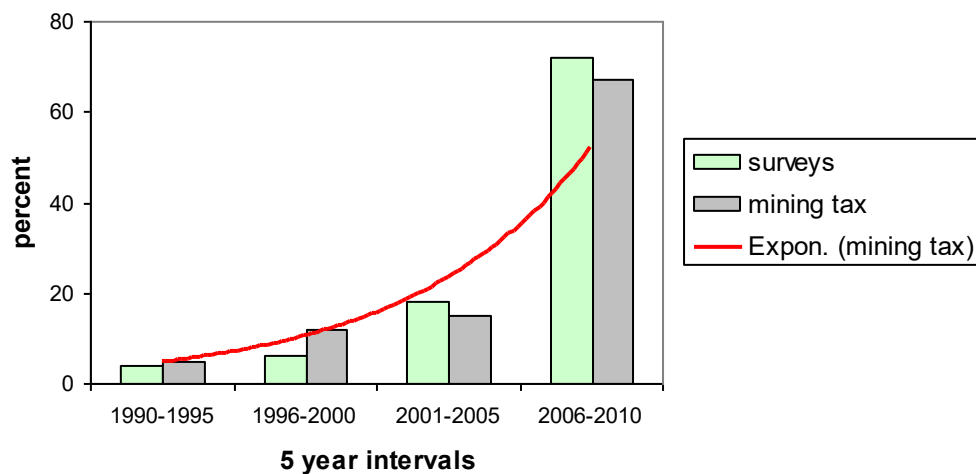


6: In the public eye

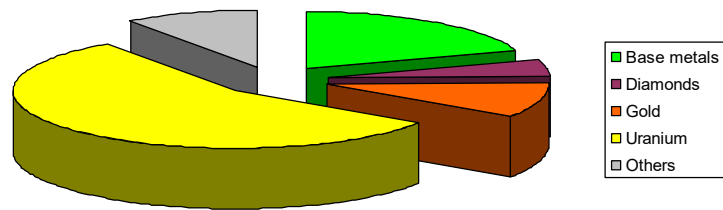
archaeology and the image of the mining industry

During the last two decades, exploration and mining in the Namib Desert have gone well beyond mere compliance with the law, to make a major contribution to furthering archaeological knowledge. On the basis of the accumulated record of archaeological survey from this period, the Namib is among the most intensively surveyed desert regions of the world. However, since nearly all of this survey cover is the result of exploration assessments, it is still patchy and much ground remains to be covered.

There is almost no official funding of archaeological research in Namibia, and survey results from mining and other project assessments represent the largest contributor to field research. The diagram below illustrates the proportionate increase in archaeological survey since Namibian independence, compared to the proportionate increase in taxable mining revenues (non diamond) as an illustration of the growth of archaeological survey in Namibia.

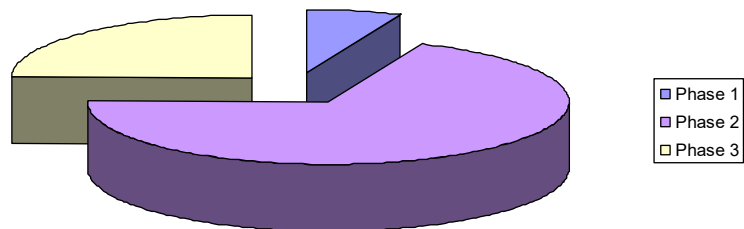


As reflects the general profile of exploration and mining in the Namib Desert, most archaeological surveys (55%) were carried out for uranium projects, followed by base metals (19%), with diamonds, gold and other projects such as dimension stone featuring less prominently. This pattern is likely to change as uranium projects enter the operational stage and exploration for other resources continues.



ABOVE: Relative importance of mining resources to archaeological survey and assessment in the Namib Desert.

The three phases of archaeological survey and assessment are clearly reflected in the record of exploration and mining in the Namib during this period. Phase 1 evaluation, or desk assessment, accounts for a relatively small proportion of archaeological investigation (7%). This may be related to the fact that uranium projects, as the dominant exploration field, combined the Phase 1 and Phase 2 stages in order to establish reliable baseline data. Thus, Phase 2 investigations account for 68% of the total. The fact that Phase 3 mitigation accounts for 25% of the total may reflect the advanced stage of development in a number of uranium projects.



ABOVE: Percentage distribution of archaeological survey and assessment phases in Namib Desert exploration and mining projects.

These simple statistics show that archaeological survey and assessment is an increasingly integral part of exploration and mining in the Namib, that archaeological investigations reflect the general resource profile of the industry in this part of the country, and that most projects accommodate the three phase sequence of archaeological evaluation, assessment and mitigation discussed here.

Beyond compliance with legal and policy requirements there are many opportunities for mining companies to make a contribution to archaeological conservation and education in Namibia. Some sites are suitable for small-scale tourism and could generate local employment and income; others may be used for school or university groups. There is also a need for informative and modern museum exhibitions on the subject of Namib Desert archaeology, and there is a ready demand for both popular and scientific publications on the subject. As mining in the Namib enters a more mature stage in its history it would be appropriate to consider some of these options.

The Namib Desert Archaeological Survey

In the last five years the Namibia Archaeological Trust (est. 1991) has launched a major project to maximize the research potential of archaeological survey and assessment results from the Namib. This project, the Namib Desert Archaeological Survey <http://antiquity.ac.uk/projgall/kinahan325/> has collated all available data to create a common spatial platform; collated all available radiocarbon dating results to provide a single integrated sequence; and adopted uniform standards of site and terrain description to aid regional scale comparative research. The results of the project will appear as a series of research publications, handbooks, and on-line data resources. Some of these are already available at www.archaeologynamibia.com The Namib Desert Archaeological Survey would welcome direct support from the mining sector to help it realize some of these goals.

RESOURCES

Namibian legislation

National Heritage Act (27 of 2004) Government Notice 287 29th December 2004

www.archaeologynamibia.com

Environmental Management Act (7 of 2007) Government Notice 232 27th December 2007

www.archaeologynamibia.com

Commencement of the Environmental Management Act, 2007. Government Notice 28 6th February 2012-04-27

www.archaeologynamibia.com

List of activities that may not be undertaken without Environmental Management Certificate:
Environmental Management Act, 2007. Government Notice 29 6th February 2012-04-27

www.archaeologynamibia.com

Environmental Impact Assessment Regulations: Environmental Management Act, 2007. Government Notice 30 6 February 2012

www.archaeologynamibia.com

Baseline assessment

Strategic Environmental Assessment for the central Namib Uranium Rush (2011) Windhoek, Ministry of Mines and Energy, prepared by the Southern African Institute for Environmental Assessment

<http://www.saiea.com/uranium/index.html>

Cumulative effects analysis: Archaeology

http://www.saiea.com/uranium/24Chap7_8March2011.pdf

International conventions & guidelines

Convention concerning the protection of the world cultural and natural heritage. UNESCO 1972.

www.unesco.org

Cultural heritage management guidance: Rio Tinto Community relations guidance note. Rio Tinto 2007

www.riotinto.com

Good practice guide: Indigenous peoples and mining, ICMM (International Council on Mining & Metals) 2010

www.icmm.com

Guidance note 8: Cultural heritage. IFC (International Finance Corporation) 2007

www.ifc.org

Procedure for the Management of Indigenous Cultural Heritage Sites. Santos Ltd 2007

www.santos.com

Archaeological resources and links

The Namibia Archaeological Trust

www.archaeologynamibia.com