McGregor Museum
Department of Archaeology

HERITAGE IMPACT ASSESSMENT REPORT FOR THE PROPOSED TRANSNET SISHEN RAILWAY LINE LINK, NEAR KATHU, GAMAGARA LOCAL MUNICIPALITY, NORTHERN CAPE PROVINCE

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1. Introduction

The McGregor Museum archaeology department was subcontracted by AECOM. This report provides an Archaeological Impact Assessment for the proposed Sishen Rail Link to be connected to Transnet Rail, south of Kathu in the Northern Cape. The aim of the study was to undertake and compile an archaeological baseline and impact assessment for the proposed development.

The site of proposed development is about 6 km south-east of Dingle and about 16 km south-west from the town of Kathu, Northern Cape. The proposed development would comprise the construction of a railway line to link two existing railway tracks.

1.1 Focus and Content of Specialist Report: Archaeology

The archaeology and heritage specialist study is focused on the servitude of the proposed railway link.

Study outline:

- Introduction to the specialist in terms of qualifications, accreditation and experience to undertake the study (1.2, below)
- description of the affected environment (2) providing background to the development and its infrastructural components (2.1); background to the heritage features of the area (2.2); and defining environmental issues and potential impacts (2.3)
- Methodology (3) including an assessment of limitations (3.1);statement of expectations and predictions (3.2) and outline of EIA procedures including criteria for assessing archaeological significance (3.3)

- Observations and assessment of impacts (4), including field observations (4.1); characterizing archaeological significance (4.2)
- Impact Assessment (5) including Purpose and scope (5.1); Impact Assessment Methodology (5.2); Impact Assessment Criteria (5.3); Assessment of Significance Criteria (5.4); Assessment of Significance (5.5)
- Conclusions & Recommendations (6)
- Acknowledgements (7)
- References (8)
- Appendix 1.

1.2 Authors of this Report

The authors (both on staff of the McGregor Museum) are independent of the organization commissioning this specialist input, and provide this heritage assessment (archaeology and cultural heritage of the specific locale; but not palaeontology) within the framework of the National Heritage Resources Act (No 25 of 1999).

The senior author is a professional archaeologist (PhD) accredited as a Principal Investigator by the Association of Southern African Professional Archaeologists. He has worked as a museum archaeologist and has carried out specialist research and surveys in the Northern Cape and western Free State since 1985, including surveys and fieldwork on sites in the Kathu area (Beaumont & Morris 1990; Morris & Beaumont 2004). In addition he has UCT-accredited training on Architectural and Urban Conservation: researching and assessing local (built) environments (S. Townsend, UCT). As Chairman of the Historical Society Kimberley and the Northern Cape (registered as a Conservation organisation on SAHRIS) he also has general appreciation of heritage and history in the Northern Cape.

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

Where archaeological sites and palaeontological remains are concerned, the South African Heritage Resources Agency (SAHRA) at national level acts on an agency basis for the Provincial Heritage Resources Agency (PHRA) in the Northern Cape. The Northern Cape Heritage Resources Authority (formerly called Ngwao Bošwa ya Kapa Bokone) is responsible for the built environment and other colonial era heritage and contemporary cultural values.

2. Description of the affected environment and potential impacts

The proposed project is located near Kathu in the Gamagara Local Municipality of the Northern Cape Province. The site is approximately 16 km south-west of Kathu, and some 6 km south eats of Dingle. It is accessible via the N14 which connects to Upington and Kuruman and the R385 from Postmasburg.

Figure 1: Locality map for the proposed Sishen railway link.

In terms of bioregional context, the proposed development locale is characterized as part of the Savanna Biome with Kathu Bushveld and Kuruman Thornveld vegetation types. It lies on a gentle slope within the Gamagara valley, and immediately east of the Gamagara River floodplain, with rock outcrops dominating the northern part of the development site and sandy sediment overlying the southern portion (Figure 2). The surrounding landscape is substantially disturbed by existing rail and road infrastructure, and, beyond this, by iron ore/manganese mining. Landscape surface visibility at the time of the site visit was relatively good in terms of observing surface archaeological traces, despite recent rains and, in places, dense grass-cover.

Figure 2: Location showing proposed rail link (green); zone not examined archaeologically (between red lines) owing to its heavily disturbed nature (including restricted strip on either side of an existing conveyor belt, the existing railway/roadway servitude); and numbered archaeological observations mentioned in this report (below).

The easternmost extent of the proposed railway link (that indicated between roughly parallel red lines in Figure 2) could not be accessed because of mining restrictions, but it is noted that that zone (servitude) is heavily disturbed by an existing conveyor belt, as well as the existing railway and service road.

2.1. Project background

The proposed development consists of the development of a railway extension to be situated adjacent to existing infrastructure, including a railway line, the N14 highway and two secondary roads. The area scheduled to be developed in construction of the railway extension is approximately 0.79 kilometres in extent (Figure 2).

Figure 3: Part of the existing railway infrastructure in the vicinity.

2.2 Background to heritage features of the area

The Northern Cape has a wealth of archaeological sites and landscapes reflecting Stone Age to Colonial histories. No archaeological survey work had been carried out in the immediate vicinity of the proposed railway link. But sites and site complexes in the surrounding region have been investigated in some detail in the last quarter century, and are subject to on-going research. This is especially true of the landscape in the vicinity of Kathu researched by Beaumont in 1979-1982 and with renewed research by an international team in partnership with the McGregor Museum from 2004 (Beaumont & Morris 1990; Beaumont 2004; Morris & Beaumont 2004; Porat *et al*. 2010; Walker *et al*. 2014). Numerous Stone Age sites have been documented and excavated in what is now referred to as the Kathu Archaeological Complex, including sites at Kathu Pan, Kathu Townlands and Bestwood (Beaumont 2013; Beaumont and Morris 1990; Beaumont and Vogel 2006; Kaplan 2008; Thackeray et al. 1981). Part of the particular significance of the Kathu Pan sites derives from the study by Michael Chazan and Jayne Wilkins (Wilkins *et al*. 2012) which proposes evidence of 500 000 year old stone points (excavated by Peter Beaumont in 1979-1982) having been hafted – argued to represent the oldest stone-tipped spears to date. Kathu Pan is a shallow depression with internal drainage and high water table, with sites having formed in filled-in sinkholes/dolines that formed within calcretes of the Tertiary-aged Kalahari Group. Kathu Pan 1 preserves the longest lithostratigraphic and archaeological sequence of the sites, documenting a history of human occupation at the pan through the ESA, MSA, and LSA.

Wonderwerk Cave, somewhat further away, on the eastern flank of the Kuruman Hills to the east of Kathu, is a very large 140 m-deep cave in the base of a foothill. Wonderwerk Cave has been the subject of a number of archaeological investigations since the first published description by Malan and Wells in 1943 (Thackeray et al. 1981) – by Beaumont, 1978-1993, and by a project led by Chazan, Horwitz and Berna, 2004-present (reviewed by Horwitz & Chazan 2015).

This existing work suggests that further sites of significance may yet be brought to light in the region. Broadly speaking, the archaeological record of this region reflects the long span of human history from Earlier Stone Age times (about two million to about 270 000 years ago), through the Middle Stone Age (about 270 000 – 40 000 years ago), to the Later Stone Age (up to the protocolonial era). The last 2000 years was a period of increasing social complexity with the appearance of farming (herding and agriculture) alongside foraging, and of ceramic and metallurgical (Iron Age) technologies alongside an older trajectory of stone tool making. Of interest in this area is evidence of early mining of specularite, a sparkling mineral that was used in cosmetic and ritual contexts in from early times (Beaumont 1973). Rock art is known in the form of rock engravings (Fock & Fock 1984; Morris 1992; Beaumont 1998).

At a regional level the sites of Wonderwerk Cave (east side of the Kuruman Hills) and the Kathu complex of sites (Porat *et al*. 2010) provide important sequences against which to assess the age and significance of finds that may be made at the site of the proposed Sishen Railway link.

2.3 Environmental issues and potential impacts

Heritage resources including archaeological sites are in each instance unique and non-renewable resources. Any area or linear, primary and secondary disturbance of surfaces in the development locales could have a destructive impact on heritage resources, where present. In the event that such resources are found, they are likely to be of a nature that potential impacts could be mitigated by documentation and/or salvage following approval and permitting by South Africa Heritage Resources Agency and, in the case of any built environment features, by Northern Cape Heritage authority (previously called Ngwao Boswa jwa Kapa Bokone). Although unlikely, there may be some that could require preservation in situ and hence modification of intended placement of development features.

In this instance, an area impact within a linear swathe is expected to occur.

Disturbance of surfaces includes any construction: of a road, a pipeline, erection of a pylon, or any other clearance of, or excavation into, land surface. In the event of archaeological materials being present such activity would alter or destroy their context (even if the artefacts themselves are not destroyed). Without context, archaeological traces are of much reduced significance. It is the contexts as much as the individual items that are protected by the legislation.

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

3. METHODOLOGY

This study defines the heritage (archaeology) component of the EIA process being undertaken for the proposed Sishen railway link. The area was inspected on foot on the 19 March 2018. Heritage traces were evaluated in terms of their archaeological significance.

In preparation for this:

- A desktop assessment was done of the development footprint relative to the known wider archaeological landscape.
- A search was done on SAHRIS database to determine what previous Archaeological and Heritage Impact studies existed for the area.
- Predictions were made which the study would test with observations made in the field.

3.1 Assumptions and limitations

As mentioned above, the zone between the red lines marked in figure 2 was inaccessible due to stringent mining and safety access policies, but it may be assumed that no major impacts would occur there since the area in question is already substantially disturbed as a result of construction of a conveyor belt within the servitude. Predictions about heritage resources potentially occurring there (should any survive) could be made on the basis of observations made in the adjacent landscape.

It was assumed that, by and large in this landscape, with its shallow soil profiles, that some sense of the archaeological traces to be found in the area would be readily apparent from surface observations (including assessment of places of erosion that expose erstwhile below-surface features). It was not considered necessary to conduct excavations as part of the EIA to establish the potential of sub-surface archaeology. A major portion of the area examined consists of exposed bedrock/rocky ridge, where any archaeological traces present would occur on the surface.

Figure 4: View eastwards across the restricted conveyor belt servitude towards the existing Sishen-Saldanha railway.

A proviso is routinely given, that should sites or features of significance be encountered during construction (this could include an unmarked burial, an ostrich eggshell water flask cache, or a high density of stone tools, for instance), specified steps are necessary (cease work, report to heritage authority).

This study does not address palaeontology.

3.2 Predictions/expectations

Against the archaeological background reviewed (2.2 above), it was expected that archaeological traces might occur in the following sets of circumstances:

- Landscape settings in which dolines occur might yield archaeological sites similar to those documented in the case of Kathu Pan.
- Rich raw material sources outcropping locally might be foci for 'workshop' knapping sites such as Kathu Townlands.
- Riverside settings might support higher density site/artefact occurrences because of the affordances of proximity to water and river-side ecologies.

- Exposure of bedrock in the form of boulders or smooth sheets of rock may support rock art in the form of engravings.
- Topographic features such as hills or rocky ridges may provide shelters with traces of precolonial Stone Age occupation/activity.
- Iron Age traces including pottery are known from ridges in the wider landscape as well as from sandy plains.

3.3 Determining archaeological significance

In addition to guidelines provided by the National Heritage Resources Act (Act No. 25 of 1999), a set of criteria based on Deacon (nd) and Whitelaw (1997) for assessing archaeological significance has been developed for Northern Cape settings (Morris 2000a). These criteria include estimation of landform potential (in terms of its capacity to contain archaeological traces) and assessing the value to any archaeological traces (in terms of their attributes or their capacity to be construed as evidence, given that evidence is not given but constructed by the investigator). These are included in Appendix 1 of this report.

4. OBSERVATIONS AND ASSESSMENT OF IMPACTS

The manner in which archaeological and other heritage traces or values might be affected by the proposed development may be summed up in the following terms: it would be any act or activity that would result immediately or in the future in the destruction, damage, excavation, alteration, removal or collection from its original position, any archaeological material or object (as indicated in the National Heritage Resources Act (No 25 of 1999)). The most obvious impact in this case would be land surface disturbance associated with infrastructure construction.

4.1 Specific field observations

Relative to desktop predictions (3.2 above), it was found that the vicinity of the proposed railway development lacked many of the aspects or features that might point to potentially significant archaeological sites being present. However, the rock ridge and exposed bedrock was carefully scanned to evidence of rock engravings. On the whole it was found that the development site has generally low surface density of isolated Stone Age artefacts, probably mainly of Pleistocene age (though often difficult to type definitively), of low archaeological integrity (e.g. lithics only, lacking context and potential for dating), and hence of limited significance. Notable observations made on 19 March 2018 are tabulated below.

In relation to the predictions made in 3.2, above, we summarise:

No dolines were observed and no hint of sites similar to those at Kathu Pan was found.

There were no rich preferred raw material sources (e.g. jaspiite) outcropping locally and no sense of concentrated knapping was evident (many of the artefacts found were however on jaspilite and represent instances of stone tools carried in – whether by humans or [to some extent] natural secondary depositional processes).

The development site lies upslope from the course of the Gamogara River and this proximity may in part account for the occurrence of such artefacts as were observed.

The rocky ridge and outcrops presented some potential for rock art – but none was found. Nor was it of a nature that provided any particular shelter.

No ceramics were found or any stone-walled feature suggestive of Iron Age occupation.

Table 1: Archaeological observations

Observation Number (Fig 2, 5b) and GPS waypoint (Fig 5a)	Latitude	Longitude	Comment	Significance
1 (GPS waypoint 535)	27°50’08.9”	022°59’46.6”	Isolated jaspilite flakes and cores observed amongst rock outcrops.	LOW
2 (GPS waypoint 530)	27°50’09.8”	022°59’46.6”	Isolated surface finds of jaspilite flakes with ‘Kathu Townlands dots’. [A	LOW

			characteristic impurity in the banded ironstone found thus far only on artefacts and raw material at Kathu Townlands: its occurrence here may point either to local artefacts having come from Kathu Townlands some 16 km away – or to this apparent Townlands marker not being unique to that site]	
3 (GPS waypoint 537)	27°50’09.9”	022°59’49.5”	Isolated radial core on quartzite.	LOW
4 (GPS waypoint 536)	27°50’10.6”	022°59’50.3”	Dispersed scatter of jaspilite flakes.	LOW
5 (GPS waypoint 532)	27°50’07.2”	022°59’52.9”	Isolated MSA and other flakes on jaspilite.	LOW

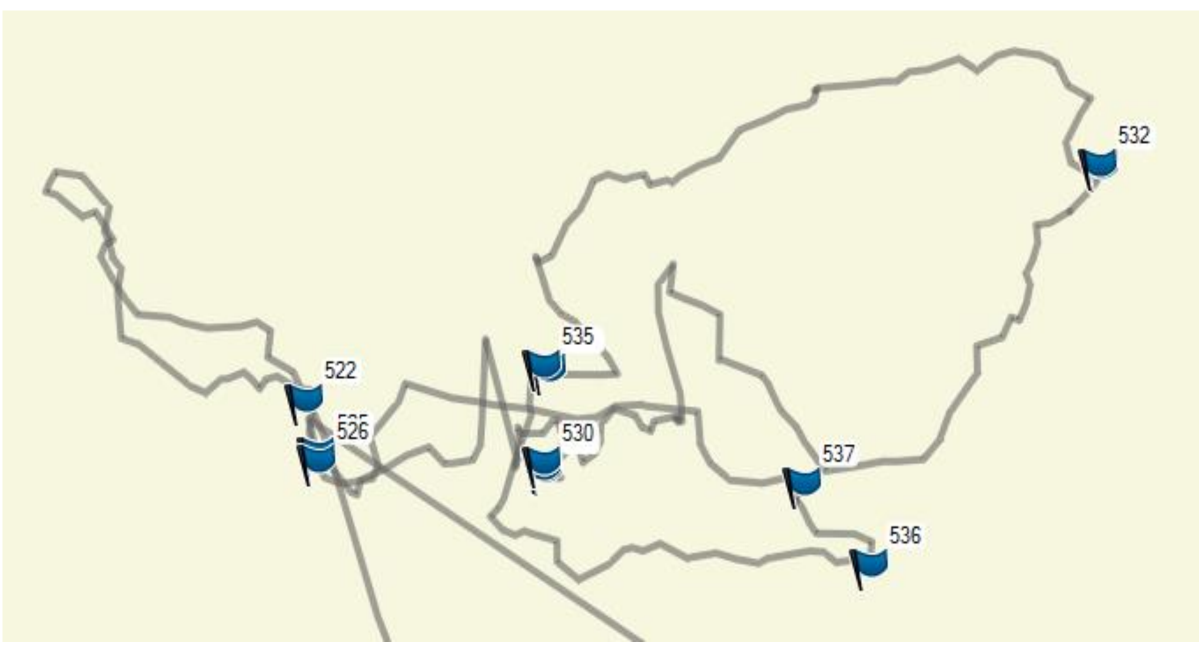


Figure 5a: GPS track: A comprehensive idea of the nature and spread of heritage traces was obtained by way of inspection on-foot.

Figure 5b. GPS track superimposed on Google Earth image and route of proposed railway link.


Figure 6: Jaspilite pieces with features suggestive of Kathu Townlands 'dots' (see comment for Observation 2 in Table 1).


Figure 7: MSA and other flaked material.

Figure 8: View southwards across the rocky ridge

4.2 Characterizing archaeological significance

In terms of the significance matrices in Tables 1 and 2 in Appendix 1 (see 3.3 above), most of the archaeological observations fall under Landforms L1 and L3 Type 1 or 2. In terms of archaeological traces they all fall under Class A1 Type 1. All of these ascriptions (Table 1 in Appendix 1) reflect poor contexts and likely low archaeological significance for these criteria.

For site attribute and value assessment (Table 2 in Appendix 1), all of the observations noted fall under Type 1 for Classes 1-7, again reflecting low significance, low potential and absence of contextual and key types of evidence.

Overall, then, archaeological significance – by these criteria – is reckoned to be low. In the next section significance is arrived at using the criteria and methodology generated by AECOM.

5. IMPACT ASSESSMENT

5.1 Purpose and Scope

A standard impact assessment methodology provided by AECOM is used here in the capture of generic anticipated impacts and potential mitigation measures. This methodology complies with the requirements of the EIA Regulations (2014), promulgated in terms of the National Environmental Management Act, 1998 (Act No.

107 of 1998). The methodology of impact assessment is used in relation to the Impact Assessment Rating Matrix Tool.

5.2 Impact Assessment Methodology (AECOM)

Each issue identified during the EIA process consists of components that on their own or in combination with each other give rise to potential impacts, either positive or negative from the project onto the environment or from the environment onto the project. The significance of the potential impacts for the study sites will be considered before and after identified mitigation is implemented. The criteria used for the assessment of the potential impacts of the proposed project are described in the following section and Table 2.

5.3 Impact Assessment Criteria

The criteria used for the assessment of the potential impacts of the proposed project are described in Table 2.

Table 2. Impact Assessment Criteria

Criteria	Description
Nature	Includes a description of what causes the effect, what will be affected and how it will be affected.
Duration	Lifetime of the impact is measured in relation to the lifetime of the project.
Extent	Physical and spatial scale of the impact.
Intensity	Examining whether the impact is destructive or benign, whether it destroys the impacted environment, alters its functioning, or slightly alters the environment.
Type	Description of the impact as positive, negative or neutral, and direct or indirect.
Consequence	Combination of duration, extent and intensity of impact in relation to the type.
Probability	This describes the likelihood of the impacts actually occurring. The impact may occur for any length of time during the lifecycle of the activity, and not at any given time.
Significance	Synthesis of the characteristics described above and assessed as low, medium or high. Distinction will be made for the significance rating without the implementation of mitigation measures and with the implementation of mitigation measures.

5.3.1 Duration

The lifetime of the impact is measured in relation to the lifetime of the proposed project (Table 3).

Table 3. Description of Duration Criteria

Description	Explanation	Scoring
Short term	Impact will either disappear with mitigation or will be mitigated through a natural process in a period shorter than any of the development phases.	1
Short to medium term	Impact will be relevant through to the end of the construction phase.	2
Medium term	Impact will last up to the end of the development phases, where after it will be entirely negated.	3
Long term	Impact will continue or last for the entire operational lifetime of the development, but will be mitigated by direct human action or by natural processes thereafter.	4
Permanent	The only impact class that is non-transitory. Mitigation by man or natural process will not occur in such a way or time span that the impact can be considered transient.	5

5.3.2 Extent

The physical and spatial scale of the impact is classified below (Table 4).

Table 4: Description of Extent Criteria

Description	Explanation	Scoring
Footprint	Impacted area extends only as far as the activity, such as footprint occurring within the total site area.	1
Site	Impact could affect the whole, or a significant portion of the site.	2
Regional	Impact could affect the area around the site including neighbouring farms, transport routes and adjoining towns.	3
National	Impact could have an effect that expands throughout the country (South Africa).	4
International	Impact has international ramifications that go beyond the boundaries of South Africa	5

5.3.3 Intensity

The assessment of the intensity of the impact will be a relative evaluation within the context of all the activities and the other impacts within the framework of the project. The intensity will be measured using the criteria listed in Table 5.

Table 5: Description of Intensity Criteria

Description	Explanation	Scoring
Low	Impact alters the affected environment in such a way that the natural processes or functions are not affected.	2
Low-Medium	Impact alters the affected environment in such a way that the natural processes or functions are slightly affected.	4
Medium	Affected environment is altered, but functions and processes continue, albeit in a modified way.	6
Medium-High	Affected environment is altered, and the functions and processes are modified immensely.	8
High	Function or process of the affected environment is disturbed to the extent where the function or process temporarily or permanently ceases.	10

5.3.4 Consequence

Based on the above criteria, the consequence of issues will be determined using the following formula:

Consequence =Type x(Duration +Extent+ Intensity)

Table 6. Description of Consequence Criteria

Description	Explanation	Scoring
Extreme Detrimental	A very serious negative impact which may be sufficient by itself to prevent implementation of the Project. The impact may result in permanent change. Very often these impacts are immitigable and usually result in very severe effects. The impacts will be irreplaceable and irreversible should adequate mitigation and management measures not be successfully implemented.	-18 to-20
High Detrimental	A serious negative impact which may prevent the implementation of the Project. These impacts would be considered by society as constituting a major and usually a long-term change to the (natural and/or social) environment and result in severe effects. The impacts may result in the irreversible damage to irreplaceable environmental or social aspects should mitigation measures not be implemented.	-14 to > -17
Moderate Detrimental	An important negative impact which requires mitigation. The impact is insufficient by itself to prevent the implementation of the Project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in negative medium to long-term effect on the social and/or natural environment.	-10 to -13
Slight Detrimental	A small negative impact. The impact will result in medium to short term effects on the social and/or natural environment.	-6 to -9
Negligible	An acceptable negative/positive impact for which mitigation is desirable but not essential. The impact by	-5 to 5

Description	Explanation	Scoring
	itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in negative/positive medium to short term effects on the social and/or natural environment. The impacts are reversible and will not result in the loss of irreplaceable aspects.	
Slight Beneficial	A small positive impact. The impact will result in medium to short term effects on the social and/or natural environment.	6 to 9
Moderate Beneficial	An important positive impact. The impact is insufficient by itself to justify the implementation of the Project. These impacts will usually result in positive medium to long-term effect on the social and/or natural environment.	10 to 13
High Beneficial	A beneficial impact which may help to justify the implementation of the Project. These impacts would be considered by society as constituting a major and usually a long-term positive change to the (natural and/or social) environment.	14 to 17
Extreme Beneficial	A very beneficial impact which may be sufficient by itself to justify implementation of the Project. The impact may result in permanent positive change.	18 to 20

5.3.5 Probability

Probability describes the likelihood of the impact(s) occurring for any length of time during the lifecycle of the activity, and not at any given time. Table 7 shows the classes.

Table 7: Description of Probability Criteria

Description	Explanation	Scoring
Improbable	Possibility of the impact occurring is none, due either to the circumstances, design or experience. The chance of this impact occurring is thus zero (0%).	1
Possible	Possibility of the impact occurring is very low, either due to the circumstances, design or experience. The chances of this impact occurring is defined as 25%.	2
Likely	There is a possibility that the impact will occur to the extent that provisions must therefore be made. The chances of this impact occurring is defined as 50%.	3
Highly likely	It is most likely that the impacts will occur at some stage of the Development. Plans must be drawn up before carrying out the activity. The chances of this impact occurring is defined as 75%.	4
Definite	Impact will take place regardless of any prevention plans, and only mitigation actions or contingency plans to contain the effect can be relied upon. The chance of this impact occurring is defined as 100%.	5

5.3.6 Confidence

The level of knowledge or information that the EAP or a specialist had in their judgement is rated as shown in Table 8. Note that this criterion is not given a numerical value.

Table 8: Description of Confidence Criteria

Criteria	Description
Low	Judgement is based on intuition and not on knowledge or information.
Medium	Judgement is based on common sense and general knowledge.
High	Judgement is based on scientific and/or proven information.

5.3.7. Reversibility

Reversibility is the ability of the affected environment to recover from the impact, with or without mitigation (**Error! Reference source not found.**). Note that this criterion is not given a numerical value.

Table 9: Description of Reversibility Criteria

Criteria	Description
Yes	The affected environment will be able to recover from the impact.
No	The affected environment will be unable to recover from the impact that is permanently modified.

5.3.8 Replaceability

Replaceability is an indication of the scarcity of the specific set of parameters that make up the affected environment (**Error! Reference source not found.**). That is, if lost can the affected environment be (a) recreated, or (b) is it a common set of characteristics and thus if lost is not considered a significant loss. Note that this criterion is not given a numerical value.

Table 10: Description of Replaceability Criteria

Criteria	Description
Yes	Affected environment is replaceable, that is, an irreplaceable resource is not damaged, or the resource is not irreplaceable (not scarce).
No	Affected environment is irreplaceable.

5.4 Level of Significance Criteria

Based on the above criteria, the significance of issues will be determined using the following formula:

Significance =Consequence x Probability

The significance of the impact is rated as follows (Table 11)

Table 11: Impact Assessment Significant Rating

Description	Explanation	Scoring
No Impact	There is no impact	0 – 10
Low	Impacts are less important. Some mitigation is required to reduce the negative impacts.	11 – 30
Medium	Impacts are important and require attention. Mitigation is required to reduce the negative impacts.	31 – 60
High	Impacts are of high importance. Mitigation is essential to reduce the negative impacts.	61 – 89
Fatal Flaw	Impacts present a fatal flaw, and alternatives must be considered	90 – 100

5.5 Assessments of significance

The potential impacts for the different project stages of the proposed railway extension are indicated below:

Construction phase

- disturbance of land surface at and in vicinity of construction site

Operational phase

- Any additional disturbance

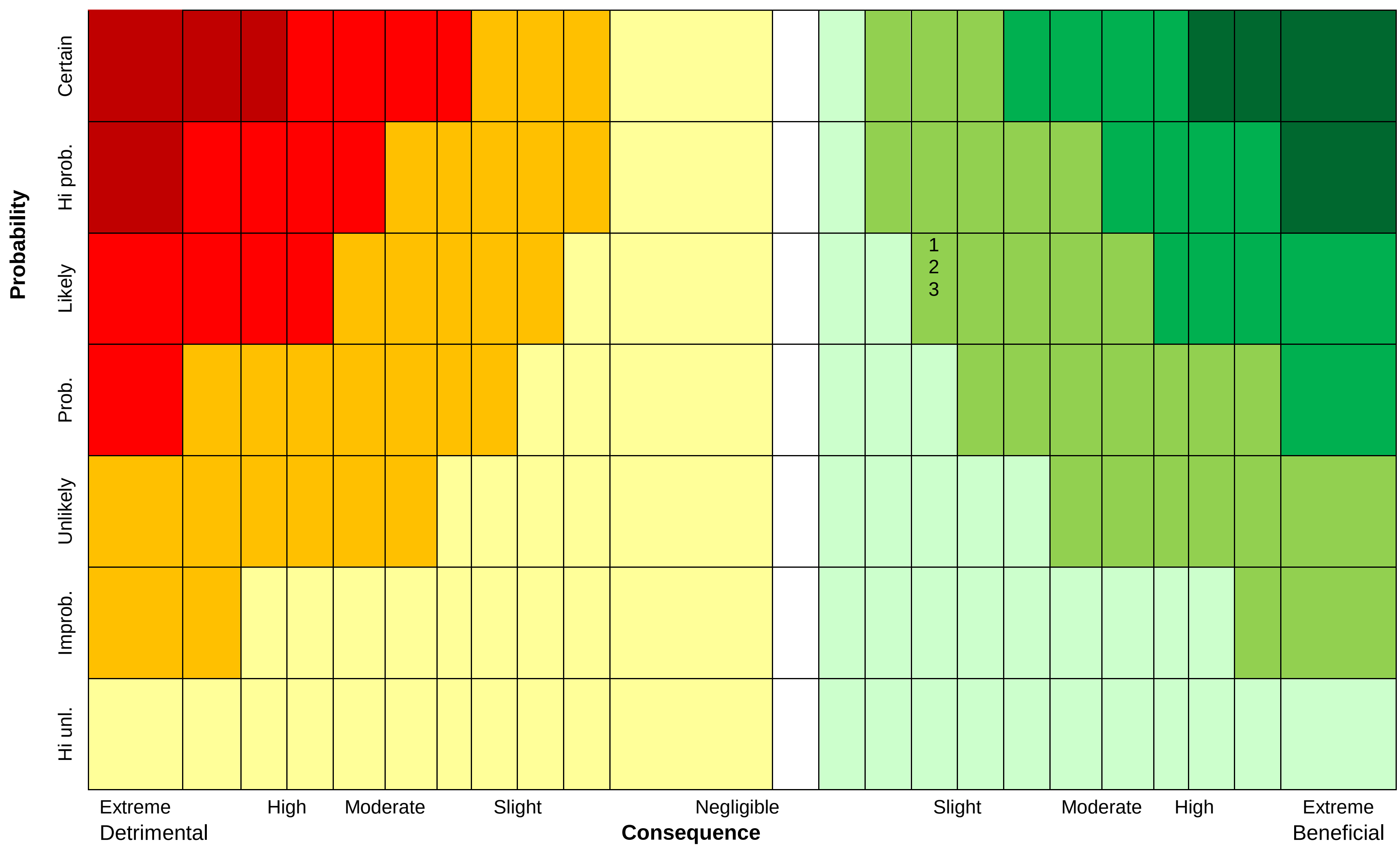
Decommissioning phase

- Any additional disturbance

Table 12: Assessment f significance of potential heritage/archaeological impacts associated with the proposed railway link pre-mitigation.

Code	Impact	Pre-Mitigation					
		Duration	**Extent**	**Intensity**	**Consequence**	**Probability**	**Intensity**
1	Disturbance of land surface at and in vicinity of construction site	Permanent	Footprint	Low - positive	Slightly beneficial	Likely	Low positive
2	Any additional disturbance	Permanent	Footprint	Low - positive	Slightly beneficial	Likely	Low positive
3	Any additional disturbance	Permanent	Footprint	Low - positive	Slightly beneficial	Likely	Low positive

Table 13: The consequence and probability rating pre-mitigation.



6. CONCLUSIONS AND RECOMMENDATIONS

The manner in which archaeological and other heritage traces would be affected by the proposed railway link has been indicated above. In summary, it would be any act or activity that would result, immediately or in future, in the destruction, damage, excavation, alteration, removal or collection from its original position, of any heritage material, object or value (as indicated in the National Heritage Resources Act (No 25 of 1999). The most obvious impact in this case would be land surface disturbance associated with the infrastructure construction.

There is a remote chance, as noted above, that some material of significance may still occur subsurface which, if encountered during construction, operational or decommissioning phases, should be brought to the immediate attention of the heritage authorities. Work should be halted and SAHRA and/or the Northern Cape Heritage Resources Agency be contacted to allow for further assessment and mitigation recommendations.

Low density heritage traces were found dispersed across most of the development footprint. From an archaeological perspective the observed heritage resources are of low significance, with no mitigation measures considered necessary. Criteria used here for impact significance assessment rate the impacts during construction, operational and decommissioning phases of the proposed development as Low.

7. Acknowledgements

We thank Miss Jani Louw (McGregor Museum Archaeology Intern) who assisted us with field observations.

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Appendix 1: Tables for determining archaeological significance

Estimating site potential

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

Assessing site value by attribute

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

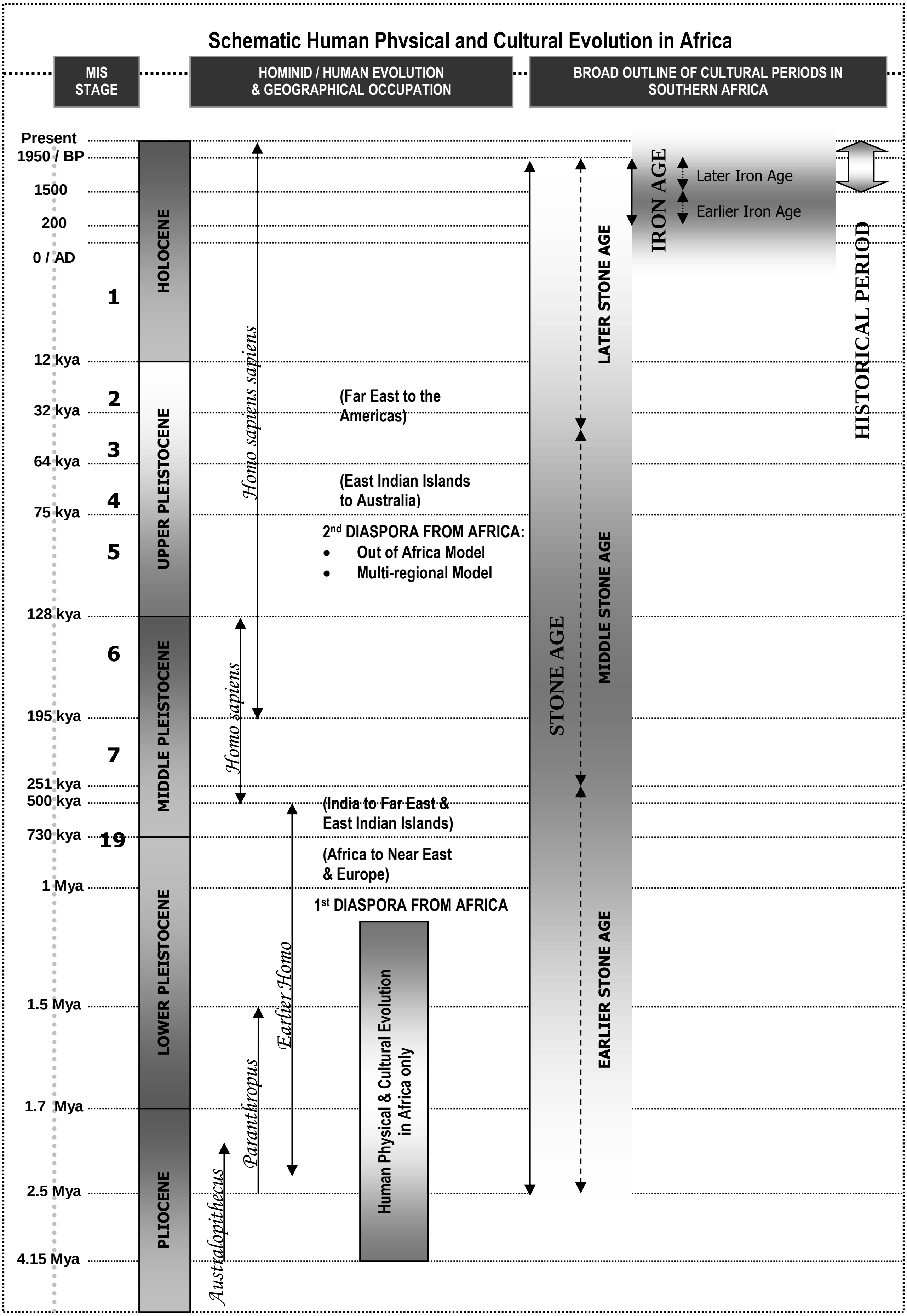
Table 1. Classification of landforms and visible archaeological traces for estimating the potential for archaeological sites (after J. Deacon, National Monuments Council).

Class	**Landform**	**Type 1**	**Type 2**	**Type 3**
L1	Rocky surface	Bedrock exposed	Some soil patches	Sandy/grassy patches
L2	Ploughed land	Far from water	In floodplain	On old river terrace
L3	Sandy ground,	Far from water	In floodplain or near	On old river terrace

Class	Landform	Type 1	Type 2	Type 3
	inland		feature such as hill	
L4	Sandy ground, Coastal	>1 km from sea	Inland of dune cordon	Near rocky shore
L5	Water-logged deposit	Heavily vegetated	Running water	Sedimentary basin
L6	Developed urban	Heavily built-up with no known record of early settlement	Known early settlement, but buildings have basements	Buildings without extensive basements over known historical sites
L7	Lime/dolomite	>5 myrs	<5000 yrs	Between 5000 yrs and 5 myrs
L8	Rock shelter	Rocky floor	Sloping floor or small area	Flat floor, high ceiling
Class	**Archaeo-logical traces**	**Type 1**	**Type 2**	**Type 3**
A1	Area previously excavated	Little deposit remaining	More than half deposit remaining	High profile site
A2	Shell or bones visible	Dispersed scatter	Deposit <0.5 m thick	Deposit >0.5 m thick; shell and bone dense
A3	Stone artefacts or stone walling or other feature visible	Dispersed scatter	Deposit <0.5 m thick	Deposit >0.5 m thick

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

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


Schematic Human Phvsical and Cultural Evolution in Africa
MIS STAGE
HOMINID / HUMAN EVOLUTION & GEOGRAPHICAL OCCUPATION
BROAD OUTLINE OF CULTURAL PERIODS IN SOUTHERN AFRICA
Present
1950 / BP
1500
200
0 / AD
12 kya
32 kya
64 kya
75 kya
128 kya
195 kya
251 kya
500 kya
730 kya
1 Mya
1.5 Mya
1.7 Mya
2.5 Mya
4.15 Mya
1
2
3
4
5
6
7
19
HOLOCENE
UPPER PLEISTOCENE
MIDDLE PLEISTOCENE
LOWER PLEISTOCENE
PLIOCENE
Homo sapiens sapiens
Homo sapiens
Earlier Homo
Paranthropus
Australopithecus
(Far East to the Americas)
(East Indian Islands to Australia)
2nd DIASPORA FROM AFRICA:
Out of Africa Model
Multi-regional Model
(India to Far East & East Indian Islands)
(Africa to Near East & Europe)
1st DIASPORA FROM AFRICA
Human Physical & Cultural Evolution in Africa only
STONE AGE
LATER STONE AGE
MIDDLE STONE AGE
EARLIER STONE AGE
IRON AGE
Later Iron Age
Earlier Iron Age
HISTORICAL PERIOD