HERITAGE IMPACT ASSESSMENT OF XOLOBENI MINERAL SANDS PROJECT, EASTERN CAPE PROVINCE, SOUTH AFRICA

Assessment and report by

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Management summary

eThembeni Cultural Heritage was appointed by GCS (Pty) Ltd to undertake a heritage impact assessment of the proposed Xolobeni mineral sands project in the Eastern Cape Province, in terms of the South African Heritage Resources Management Act No 25 of 1999. eThembeni staff members inspected the area on 5 to 7 and 12 to 14 September 2007 and completed a controlled-exclusive surface survey, as well as a database and literature search.

We identified various heritage resources, requiring the following mitigation measures:

Site specific

- Places to which oral traditions are attached or which are associated with living heritage

A heritage practitioner should undertake an oral history recording project in the local area (up to five kilometres from the project area). Parameters for the study should be set by SAHRA.

- Landscapes and natural features

A heritage practitioner should undertake an intensive study of the site and local landscape and natural features, within parameters set by SAHRA. At a minimum, the study should record local perceptions of past, current and future land uses, within the context of potential mining activities.

- Archaeological sites

- Sites A and B

Early and Middle Stone Age specialists should undertake detailed mapping of exposed archaeological deposits; excavation in both exposed and unexposed areas to determine the extent of sites; and sampling of artefacts, with the appropriate permit(s) from SAHRA.

Provision should be made for appropriate dating of archaeological materials, including optically stimulated luminescence dating.

A multidisciplinary specialist team should collaborate to determine the dating of dune formation processes and place archaeological materials in chronological sequence.

The multidisciplinary team should provide recommendations for the management of archaeological sites within the proposed mining area, including the consideration of excision of one or more areas from mining activities to preserve sites for future research.

- Sites C and D

No further mitigation is required, but the developer must obtain permits for the destruction of these sites from SAHRA.

- Remainder of proposed mining area

Early and Middle Stone Age specialists should undertake excavations in various parts of the remainder of the proposed mining area to determine whether subsurface archaeological sites are present, with the appropriate permit(s) from SAHRA.

- Palaeontological sites

The resident geological engineer should inform SAHRA and a specialist palaeontologist in the event that fossiliferous Mzamba strata or the basal conglomeratic marine unit to the red sands are exposed. This recommendation should be part of the protocol developed by a heritage practitioner.

- Graves and burial grounds

Graves may not be altered in any way without the permission of the families concerned and a permit from SAHRA. Various guidelines and regulations for the removal of human remains include:

- Notification of the impending removals (using all relevant language media and notices at the grave site);
- Consultation with individuals or communities related or known to the deceased;
- Procurement of permits from SAHRA;
- Appropriate arrangements for exhumation and re-interment;
- Observation of rituals or ceremonies required by the families.

General

A heritage practitioner should:

- Compile a protocol to be followed by the mining company in the event that any heritage resources are discovered during mining activities.
- Compile and conduct training courses for all relevant mining personnel to enable them to participate effectively in heritage resource management.
- Undertake regular monitoring as mine activities proceed.

We recommend that the development proceed with the proposed heritage mitigation and have submitted this report to the South African Heritage Resources Agency (SAHRA) in fulfilment of the requirements of the Heritage Resources Management Act. The relevant SAHRA personnel are Dr Antonieta Jerardino (telephone 021 462 4502) and Mr Thanduxolo Lungile (telephone 043 722 1740/2/6).

If permission is granted for the development to proceed, the client is reminded that the Act requires that a developer cease all work immediately and notify SAHRA should any heritage resources, as defined in the Act, be discovered during the course of development activities.

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1. Introduction

1.1 Background

eThembeni Cultural Heritage was appointed by GCS (Pty) Ltd to undertake a heritage impact assessment of the proposed Xolobeni mineral sands project in the Eastern Cape Province, in terms of the South African Heritage Resources Management Act No 25 of 1999. Section 38(1) of the Act requires such an assessment in case of:

(a) construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;
(b) construction of a bridge or similar structure exceeding 50 m in length; and
(c) any development, or other activity which will change the character of an area of land, or water –
  (i) exceeding 10 000 m^2 in extent;
  (ii) involving three or more existing erven or subdivisions thereof; or
  (iii) involving three or more erven, or subdivisions thereof, which have been consolidated within the past five years; or
(d) the costs of which will exceed a sum set in terms of regulations; or
(e) any other category of development provided for in regulations.

1.2 Project description

The Xolobeni mineral sands project is situated approximately 250 kilometres south west of Durban, 60 kilometres south east of Mbizana and 30 kilometres south of Port Edward in the Eastern Cape Province. Transworld Energy and Mineral Resources (SA) (Pty) Limited (TEM) holds a five year new order Prospecting Right for ilmenite, zircon, rutile and leucoxene under the Mineral and Petroleum Resources Development Act No 28 of 2002 (MPRDA) over the Xolobeni tenement area. The Xolobeni Empowerment Company (Pty) Ltd (XolCo) holds a 26% stake in the project. XolCo is a Black Economic Empowerment company representing the Amadiba community at Xolobeni through a group of local registered stakeholders' trusts.

The Xolobeni area is the traditional homeland of the Pondo speaking Amadiba Tribal Authority. The project takes it name from the nearby Xolobeni School and trading store. The tenement area covers an area of approximately 22 kilometres long by 1.5 kilometres wide and is 2867 hectares in size. It is anticipated that mining will only take place on 885 hectares.

The prospecting activities undertaken by TEM have indicated the feasibility of mining heavy minerals in the area. In accordance with the requirements of the MPRDA (specifically section 39(1)) and the regulations promulgated under Section 24 of the National Environmental Management Act No 107 of 1998 (NEMA), and after the submission of the Mining Rights Application the project has started the Scoping and Environmental Impact Assessment (EIA) phase. GCS (Pty) Ltd, an independent environmental consulting firm, has been appointed to undertake the EIA and co-ordinate the specialist investigations that form part of the EIA. GCS will also be responsible for the public participation process related to the proposed project.

The project mining area is divided into five distinct areas:

- The Mtentu Block, situated between the Mtentu and Sikombe Rivers;
- The Sikombe Block, situated between the Sikombe and Kwanyana Rivers;
- The Kwanyana Block, situated between the Kwanyana and Mnyameni Rivers;
- The Mnyameni Block, situated between the Mnyameni and Mphalane Rivers; and
- The Mphalane Block, situated between the Mphalane and Mcamba Rivers.

The heavy mineral deposits at Xolobeni occur within recent sands and remnant 'red beds' of the Pleistocene Berea Formation that have been derived from the breakdown of the granite and basalt hard rocks. The deposits were formed around one million years ago when the sea was 120 metres above its current level. As the sea regressed it left stranded heavy mineralised coastlines termed 'strandlines'. Further wind erosion and processes of deposition have concentrated the heavy minerals as a series of dunes.

At Xolobeni heavy minerals make up an average of approximately 5% of the sand. Approximately 65% of the heavy minerals are commercially valuable. The predominant mineral is ilmenite, although rutile, zircon and leucoxene add to the value of the deposit. Ilmenite, rutile and leucoxene are used as a titanium feedstock, predominantly for the paint pigment industries. Zircon is used as a refractory mineral as well as the ceramic

and specialty glass production (for example television glass). The Sikombe, Kwanyana and Mnyameni blocks contain the bulk of the resource.

The mining activities can be divided into three stages:

- mining and wet separation;
- a mineral separation plant; and
- a smelter.

A dry mining method was chosen for the Xolobeni project. This method will use scrapers as the main method to excavate sand. The material is stockpiled and front end loaders will be used to move the material from the stockpile to the hopper system which will be located in the pits. Excavated sand is mixed with water in the hopper to form a slurry and then pumped to the wet separation plant. The valuable heavy minerals are separated from the sand and clay in the wet separation plant. The in-pit hoppers and slurry plants will be moved regularly to maintain economic haul and pumping distances. A separate wet separation plant site will be required for each mining block.

After the wet separation plant, the clay and silt are recombined with the sand tailings and pumped back to the mining area for disposal as part of the rehabilitation.

Heavy minerals will be separated from the washed sands by gravity separation in the wet concentrating plant. The heavy mineral concentrate is transported to the mineral separation plant where it is passed over a low intensity magnetic separator to remove highly magnetic, uneconomic minerals, which are combined with the plant tailings. In the mineral separation plant ilmenite, zircon, rutile and leucoxene are separated in four different streams. From here the product will be sent to a smelter for further beneficiation.

It is the intention to construct a mineral separation plant and smelter as part of the project. However, the location of this facility has not been finalised as TEM will only consider this part of the infrastructure once the mining rights for the areas stated above have been granted. The site selection will also be dependent on a detailed Environmental Impact Assessment under the NEMA Regulations at the time.

The environmental sensitivity of the Wild Coast area is recognised and for this reason the following areas have been demarcated and excluded from mining:

- Culturally sensitive areas
- Beaches and coastal fore dunes
- Riverine and estuarine areas and
- Coastal wetlands.

The findings of the EIA will provide information that will be used to define the extent of these areas.

2. Terms of reference

2.1 General

National heritage legislation determines the general nature and scope of heritage impact assessments. Reports in fulfilment of Section 38(3) of the Heritage Resources Management Act 1999 must include the following information:

(a) the identification and mapping of all heritage resources in the area affected;
(b) an assessment of the significance of such resources in terms of the heritage assessment criteria set out in regulations;
(c) an assessment of the impact development on such heritage resources;
(d) an evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development;
(e) the results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources;
(f) if heritage resources will be adversely affected by the proposed development, the consideration of alternatives; and

(g) plans for mitigation of any adverse effects during and after completion of the proposed development.

Heritage resources include the following wide range of places and objects:

(a) places, buildings, structures and equipment;
(b) places to which oral traditions are attached or which are associated with living heritage;
(c) historical settlements and townscapes;
(d) landscapes and natural features;
(e) geological sites of scientific or cultural importance;
(f) archaeological and palaeontological sites;
(g) graves and burial grounds, including -
  (i) ancestral graves,
  (ii) royal graves and graves of traditional leaders,
  (iii) graves of victims of conflict,
  (iv) graves of important individuals,
  (v) historical graves and cemeteries older than 60 years, and
  (vi) other human remains which are not covered under the Human Tissues Act, 1983 (Act No.65 of 1983 as amended);
(h) sites of significance relating to the history of slavery in South Africa;
(i) movable objects, including -
  (i) objects recovered from the soil or waters of South Africa including archaeological and palaeontological objects and material, meteorites and rare geological specimens;
  (ii) ethnographic art and objects;
  (iii) military objects;
  (iv) objects of decorative art;
  (v) objects of fine art;
  (vi) objects of scientific or technological interest;
  (vii) books, records, documents, photographic positives and negatives, graphic, film or video material or sound recordings; and
  (viii) any other prescribed categories,
  but excluding any object made by a living person.

2.2 Project specific

The South African Heritage Resources Agency (SAHRA) stipulated the following in a letter to Groundwater Consulting Services dated 6 July 2007:

- A heritage impact assessment of the proposed mining area should include an archaeologist (specialising in the Iron Age and the Early and Middle Stone Ages), a palaeontologist and a geologist or geomorphologist;

- Each specialist should comply with the requirements of Section 38(3) of the Heritage Resources Management Act 1999 as stipulated above; and

- The archaeologist should also liaise with Dr Kathleen Kuman of the School of Geography, Archaeology and Environmental Studies at the University of the Witwatersrand.

3. Methodology

eThembeni staff members inspected the area on 5 to 7 September (accompanied by Prof Mike Cooper, a palaeontologist and geologist) and 12 to 14 September 2007. We completed a controlled-exclusive surface survey, where 'sufficient information exists on an area to make solid and defensible assumptions and judgements about where [heritage resource] sites may and may not be' and 'an inspection of the surface of the ground, wherever this surface is visible, is made, with no substantial attempt to clear brush, turf, deadfall, leaves or other material that may cover the surface and with no attempt to look beneath the surface beyond the inspection of rodent burrows, cut banks and other exposures that are observed by accident' (King 1978).

We have included detailed road directions to the site in Appendix A, given the undeveloped and relatively inaccessible nature of the area. We consulted various provincial databases[1] and undertook a limited literature review (confined to the Later Stone Age and Iron Age), included as Appendix B. Literature reviews of the Early and Middle Stone Ages are included in the reports provided in Appendices F and G, respectively.

We assessed the value and significance of heritage resources, as defined in the Heritage Resources Management Act 1999 and the criteria contained in Appendix C. Culturally significant landscapes were assessed according to the criteria in Appendix D. We assessed the overall impacts on heritage resources according to the impact rating scale provided by the client in Appendix E.

We obtained reports concerning the significance of the archaeological resources from Dr Kathleen Kuman (Appendix F) and Ms Marlize Lombard (Appendix G). Prof Mike Cooper's palaeontological and geological report is included in Appendix H. All references cited in this report, including the appendices, are provided in Appendix I. Appendix J contains a statement of independence and a summary of our ability to undertake this heritage impact assessment, as well as Prof Mike Cooper's resume.

The client has provided a map of the area, submitted to SAHRA separately. Geographic coordinates were obtained with a handheld Garmin GPS72 global positioning unit. Photographs were taken with a Nikon Coolpix S200 digital camera and submitted to SAHRA on compact disc.

The assumptions and limitations of this heritage impact assessment are as follows:

- We have assumed that the description of the proposed project, provided by Groundwater Consulting Services, is accurate.
- We have assumed that the public consultation process undertaken as part of the Environmental Impact Assessment is sufficient and adequate and does not require repetition as part of the heritage impact assessment.
- Soil surface visibility was moderate to good overall. Heritage resources might be present in areas of limited visibility and we remind the client that the Act requires that a developer cease all work immediately and notify SAHRA should any heritage resources, as defined in the Act, be discovered during the course of development activities.
- No subsurface investigation (including excavations or sampling) were undertaken, since a permit from SAHRA is required to disturb a heritage resource.

[1] The archaeology department of the Albany Museum in Grahamstown is the provincial repository for archaeological site information and material in the Eastern Cape, including the study area. However, Dr Johan Binneman, head of the department, informs us 'That area was never really covered by the Albany Museum as far as recordings are concerned; we don't even have maps for that former Transkei region because nobody went there' to do research because of perceptions that it was unsafe (email communication 17 March 2005).

4. Description of existing environment

The study area comprises part of the Pondoland Centre of Endemism and the vegetation is predominantly Pondoland-Ugu Sandstone Coastal Sourveld. It is largely underlain by the Msikaba Sandstone Formation which comprises a fairly gently sloping plateau, ranging from about 450 metres in elevation at its inland boundary to about 80 metres high at the coastal escarpment. It is characterised by gently rolling hills, flat plains and deeply incised gorges on the Msikaba, Mthentu, Mnyameni, Mzamba and Mthamvuna rivers. Coastal and scarp forest occurs within these river gorges and their secondary tributary valleys.

The proposed mining areas encompass the immediate coastal littoral of Plio-Pleistocene palaeo-dunes overlain with more recent Late Pleistocene-Holocene aeolian sands. The basal cover here is predominantly Coastal Sourveld. The dunes are aligned parallel to the coastal foreshore and the first primary dunes comprise climax dune forest. At their inland extent the dune fields abut a palaeo-shoreline of Msikaba Sandstone. The primary rivers bisect these dunes at their entrance to the sea and, in the lee of the dune-fields, have created extensive estuarine systems with tidal marshes and stands of mangroves.

The Plio-Pleistocene palaeo-dunes overlie a Mio-Pliocene beach boulder horizon emanating from previously lower sea-stands, below which occurs the fossil-rich Mzamba Cretaceous Formation. The latter is evident as a wave cut platform at the mouth of the Mzamba River and occurs within the inter-tidal zone intermittently as far south as the Mtentu Estuary.

Surrounding land use comprises traditional clan-based scattered rural subsistence settlements in clusters of agnatic kin. The primary economic activity is garden and field crop agriculture with livestock husbandry on communal range lands. Limited woodlots occur. Little to no infrastructure is present, with a few schools and tuck shops, a very poor mostly informal road network, no water or sewage reticulation and telecommunications limited to cellular reception in a few places.

5. Impact assessment

No development activities associated with the proposed project had begun at the time of our visit, in accordance with national heritage legislation.

- Places, buildings, structures and equipment

No such resources older than sixty years or with other heritage significance were identified within the proposed development area.

Impact – Not applicable.

- Places to which oral traditions are attached or which are associated with living heritage

The entire proposed development area is associated with the living heritage of the Amadiba Tribal Authority (see following photograph). Many homesteads and food gardens occur immediately adjacent to the mining area, while the mining area itself is used to graze livestock communally. Artisanal fishing and seafood harvesting are conducted in the estuaries and along the rocky shorelines. As a whole the place has medium to high heritage significance at the site specific, local and regional levels, with low to medium significance at all other levels.

Impact – People living immediately adjacent to the proposed mining area will be affected by the noise and air pollution (including windborne sand) generated by mining activities. They will no longer have access to the mining area itself for grazing purposes. In some areas their access to the coastline for food, medicinal plant and firewood collection will be compromised.

Probability	probable to definite
Extent	site and local
Duration	long term to permanent (given that some residents might choose to leave the area permanently as a direct result of mining activities)
Intensity	medium to very high
Significance	moderate to high to very high

- Historical settlements and townscapes

No formally protected historical settlements or townscapes occur within the proposed development area.

Impact – Not applicable.

- Landscapes and natural features

No formally protected landscapes or natural features occur within the proposed mining area. However, the entire area may be considered as an integral part of an ethnographic landscape that has evolved over at least the last five hundred years due to a particular pattern of use, i.e. extensive livestock management within the context of low density human settlement and subsistence agriculture (see following photograph). This landscape has medium to high heritage significance at the site specific, local and regional levels, with low to medium significance at all other levels.

Impact – This landscape will be altered visually and in terms of its current and potential land use. For example, its development as an ecotourism destination will be impossible for the duration of mining activities and until dune rehabilitation has restored its visual qualities.

Probability	definite
Extent	site and local
Duration	long term to very long term
Intensity	high to very high
Significance	moderate to high to very high

- Geological sites of scientific or cultural importance

Refer to Appendix H for a summary of the geology of the proposed mining area. No geological sites of scientific or cultural importance were identified within the proposed development area.

Impact – Not applicable.

- Archaeological sites

Aeolian deflation exposures (revealing archaeological sites) occur only in the Sikombe and Kwanyana Tenement areas. No deflation exposures were observed in the Mnyameni Tenement area through to the Mzamba Estuary, nor south of the Sikombe Estuary to the mouth of the Mtentu River.

Profusions of lithic debitage and incomplete formal tools occur within these aeolian deflated areas, and the Sikombe and Kwanyana Tenement areas should be mapped as archaeological sites in their entirety (designated sites A and B, respectively). These comprise Early Stone Age lithics on quartzite; Sangoan and Middle Stone Age on hornfels (indurated shales) and quartzites; and numerically sparse Later Stone Age on quartz and chalcedony. Ferricrete nodules ranging from fist size to vermicelli were observed at all the deflation exposures as were fossil traces of intensive root growth in the form of root channels (rhizoliths) that were lighter in colour to the surrounding oxidised sands. The subterranean remnants of termitaria were observed as erosion resistant mounds extending down onto the paleo-dune surfaces. Ferruginous accretions were also observed as forming a layered patina on some of the lithic debitage.

More Early Stone Age and Sangoan artefacts than Middle Stone Age material was observed at Esibomvu (S31 11 48.5; E30 05 22.5), in the badlands south of the Kwanyana river. At the southern end of the Sikombe Tenement area (S31 12 55.0; E30 04 100) extensive exposures within three parallel dune ridges yielded the visually richest concentrations all periods of Stone Age lithics (see the following photographs).

The Kwanyana Tenement area has the most extensive areas of deflation and exposure and Stone Age lithics are ubiquitously scattered throughout the dune fields. Fragments of fossilized wood were observed at four localities in the tenement area. These are considered to be manuports from the Cretaceous deposits occurring within the inter-tidal zone along the adjacent beaches. Indeed, when inspecting the intertidal zone north of the Sikombe River mouth for Cretaceous deposits, we noticed fossilized wood fragments in the beach boulder and gravel beds. This further suggests that the manuported raw materials for stone tool manufacture were derived from similar contexts.

Sites A and B have high heritage significance at all levels for their scientific values (refer to Appendices F and G for specialist reports concerning these archaeological occurrences).

Site C (S31 10 33.0; E30 06 15.0) probably dates to the twentieth century due to the occurrence of buried cloth fragments, a glass teacup handle and the rim of a glass plate (trading store ware), a severely oxidized iron fragment, reminiscent of a rifle breach, and a Vaseline medicine jar. Two bovid molars, ephemeral *Perna perna* fragments and a small scatter of thin-walled ceramic fragments were also observed. Site C has low heritage significance at all levels for its social values.

Site D is a shell midden located at S31 09 06.5; E30 07 30.0. The midden lies within loose aeolian sands and straddles an underlying red sand paleo-dune. It is composed largely of *Perna perna* and *Patella spp*. fragments and has been truncated by down slope erosion of the paleo-dune. Some thin walled ceramic fragments were observed in the erosion gulley down slope of the midden. A passing resident, Mrs Victoria Shude, stated that the locale had been the homestead of a local Jali family, who had moved further inland some decades previously. Site D has low heritage significance at all levels for its social values.

Impact – Sites A, B, C and D will be destroyed by the proposed mining activities.

Probability	definite
Extent	site
Duration	permanent
Intensity	very high
Significance	low (Sites C and D), moderate to high to very high (Sites A and B)

- Palaeontological sites

Refer to Appendix H for a full discussion of the palaeontology of the proposed mining area.

Impact – None, unless fossiliferous Mzamba strata or the basal conglomeratic marine unit to the red sands are exposed.

Probability	improbable to possible
Extent	site
Duration	permanent
Intensity	uncertain, but could be very high
Significance	uncertain, but could be very high

- Graves and burial grounds

Sites E (S31 09 07.4; E30 07 28.7) and F (S31 09 08.8; E30 07 26.9) are two stone packed graves associated with Site D (the shell midden). The graves are located within severely deflated areas that might be recent rather than ancient and may well be anthropogenic in origin. Site G (S31 10 33.0; E30 06 15.5) is a stone packed grave located close to Site C (see photograph below). All three graves have high heritage significance for their social values.

Impact – Sites E, F and G will be destroyed by the proposed mining activities.

Probability	definite
Extent	site
Duration	permanent
Intensity	very high
Significance	very high

- Sites of significance relating to the history of slavery in South Africa;

None were identified within the proposed development area.

Impact – Not applicable.

- Movable objects excluding any object made by a living person

None were identified within the proposed development area.

Impact – Not applicable.

6. Mitigation measures

6.1 Specific

- Places, buildings, structures and equipment

No further mitigation measures required.

- Places to which oral traditions are attached or which are associated with living heritage

A heritage practitioner should be appointed to undertake an oral history recording project in the local area (up to five kilometres from the project area). Parameters for the study should be set by SAHRA.

- Historical settlements and townscapes

No further mitigation measures required.

- Landscapes and natural features

A heritage practitioner should be appointed to undertake an intensive study of the site and local landscape and natural features, within parameters set by SAHRA. At a minimum, the study should record local perceptions of past, current and future land uses, within the context of potential mining activities.

- Geological sites of scientific or cultural importance

No further mitigation measures required.

- Archaeological sites

Sites A and B
Early and Middle Stone Age specialists should undertake detailed mapping of exposed archaeological deposits; excavation in both exposed and unexposed areas to determine the extent of sites; and sampling of artefacts, with the appropriate permit(s) from SAHRA.
Provision should be made for appropriate dating of archaeological materials, including optically stimulated luminescence dating.
A multidisciplinary specialist team should collaborate to determine the dating of dune formation processes and place archaeological materials in chronological sequence.
The multidisciplinary team should provide recommendations for the management of archaeological sites within the proposed mining area, including the consideration of excision of one or more areas from mining activities to preserve sites for future research.

Sites C and D
No further mitigation is required, but the developer must obtain permits for the destruction of these sites from SAHRA.

Remainder of proposed mining area
Early and Middle Stone Age specialists should undertake excavations in various parts of the remainder of the proposed mining area to determine whether subsurface archaeological sites are present, with the appropriate permit(s) from SAHRA.

- Palaeontological sites

The resident geological engineer should inform SAHRA and a specialist palaeontologist in the event that fossiliferous Mzamba strata or the basal conglomeratic marine unit to the red sands are exposed. This recommendation should be part of the protocol developed by a heritage practitioner (see 6.2).

- Graves and burial grounds

Graves may not be altered in any way without the permission of the families concerned and a permit from SAHRA. Various guidelines and regulations for the removal of human remains include:

Notification of the impending removals (using all relevant language media and notices at the grave site);
Consultation with individuals or communities related or known to the deceased;
Procurement of permits from SAHRA;
Appropriate arrangements for exhumation and re-interment;
Observation of rituals or ceremonies required by the families.

- Sites of significance relating to the history of slavery in South Africa;

No further mitigation measures required.

- Movable objects excluding any object made by a living person

No further mitigation measures required.

6.2 General

A heritage practitioner should:

- Compile a protocol to be followed by the mining company in the event that any heritage resources are discovered during mining activities.
- Compile and conduct training courses for all relevant mining personnel to enable them to participate effectively in heritage resource management.
- Undertake regular monitoring as mine activities proceed.

7. Conclusion

We recommend that the development proceed with the proposed heritage mitigation and have submitted this report to SAHRA in fulfilment of the requirements of the Heritage Resources Management Act. According to Section 38(4) of the Act:

> The report shall be considered timeously by the Council which shall, after consultation with the person proposing the development, decide -
> (a) whether or not the development may proceed;
> (b) any limitations or conditions are to be applied to the development;
> (c) what general protections in terms of this Act apply, and what formal protections may be applied to such heritage resources;
> (d) whether compensatory action shall be required in respect of any heritage resources damaged or destroyed as a result of the development; and
> (e) whether the appointment of specialists is required as a condition of approval of the proposal.

The relevant SAHRA personnel are Dr Antonieta Jerardino (telephone 021 462 4502) and Mr Thanduxolo Lungile (telephone 043 722 1740/2/6).

APPENDIX A

DIRECTIONS FOR ROAD ACCESS TO THE PROPOSED MINING AREA

Road access to the proposed development area is from the N2 freeway southbound from Durban. Travel through the Oribi toll plaza at Port Shepstone onto the R61. Proceed through Port Edward across the Mtamvuna River and continue towards Bizana for approximately 20 kilometres. Turn off to the left onto a dirt road at a defaced signboard to the Mtentu Estuary located at S31 00 06.8; E30 02 38.0 (at the time of our field work this gravel district road was in very poor condition with safe speeds of no more than 40 km/h possible in a four wheel drive vehicle).

Proceed southwestwards along this road for three kilometres, crossing the Ntekwe River on a high level single-span bridge, and continue to a Y-junction at S31 01 19.0; E30 01 41.5 signposted Mdatya SS School. Take the left fork and proceed for two kilometres, descending on a concrete paved switch-back to the low level causeway over the Mzamba River. Continue to the Y-junction at S31 03 24.0; E30 01 55.5 and take the left turn (again signposted Mdatya SS School) and proceed for approximately five kilometres. The road is braided with various options between kilometres four and five, but crests the hill at a school on the left and a pink house on the right and swings right past a trigonometric beacon located at S31 04 20.8; E31 04 14.2.

Proceed for 3.1 kilometres to a Y-junction at S31 05 55.5; E30 04 54.0 indicating Mdatya SS School turning to the left. The left turn is the route to be taken to access the Mnyameni / Mzamba Tenement Area following local tracks on an easterly bearing to S31 08 38.0; E30 08 27.0.

Taking the right turn, proceed for 6.5 kilometres to the Mnyameni River low level causeway and continue over the river and out of the valley for a further 1.5 kilometres to the road junction at S31 09 43.0; E30 04 07.5 in the vicinity of the old Xolobeni trading store. Proceed along the gravel road to the north east for two kilometres to a road junction at S31 09 28.7; E30 05 19.9. From this point travel east south east for 3.5 kilometres to S31 11 00.5; E30 06 14.5, the southern extent of the Kwanyana Tenement Area. The northern extent of the Kwanyana Tenement Area is reached by travelling east north east for four kilometres from the road junction to S31 09 07.4; E30 07 28.7.

The Sikombe Tenement area is reached by travelling one kilometre south of the road junction in the vicinity of the old Xolobeni Trading Store to the Xolobeni SS School at S31 10 10.5; E30 03 40.0. Turn to the east off the district road and follow a track for approximately seven kilometres to S31 13 10.5; E30 04 13.5, this being the southern limit of the Sikombe Tenement Area.

APPENDIX B

LITERATURE REVIEW

Although the following references allude, for the most part, to the KwaZulu-Natal region of southern Africa, interregional cultural similarities and continuities allow us to extrapolate to the study area, where appropriate.

The general area is one of variable heritage resource significance and the following tables provide a brief summary of archaeological time periods, enabling the reader to understand the relative ages of Stone and Iron Age sites:

E arly	1.5 million to 180 000 years ago	Only stone artefacts remain from
S tone		this time period, including large
A ge		choppers, cleavers and hand axes
M iddle	180 000 to 35 000 years ago	Stone tools smaller than in ESA;
S tone		include blades and flakes; human
A ge		and animal remains also found
L ater	35 000 years ago to the time	Variety of artefacts made from
S tone	of European settlement	organic and inorganic materials;
A ge		human remains, shell middens etc

E arly	400 – 500 AD	Mzonjani phase
I ron	500 – 700 AD	Msuluzi phase
A ge	700 – 900 AD	Ndondondwane phase
	900 – 1200 AD	Ntshekane phase
L ate	1200 – 1500 AD	Settlement by Nguni speakers
I ron	1500 – 1700 AD	Introduction of maize
A ge	1700 – 1850 AD	Pre-European settlement
	1850 AD to present	Historical

[Refer to Appendices E and F for literature reviews of the Early and Middle Stone Ages, respectively.]

Later Stone Age sites occur throughout the province, with high concentrations in mountainous areas where rock shelters suitable for occupation are plentiful.

> ‘Stone artefacts are overwhelmingly the most common cultural item recovered from the excavations that have been carried out, followed by pottery (belonging to the last 2 000 years), ground, polished and shaved bone, beads and ostrich eggshell… [Stone] scrapers were probably used for removing the fat from animal skins before these were pegged out to dry. Adzes were probably used for shaving wood and, to a lesser extent, bone; while backed pieces, of which there are different types, were probably employed in hunting and cutting up carcasses.
>
> ‘A great deal of information about the foods Later Stone Age hunter-gatherers ate has been obtained from animal, plant and marine and freshwater shell remains. In some cases, it has been possible to identify the remains of individual species. As small animals in particular are sensitive to environmental fluctuations, these remains can also tell us much about past environments. Botanical remains are also very useful, for seeds can indicate which fruits and berries Later Stone Age people ate. And, because fruits and berries are seasonal, they can also provide information about the months during the year when sites were occupied’ (Mazel 1989: 11-12).
>
> ‘The advent of the Iron Age saw not only the introduction of metallurgy. Of even greater significance was the introduction of agriculture, necessitating a settled, village way of life instead of the nomadic patterns of the Stone Age. It also provided for an appreciable increase in population density, as well as a more complex life-style. Richly decorated pottery is a hallmark of these early settlements. Domestic

animals including cattle, sheep, goats and dogs were also a feature of the Iron Age, although current information indicates that they had already reached parts of South Africa, but apparently not Natal, during the Late Stone Age, through the agency of Khoisan herders…

‘,,, the earliest Iron Age sites in South Africa, including Natal, relate to an eastern coastal and lowland cultural tradition with links as far north as the Kwale sites of eastern Kenya. This tradition has been named ‘Matola’, after a site in southern Mozambique, which provided close typological links between the Natal and eastern Transvaal sites[2]. [In KwaZulu-Natal] almost all of them are on the belt of ancient dunes, which would have been covered by coastal forest at the time.

‘In the St. Lucia area especially, sites are concentrated at the inland foot of the dunes, where they meet seasonally flooded grassland. It has been argued that these sites were the first choice of immigrant farmers because they afforded some open, but not flooded, space. The sandy soils are poor and leached but the accumulated forest humus would have ensured good crops for the first year or two after they had been cleared. Apart from being attracted by this agricultural potential, the [Mzonjani] people exploited the wild plant and animal resources of the forest and adjacent sea-shore.

‘Although no direct evidence of agriculture has as yet been obtained from Natal sites, seeds of bulrush millet (a tropical African cultigen) have been recovered from [an Mzonjani] site in the Transvaal. Bulrush millet is still a favoured crop on the dunes around Kosi Bay. Evidence of domestic animals has yet to be found on any [Mzonjani] site and it seems likely that they were rare, if present at all. The forest environment would certainly have been unsuitable as pasture for domestic animals. Marine mussels may therefore have played an important part as a protein source in place of meat or milk’ (Maggs 1989: 29-31).

‘Most Early Iron Age sites in Natal are later than the [Mzonjani] period and are classified according to ceramic styles [refer to the table above]…By this time villages, often about eight hectares in size and probably containing a hundred or more people, had become common in the lower-lying and savannah areas, below an altitude of 1 000 metres. They were most common along the major rivers and in the coastal belt, where there was good, deep soil, sweet year-round grazing, and timber for building and fuel…

‘Diet was based on agriculture and pastoralism, with a little supplementary hunting, fishing and gathering of wild plants and shellfish. Crops identified from seeds include several grains (bulrush millet, finger millet and probably sorghum), and probably the African melon… Most villages had one or more iron smelting areas and therefore produced their own requirements’ (Maggs 1989: 31-32).

The beginning of the Late Iron Age marked a period of significant change in pottery styles, attributable to both socio-political and demographic factors (Maggs 1989). Settlements were no longer located in river valleys, but were built on higher ground where homesteads would benefit from cooling breezes and good views for strategic purposes.

Steep slopes, wetlands and marshy areas were used for grazing domestic animals and gathering wild food and medicinal plants. Settlements appear to have been much smaller, implying that ‘society underwent a change away from the large Early Iron Age villages and towards the individual family homesteads of the historic Nguni-speaking peoples (Maggs 1989: 35).

Artefacts on Iron Age homestead sites include ceramic sherds, upper and lower grindstones and human and animal bones. Metalworking sites are often located in areas where iron ore is available and associated debris includes furnace remains, slag, bloom and ceramic sherds.

‘The evidence or written sources [from shipwrecked Portuguese and other European mariners, who traversed lowland and coastal Natal on their way northwards to Mozambique] shows that, by the 1550s, while the coastal sourveld of Pondoland was thinly inhabited, coastal Natal from the Mtamvuna northwards was already well populated. A settlement of twenty hemispherical huts built of poles and thatch is described as being typical of the coast at that time. A later report confirms that such ‘small villages’ were the homes of kinship groups, each under the authority of a senior man. There can have been little difference between these homesteads and those of the nineteenth century in Natal and Zululand.

‘The agro-pastoral economy of the Iron Age prevailed throughout the coastal regions, with cultivation typically a combination of grains, legumes and vegetables of the pumpkin-melon family. There were three types of grains, one being sorghum and another a smaller-seeded millet, specific identification being difficult to establish from the old Portuguese documents. Vegetables included beans, African groundnuts (both legumes), gourds, watermelons and pumpkins, while sorghum was cultivated for its sweet pith as well as for its seeds…There is evidence to show

[2] This tradition is now known as Mzonjani in KwaZulu-Natal.

> that tobacco was being cultivated and smoked by 1686. Cattle, sheep and goats were seen in quantities, as were chicken from southern Natal northwards' (Maggs 1989: 39).

Archaeological studies documenting early farming communities in the former Transkei have been undertaken along the middle reaches of the uMzimvubu River (Prins and Granger 1993). Although this research occurred some distance inland from the study area, findings may be extrapolated to the coastal region to some extent. The first millennium (Early Iron Age) site of Ntsitsana was excavated, revealing two occupational phases dated to around AD 660 and AD 770.

> 'This study provided new information on early farming settlement in a relatively poorly researched area in southeastern Africa. Since the inception of serious academic research of Transkei, pleas have been made, by both anthropologists and historians [references] for information on African farmers in precolonial times. Such information, based on archaeological surveys and limited excavation, has accumulated slowly. There is good evidence, from ceramics and settlement location studies to show that first-millennium farming settlement in Transkei was an extension of that in Natal.
>
> 'Nevertheless, local variations in ceramic style and the organisation of space on settlements need to be researched. The archaeology of farming communities of the last two thousand years is poorly researched and could be the focus of large-scale investigation. Much more archaeological research into all aspects of the history of Transkei, such as the interaction between farmers and their herder and hunter-gatherer neighbours, is needed to provide an understanding of the historical factors that contributed to the shaping of the modern African societies of the region' (Prins and Granger 1993: 170).

APPENDIX C

SIGNIFICANCE AND VALUE OF HERITAGE RESOURCE SITES

The following guidelines for determining site significance were developed by the South African Heritage Resources Agency in 2003. We use them in conjunction with tables of our own formulation (see that for the Southern African Iron Age, below) when considering intrinsic site significance and significance relative to development activities, as well as when recommending mitigatory action.

Type of Resource
Place
Structure
Archaeological Site
Palaeontological Site
Geological Feature
Grave

Type of Significance
1. Historical Value

It is important in the community, or pattern of history
- Importance in the evolution of cultural landscapes and settlement patterns
- Importance in exhibiting density, richness or diversity of cultural features illustrating the human occupation and evolution of the nation, Province, region or locality.
- Importance for association with events, developments or cultural phases that have had a significant role in the human occupation and evolution of the nation, Province, region or community.
- Importance as an example for technical, creative, design or artistic excellence, innovation or achievement in a particular period

It has strong or special association with the life or work of a person, group or organisation of importance in history
- Importance for close associations with individuals, groups or organisations whose life, works or activities have been significant within the history of the nation, Province, region or community.

It has significance relating to the history of slavery

- Importance for a direct link to the history of slavery in South Africa.

2. Aesthetic Value

It is important in exhibiting particular aesthetic characteristics valued by a community or cultural group
- Importance to a community for aesthetic characteristics held in high esteem or otherwise valued by the community.
- Importance for its creative, design or artistic excellence, innovation or achievement.
- Importance for its contribution to the aesthetic values of the setting demonstrated by a landmark quality or having impact on important vistas or otherwise contributing to the identified aesthetic qualities of the cultural environs or the natural landscape within which it is located.
- In the case of an historic precinct, importance for the aesthetic character created by the individual components which collectively form a significant streetscape, townscape or cultural environment.

3. Scientific Value
It has potential to yield information that will contribute to an understanding of natural or cultural heritage
- Importance for information contributing to a wider understanding of natural or cultural history by virtue of its use as a research site, teaching site, type locality, reference or benchmark site.
- Importance for information contributing to a wider understanding of the origin of the universe or of the development of the earth.
- Importance for information contributing to a wider understanding of the origin of life; the development of plant or animal species, or the biological or cultural development of hominid or human species.
- Importance for its potential to yield information contributing to a wider understanding of the history of human occupation of the nation, Province, region or locality.

It is important in demonstrating a high degree of creative or technical achievement at a particular period
- Importance for its technical innovation or achievement.

4. Social Value

It has strong or special association with a particular community or cultural group for social, cultural or spiritual reasons

- Importance as a place highly valued by a community or cultural group for reasons of social, cultural, religious, spiritual, symbolic, aesthetic or educational associations.
- Importance in contributing to a community's sense of place.

Degrees of Significance
Rarity

It possesses uncommon, rare or endangered aspects of natural or cultural heritage

- Importance for rare, endangered or uncommon structures, landscapes or phenomena.

Representivity

It is important in demonstrating the principal characteristics of a particular class of natural or cultural places or objects
Importance in demonstrating the principal characteristics of a range of landscapes or environments, the attributes of which identify it as being characteristic of its class.
Importance in demonstrating the principal characteristics of human activities (including way of life, philosophy, custom, process, land-use, function, design or technique) in the environment of the nation, Province, region or locality.

Sphere of Significance	High	Medium	Low	
International	☐	☐	☐	
National	☐	☐	☐	
Provincial	☐	☐	☐	
Regional	☐	☐	☐	
Local	☐	☐	☐	
Specific Community	☐	☐	☐	----------

What other similar sites may be compared to this site?

.....
.....
.....
.....
.....
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Southern African Iron Age

	Significance		
	- low	- medium	- high
Unique or type site			Yes
Formal protection			Yes
Spatial patterning	?Yes	?Yes	?Yes
Degree of disturbance	75 – 100%	25 – 74%	0 – 24%
Organic remains (list types)	0 – 5 / m²	6 – 10 / m²	11 + / m²
Inorganic remains (list types)	0 – 5 / m²	6 – 10 / m²	11 + / m²
Ancestral graves			Present
Horizontal extent of site	< 100m²	101 – 1000m²	1000 + m²
Depth of deposit	< 20cm	21 – 50cm	51 + cm
Spiritual association			Yes
Oral history association			Yes
➢ Research potential			High
➢ Educational potential			High

Please note that this table is a tool to be used by qualified cultural heritage managers who are also experienced site assessors.

APPENDIX D

CULTURAL LANDSCAPES

The American National Parks Services sets out various criteria for the identification and management of cultural landscapes:

> ‘Cultural landscapes are complex resources that range from large rural tracts covering several thousand acres to formal gardens of less than an acre. Natural features such as landforms, soils and vegetation are not only part of the cultural landscape, they provide the framework within which it evolves. In the broadest sense, a cultural landscape is a reflection of human adaptation and use of settlement, land use, systems of circulation and the natural resources and is often expressed in the way land is organised and divided, patterns of types of structures that are built. The character of a cultural landscape is defined both by physical materials, such as roads, buildings, walls and vegetation, and by use reflecting cultural values and traditions.
>
> ‘Identifying the character-defining features in a landscape and understanding them in relation to each other and to significant historic events, trends and persons allows us to read the landscape as a cultural resource. In many cases, these features are dynamic and change over time. In many cases, too, historical significance may be ascribed to more than one period in a landscape’s physical and cultural evolution.
>
> ‘Cultural landscape management involves identifying the type and degree of change that can occur while maintaining the character-defining features. The identification and management of an appropriate level of change in a cultural landscape is closely related to its significance. In a landscape significant for its association with a specific style, individual, trend or event, change may diminish its integrity and needs to be carefully monitored and controlled. In a landscape significant for the pattern of use that has evolved, physical change may be essential to the continuation of the use. In the latter case, the focus should be on perpetuating the use while maintaining the general character and feeling of the historic period(s), rather than on preserving a specific appearance.
>
> ’A cultural landscape is a geographic area, including both natural and cultural resources, associated with a historic event, activity or person. The National Park Services recognises four cultural landscape categories: historic designed landscapes, historic vernacular landscapes, historic sites and ethnographic landscapes. These categories are helpful in distinguishing the values that make landscapes cultural resources and in determining how they should be treated, managed and interpreted…
>
> ’The four cultural landscape categories are not mutually exclusive. A landscape may be associated with a significant event, include designed or vernacular characteristics and be significant to a specific cultural group.’

APPENDIX E

IMPACT RATING SCALE

Category	Category	Rating	Description
Probability	Improbable	0	Less than 40 % sure of a particular fact or of the likelihood of that impact occurring
	Possible	1	40 to 70 % sure of a particular fact or of the likelihood of that impact occurring
	Probable	2	70 to 90 % sure of a particular fact or of the likelihood of that impact occurring
	Definite	3	More than 90 % sure of a particular fact or of the likelihood of that impact occurring
Extent	Site	1	Immediate project site
	Local	2	Up to 5 km from the project site
	Regional	3	20 km radius from the project site
	Provincial	4	Provincial
	National	5	South African
	International	6	Neighbouring countries/overseas
Duration	Very short-term	1	Less than 1 year
	Short-term	2	1 to 5 years
	Medium-term	3	5 to 10 years
	Long-term	4	10 to 15 years
	Very long-term	5	Greater than 15 years
	Permanent	6	Permanent
Intensity	Very low	0	Where the impact affects the environment in such a way that natural, cultural and social functions are not affected
	Low	1	Where the impact affects the environment in such a way that natural, cultural and social functions are only marginally affected
	Medium	2	Where the affected environment is altered but natural, cultural and social function and processes continue albeit in a modified way
	High	3	Where natural, cultural or social functions or processes are altered to the extent that it will temporarily cease
	Very high	4	Where natural, cultural or social functions or processes are altered to the extent that it will permanently cease
Significance		2 – 4	Low
		5 – 7	Low to Moderate
		8 – 10	Moderate
		11 - 13	Moderate to High
		14 – 16	High
		17 – 19	Very High

APPENDIX F

THE RED SANDS
Eastern Cape Coastal Archaeological Sites
Pondoland, Transkei Wild Coast

Report on Research
13 to 22 August 2006

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Background

A South African Heritage Resources Agency (SAHRA) permit to conduct research on the Stone Age archaeology of the Red Sands, Pondoland, (Transkei Wild Coast, Eastern Cape) was granted in November 2005, and contact was made with the community at that time through the kind assistance of a local resident, Mr S. Zukulu, a former teacher now employed by the Dept of Enviromental Affairs and Tourism. Discussions continued into 2006, but no permission was received. I therefore arranged for a visit to Pondoland in August 2006 to discuss the research in person with the community. Because of the distance involved in visiting the area and my limited time for fieldwork, my research team accompanied me in the event we received permission. This team included two staff (Dr L. Pollarolo and Mr M. Kekana), and two students (H. Kempson and G.M. Leader) who were interested to be involved in the research.

On August 17, we attended a community meeting and presented the research proposal. The meeting decided that the local development committee would have to discuss the matter before the research could proceed, but we were given permission to walk in the area with two appointed community members to view the sites concerned. By the end of that day, we had seen two of the three sites of interest. The third site was visited on August 20 in the company of Mr Zukulu through an overnight tourist booking made at the Mtentu tented camp. This report provides the results of this visual inspection of the Pondoland sites. The Wild Coast Casino sites and the Port Edward sites were also visited, as they are open to the public. The Pondoland Red Sands are currently being investigated by Mineral Commodities Limited for mining of heavy minerals in the Xolobeni Mineral Sands Project, and hence the Stone Age archaeology forms part of the heritage impact assessments that will be required if mining proceeds. We remain a registered interested party on the Red Sands archaeology and hope that this report may be of use to SAHRA and the community. If the community wishes to grant formal permission for research on the basis of this report and our discussions with them, I would be grateful for their written communication.

Introduction

In papers published by Oliver Davies some decades ago, ancient stone artefacts were reported from a number of localities where red dunes are distributed along the KwaZulu-Natal coast (Davies 1951, 1952, 1957, 1976a,b). In the Port Edward area, these ferruginized sands are popularly called the Red Desert, but geologically they are known as Berea Sands. Working mainly in Natal, Davies noted that many of these ancient artefacts belonged to a Sangoan-like industry (discussed below), with rich sites especially noted along the coast between the Tugela and the Mskikaba Rivers. South of Port Edward between the Umtamvuna and Mtentu Rivers, similar artefacts are also associated with red dune sands distributed along the Pondoland coast, but these occurrences remain unpublished.

The Sangoan Industry

The Sangoan is a widespread industrial complex that occurs in central and south-central Africa, western Kenya, Sudan and possibly Zimbabwe. While few Sangoan sites have been well dated, the industry is generally considered to be about 300,000 years old (McBrearty 1988) and widely acknowledged as a late development of the Earlier Stone Age, which ended by about 200,000 years ago. The Sangoan is characterized by heavy-duty tools such as picks, core-axes, and choppers (Clark 1970). Cleavers and handaxes also occur (as in the older Acheulean Complex), but they are rare and the handaxes often less refined. Small scrapers are also common at many Sangoan sites. Davies (1976a) eventually decided to use a local name for the South African material (the Tugela Industry), but he continued to stress its affinities with the Sangoan culture.

The most striking feature of Sangoan industries is the presence of heavy duty core tools (such as picks and core scrapers) and light-duty scrapers, tool types which suggest to many researchers that wood-working was an important function. Only during this late phase of the Earlier Stone Age did humans begin to make more specialized toolkits and inhabit new, more challenging environments, thus bringing to a close the more uniform toolkits of the preceding Acheulean Complex. Most Sangoan assemblages are located in those regions of Africa that today are dominated by closed woodland or tropical forest habitats. This fact is a simple correlation, and environmental reconstructions at some Sangoan sites show that the true picture of past habitats is more complex. Nevertheless, many of us accept that the emphasis on woodworking tools is

indirect evidence that woodlands were a significant component of Sangoan site habitats. During the cooler, drier phases of the Pleistocene, many closed habitats difficult for Acheulean people to occupy would have increased their carrying capacity through changes in vegetation and fauna (Barham 2000). As some tropical habitats shifted to more open woodland, the more evolved humans responsible for the Sangoan Industry were able to exploit these new habitats.

South Africa is more strongly influenced by arid climates and seasonality of resources than are the more tropical parts of Africa where the Sangoan is best known. However, regional climates are varied, and it is clear that the climatic swings of the last 2 million years have affected specific habitats in somewhat different ways. Research on Sangoan archaeology thus has the potential to shed light on regional changes in habitat by studying changes in human adaptation strategies revealed in artefact industries and their geographic distribution. Until recently, Davies' arguments for a Sangoan industry in Natal have been the only evidence for the Sangoan in South Africa. However, the first excavated Sangoan sites are now published (Kuman *et al.*, 2005a&b). They occur in the Mapungubwe National Park (Limpopo Province), along the border with Botswana—one of the warmest regions of the country. Both the northern Limpopo Province and the KwaZulu-Natal-Pondoland coastal regions have warm climates influenced by the Indian Ocean. The presence of Sangoan-like tools in both geographic areas suggests that they have responded similarly to changes in oceanic and air circulation patterns that occurred during the Pleistocene.

Although Davies' claims for a Sangoan industry in KwaZulu-Natal are well known, the deposits were studied as surface finds or road and construction cuttings, and no systematic excavations had been undertaken. Using surface finds as time-indicators, Davies (1970) also argued for a series of raised shorelines. However, the archaeology of these coastal deposits is complicated and surface sites need to be carefully evaluated (see also Maud 1968, Davies 1976b, Deacon 1996). This is particularly true for coastal regions subjected to intense wind deflation with the potential to re-work older deposits, concentrating artefacts from differing periods into a single winnowed horizon. To my knowledge, no dating of the red dunes has been attempted, although they have excellent potential to be studied with the OSL (Optical Stimulated Luminescence) technique. G.A. Botha (regional manager of the Council for Geoscience) believes that the red sand ridges are mid to late Pleistocene in age (Botha, pers. comm., August 2006). This probably translates to about 500,000 to 125,000 years, a period within which the Sangoan industry could well be accommodated. Underlying the dune sands are beach boulder deposits of Mio-Pliocene age (*ibid.*).

While artefacts from more than one period are likely to be present on the deflated surface of the red sands detailed in this report, the most obvious cultural component is indeed Sangoan in nature. No Later Stone Age or younger material was encountered at the sites we inspected, but Middle Stone Age (MSA) artefacts may be present. The following section reports on the details of the sites inspected in 2005 and 2006.

Report

The Pondoland red sands are intermittently exposed along a stretch of the coast for over 20 km distance between Port Edward and the Sikombe Estuary. Weathering of the sand ridges has produced the red colouration of the sand, and aeolian activity has resulted in the concentration of heavy minerals. In some places (eg., Port Edward), the sands preserve fossil traces of intensive root growth (akin to rhizoliths) in the form of paler root channels. This indicates that vegetation in these sites was once lush, like the coastal forests in the region today (R. Maud, pers. comm.), and Botha reports that other areas also preserve such structures. The water-induced erosion and wind deflation that created the characteristic red sands have also created the mineral-rich horizons, and it is on these more resistant surfaces that the stone tools we inspected have come to rest. We never observed any artefacts contained within the red sands, nor were they present in an underlying pale horizon noted in two locations (see below). It is therefore evident that the one or more horizons which originally contained the artefacts are no longer preserved in the areas we visited. Details of the sites follow:

1) Wild Coast Sun Casino
A former resident of land that is now owned by the Wild Coast Sun Casino (near the Mzamba River and close to Port Edward) showed us two areas of eroded red sand with artefacts. The first site is located in the first dune from the modern beach, about 30 m above sea level. The red sand was capped by about a metre of black, organic rich sand, and no cross-bedding was observed in the dune sand. Since the casino was built about 20 years ago, the resident noted that erosion has slowed and the dune has become more heavily

vegetated. We noted 7 picks or rough handaxes among the suface finds. The smallest artifact we found was 32 mm long, but small tools were very rare, and the artifact accumulation was not dense. The second site is located in the third dune back from the beach, about 1 km from the sea and *ca* 70 m above sea level. Here the artefacts were even less abundant. The smallest piece was 15 mm, and one facetted flake from a prepared core was noted, along with some pieces that were less weathered than at the first site. The facetted flake and prepared core could belong to either a Sangoan or an MSA assemblage and thus are not particularly diagnostic.

2) Port Edward

The Port Edward site has been visited over many decades by tourists and local geology students. The site is divided into the Upper and Lower Sands. Davies' records indicate that artefacts were once much more numerous at the Upper Sands, as many have been removed by visitors over the years. Among the surface finds we noted picks, rough handaxes, choppers, a radial core, and various other flakes and cores, along with the rhizolith-like structures as noted above. At this site there is also some exposure of the underlying beach gravel of Mio-Pliocene age. The large cobbles and boulders from this fossil beach pavement were used by the early hominids for tool-making. We also found good traces of river gravels visible in the wooded northern margin of the site (above the eroded dunes), within a depression between two small dunes. These cobbles were also used for tool-making and can be distinguished by their more rounded shapes and generally smaller sizes, in contrast with the flatter, larger beach cobbles and boulders. A second area known as the Lower Red Sands is closer to the modern beach and the highway. Artefacts there occur in isolated patches and are less prolific. The large Sangoan types are more prominent, presumably because they were more resistant to water erosion. No bedding in the dunes is preserved at the Port Edwards sites, and no artefacts are contained within the red sands. Because the artefacts have been disturbed by collectors over the years, it is not possible to say much about the material, other than that its Sangoan-like features are most prominent.

3) Xolobeni

This site is located south of the Mtolane River, east of the Xolobeni village. Here artefacts are coming to rest in large numbers on the resistant, mineralised horizons. Artefacts are overwhelmingly dominated by Sangoan-like types, but in at least one area, tools of a more Middle Stone Age appearance were present. It is not possible to say at this stage whether these types represent two periods of tools deflated onto a single surface, or alternatively a Sangoan industry with some prepared core elements, as does certainly occur in the Limpopo and Kenyan Sangoan sites. Systematic collection and study of the pieces by raw material and weathering states could help to make this determination. Some bone and teeth were also found in one area. These were red-strained but not heavily mineralised, and systematic investigation would be needed to determine if they are prehistoric or modern fauna. Some large fragments and nodules of ferricrete were noted at this site in 2005, and a fragment of fossil wood was identified by Dr M. Bamford as Cretaceous.

4) Esibomvu

The Esibomvu (named 'Red Place' by the local inhabitants) is located south of the Kwanyana River camp in the first dune from the sea. The area is characterised by a steeply eroded badlands topography. Artefacts are quite abundant in some areas, especially where they have become concentrated in gullies eroded within the dunes. Cross-bedding is preserved in some of the dune sand, which overlies an eroded and truncated yellow beach sand. This area has prominent concentrations of heavy minerals, and in one place artefacts and cobbles had become half buried in the mineralised sediment as a result of the deflation. No artefacts were found within either the red or yellow sands. Sangoan types are prominent, but two very refined, late Acheulean-style bifaces were also present. This mix of types could result from mixing with late Acheulean material, but no conclusion can be reached from this superficial observation.

5) Sikombe

The area near the Sikombe estuary has very good concentrations of artefacts over some distance in both the second and third dunes back from the sea. In the second dune, we noted artefacts exposed over a distance of 400m. In the third dune, there is good cross-bedding preserved in the red sands, which are underlain by yellow sands in one location (see Appendix). Neither sand contained any *in situ* artefacts, and high concentrations of heavy minerals indicate extensive deflation of some deposits despite the preservation of stratigraphy in this area. A thorough survey of this westernmost flank of the dune ridge is essential for the archaeology. Because of the clear stratification, we had hopes of trying to locate some trace of overlying

deposit/s from which the artefacts must have eroded. By the time we had located the stratified area, however, heavy rain had set in and we were unable to continue with the survey. On our return walk, we passed a patch of gravely sediment with artefacts, a unique occurrence that needs further investigation.

Recommendations

I was informed by Mr John Barnes of the Xolobeni Mineral Sands Project that the mining company has contracted the Albany Museum to do the Heritage Impact Assessment for the proposed work which is being considered by the community. Our research is concerned only with the oldest archaeology of the area and hence is very focussed, but the museum's survey will provide a comprehensive study of all periods. Based on this short research visit, I make the following recommendations.

Survey
The older Stone Age archaeology is the most prominent feature of the heritage in the dunes proposed for mining. Given the rarity of Sangoan sites in this country and the restricted habitats in which such sites are found, a thorough assessment of the archaeology is required. It is important that the dunes, particularly along the western side, and the fixed dunes further from the sea, be surveyed for stratification and for potential remnants of the original upper horizon/s that contained the artefacts. Those artefact-bearing sediments are nowhere preserved in the eroded exposures where deflation has been very active, but some remnant in the fixed dunes might potentially be discovered through systematic survey and test-pitting. Test-pitting is particularly important for the currently vegetated dunes if they are to be affected by mining. One limitation of previous work published on the dunes archaeology is its focus on eroded exposures that cannot provide answers to the archaeological questions because of their disturbed context. Therefore shovel testing, followed by test-pitting, should be required for a thorough assessment of any vegetated dune areas that might be affected by the mining. It is also advisable that an archaeologist regularly inspect any fixed dunes during mining, as such operations will expose much deeper cuttings into the sediments than test pits would do. In practical terms, one or more local residents should be trained and employed by the archaeologist to monitor these cuttings during mining. This would allow the archaeologist to be called in when necessary to provide mitigation for any archaeological horizons that might be destroyed.

Dating
Dune formation and aeolian re-working of sediments are complex processes that create intricate stratigraphic relationships between sediments mobilised over long periods of time. Because stratification is preserved in at least two areas, OSL dating could provide dates for the older deposits. Such dates would be of significant palaeoenvironmental interest, even in the absence of archaeology. Given the Sangoan-like nature of the bulk of the artefacts deflated onto the red sands, I expect that the overlying horizon/s from which they derive should be in the range of 300,000 years old, or possibly older. This means that the red sands onto which the artefacts have deflated should theoretically fall within the mid (rather than the late) Pleistocene, but they could be older. If the red sands produce a date of 300-400,000 years, then the bulk of the artefacts would be confirmed as Sangoan. If, however, the red sands date to 500-600,000 years, this result would not refute the presence of Sangoan artefacts, but it would suggest that Acheulean elements may also be incorporated in the dunes. Thus even in the absence of the original artefact-bearing horizon, dating of the deflated surface has potential to address the Sangoan question. Wits is currently establishing a new OSL facility and dating is a feasible task our group could undertake, particularly in conjunction with the more thorough assessment of the sands (contracted to the Albany Museum) and through collaboration with the regional Council for Geosciences, if desired by Dr Botha.

Cultural heritage
While the dominant aspect of the dune collections is the heavy, Sangoan-like component, there are also elements that could be Middle Stone Age (MSA: 250,000 to 30,000 years old). Davies and others have noted MSA horizons in some open-air localities in KwaZulu-Natal, but no systematic work was published. However, an MSA component cannot be assumed to be present without further work, because some Sangoan assemblages include prepared core (MSA-like) technology, yet they are older. This is the case in Limpopo Province, as well as some other African sites. Even if no trace of the original artefact-bearing sediments is discovered, there is still research and educational value in making a systematic collection of artefacts, regardless of whether the mining takes place. Pieces can be categorised according to weathering states and technology, and this may reveal the number of assemblages from different periods that could be represented on the deflated red sands. The more interesting and diagnostic artefacts could then be used to create

educational displays on the Stone Age heritage of the area, and this would undoubtedly add value to the eco-tourism potential for the region. The richest concentrations of artefacts could also be preserved as a national monument, and hiking and horseback trails to see the dunes archaeology at such sites could provide employment to community members as guides and curators.

Locations Recorded by GPS

The following GPS locations were recorded. Most sites do not plot accurately on the government 1:50 000 map (Third Edition), produced in 1993. Two different GPS units were used for some readings, and the discrepancies with the map appear to be too large for GPS error. The differences may thus be due to the earth coordinate system used at the time of map production.

1) Wild Coast Sun Casino
Site in first dune: 31°06'6.33"S; 30°10'42.72"E
Site in second dune: 31°05'29.25"S; 30°10'14.1"E

2) Port Edward
Upper Sands: 31°03'59.1"S; 30°11'28.6"E
Lower Sands: 31°04'15.1"S; 30°11'41.6"E

3) Xolobeni
31°03'52.65"S; 30°11'22.86"E

4) Esibomvu
31°11'50.1"S; 30°05'25"E

5) Sikombe
Concentrations in second dune:
From 31°12'53.9"S; 30°10'13.8"E to 31°12'44.2"S; 30°04'28.6"E
Third dune: 31°12'30.3"S; 30°04'32"E

APPENDIX G

Ms Marlize Lombard, Head of Archaeology and Assistant Director Human Sciences at the Natal Museum in Pietermaritzburg, provided eThembeni with the following report, based on her reading of Dr Kuman's report in Appendix E and examination of photographs of artefacts supplied by eThembeni.

Assessment of the Stone Age cultural material from the Red Sands sites

Stone Age industries represented

The cultural material mostly represents a mix of Middle Stone Age (MSA) artefacts, pieces that can be ascribed to an Earlier Stone Age (ESA)/MSA transitional phase that could be associated with the Sangoan Industry or a KwaZulu-Natal/Eastern Cape variant thereof, and some largish handaxes and cleavers possibly of ESA Late Acheulean origin. This assortment could represent more than 300 000 years of human occupation in the area during a period that is crucial for the understanding of the origins of anatomically and behaviourally modern *Homo sapiens* in southern Africa.

The oldest tools are probably the largish handaxes and cleavers manufactured mostly on quartzite, representing the Late Acheulean of the ESA. This would be consistent with observations made by Davies (1976) with regard to similar assemblages. Tools observed in the surveyed area that might be ascribed to an ESA/MSA transitional phase, similar to the Sangoan, include radially/discoidal prepared cores, core scrapers, small crude handaxes with little or no cortex, small pebble choppers and pebble-butted picks and discoidal scrapers executed on hornfels (indurated shale) and quartzites. The MSA is characterised by the dominance of prepared core flake manufacture and flake tools (sometimes manufactured using Levallois technology), blade technology and retouched pointed tools, predominantly on hornfels. All these characteristics seem to be represented on the pieces recorded in the field.

Significance of the material

Although the observed material is of mixed context, it is of high significance with regard to current international research trends and Stone Age cultural material collections. There are no existing museum or research collections that could be considered truly representative of the ESA/MSA transitional phase in KwaZulu-Natal or the Eastern Cape. A clear description of the industry first described as the Tugela Industry (Cramb1935, 1937; Davies 1976) is hampered owing to wind and water erosion which has removed the relevant land-surfaces, renewed phases of dune-building, slumped material, and collections suffering from selective sampling conducted many years ago by non-professionals.

Notwithstanding these difficulties, Davies (1976) described the typical Natal coastal Sangoan as including; pebble-butted picks, bifacial picks or hand-axes with little or no cortex, miniature picks, pebble-choppers, core-scrapers, thick side-scrapers, large gouges, small side- & end-scrapers and discoidal scrapers. Collections also contain cores, blades and points of MSA type, but this could be due to mixing. Davies recorded that this industry extends south of the KwaZulu-Natal border along the coast, but south of the end of the red dunes there is no trace of it, and it has not been found elsewhere in the Eastern Cape.

In central and eastern Africa, the Sangoan is probably the only well-described industry that consistently occurs interstratified at the boundary of the Acheulean and MSA. In South Africa the Fauresmith Industry of the central interior, with its well-made small handaxes (Clark 1970), is similarly situated, while a Sangoan or Sangoan-like industry has recently been recorded in the northern regions of the country (Kuman et al. 2005a, 2005b). The classic Sangoan Industry differs from the Acheulean in several ways: handaxes or cleavers are rare, there are small scrapers, core-scrapers and robust tools called picks and core-axes (Clark 1974; Marean & Assefa 2005). A Rodesian Sangoan, with several variants, was described by Clark (1950) to include crudely pointed picks, crude handaxes with un-worked butts and irregular edges, round scrapers on cores, crude scrapers, oval and discoidal prepared cores, flakes with faceted striking-platforms, boat shaped points or picks and pebble choppers. Kuman et al. (2005b) link the Sangoan-like assemblages from northernmost South Africa with the Zimbabwean Charaman Industry (Late Sangoan) described by Cooke (1966). This industry was said to include handaxes, 'pigmy picks', crude unifacial and bifacial points, radial

and prepared cores and a veriety of steeply retouched, notched, denticulated or convex scrapers. Any assessment of these industries remains very difficult as most described Sangoan or Sangoan-like assemblages are highly selected from surface sites or come from disturbed contexts.

Acheulean occurrences lacking classic handaxes occur at roughly the same time as early MSA sites with and age of more than 285 000 years ago. Based on their work in East Africa, Tryon and McBrearty (2002) conclude that the Acheulean to MSA transition was gradual and characterised by simultaneous use of Acheulean, Sangoan and MSA technologies. Evidence to date suggests that the Acheulean-MSA transition occurred sometime between 300 and 250 ka ago, squarely within glacial OIS 8. The dramatic rotations between cold-dry and warm-wet climates during the late Middle and Upper Pleistocene posed a recurrent and amplifying cycle of vegetation change and habitability of the African continent (Marean & Assefa 2005,). While some researchers think it likely that a true transition from Acheulean to MSA occurred in just one region and spread outward, resulting in a widespread patchwork pattern of technological turnovers and eventual replacement of Acheulean by MSA technology (Marean & Assefa 2005), the possible uniqueness of the KwaZulu-Natal/Eastern Cape variant of the Sangoan might indicate a different scenario, but the lack of systematically collected, well-excavated, well-dated sites remains a massive handicap (Walker & Thorp 1997; Mitchell 2002).

The Acheulean-to-MSA transition is a large scale behavioural change that is significant when viewed in an evolutionary context. It is linked with the appearance of *Homo sapiens* on the African landscape (McBrearty & Tryon 2005). Linking technological and evolutionary change requires information from the transitional period, which is presently poorly understood. Technological innovations can be seen as the causes or consequences of anatomical changes that reflect new habitual positional, manipulative, or locomotor behaviours. The Acheulean-to-MSA transition, marked by new stone tool technology, is amongst the first visible signs in a record of continuous behavioural development in the African middle Pleistocene that continued to accumulate over the course of the next 250 000 years into complex modern hunter-gatherer behaviours and social structures (McBrearty & Tryon 2005).

The surveyed area thus presents the unique opportunity to conduct systematic surface collections and excavation/monitoring of exposed dune portions in order to generate viable research samples before these are further disturbed or destroyed. Davies's interpretation of a unique regional variant of the Sangoan could then be assessed by comparison with new research results from the northern parts of South Africa and central and eastern Africa. Refined approaches in stone tool analysis including technological analyses and *chaine operatoire* methods, as well as new dating techniques such as optically stimulated luminescence (OSL) dating, can now be used to start teasing apart technological trends and innovations in mixed assemblages. South Africa is a hot-spot for research regarding the origins of modern humans. The systematic study of ESA/MSA transitional technologies such as represented in the KwaZulu-Natal/Eastern Cape coastal Sangoan could add considerably to our knowledge with regard to technological and behavioural developments between about 300 000 and 100 000 years ago.

Assessment of the Kuman (2006) Research Report

In her research report Dr Kuman provides a succinct background to the Sangoan Industry, its known distribution, possible associated habitats and age. As a functional specialist I am somewhat sceptical about the generalised woodworking assumption for tools from this industry – this can only be established through extensive usetrace analyses – and the subsequent environmental deductions that are made from this assumption. Independent datasets should be sought to assess these inferences. This is a further reason for continioued mitigation at these sites. From the material presented to me I agree that there is a Sangoan-like component, but, in my opinion and based on experience with MSA assemblages from stratified sites in KwaZulu-Natal, MSA material is strongly represented, and there may also be Acheulean pieces. I agree with Kuman's recommendations for further mitigation for the reasons discussed above.

APPENDIX H

General geology of the mining area

(Prof Mike Cooper)

Three major geological units are encountered in the area, all of which are fossiliferous:
(c) Late Cainozoic sands.
(b) Mzamba Formation.
(a) Msikaba Formation

The **Msikaba Formation** is a Palaeozoic (Devonian-Carboniferous) unit which forms the foundations to the area. It is a hard, subhorizontal, thinly-bedded to massive, cross-bedded coarse-grained quartz arenite up to 1000 m thick which, in the area, comprises mainly thin- to medium-bedded sheet sandstones with pebble lags. Although locally this formation preserves trace fossils (*Scolicia. Skolithos, Planolites*) and, at Port St John's, has yielded a plant (lycopod) stem, the formation is for all intents and purposes unfossiliferous and no fossils were encountered in the mining area.

The **Mzamba Formation** is an Upper Cretaceous (Middle Santonian-Lower Campanian) unit (Greyling 1988) with onshore thicknesses of up to 33 m (Thomas 1988). It rests unconformably on the Msikaba sandstones with a stepped basal contact due to planation by two discrete transgressions (Middle Santonian, Lower Campanian) (Cooper & Greyling 1996). The strata are subhorizontal, dipping very shallowly (2-4°) to the SE, and comprise mainly blue-grey to dark olive-green sandstones alternating with richly-fossiliferous limestones which are generally pebbly in the lower part of the succession. The protected stratotype is on both sides of the Mzamba estuary where it is exposed for some 2 km, both in cliffs and as a surf zone platform.

The Cainozoic sands comprise older rubified "reds sands" of Pliocene age (Cooper & Liu 2006) and the modern white dune cordon (**Amanzimtoti Formation**) which dates to the Holocene. As recognized by Cooper & Liu (2006), the "red sands" are a composite unit comprising three different generations of sands, each related to a discrete transgressive-regressive event. The **Berea Formation** (Lower Pliocene) was restricted to the red beds (mainly decalcified aeolianites) resting on a marine-cut platform between +45-82 m amsl. An **unnamed formation** (Middle Pliocene) rests upon a wavecut platform between +10-33 m amsl, and the **Bluff Formation** (Late Pliocene) rests upon a platform between -3m and +10 m amsl. The unnamed formation seems to be the main unit in the Xolobeni area.

Geology of the tenement blocks

Mphalane Tenement Block

The south bank of the Mzamba River represents part of the stratotype of the **Mzamba Formation**, with fossiliferous Cretaceous deposits exposed to an elevation of +12 m above sea level. As this exposure falls within the Environmental Exclusion Zone it is not threatened. No other surface exposures of the Mzamba Formation were detected in this area, although it could occur as a wavecut platform exposed at low tide.

Mnyameni Tenement Area

No surface exposures of Mzamba Formation were encountered in this area. Just south of the Mpahlanyana River, two exploratory boreholes were drilled (Thomas 1988, Greyling 1992). **DD9** had a collar altitude of +80 m and penetrated the Cretaceous at 102.43 m, i.e. -22.43 m, and **DD10** had a collar altitude of +26 m and penetrated the Cretaceous at a depth of 35.60 m, i.e. -7.60 m (Greyling 1992). It is clear, therefore, that this area marks a post-Cretaceous palaeo-embayment in the Mzamba Formation and that the contact between the red sands and the underlying Mzamba Formation fluctuates markedly, i.e. there is significant palaeorelief. This embayment may be termed the **Xolobeni palaeo-embayment**.

Kwanyana Tenement Area

No evidence for onshore Mzamba Formation was found in this area. It would seem, therefore, to be part of the Xolobeni palaeo-embayment. The red sands crest at altitudes between 33-94 m at this locality, so the possibility exists that two dune cordons are involved and that they rest upon different wave-cut platforms, i.e. the base is stepped.

Sikombe Tenement Area

The Mzamba Formation occurs as a surf zone platform for about 1 km northwards from the Sikombe mouth, but no inland exposures were encountered. The northernmost exposure can be taken to mark the southern limit of the Xolobeni palaeo-embayment. Here the formation comprises dark olive green sandstones and pebbly grits with a typical Mzamba fauna including *Baculites*, *Pseudomelania*, *Acanthotrigonia*, *Platyceramus*, *Meretrix* and fossil wood. The red sands crest at between 50-76 m, with a suggestion that two generations of red sands may be represented, and that the basal contact is stepped.

Mtentu Tenement Area

This area is made up entirely of Msikaba Sandstones, with no evidence of Cretaceous Mzamba Formation or red sands. However, several wavecut platforms backed by palaeocliffs record Late Cainozoic fluctuations in sea level.

Recommendations

There is no palaeontological reason why mining should not occur in this area. Although the basal contact of the metalliferous red sands is likely to be both stepped and undulatory, and hence, unpredictable, the marked lithological and colour contrasts between the unconsolidated red sands and the underlying consolidated clay-rich dark olive-green Mzamba Formation should make discrimination easy. Should, however, fossiliferous Mzamba strata be exposed, it is recommended that the palaeontologist be called in to conduct a rescue mission to collect the fossils and document the exposure. Moreover, the basal conglomeratic marine unit to the red sands is also potentially fossiliferous and, if this is the case, it is likewise recommended that the palaeontologist be contacted as this would be of considerable palaeontological interest.

APPENDIX I

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APPENDIX J

We declare that Len van Schalkwyk, Beth Wahl and eThembeni Cultural Heritage, and the specialists who have contributed to this report, have no financial or personal interest in the proposed development, nor its developers or any of its subsidiaries, apart from in the provision of heritage assessment and management consulting services.

Len van Schalkwyk and Beth Wahl are equal partners in eThembeni Cultural Heritage and the following synopsis of our respective qualifications and experience demonstrates our ability to complete heritage impact assessments. We are accredited by Amafa aKwaZulu-Natali to complete heritage impact assessments in KwaZulu-Natal, and by the Cultural Resources Management section of the Association of South African Professional Archaeologists to do so in the rest of South Africa.

Len has a master's degree in archaeology (specialising in the history of early farmers in southern Africa) from the University of Cape Town and sixteen years' experience in cultural heritage management. He left his position as assistant director of Amafa aKwaZulu-Natali, the provincial cultural heritage authority, to start eThembeni. Len has worked on projects as diverse as the establishment of the Ondini Cultural Museum in Ulundi, the cultural management of Chobe National Park in Botswana and various archaeological excavations and oral history recording projects. He was part of the writing team that produced the KwaZulu-Natal Heritage Act, 1997. Len has worked with many rural communities to establish integrated heritage and land use plans and speaks good Zulu.

Beth has an honours degree in African studies (majoring in archaeology and sociology) from the University of Cape Town and is completing her masters in heritage and tourism at the University of KwaZulu-Natal. Most recently she was employed by Amafa aKwaZulu-Natali as head of archaeology, which position she left to start eThembeni. Beth was a co-developer of the cultural heritage management plan for the uKhahlamba Drakensberg Park World Heritage Site and has developed and implemented training programmes for community guides and members of the public. Much of this training has focussed on the rock paintings of the uKhahlamba (Drakensberg) mountains.

❖ Heritage impact assessments

Such assessments are required as part of Environmental Impact Assessments by the KwaZulu-Natal Heritage Act 1997, the South African Heritage Resources Management Act 1999 and all national and provincial environmental legislation. We have completed numerous projects and Amafa aKwaZulu-Natali and the South African Heritage Resources Agency have supported our recommendations, without exception. The following projects are a sample of our work during 2005 and 2006:

Eskom power lines

- Braamhoek integrated power supply for PBA International
- Obanjeni, Mtunzini substation and power lines for SiVEST Environment and Planning
- Majuba Mfolozi power lines for BKS Environmental Management Division
- Idwala Carbonates for Stemele Bosch Africa
- Braamhoek power lines for Ludloko Developments

Housing, office and game estate developments

- Shakaskraal residential and commercial estate for ACER (Africa)
- Bird Valley Estate, Cramond; Camdeboo, Hilton and Sundara Estate, Oliviershoek for Alletson Ecologicals
- Muluja Heights, uKhahlamba Drakensberg for Brousse-James & Associates
- Lot 938 Port Edward for Buk'Indalo Consultancy cc
- Uitvlugt equestrian and wildlife estate, Pietermaritzburg for DR A'Bear & Associates
- New Forest, Dargle for Environmental Assessments cc
- Burlington Greenfield, Queensburgh; Hillary, Durban; Umkhumbaan, Cato Manor; Rem of Lot 125 Ifafa; Lot 6417 Tongaat, Westbrook Beach
- Erf 121 Bazley Beach and Rem of Lot 1 Umzumbe for Environmental Solutions
- Intathakusa Retreat, Inanda for futureWORKS!
- Alverstone, Assagay for Gary van Wyk and Scott Gelder
- Bishopstowe; Brookdales, Howick; Himeville; Kamberg; Northington, Mooi River; Phinda Game Reserve; Rietvallei equestrian estate, Lidgetton; Rietvlei, Craigieburn; Riversdale, Himeville; Spring Grove,

Nottingham Road;
- Inhluzani, Dargle / Impendle; Umdloti; Lot 535 Kloof; Meycol Farm, uThukela Mouth; New Guelderland, Blythedale Beach; Simbithi eco-estate, Shakas Rock
- Zinkwazi Lagoon Lodge and forest estate for Indiflora cc Environmental Services
- Umbogintwini golf course for Kerry Seppings Environmental Management Services
- Zwelisha, Bergville for McFerran & Associates
- Executive Village, Umhlanga Triangle and Umhlanga New Town Centre for Moreland Developments (Pty) Ltd
- Cherry Farm, Port Shepstone; Kingthorpe equestrian estate, Pietermaritzburg; San Marina estate, Marina Beach; Shelly Ridge, Marburg Commonage; Sunrise Bay eco-estate; The Plantation agri eco-estate, Ramsgate; Uplands, Margate for NMH Consulting
- Buffelshoek, Winterton for Peter Jewell Consulting Services
- Umdloti Lagoon Valley and KwaDabeka C, Durban for SiVEST Environment and Planning
- Garden Park residential and commercial development for Spencer Gore Construction
- Manzengwenya dive camp for Strategic Environmental Focus (Pty) Ltd
- Balcomb, Mtunzini; Braeside Farm, Umhlali; Hillside farm, Umhlali; Helmsley Farm, Umhlali; Lot 617 Sheffield Beach; Mtikini, Ulundi; Palm Lakes, Umhlali; Tara Estate, Salt Rock for Sustainable Development Projects
- Allemans Drift and Waterford, Howick for WSP Environmental
- Almond Bank, Pietermaritzburg for Afzelia Environmental Consultants cc
- Nodunga and Cele-Nhlangweni for CHS Developments
- Eendvogel Vley and Gordon Hill, Ladysmith for DEK Simpson Professional Land Surveyors
- Mhlumayo housing for Inkonjane Developments

Road upgrades
- Road 1B Mkhazeni, Mgai farm road, Esifubeni road and Sani Pass Phase 1 for ACER (Africa)
- Ncengeni road, Tugela Ferry for J Mitchell & Associates
- Vukani Phase 2, Inanda for Pravin Amar Development Planners
- P230 road, Empangeni / Eshowe and Zwelimbomvu road for Terratest Incorporated
- Hillcrest roads for WSP Environmental

Bridge construction
- Bridge 1 Batshe and Bridge 18 Diki for ACER (Africa)
- Mfule River bridge, Nkwalini for Eyethu Engineers

Water supply projects
- Fairbreeze mine and Simdlangentsha for ACER (Africa)
- Makhabeleni, Masihambisane and Ntanzi for Saunders & Wium Trust
- Ozwathini / Mathulini and Wosiyane, Emalangeni and Cibane for SiVEST Environment and Planning
- KwaDeyi / St Faiths, KwaFodo and Stuartsville for Stemele Bosch Africa
- KwaGqugquma for Terratest Incorporated
- Albert Falls and south coast water supply system, Amanzimtoti to Umzinto / Scottburgh for Umgeni Water Amanzi

Dams
- Nsami, Molepo and Acornhoek dams, Limpopo Province for Cave Klapwijk & Associates
- Sundara, Oliviershoek for Alletson Ecologicals

Virgin soil assessments
- Ideal View and Mid-Selbourne farms, Underberg for Alletson Ecologicals

Other
- Gautrain tunnel and portal variants, Johannesburg for Bohlweki Environmental
- Gautrain route variants, Tshwane for Felehetsa Environmental (Pty) Ltd
- Ermelo Majuba rail realignments for Cave Klapwijk & Associates
- Nondabuya and Welcome agricultural development programmes for ACER (Africa) and Institute for Natural Resources
- Ntingwe tea estate, N11 and N12 borrow pits for ACER (Africa)
- Ashburton quarry, Pietermaritzburg and Idwala mining, Port Shepstone for Council for Geoscience
- King Matiwane cultural village for NDG Africa
- Alton North ferrochrome smelter, Richards Bay for CSIR Environmentek
- Chieveley, KwaDlamini, Injasuthi and Elandskraal base stations for David Totman & Associates

- Msukeni and Lugelweni ecotourism developments, Eastern Cape for Environmental and Rural Solutions
- KwaBulawayo tourism development for ZAI Consultants
- Avon and Georgedale peaking power plants for Environmental Impact Management Services (Pty) Ltd
- Riverside industrial park, Durban for Environmental Planning & Design
- Port Shepstone commercial development for Environmental Solutions
- Nquthu artefact collection for Ernst Cloete & Associates
- Braamhoek Pumped Storage Scheme impact assessment and monitoring for Eskom
- Erf 50 Cato Ridge and Westway commercial developments for Guy Nicolson Consulting cc
- Wellington wine estate, Rosetta for Harbour Rocks Properties (Pty) Ltd
- Enyokeni, KwaKhangela for SiVEST Environment and Planning
- Nanxing mining, Wartburg for Terratest Incorporated
- Sappi Saiccor Amakhulu expansion, Umkomaas and underground cable installation, Richards Bay for WSP Environmental
- 10 000BC filming location, Garden Castle for Brousse-James & Associates
- Heritage resources component of the KwaDukuza Strategic Environmental Assessment for SiVEST Selatile Moloi

CURRICULUM VITAE OF Michael Robert Cooper

Date of birth: 2nd June, 1946.
Place of birth: Salisbury, Southern Rhodesia.
Present age: 62.
Nationality: South African citizen; I.D.No.4606025548082.
Marital status: Married (30/10/1977), to Brenda Carter.
Children:
Fern Margaret (b. 5/5/1980).
David (b.2/11/1981).
Rosemary Gail (b.18/12/1982).
Michael Dirk (b.27/1/1984).

Schooling:
1954-55 Hatfield Junior School, Salisbury.
1955-58 Digglefold School, Marandellas.
1959-64 Ellis Robins School, Salisbury.

Examinations:
1962 CSC (5 credits, 2 passes).
1963 HSC [Subsidiary Exam] (2 distinctions, 1 pass).
1964 G.C.E. "A" Level (3 passes).

Tertiary education:
1967-70 University of Natal, Durban.
1974-76 University of Oxford, England.

Degrees:
1969 - B.Sc. (Natal).
1970 - B.Sc.Hons (Natal).
1973 - M.Sc. (Natal).
1976 - D.Phil. (Oxon.).

Awards and scholarships:
1963 Award of Merit (Geography).
1967-69 MTD (Mangula) bursary.
1967 Certificate of Merit (Geology I).
1968 Certificate of Merit (Geology IIA).
1969 Certificate of Merit (Geology IIIC).
1969 Johnathon Ian Ellis Memorial Prize.
1970 Certificate of Merit (Geology IV).
1970 Charelick Salomon Scholarship.

1975 Wolfson Scholar, Oxford.
1990 Appointed Research Associate, Durban Natural Science Museum.
1990 Elected Trustee, Durban Natural Science Museum.
1991 Elected "Man of the Year", American Biographical Institute (ABI).
1992 Honorary appointment, Research Board of Advisors, ABI.
1992 Elected Fellow, Geological Society of South Africa.
1993 Elected Fellow, Geological Society of London.
1996 Elected Research Fellow, University of Durban-Westville.

Biographical citations:

1992 *The International Directory of Distinguished Leadership*. 4th ed.
1992 *Five Thousand Personalities of the World*. 3rd ed.
1992 *Men and Women of Distinction*. 4th ed.
1993 *Men of Achievement*. 15th ed.
1993 *Five Hundred Leaders of Influence*.
2001 *2000 Outstanding Scientists of the Twentieth Century*.

Employment:

1965-66 Underground sampler, MTD (Mangula) Ltd, Rhodesia
1971-74 Scientific Research Officer, South African Museum, Cape Town
1977 Sectional Geologist, Lomagundi Smelting and Mining, Zimbabwe-Rhodesia.
1978 Post-doctoral Research Assistant, Oxford University.
1979-83 Curator of Geology / Palaeontology, National Museums of Zimbabwe.
1985 Temporary Junior Lecturer, Dept of Geology, UDW.
1986-88 Lecturer, Dept of Geology, UDW.
1989-90 Senior Lecturer, Dept of Geology, UDW.
1991-92 Associate Professor, Dept of Geology, UDW.
1993-2002 Professor, Dept of Geology, UDW.
2003 Emeritus Professor, UDW/UKZN.

Publications:

Over 100 publications on geology and palaeontology, mainly of Southern and Central Africa.