SAHRA National Heritage Documents-Appendix G

BMM WHS NOMINATION DOSSIER
APPENDIX G:
SAHRA NATIONAL HERITAGE DOCUMENTS

BARBERTON-MAKHONJWA MOUNTAINS
WORLD HERITAGE SITE PROJECT

Letter Received from
The South African Heritage Resources Agency
and Application Forms Submitted for
National Heritage Status of
Geosites Occuring outside of the NRs

Compiled by

Tony Ferrar

December 2016

Version 1.

an agency of the
Department of Arts and Culture

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Enquiries: hweldon@sahra.org.za

07 November 2016

Mr Rekwele Mmatli
Programme Manager
Barberton Tourism and Biodiversity Corridor
Barberton Chamber of Business
PO Box 221
Barberton
1300

Copy: Dr Dion Brandt
Concession Creek Consulting
PO Box 251
Barberton
1300

Dear Mr Mmatli

NOMINATION OF THE SITE FOR GRADE 1 STATUS IN TERMS OF SECTION 7 OF THE NATIONAL HERITAGE RESOURCES ACT NO 25 OF 1999: THE BARBERTON MAKHONJWA MOUNTAIN LAND, BARBERTON AREA, MPUMALANGA

We wish to advise that the Council of SAHRA approved the Grade 1 status of the Barberton Makhonjwa Mountain Land on 29th July 2016.

Notifications of the intention to declare the abovementioned sites as part of Barberton Makhonjwa Mountain Land will be sent to the relevant landowners, tenants or occupiers, and other registered interested and affected parties; once these details have been received by SAHRA. All parties will be given 60 days to submit to SAHRA any comments, objections or conditions under which they deem the declaration to be acceptable.

Should you have any queries with regards to the above, please contact Ms Nkosazana Machete nmachete@sahra.org.za or Ms Heidi Weldon hweldon@sahra.org.za (012 941 4960).

We look forward to the continued collaboration in the national protection of this unique heritage resource.

Sincerely,

Ms V Baduza
CHIEF EXECUTIVE OFFICER

Form 601 /v2
June 2011

Official Use
File Ref:.....
Site Ref:.....
Grade 1:.....
Committee Date:.....

an agency of the
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National Heritage Site Nomination Form

A. Proposed National Heritage Site:... BARBERTON MAKHONJWA GEOTRAIL .....

B. Brief Statement of Significance: *(A full statement of significance is required as an attachment)*

.....

The Barberton Makhonjwa Mountain Land (BMML) contains the oldest well-preserved sequence of volcanic and sedimentary rocks on Earth. These highly accessible Archaean outcrops present a continuous 350 million year geological sequence, from 3 600 million years ago. The physical and chemical characteristics of these rocks are so remarkably well preserved that they provide a globally unparalleled history of the early Earth. In particular, they provide unique evidence of the formation of the earliest oceanic and continental crusts and of the initial phase of the evolution of our biosphere. The Barberton Makhonjwa Geotrail is the principal geoheritage product within the BMML. It was planned and developed in 2012/13, and opened on 30 April 2014. With its attractive and informative roadside panels, built into vehicle laybyes on the 37km road between Barberton and the Swazi border at Bulembu, it is the only geotourism product of its kind in South Africa and probably similarly unique to the continent as a whole. *(For more detail per geosite see Appx #4.a on pg 6)*

.....

C. Proposed By: BATOBIC, Barberton ..... Date Proposed: ... June /2016

... (4/May/2006 – the first WHS planning meeting between Barberton Business Chamber, SAHRA, MTPA, et.al.)...

Contact Details: ... Rekwele Mmatli, BATOBIC Director, ...(Rekwele@batobic.co.za) ... 013 712 6490.....

D. Name of Property: Barberton Makhonjwa Geotrail (24 serial sites within a linear locality, comprising a 37 km roadside Geotrail with 11 parking laybyes containing rock specimens and interpretative panels for visitors and for outdoor education.) .....

Street Number and Street:.....R 40 – Barberton to Swaziland border at Bulembu .....

Suburb:...N/A ..... **Town**:...Barberton .....**District**:... Ehlanzeni DM, Mpumalanga .....

E. Cadastral Information

Erf/ Farm Number:...National Road section .....

Registration Division:.... 2531 CC Barberton JU, all properties .....

Map Ref:...1 in 50 000 series, Barberton 2531 CC **Recording Method**: Written & mapped GIS locs..

F. Type of Resource

Place	**× - no**
Structure	**× - no**
Archaeological Site	**× - no**
Palaeontological Site	**× - no**
Geological Feature	**✓ - Yes, twenty four (24) serial geological features**
Grave	**× - no**

Do moveable objects relating to the site form part of the Nomination? **× - no**

Serial nomination (Is more than one site being nominated as a 'Joint Nomination') **✓ - 12 geosites**

(For serial nominations, complete one form for each site, supply additional details about the information relating to the relation of the sites, and the management and phasing of proposed nomination be attached).

G. Sphere of Significance

	High	Med	Low	
International	**✓ Yes**	☐	☐	**(All Nationally significant sites are**
National	**✓ Yes**	☐	☐	**also significant at all other levels,**
Provincial	**✓ Yes**	☐	☐	**including International)**
Regional	**✓ Yes**	☐	☐	
Local	**✓ Yes**	☐	☐	
Specialist group or community	**✓ Yes**	☐	☐	**(Geology interest groups and learners)**

H. What other similar sites may be compared to the site? How does the site compare to these sites?

There are no other comparable sites or localities in SA

(Please expand on separate sheet)

I. Owner:

Public property on 37km SANRAL R40 road reserve (30m) plus small extensions into nearby private and public land (SAPPI; MTPA). All developed with owner's consent. See list of properties traversed, Appx 1, Para 6 below.

(If state-owned; responsible department and official position of contact)

Postal Address:... .....

Telephone:... .....**Fax:** ... ...**Cell:** ....

E-Mail: .... **Web Page:** ...N/A .....

Contact Person: *(If different from above. Please supply contact details)* ....
.....

- ☐ **1*** Expanded statement of significance; *(Refer specifically to significance criteria listed below)*
- ☐ **2*** Motivation for declaration as a National Heritage Site, including potential heritage value, threats and vulnerabilities;
- ☐ **3*** Short history of the place;
- ☐ **4*** Physical description of the heritage resource;
- ☐ **5*** Locality plan (map) and Site Plan;
- ☐ **6*** Photographs and plans;
- ☐ ** List of moveable objects relating to site that are proposed as part of nomination, or for archaeological or palaeontological site ;list of repositories where these are housed; N/A
- ☐ ** Bibliography of documentation relating to the heritage resource; (there are +/- 2 500 refereed and published scientific papers on the BMML, ref Prof Carl Anhaeusser)
- ☐ ** Statement of current protections and restrictions (e.g. previous national monument; register of immoveable property; conservation area; current zoning; servitudes); NIL
- ☐ ** List any heritage organizations consulted and their comments on the proposed nomination. (Geological Society of SA [GSSA])
- ☐ *** Site plan (with proposed site boundaries); (Can provide the field-trip maps)
- ☐ *** Conservation or management plans (send immediately if any exist);
- ☐ *** Heritage Agreement (if required).

(Please supply those marked (*) with this nomination form, as well as any others that are already available. Those marked (**) will be requested when the proposal first goes to SAHRA Council for endorsement (Tentative List of National Heritage Sites). Those marked (***) will be required when the Nomination goes to the following Council Meeting for approval as a National Heritage Site). All information submitted to SAHRA will remain with SAHRA.

Type of Significance

[Comments below relate to all geosites in the BMML WHS. Each site, and the landscape as a whole, contribute in part to the overall Outstanding Universal Value of the BMML WHS.]

	Indicate with a tick	*Comment where appropriate. Indicate sphere of significance: i.e. National, Provincial, Local and degree of significance: i.e. High, Mediumor Low.*

1. Historical Value ✓

a. It is important in the community, or pattern of history

i. Importance in the evolution of cultural landscapes and settlement patterns ☑

ii. Importance in exhibiting density, richness or diversity of cultural features illustrating the human occupation and evolution of the nation, Province, region or locality. ☐

iii. 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. ☐

iv. Importance as an example for technical, creative, design or artistic excellence, innovation or achievement in a particular period ☐

b. It has strong or special association with the life or work of a person, group or organisation of importance in history

i. Importance for close associations with individuals, groups or organizations whose life, works or activities have been significant within the history of the nation, Province, region or community. ☐

c. It has significance relating to the history of slavery

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

Each geosite has little or no historical value in human terms due to their extreme age. The geology as a whole has historic significance as related in the Appendix

2. Aesthetic Value N/A

a. It is important in exhibiting particular aesthetic characteristics valued by a community or cultural group

i. Importance to a community for aesthetic characteristics held in high esteem or otherwise valued by the community. ☐

ii. Importance for its creative, design or artistic excellence, innovation or achievement. ☐

iii. 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 ☐

iv. created by the individual components which collectively form a significant streetscape, townscape or cultural environment.

3. Scientific Value ✓

a. It has potential to yield information that will contribute to an understanding of natural or cultural heritage

i. 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. ☑

YES – site of oldest physical record of the evolution of the present earth's crust and biosphere, of value for research, education and tourism

ii. Importance for information contributing to a wider understanding of the origin of the universe or of the development of the earth.	☑	YES – as above
iii. 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.	☑	YES – location of earliest known evidence of life on earth that is visible to the naked eye
iv. 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.	☐	
b. It is important in demonstrating a high degree of creative or technical achievement at a particular period		
i. Importance for its technical innovation or achievement.	☐	
4. Social Value		
a. It has strong or special association with a particular community or cultural group for social, cultural or spiritual reasons		
i. Importance as a place highly valued by a community or cultural group for reasons of social, cultural, religious, spiritual, symbolic, aesthetic or educational associations.	☐	
ii. Importance in contributing to a community's sense of place.	☐	
Degrees of Significance		
5. Rarity: ✓		
a. It possesses uncommon, rare or endangered aspects of natural or cultural heritage		
i. Importance for rare, endangered or uncommon structures, landscapes or phenomena.	☑	Such well-preserved and diverse rock types of great age (3.6 – 3.15 billion years) do not exist anywhere, let alone in such an accessible location.
ii. Importance in demonstrating a distinctive way of life, custom, process, land-use, function or design no longer practiced in, or in danger of being lost from, or of exceptional interest to the nation, Province, region or locality.	☐	
6. Representivity:		
a. It is important in demonstrating the principal characteristics of a particular class of natural or cultural places or objects		
i. 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.	☐	
ii. 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.	☐	

Signature:…… Rekwele Mmatli (for Batobic) …… **Date**:……

APPENDIX 1 (as per SAHRA Grading and Declaration processes chart, 2015)

1. EXPANDED STATEMENT OF SIGNIFICANCE

The Barberton-Makhonjwa Mountain Land (BMML), situated in south-eastern Mpumalanga, contains the oldest well preserved sequence of volcanic and sedimentary rocks on Earth. These highly accessible Archaean outcrops present a continuous 350 million year sequence of rocks, from 3 600 million years BP. The physical and chemical characteristics of these rocks are so remarkably well preserved that they provide an unparalleled history of the early Earth. In particular, they provide unique evidence of the formation of the earliest oceanic and continental crusts and the evolution of ancient oceans and the atmosphere.

BMML is South Africa's largest and most scientifically well-researched and important Greenstone Belt. Its sequence of rock types display great geodiversity and most outcrops are very easy to access. Together they illustrate spectacularly some of the earliest tectonic events and formative processes of Earth's measurable history, including valuable clues as to the origin of life itself. The outstanding value of these rocks lies in the large number of sites and high quality features that, when combined, provide a unique and as yet only partially explored scientific resource. Their value for education and tourism, both leading to community benefits, have great potential.

The scientific geological value of these sites and of the BMML WHS as a whole, represent the globally Outstanding Universal Values of the area justifying WHS status. But there are also National and Provincial heritage values inherent in the historic settlement patterns of the region. The Makhonjwa Mountains have long marked the limits of Swazi influence during the so called Difacane conflicts among the Nguni people and their neighbours and later dominance struggles within Swaziland itself. These temporary power-driven population movements slowed and eventually halted with the advent of colonial settlers and firearms. These patterns had become virtually static by the time gold was discovered near Barberton in the 1880s. The mining that resulted announced the beginning of the industrial era in South Africa the start of a whole new pattern of economically driven migration that continues to this day.

The BMML Archaean sequence exposed along the Geotrail provides a cross-section of almost the entire geological Barberton Group sequence. As a group of potentially about 20 geosites, it presents a very representative sample of BGB geology that provide reliable information about the surface conditions of the early Earth in a very rich and diverse context. This is where our learning about the early earth and the evolution of the biosphere started. It includes outcrops that record the following most significant geosites arranged oldest to youngest:

- Basaltic lavas extruded as sub-marine tubes and 'pillows';
- Chemical sediments of black chert, location of Earth's earliest life forms;
- Volcanic lapilli (ash-ball hailstones) from Earth's earliest volcanic eruptions;
- Red and black banded iron formations created by biogenesis and precipitation;
- Submarine earthquake evidence: the cause of a 3 billion year old tsunami;
- Spherule layers indicating earth's earliest very large meteorite impact events;
- 3.2 billion year old beach deposits with biomats, mud cracks, wave ripples and tidal patterns, all clearly visible to the naked eye;
- Interface between the Barberton Greenstone rocks and younger underlying granites.

2.a MOTIVATION

The identified outcrops form part of the BMML WHS which has acknowledged Outstanding Universal Value in terms of UNESCO's guidelines for a Category (viii) World Heritage Site, viz:
"... be outstanding examples representing major stages of earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features;"

By reason of the acceptance by UNESCO (6 June 2008) for Tentative WHS status, the geosites within the WHS should automatically qualify for National Heritage Status in South Africa.

2.b STATEMENT OF THREAT, VULNERABILITY AND POTENTIAL

All identified rock outcrops occur naturally in the landscape, but those along the Geotrail are mostly exposed by excavations and road cuttings. Each is a non-living and durable natural resource that does not require manufactured protection, except possibly from the impact of human activities. Generally these outcrops have little or no commercial value, other than to geological researchers and collectors. As such they have very limited and fairly predictable VULNERABILITY. Similarly, THREATS to their protection and persistence are limited, and are readily managed by means of the Integrated Management Plan (IMP) set out below.

The POTENTIAL of these geosites, and the WHS as a whole, is for them to become a world class scientific and educational resource for ongoing geological research, public education and geo-tourism. The Geotrail is an example of that kind of educational tourism product. It's geosites are set in a very attractive natural environment that is highly accessible to visitors. These features, occurring close to several large Protected Areas with abundant wildlife and very attractive scenery, provide a sound basis for the development of sustainable tourism.

This tourism product is somewhat specialized, occupying as it does the rapidly growing geo-tourism niche that is well developed in the northern hemisphere but is relatively undeveloped in South Africa. The Geotrail has benefitted from the northern hemisphere experience in the geotourism field and is already tapping the global geo-tourism market. The roadside panels at the 12 developed geosites and the accompanying guidebook form the basis of a sophisticated educational and interpretative program which has room for expansion to additional sites once additional funds become available. Part of the intended expansion will be a specially targeted learning programme for teachers and secondary school learners. The feed-back already obtained from this Geotrail has provided motivation for the development of other local geotrails (both roadside and hiking) for the more scientifically-orientated geological interest groups in this niche market. These are currently under active development by local planners and geologists.

3. SHORT HISTORY

The significance of the Barberton Greenstone Belt (BGB, geological name for the BMML) achieved scientific prominence in 1968/9, when Wits University doctoral candidate, Richard Viljoen described a completely new volcanic rock type that he called komatiite, named from the nearby Komati River. News of this remarkable discovery spread quickly in geo-science circles and researchers from all around the world began discovering komatiite in Archaean Greenstone Belts everywhere. Since then the highly accessible and wonderfully well-preserved BGB has become a mecca for geological researchers who, since then, have published over 2500 scientific papers in refereed journals around the world.

The landscape is mountainous so it has attracted little development other than mining, timber plantations and nature conservation. In the 1920s a road was surveyed on horseback to Piggs Peak in Swaziland, to access mines and timber properties. It remained a winding dirt track for 80 years before being tarred in 2007, at which point new road cuts were exposed showing interesting fresh rock exposures. The road was then visited by Prof Christoph Heubeck from Germany, who had first mapped the area's geology in 1989. The new rock exposures were discussed with local enthusiasts and the geotrail idea was born.

Apart from a world-class series of Archaean geosites, the 40 km journey also showcases beautiful mountain scenery with views in all directions; wilderness areas with high quality water catchments; and montane grassland vegetation types that comprise a SANBI-registered biodiversity hot-spot, especially for rare plants. The combined natural resource values of the area form an excellent basis for sustainable tourism, as well as an unparalleled out-door education facility for teachers and secondary school learners.

Nurturing an interest in Earth's history through this area's unique geology provides an important extra reason for conserving and using the Barberton Mountain Land for tourism and for outdoor education.

4.a <u>PHYSICAL DESCRIPTION</u> (and legal circumstances of Heritage Declaration)

The entire 37km Geotrail, together with its history and environmental and developmental background, is described in the accompanying Barberton-Makhonjwa Geotrail Guidebook. The 12 developed geosites, which include the Nukain Mabuza-inspired gateway at the start, provide not only very significant geological insights, but locate the Earth-history story within the landscape as a whole – it's environmental, biodiversity, historic and cultural context – wherever the opportunity offers. An additional 5 or 6 future Geotrail sites are already known and recorded, and discussions towards extending the trail into Swaziland to Pigg's Peak have already taken place at Ministerial level. The newly demonstrated popularity of the existing Geotrail makes it a near certainty that these improvements and extensions are certain to take place.

Table 1 below, provides a summary of the serial geosites formally incorporated into the Geotrail, plus those nearby that are regularly accessed by geological researchers and guided tour groups. This is followed by a map of the Geotrail's 'locality', with the developed geosites on the trail marked in red.

Legal considerations- defining role for the Road Reserve
The full spatial 'locality' that should serve to include all serial geosites in this area, is not demarcated on the map (Appx 1a) in this case. This is because it cannot serve any useful purpose. The R40 road that links these serial geosites and provides access for visitors, traverses only very large Timber Plantation and Nature Reserve properties. In the knowledge of this difficulty, it is earnestly requested that SAHRA considers registering these Geosites as located within the legislated Road Reserve of the R40. This recently re-constructed road was built, and is now managed by SANRAL, who have already authorized the location and construction of the lay-bys and the signage and safety features associated with the 12 formal stops along this road. For SAHRA, this arrangement may be unprecedented but we believe it is a workable option about which all relevant parties are positive or at least open minded. **We ask that in this case, the R40 Road Reserve is used to define the 'locality' for these serial sites.**

TABLE 1. BARBERTON MAKONJWA GEOTRAIL – 14 HP & 10 PRIORITY GEOSITES

KEY- to Columns 8 & 9				
	HP	High Priority Sites	ot	"off trail" (away from the road)
	P	Priority Sites	2x	Double Geosite (2 geo-displays per site)
	O	Other Sites	ud	Undeveloped site (for future development)

G/s No.	WHS ref.	Km	Name of Feature	Description	Value	"NB"	Photo Ref
0	-	0.0	Nukain Mabuza inspired Gateway to Barberton	R38/R40 intersection – 'Nukain Painted Stones', landscaped entry feature to Barberton town and start of the Geotrail.	P		
1	206	2.4	GT site 1, "Greenstone View and BGB Boundary"	View north with town and mining features; Geosite shows well exposed contact between Kaap Valley Tonalite pluton (Na-rich granite) and older Barberton Greenstone Belt rocks.	HP	2x	
-		3.0	"Rifle Range View"	View west over Rifle Range, Barberton & Kaap valley beyond.	P	ud	
-		4.5	Sheba Fault and May Mine	Gold-bearing Sheba fault crosses the road from SW to NE & provides a view of the old May Mine on the opposite slope.	HP	ud, 2x	
-	172	6.2	View of the Saddleback & Barbrook faults	Saddleback Syncline in Moodies Group sediments; excellent easterly view of the Saddleback Fault valley and the Barbrook Fault, seen from the hairpin bend near Gs2.	P		
2	207	6.3	GT site 2, "De Kaap Valley View"	Best view of the eroded KVT pluton in the de Kaap Valley below the curved north flank of the BML; foreground shows old gold mining and prospecting activity.	HP		P
-	148	6.8	Moodies sedimentary sequence with paleosols	Moodies sediments in the N-limb of the Dycedale Syncline; road-side cutting exposes basal conglomerates, tidal and interference ripples, a mafic (lava) dyke, primitive paleosols and extensive cross-bedded sandstones.	HP		
3	208	7.0	GT site 3, "Tidal Sandstone"	White Tidal Sandstone: youngest major unit of the BGB displaying white-weathered, decemented, rippled and cross-bedded sandstones of upper Moodies Group. Abundant sedimentary structures of an early tidal environment.	HP		P
-	149	7.2	Dycedale Syncline – multiple sedimentary features	Off-road site to the N; access requires key to pedestrian gate; southern limb of the syncline shows Moodies sediments with mud cracks, ripple marks and rip-up foreset-crossbeds.	HP	ot	P

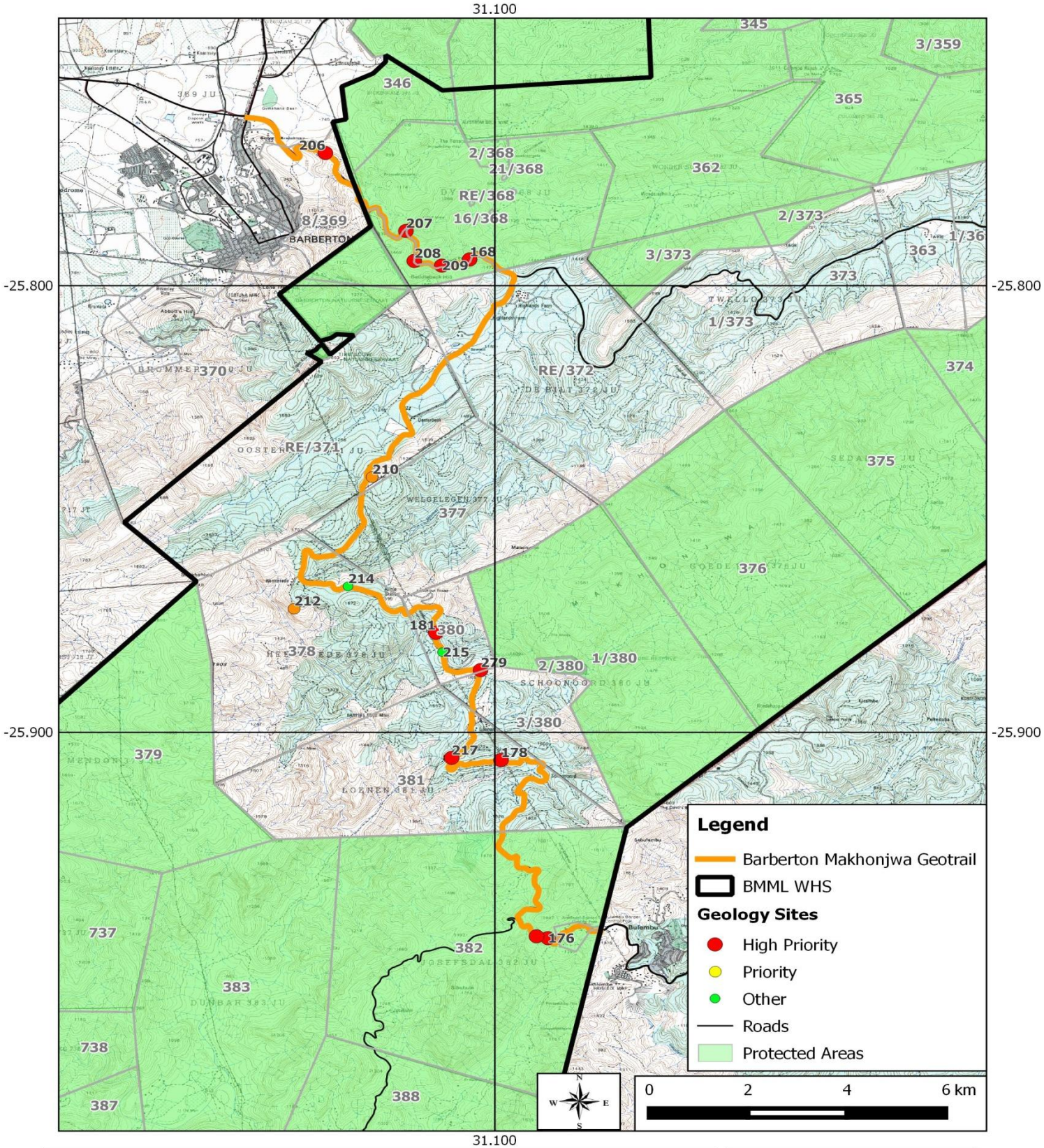
4	209	7.3	GT site 4, "Eureka View" " Alluvial Conglomerate" on Saddleback Pass	At large paved lay-by, impressive view across Mountainlands NR to distant Eureka City; Dycedale Syncline in foreground. Coarse conglomerate boulder from wedge-shaped alluvial fan deposit above road; trace of vanished mountain range.	HP	2x	
5	168	8.2	GT site 5, "Dycedale Syncline" and "Biomats"	Spectacular boat-shaped boulder shows biomats with several 'fluid escape features': first signs of life on Earth visible to the naked eye. Good view of the hinge of the Dycedale Syncline formed of tightly folded Moodies sediments	HP	2x	
-	210	-	Oosterbeek ridge - extensive biomat exposures	Off-road site to the E; extensive exposures of crinkly laminated biomats in Moodies sediments along Oosterbeek Firebreak and the high ridge to the East of the road.	p	ot	
-	182	-	Biomats – (sampling site at broken boulders)	Crinkly biomat laminations in (collapsed) roadside cutting in Moodies sediments (Stopping? Beware narrow road.).	p		P
-	212	-	View of Shokolwa Mountain & waterfalls	Off-road site to the W; 1km on logging road to panoramic view of high point (Shokolwa or 'Maid-of-the-Mist'). View across deep gorge (dyke) and northern Songimvelo NR, showing tightly folded Moodies sediments typical of youngest BGB rocks .	p	ot	P
6	181	23.6	GT site 6, "Painted Quarry" and "Baryte"	Quarry shows chevron folded strata of leached, iron-rich chert and shale; Fig Tree Group chemical sediments. Slabs of crystalline barite (barium sulphate) from nearby roadside deposit, also displayed in the quarry.	HP	2x	P
-	215	24.3	Baryte sample pits	Off-road: small sampling pits for barite, 20m west of road; part of a 12 km E-W outcrop, mined for barium in the 1950s.	O	ot	
-	278	-	Meteorite spherule layer	Off-road: newly found meteorite spherule bed N of the road.	P	ot	
7	279	25.3	GT site 7, "Makhonjwa/ Lebombo View"	Large central view-site and picnic stop with comprehensive geological display of all rocks found along the Geotrail.	HP	2x	P
-	216	-	Puddingstone Quarry	Off road site to the E; quarry where highly silicified, colourful, translucent conglomerate (puddingstone) was mined briefly for decorative use. Outcrop parallels barite & mined at same time.	P	ot	P

8	217	27.7	GT site 8, “Tsunami Conglomerate”	This excavated site displays clasts of an unusual chert and shale conglomerate of relocated Fig Tree sediments. Evidence of a tsunami-causing sub-marine earthquake, these fragments are re-deposited in an ocean trench with slight sorting.	HP		217
9	178	29.2	GT site 9, "Banded Ironstone"	Jaspilitic banded iron formation (BIF) in roadside cutting shows dark red chert and magnetite/ hematite banding, rich in iron; to the left is a yellow-red band of soft ochre, an example of the cosmetic use of these outcrops going back to the dawn of man.	HP		178a
-	179	-	Deformed banded chert	More folded banded chert with limited iron content; chemical sediment with some organic matter (black) and shale, especially tightly crumpled at the top end of the exposure.	P	ud	
-	218	-	Overturned Onverwacht/Fig Tree contact	Horizontal fault with Fig Tree sediments and chert-clast conglomerates located above older Onverwacht lavas, lapilli, tuffs etc. Fault lies parallel to the road at knee height for 100m.	P	ud	
10	177	36.3	GT site 10, "Volcanic Lapilli" and "Black Chert"	Accretionary volcanic lapilli (ash-ball hailstones) are visible embedded in this outcrop of grey Onverwacht chert. Black chert gets its colour from kerogen, derived from the organic carbon from the earth’s earliest micro-organisms.	HP	2x	
11	176	36.6	GT site 11, "Pillow Lavas" and “Msauli- Bulembu View”	Two different outcrops of basaltic Pillow Lavas; formed when molten lava extrudes from fissures on the sea floor. Two-meter diameter makes these the biggest known in the BML. View includes two closed asbestos mines, Bulembu (E) and Msauli (S).	HP	2x	P

Appendix: 1a

DRAFT MAP

Baberton Makhonjwa Mountain Lands World Heritage Site - Barberton Makhoniwa Geotrail



Footnote: This map has been compiled utilising inputs from a limited number of specialists. Further inputs will be obtained in due course to improve the accuracy of the and content of the maps. It should be noted that certain knowledge gaps as well as access to specific sites may limit the accuracy of data portrayed in this map.

Date created: 19 May 2016
Map Version: 1

4.b OWNER ATTITUDES AND CONSULTATION

Landowners along the length of the geotrail from Barberton to Bulembu (R40), include the following (with indicative distances):

1. Umjindi Municipality - first 1 km
2. SA Department of Defense - 2.4 km
3. Private Nature Reserve (Oosthuizen Family Trust and co-owners) - 5.6 km
4. Timber plantations, SAPPI Forests - 24 km
5. Provincial Nature Reserve – MTPA / Communal Property Association - last 5 km

Land owner support for the Geotrail and its resultant visitors, has been readily obtained prior to construction in 2013. Details of the different roles that may be played by each landowner have not yet been investigated, discussed and agreed to, but this will be done in due course when WHS Stakeholder Engagement is completed.

Most geosites and their attendant parking spaces occur within the road servitude – 15m from the road centre-line. A few of these geosite structures extend slightly into the property through which the road passes, as indicated above. In all cases, the landowners have agreed to the development of visitor facilities on their properties without charge or unreasonable preconditions for public use.

5. PLANS AND PHOTOS

The Geotrail guidebook should cover all that is expected in this section. Earlier planning graphics and photographs can be provided if requested.

6. LOCALITY AND MAP

Barberton-Makhonjwa Geotrail is located along the R40 National Road between Barberton and the Swaziland border at Josefsdal. Key GPS locations as follows:
Start> E 25deg 45,42', S 31deg 03,06'; End> E 25deg 56,36', S 31deg07,05' (see also Geotrail Guidebook).
Copy of a section of the 1/50 000 scale Survey Dept map, BARBERTON 2531 CC attached as Appx 1a.

The following are the properties through which the Geotrail (R40) passes, N to S.

Property	Registration code	Property	Registration code
Barberton Townlands	369 JU	Heemsteede	378 JU
Dycedale	368 JU	Schoonoord	380 JU
De Bilt	372 JU	Loenen	381 JU
Oosterbeek	371 JU	Josefsdal	382 JU
Welgelegen	377 JU		

NOTE:: The headings and subject matter below are taken from the 'SAHRA Grading and Declaration' flow chart. This includes appropriate content for a Conservation Management Plan for geological outcrops (see # 8 to 14 below).

7. EXPERT ENDORSEMENT

A number of endorsements have been obtained and recorded (see Geotrail Guidebook).
(We welcome advice on whether these need to be more formalized / repeated (i.e. signed documents??)

8. INTEGRATED CONSERVATION AND MANAGEMENT PLAN (ICMP)

The identified sites along the Barberton-Makhonjwa Geotrail (BMG) are mostly naturally occurring hard rock outcrops. Some are exposed in roadside borrow-pits and some are naturally weathered and erodible when exposed to the elements. Several, especially those on cool, damp south-facing cuttings, are rapidly covered by moulds and lichens that obscure their natural colours and textures. The majority present durable, naturally resistant surfaces that have negligible rates of erosion or natural attrition. Geosites are naturally self-

protecting and require minimal management. Such surfaces need only to be protected from human-induced physical damage and from activities that obscure them from view or interfere with legitimate human access.

Along this National Road with open and largely un-monitored public access, the only management and maintenance practically feasible, includes:

1. Monitoring, control and repair of deliberate damage to geosites and associated physical structures and interpretative panels;
2. Litter collection - including control and prevention where possible;
3. Landscape maintenance at and around geosites and laybyes: care for planted trees; weed and erosion control; alien plant removal; view management.

Management and maintenance are easier said than done while the Geotrail has no officially mandated management agency identified. Two years of experience has shown that common vandalism is less than expected, although it is prominent at the most popular sites close to Barberton. It is disappointing to note that geology students, geo-professionals and rock-collectors are the main source of direct damage to the geological outcrops themselves, especially to the more iconic outcrops. A targeted publicity and education campaign is needed to control this activity.

9. **DESCRIPTION OF THE ASSETS:** THEIR LOCATION AND VALUE

((THERE IS DUPLICATION HERE WITH PARA 4.a ABOVE. IN THIS CASE THE GUIDEBOOK ALSO PROVIDES THIS INFORMATION IN GENEROUS DETAIL. PLEASE ADVISE :::>))

The Barberton-Makhonjwa Geotrail is fully described in the Guide Book. All descriptive details and broader local context are provided with graphics and maps. Practical advice on logistics and use of the Geotrail are included. The original plan for the Geotrail's development included 20 geosites, some being discarded for practical and traffic-safety reasons. Since construction additional geosites and/or displays have also been identified. The possibility of extending the Geotrail into Swaziland was discussed very positively at Swazi ministerial level in 2015. The likelihood for growth and improvement is therefore good. (see also 4.a above)

The use of the Geotrail as an outdoor education facility is arguably it's most important value. Set in diverse landscapes with multiple land-uses and cultural settings, makes for many richly textured narratives about science and history, culture and economics, evolution and religion. It is necessary to develop specialized guides and interpretive material for schools that are syllabus-compatible, to get the rocks to tell their story more effectively and more widely. Building a sense of ownership and 'knowing' among teachers and learners instills interest and pride; visitor interest builds tourism that will attract investment and ultimately create jobs.

10. **PURPOSE AND VISION** FOR GEOSITE PROTECTION

The **purpose** of protecting these geosites is to safeguard their scientific and educational values, which are of global significance, and to provide access to them by the public and present and interpret them in ways that allow their value to be readily understood by all, especially local residents.

The **vision** involved in protecting and publicizing these sites is to maximize their combined scientific and educational value for all humanity and through creative development of this specialized niche in the tourism market, to benefit local residents via tourism-linked sources of sustainable income.

11. **HOW TO MANAGE THE ASSETS FOR VISITORS**: VULNERABILITIES AND THREATS

The outcrops involved at all geosites along the Geotrail are naturally occurring exposures of resistant bedrock that are inanimate. As such they are self-protecting, their management requiring only prevention of damage, defacement or unnatural concealment. There is particularly low likelihood of widespread vandalism as few people live along the road at present and this trend is likely to be unchanged in the near future.

The geosites have little commercial value at present, so the most likely sources of damage and defacement are:

- Rock collectors, researchers and geologists taking specimens with geo-picks;
- Construction: road maintenance and roadside developments;
- Excavation, quarrying and land-fill;

- Defacement or painting the rock surfaces.

Where possible these activities must be prevented throughout the length of the Geotrail, and most importantly at all geosites. The Geotrail is included in the Umjindi LED and IDP documents. Professional associations such as Geological Society of SA and relevant special-interest groups (gem and rock collecting clubs) should be alerted to avoid and prevent abuse. Local community members resident near identified geosites must be similarly alerted to these sensitivities.
Until a management agency is appointed, the Police and other regular road users need to be alerted to damaging activities and persuaded to intervene if possible. Local residents need to be made aware of these restrictions and asked to co-operate. No constructional developments are anticipated along this stretch of the R40, except possibly very close to the Swazi border. Pressure for such travel-related development may increase when the Swazi road from the border post to Pigg's Peak is completed.

12. **MAXIMIZING SUSTAINABLE BENEFITS**: AWARENESS OF VALUES AND OPPORTUNITIES

Most obvious benefits to local residents will depend on growing sustainable tourism and outdoor education programs. The former will depend on effective promotion of the Geotrail to the relatively small niche market in southern Africa and to the much larger and more developed foreign geotourism market. The need for specialized web-based marketing is a pre-requisite with its ability to be very target-specific and far-reaching. As geoheritage interests and geotourism are currently limited activities domestically, initial goals should be conservative aimed at steady, demand-driven growth. Partnerships with more established mainstream tourism products would be advisable.

Special emphasis is needed to develop interpretive educational material targeting young people who have emerged from the South African multi-lingual schooling system. That specific educational target will require its own interpretative style, level of detail and language; although all will be based on the same scientific information. This approach will be a specialized task for interpretive educational professionals and should produce material also suitable for adults with limited education.

13. **MONITORING** OF PROTECTION AND MANAGEMENT ACTIVITIES

Activities from which all geosites require protection are listed in 11) above. Two agencies in particular will be separately and jointly responsible for different aspects of management and use of the Geotrail:

1. At a municipal planning level, the Municipal Manager, as advised by the municipality's Town Planning division and its LED and IDP documents. These documents (and officials) will be responsible for acknowledging the existence of the Geotrail and guarding against any developments that may damage or diminish the Geotrail and hinder its growth and smooth functioning.
2. The WHS Management Agency (in process of being planned) will be the authority ultimately responsible for the Geotrail. It will publicize its geosites, ensure good management and maintenance and ensure an adequate and well-balanced guiding service. This agency will in particular be responsible for reporting routinely on the effectiveness of Geotrail protection, maintenance and visitor use.

The WHS Management Agency will ultimately be responsible for all the assets of the BMML World Heritage Site and all activities related to tourism and education within it and associated with it.

14. **COSTS AND BENEFITS** TO LOCAL PEOPLE

Few costs to people resident along the Geotrail are anticipated, because very few folk reside along the R40 to Bulembu. By the same account, there will be few benefits for them as well. Tourism related businesses in and around Barberton will benefit as the Geotrail's reputation grows, including where visitors shop, eat and hire accommodation. The WHS Management Agency along with BCT (Barberton Community Tourism) and the Umjindi Municipality will need to co-operate to monitor these costs and benefits and reflect their results in their routine reports.

Benefits to local people will similarly be encouraged by promoting tourism and tourism business development that together, create sustainable employment. This cooperative effort should focus on understanding and

positively influencing the attitudes of local residents towards the role of tourism in sustaining employment in the region. Monitoring these attitudes, and how they change both positively and negatively, will be an important responsibility of the co-operative.

In the longer-term tourism promotional activities will vary from large-scale infrastructure development, such as roads and resorts, to small-scale tourism product-owning and service-providing businesses. In keeping with the nature of this niche-market in tourism, these promotional activities should be approached with caution and prioritized by indicators of demand.

NB:: Completion of the Stakeholder Engagement programme will identify the people and activities to be monitored and how the costs and benefits to these people will be measured and / or estimated. Most importantly, this analysis must provide the insight to encourage and manage sustainable economic activity that is a benefit derived directly or indirectly from achieving WHS status. Benefits may be tangible (income) or intangible (education and pride of ownership or association). They may also be slow in coming, so raising false expectations must be guarded against.

APPENDIX 2
(Geosite Photos and other graphics)

tf/21 May, 2016

Form 601 /v2
June 2011

Official Use
File Ref:.....
Site Ref:.....
Grade 1:.....
Committee Date:.....

an agency of the
Department of Arts and Culture

111 Harrington Street
Cape Town, 8001
Tel: 021 4624502 Fax: 021 4624509 E-mail: info@sahra.org.za
Web Page: www.SAHRA.org.za

National Heritage Site Nomination Form

This form precedes the submission of the 'Nomination Document' and is designed to assist with the grading of heritage resources in terms Section 3(3) of the National Heritage Resources Act, as part of the process of declaration as a National Heritage Site (Section 27). Nominated heritage resources that are of special national significance will be graded as Grade 1 and considered for National Heritage Site status.

A. Proposed National Heritage Site:...BMML World Heritage Site - Mooiplaas section...

B. Brief Statement of Significance: *(A full statement of significance is required as an attachment)*

.....

The Barberton Makhonjwa Mountain Land (BMML) contains the oldest well-preserved sequence of volcanic and sedimentary rocks on Earth. These highly accessible Archaean outcrops present a continuous 350 million year geological sequence, from 3 600 million years ago. The physical and chemical characteristics of these rocks are so remarkably well preserved that they provide a globally unparalleled history of the early Earth. In particular, they provide unique evidence of the formation of the earliest oceanic and continental crusts and of the initial phase of the evolution of our biosphere. The Barberton Makhonjwa Geotrail is the principal geoheritage product within the BMML. It was planned and developed in 2012/13, and opened on 30 April 2014. With its attractive and informative roadside panels, built into vehicle laybyes on the 37km road between Barberton and the Swazi border at Bulembu, it is the only geotourism product of its kind in South Africa and probably similarly unique to the continent as a whole. *(For more detail per geosite see Appx #4.a on pg 6)*

.....

C. Proposed By: BATOBIC, Barberton ..... Date Proposed: ... June /2016

(4/May/2006 – the first WHS planning meeting between Barberton Business Chamber, SAHRA, MTPA, et.al.)...

Contact Details: ... Rekwele Mmatli, BATOBIC Director, ...(Rekwele@batobic.co.za) ... 013 712 6490.....

D. Name of Property: BMML World Heritage Site - Mooiplaas Section (locality)

Street Number and Street:.....N/A ..... **Suburb:**...N/A .....

Town:...Badplaas / Elukwatini (??) .....**District**:... Albert Luthuli, Mpumalanga .....

E. Cadastral Information

Erf/ Farm Number:.....see # 9. DESCRIPTION OF THE ASSETS below.....

Registration Division:.....All properties in IT .....

Map Ref: 1 in 50 000 series, "LOCHIEL - 2630 BB"... **Recording Method**: Written & mapped GIS locs ....

F. Type of Resource

Place	**× - no**
Structure	**× - no**
Archaeological Site	**× - no**
Palaeontological Site	**× - no**
Geological Feature	**✓ - Yes, seven (7) serial geological features**
Grave	**× - no**

Do moveable objects relating to the site form part of the Nomination? **× - no**

Serial nomination (Is more than one site being nominated as part of a 'Joint Nomination') **✓ – 8 geosites**

(For serial nominations, complete one form for each site, supply additional details about the information relating to the relation of the sites, and the management and phasing of proposed nomination be attached).

G. Sphere of Significance

	High	Med	Low
International	**✓Yes**	☐	☐ **(All Nationally significant sites are**
National	**✓ Yes**	☐	☐ **also significant at all other levels,**
Provincial	**✓ Yes**	☐	☐ **including International)**
Regional	**✓ Yes**	☐	☐
Local	**✓ Yes**	☐	☐
Specialist group or community	**✓ Yes**	☐	☐**(Geology interest groups and learners)**

H. What other similar sites may be compared to the site?
How does the site compare to these sites?

... There are no other comparable sites or localities in SA .....

(Please expand on separate sheet)

I. Owner:

... Officially State Land. Communal ownership to be confirmed & elaborated when known.

(If state-owned; responsible department and official position of contact)

Postal Address:... .....

Telephone:... .....**Fax:** ... ...**Cell:** ... .

E-Mail: .... **Web Page:** ...N/A .....

Contact Person: *(If different from above. Please supply contact details)* **.....** .....
.....

- ☐ **1*** Expanded statement of significance; *(Refer specifically to significance criteria listed below)*
- ☐ **2*** Motivation for declaration as a National Heritage Site, including potential heritage value, threats and vulnerabilities;
- ☐ **3*** Short history of the place;
- ☐ **4*** Physical description of the heritage resource;
- ☐ **5*** Locality plan (map) and Site Plan;
- ☐ **6*** Photographs and plans;
- ☐ ** List of moveable objects relating to site that are proposed as part of nomination, or for archaeological or palaeontological site ;list of repositories where these are housed;
- ☐ ** Bibliography of documentation relating to the heritage resource;
- ☐ ** Statement of current protections and restrictions (e.g. previous national monument; register of immoveable property; conservation area; current zoning; servitudes);
- ☐ ** List any heritage organizations consulted and their comments on the proposed nomination.
- ☐ *** Site plan (with proposed site boundaries);
- ☐ *** Conservation or management plans (send immediately if any exist);
- ☐ *** Heritage Agreement (if required).

Please supply those marked (*) with this nomination form, as well as any others that are already available. Those marked (**) will be requested when the proposal first goes to SAHRA Council for endorsement (Tentative List of National Heritage Sites). Those marked (***) will be required when the Nomination goes to the following Council Meeting for approval as a National Heritage Site). All information submitted to SAHRA will remain with SAHRA.

Type of Significance

[Comments below relate to all geosites in the BMML WHS. Each site, and the landscape as a whole, contribute in part to the overall Outstanding Universal Value of the BMML WHS.]

	Indicate with a tick	*Comment where appropriate. Indicate sphere of significance: i.e. National, Provincial, Local and degree of significance: i.e. High, Mediumor Low.*

9. Historical Value ✓

a. It is important in the community, or pattern of history

i. Importance in the evolution of cultural landscapes and settlement patterns ☑

ii. Importance in exhibiting density, richness or diversity of cultural features illustrating the human occupation and evolution of the nation, Province, region or locality. ☐

iii. 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. ☐

iv. Importance as an example for technical, creative, design or artistic excellence, innovation or achievement in a particular period ☐

b. It has strong or special association with the life or work of a person, group or organisation of importance in history

i. 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. ☐

c. It has significance relating to the history of slavery

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

Each geosite has little or no historical value in human terms due to their extreme age. The geology as a whole has historic significance as related in the Appendix

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10. Aesthetic Value N/A

a. It is important in exhibiting particular aesthetic characteristics valued by a community or cultural group

i. Importance to a community for aesthetic characteristics held in high esteem or otherwise valued by the community. ☐

ii. Importance for its creative, design or artistic excellence, innovation or achievement. ☐

iii. 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. ☐

iv. 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. ☐

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11. Scientific Value ✓

a. It has potential to yield information that will contribute to an understanding of natural or cultural heritage

i. 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. ☑

YES – site of oldest physical record of the evolution of the present earth's crust and biosphere, of value for research, education and tourism.

.....
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ii.	Importance for information contributing to a wider understanding of the origin of the universe or of the development of the earth.	☑	YES – as above
iii.	Importance for information contributing to a wider under-standing of the origin of life; the development of plant or animal species, or the biological or cultural development of hominid or human species.	☑	YES – location of earliest known evidence of life on earth that is visible to the naked eye.
iv.	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.	☐	
b.	**It is important in demonstrating a high degree of creative or technical achievement at a particular period**		
i.	Importance for its technical innovation or achievement.	☐	

12. Social Value **N/A**

a.	**It has strong or special association with a particular community or cultural group for social, cultural or spiritual reasons**		
i.	Importance as a place highly valued by a community or cultural group for reasons of social, cultural, religious, spiritual, symbolic, aesthetic or educational associations.	☐	
ii.	Importance in contributing to a community's sense of place.	☐	

Degrees of Significance

13. Rarity: ✓

a.	**It possesses uncommon, rare or endangered aspects of natural or cultural heritage**		
i.	Importance for rare, endangered or uncommon structures, landscapes or phenomena.	☑	YES - Such well-preserved and diverse rock types of great age (3.6 – 3.15 billion years) do not exist anywhere, let alone in such an accessible location.
ii.	Importance in demonstrating a distinctive way of life, custom, process, land-use, function or design no longer practiced in, or in danger of being lost from, or of exceptional interest to the nation, Province, region or locality.	☐	

14. Representivity: **N/A**

a.	**It is important in demonstrating the principal characteristics of a particular class of natural or cultural places or objects**		
i.	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.	☐	
ii.	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.	☐	

Signature:… Rekwele Mmatli (for Batobic) **Date**:……

APPENDIX 1 (as per SAHRA Grading and Declaration processes chart, 2015)

2. EXPANDED STATEMENT OF SIGNIFICANCE

The Barberton-Makhonjwa Mountain Land (BMML), situated in south-eastern Mpumalanga, contains the oldest well preserved sequence of volcanic and sedimentary rocks on Earth. These highly accessible Archaean outcrops present a continuous 350 million year sequence of rocks, from 3 600 million years BP. The physical and chemical characteristics of these rocks are so remarkably well preserved that they provide an unparalleled history of the early Earth. In particular, they provide unique evidence of the formation of the earliest oceanic and continental crusts and the evolution of ancient oceans and the atmosphere.

BMML is South Africa's largest and most scientifically well-researched and important Greenstone Belt. Its sequence of rock types display great geodiversity and most outcrops are very easy to access. Together they illustrate spectacularly some of the earliest tectonic events and formative processes of Earth's measurable history, including valuable clues as to the origin of life itself. The outstanding value of these rocks lies in the large number of sites and high quality features that, when combined, provide a unique and as yet only partially explored scientific resource. Their value for education and tourism, both leading to community benefits, have great potential.

The scientific geological value of these sites and of the BMML WHS as a whole, represent the globally Outstanding Universal Values of the area justifying WHS status. But there are also National and Provincial heritage values inherent in the historic settlement patterns of the region. The Makhonjwa Mountains have long marked the limits of Swazi influence during the so called *Difacane* conflicts among the Nguni people and their neighbours and later dominance struggles within Swaziland itself. These temporary power-driven population movements slowed and eventually halted with the advent of colonial settlers and firearms. These patterns had become virtually static by the time gold was discovered near Barberton in the 1880s. The mining that resulted announced the beginning of the industrial era in South Africa the start of a whole new pattern of economically driven migration that continues to this day.

Specifically the Mooiplaas locality with its seven serial geosites, contributes to our knowledge of the unique BGB by providing outcrops that contribute vital, although limited representative information, about the surface conditions of the early Earth. These individual sites add to the overall understanding of this uniquely rich geological landscape by presenting:

- Excellent exposures of pillowed komatiites, some with spinifex textures, that are the signature outcrops of this most diverse of the world's Archaean Greenstone Belts;
- Examples of volcanic processes in rocks known as felsic agglomerates, dacitic tuffs and lavas, that show their extrusive characteristics and relationships with other older and younger rocks, when the Earth was much hotter than it is today.
- Rocks that show other structural relationships, including the intense deformation they have undergone while buried within the Earth's crust for three billion years. Now recently exposed from this 'cool and shallow' burial, they present remarkably well-preserved features available for study by leading geo-scientists from around the world.

2.a MOTIVATION

The identified outcrops form part of the BMML WHS which has acknowledged Outstanding Universal Value in terms of UNESCO's guidelines for a Category (viii)World Heritage Site, viz:

> *"... be outstanding examples representing major stages of earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features;"*

By reason of the acceptance by UNESCO (6 June 2008) for Tentative WHS status, the geosites within the WHS should automatically qualify for National Heritage Status in South Africa.

2.b STATEMENT OF THREAT, VULNERABILITY AND POTENTIAL

All identified rock outcrops occur naturally in the landscape. Each is a non-living and durable natural resource that does not require manufactured protection, except possibly from the impact of human activities. Generally these outcrops have little or no commercial value, other than to geological researchers and collectors. As such they have very limited and fairly predictable VULNERABILITY. Similarly, THREATS to their protection and persistence are limited, and are readily managed by means of the Integrated Management Plan (IMP) set out below (Para 8).

The POTENTIAL of these geosites, and the WHS as a whole, is for them to become a world class scientific and educational resource for ongoing geological research, public education and geo-tourism. The geosites are set in a very attractive natural environment that is highly accessible to visitors. These features, occurring close to several large Protected Areas with abundant wildlife and very attractive scenery, provide a sound basis for the development of sustainable tourism. . XXX geosites have been identified in the BMML, of which YYY fall within the proposed WHS boundary which has been delineated to enclose at least 60% of all high value geosites. As a basis for this delineation all geosites have been value-graded by experienced senior geologists into, 1) High Priority, 2) Priority, 3) Significant other sites. Grades 1) and 2) are the high value sites that have guided the location of the WHS boundary.

The geological component of this tourism product is somewhat specialized. It occupies the rapidly growing geo-tourism niche that is well developed in the northern hemisphere but is relatively undeveloped in South Africa. This presents exciting opportunities to learn from the northern hemisphere experience, and simultaneously benefit from their development of the global geo-tourism market.

3. SHORT HISTORY

The significance of the Barberton Greenstone Belt (BGB, geological name for the BMML) achieved scientific prominence in 1968/9, when Wits University doctoral candidate Richard Viljoen described a completely new volcanic rock that he called komatiite, named after the nearby Komati River. News of this remarkable discovery spread quickly in geo-science circles and researchers from all around the world began discovering komatiite in Greenstone Belts everywhere. Since then the highly accessible and wonderfully well-preserved BGB has become a mecca for geological researchers who, since then, have published over 3000 scientific papers in refereed journals around the world.

The Mooiplaas section of the WHS landscape is relatively low profile and undulating compared to most of the Barberton Mountain Land. The distribution of high value geosites occurs almost randomly across the landscape, but is most obvious where parent bedrock is exposed, most often on hillsides and in water-washed river beds. More suitable for human habitation than the hill country, it has a history of being settled and used for livestock grazing and small-scale crop growing, for many thousands of years. Its prehistoric and its current land-use, mainly for livestock grazing, has had little impact on the appearance and accessibility of geological outcrops. Its brief occupation by white commercial farmers, from the 1920s to the 1970s, also relied on livestock grazing and has had little or no impact on geosites.

4.a PHYSICAL DESCRIPTION

In this Mooiplaas locality each geosite is different. The locality contains seven Serial Geosites listed in Table 1 below. They include three High Priority sites, Nos: 102, 107, & 110; and four Priority sites, Nos; 94, 97, 103, & 104. Nine other significant geosites occur within the locality but are not considered of sufficient merit for registration as National Heritage. The locations of all geosites within this locality are shown on the accompanying map below. The location of the Mooiplaas locality relative to the entire BMML World Heritage Site is provided in the separate overview map at a smaller scale.

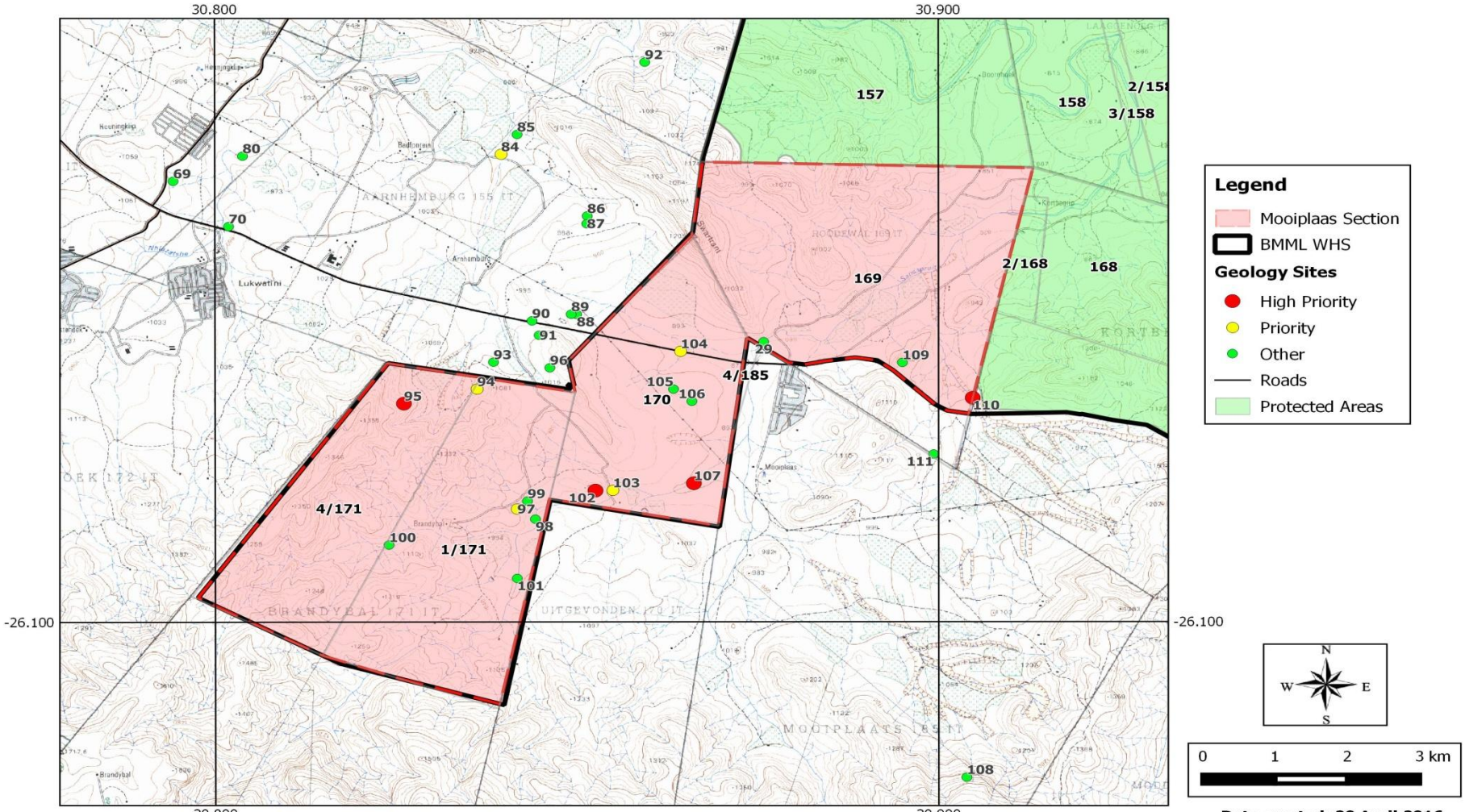
Table 1 MOOIPLAAS LOCALITY- SEVEN SERIAL GEOSITES			
Site No.	**Grade**	**Geological Description**	**Photo Ref**
102	HP	Migmatites exposed in N-S tributary of the Sandspruit River in the Uitgevonden Pluton.	102a-d
107	HP	Shear Zone gneisses in the Uitgevonden Pluton shear zone trends NNW-SSE and progressively changes strike to a N-S trend.	107a-h
110	HP	Kromberg Formation: Felsic agglomerates and dacitic tuffs and lavas in stream section north east of Mooiplaats-Diepgezet tar road (near turnoff south to Dalmein Pluton and small village).	110a-c
94	P	Sandspruit Formation - Spinifex texturein komatiite ultramafic flow units south of the Theespruit Pluton; also small quarries mined for poor quality talcoseserpentinite used for stone carvings.	95a-e
97	P	Sandspruit Formation - Contact of SandspruitFormation with porphyritic trondhjemitic gneisses of the Uitgevonden Pluton (south side greenstone remnant wedged between Theespruit and Uitgevonden plutons).	
103	P	Granitic and gneissic/migmatitic exposure on traverse from Sandspruit River, northwards across domical pavement, to contact with large xenolith of amphibolite-grade, komatiitic basalt with lit-par-lit leuco-quartz-feldspar veins.	103a-e
104	P	Migmatite platform in Sandspruit River: gneiss and migmatite intruded on east side of river platform by NW-trending mafic dyke.	104a-b

Table 1 (cont) Geosites graded "Other"

Site No.	Grade	Geological Description	Photo Ref
95	O	Sandspruit Formation - Amphibolite-grade pillowed komatiitic basalts exposed in area south of the spinifex ultramafics at Geosite 93.	95a-e
98	O	Sandspruit Formation - Start of NNW-SSE traverse across SandspruitFm sequence of metamorphosed komatiites and komatiitic basalts wedged between trondhjemitic gneiss of the Uitgevonden Pluton.	
99	O	Sandspruitmigmatites - Spectacular migmatite exposures in the Sandspruit River northeast of the SandspruitFormation exposures.	
100	O	Diabase dyke (NW-trending) in trondhjemitic gneiss NW of Sandspruit River exposures, showing contacts and columnar jointing.	
101	O	Agmatites and other migmatite exposures on river platforms along the upper reaches of the Sandspruit River close to farm track.	
105	O	Deformed, plunging pillow basalts along north side of tar road (near culvert) fromElukwatini to Mooiplaats (not a great exposure, but structurally significant).	
106	O	Shear Zone in Uitgevonden Pluton gneiss along farm track south of Elukwatini-Mooiplaats tar road.	
109	O	Granite platform exposures in foothills of the Mpuluzi Batholith and south of Dalmein Pluton (Northern Transitional Zone of Mpuluzi Batholith) showing foliated trondhjemitic gneiss intruded by granite and pegmatite dykes and veins.	
29	O	Swartrand Dyke. This mafic dyke (suggested Bushveld age) can be seen at a number of localities in the Komati River Valley, five of which are provided here: River section north of Mooiplaas village.	

DRAFT MAP

Baberton Makhonjwa Mountain Lands World Heritage Site - Mooiplaats Section



Footnote: This map has been compiled utilising inputs from a limited number of specialists. Further inputs will be obtained in due course to improve the accuracy of the and content of the maps. It should be noted that certain knowledge gaps as well as access to specific sites may limit the accuracy of data portrayed in this map.

Date created: 20 April 2016
Map Version: 1

4.b OWNER ATTITUDES AND CONSULTATION

Engagement & consultation with owners & residents are currently underway. Results so far are entirely positive. Details will be supplied when this process is complete. Where local residents are different from land owners these will be identified in due course. (CCC assumes completion of this activity is not critical to SAHRA's Heritage Grading Process per se, although it will be essential for ultimate registration.)

5. PLANS AND PHOTOS

A selection of reference photographs as indicated in Table 1, will be provided in a separate file as **Appendix 2.**

6. LOCALITY AND MAP

The Mooiplaas locality includes all or part of the following properties, listed here as recorded in the Deeds Registry. For a map of the locality see above.

Table 2

Property	Farm Portion	Hectares	Title deed registered to:
BRANDYBAL	171 IT portions/1 and /4	1758.5 ha	SA Government
ROODEWAL	169 IT	1506.1 ha	SA Government
UITGEVONDEN	170 IT	826.6 ha	SA Government

7. EXPERT ENDORSEMENT

We have several such endorsements from senior geologists for the WHS planning region as a whole. **Do these need to be more formalized (i.e. signed documents?)**

8. INTEGRATED CONSERVATION AND MANAGEMENT PLAN (ICMP)

The identified geosites in this locality of the BGB are all naturally-occurring hard rock outcrops. Some are exposed by excavation. The vast majority present durable, naturally resistant surfaces, which have negligible rates of erosion or natural attrition. These geosites are naturally self-protecting. Such surfaces need only to be protected from human-induced physical damage and from activities that obscure them from view or interfere with legitimate human access.

These circumstances indicate that the only management and maintenance needed to protect geosites from harm will be to prevent those human activities that damage or obscure them. These activities include:

- Building with masonry;
- Mining, blasting, excavation and dumping (includes quarrying);
- Permanent impoundment or flooding;
- Road-making and extensive ground leveling; and
- Any damaging, defacement or painting of outcrops.

In addition to the need for protection from these obvious negative impacts, the activities of geologists, researchers and rock collectors will have to be controlled and/or supervised. This will ultimately be controlled by means of a permitting system for all collecting and for any research activity that requires collection of rock specimens.

The use of the BGB geosites in their natural settings as outdoor education facilities is arguably their most important value. Set in their diverse natural landscapes with multiple land-uses and socio-

economic and cultural settings, makes for many richly textured narratives about science and history, culture and economics, evolution and religion. Specialized guiding and well-crafted interpretive material must be developed to get the rocks to tell their story. Building a sense of ownership and knowing among children instills pride; visitor interest builds tourism that will attract investment and ultimately create jobs.

9. **DESCRIPTION OF THE ASSETS:** THEIR LOCATION AND VALUE

See above – especially Paras 4.a and 4.b. The assets in the Mooiplaas locality are described in Tables 1 and 2 and the map, together providing location, size, ownership and an indication of scientific value. Where local residents are different from land owners these will be identified in due course.

10. **PURPOSE AND VISION** FOR GEOSITE PROTECTION (identical for all components of BMML WHS)

The **purpose** of protecting these geosites is to safeguard their globally significant scientific and educational values, and to arrange for and provide access to them by the public. Once protected, the information content and educational value of these rocks will be presented and interpreted for easy understanding by all, especially local residents and visitors.

The **vision** involved in protecting and publicizing these sites is to maximize their combined scientific and educational value for all humanity, and through creative development of this specialized niche in the tourism market, to benefit local residents with a tourism-linked source of sustainable income.

11. **HOW TO MANAGE THE ASSETS FOR VISITORS**: VULNERABILITIES AND THREATS

The rock outcrops involved at all the listed geosites in the Theespruit locality are naturally occurring exposures of resistant bedrock that are inanimate. As such they are self-protecting, requiring only prevention of damage, defacement or concealment by human agency. They have little commercial value at present, so the most likely sources of damage and defacement are:

- Rock collectors, researchers and geologists;
- Construction: building of roads, housing and other developments;
- Mining, excavation, quarrying and land-fill;
- Impoundment with flooding;
- Defacement or painting the rock surfaces.

All these activities must be actively controlled, and most importantly at all identified and displayed geosites. Local development agencies and residents need to be made aware of these restrictions and where appropriate, they should be asked to sign agreements to that effect. In practice, these constraints will impose minimal inconvenience or costs on land-owners or residents. As pre-conditions for protection under the National Heritage Resources Act of 1999, they should therefore be readily acceptable by local people, and be straight forward to ensure compliance by whatever administrative structures and development agencies are involved.

For larger scale developments involving infrastructure (roads; urban expansion; some forms of agriculture), the location of all geosites must be made known to the relevant municipalities and included in their LED/IDP documents. All development agencies should be alerted to these sensitivities and developers informed to avoid accidental damage. The most clearly identified threat known at present is from those who wish to collect (and therefore deface) rocks for whatever reason. Professional associations such as Geological Society of SA and relevant special-interest groups (gem and rock collecting clubs) should be alerted to avoid and prevent abuse. Local community members resident near identified geosites must be similarly alerted to these sensitivities.

12. **MAXIMIZING SUSTAINABLE BENEFITS**: AWARENESS OF VALUES AND OPPORTUNITIES

Most obvious benefits to local residents will depend on developing sustainable tourism and outdoor education programs. The former will depend on partnerships between state tourism agencies, tourism business operators and the support and co-operation of local residents. Participants in these partnerships must where possible, maximize the options for local employment and informal income generation, including a strong training component. As geotourism is currently a specialized tourism niche-market, initial goals should be conservative. The need for specialized marketing must be accepted as a pre-requisite.

The WHS Management Agency will have the responsibility for developing the interpretive material that makes the scientific value of these rocks understandable, both by local and foreign visitors and by local people with limited formal education. Reaching each of these three distinct educational targets will require its own interpretative style, level of detail and language for each very different audience; although all will be based on the same scientific information. This will be a specialized task for interpretive educational professionals.

In this setting, tourism-related employment can be both formal and informal. Formal employment will require some measure of appropriate training and/or experience, provided mainly by private sector tourism businesses. Informal employment can be encouraged by public agencies and training programs but will ultimately depend on the entrepreneurial spirit of local residents living close to the more popular geosites. In creating awareness among these local residents, their contribution to growing and sustaining tourism to the area will be important in many ways, e.g.:

- Welcoming and encouraging visitors so that they feel expected and safe on site;
- Learn about the rocks and their stories, sufficient to become local guides to inform visitors and develop pride of ownership;
- As tourism grows, develop products and services that visitors will be happy to pay for.

13. **MONITORING** OF PROTECTION AND MANAGEMENT ACTIVITIES

Activities from which all geosites require protection are listed in 11.) above. Three agencies will be separately and jointly responsible for different aspects of whatever protection is afforded.

1) At a municipal planning level, the Municipal Manager as advised by the municipality's Town Planning division and its LED and IDP documents. These documents (and officials) will be responsible for recording the location of geosites and prohibiting any construction or other development that will damage or obscure them from public view and/or prevent or obstruct public access to them.
2) The traditional leadership in communal areas will be asked to recognize in writing the occurrence of local geosites and where possible will support their protection and encourage open access to them by the public, including local teachers in particular.
3) The WHS Management Agency will be the authority ultimately responsible for publicizing the value and location of geosites, and for obtaining the support of all I&APs to ensure their protection and accessibility to visitors, especially geological professionals and school children. This agency will in particular be responsible for reporting on the effectiveness of geosite protection and visitor use of these sites, routinely in their Annual Reports.

Management of all the assets of the BMML WHS and all activities related to tourism and education will be the responsibility of its Management Agency. This function is not yet commissioned, but its responsibilities will be expected to include:

a) Marketing the BMML WHS and its geosites, to generate visitor interest and tourism investment;
b) Developing geosites and their access as needed, and negotiating for access with land-owners/local residents and defining their role in encouraging and informing visitors;
c) Promoting co-operation between I&APs to help visitor access to be a pleasant, informative and safe experience;

d) Developing interpretive material aimed at improving visitors' understanding of Earth's history and the evolution of the earliest biosphere as contained in the rocks at each geosite, both individually and as an integrated whole;
e) Developing school-orientated outdoor education programmes based on the geological and wider ecological features of the BMML and its geosites;
f) Monitoring of issues relating to visitor access and public understanding resulting from the interpretive material provided, in order to continuously revise and improve them.

14. **COSTS AND BENEFITS** TO LOCAL PEOPLE

A program of monitoring the costs and benefits experienced by local communities will be instituted by the WHS Management Agency. This will focus on understanding and positively influencing the attitudes of local residents towards the costs of the imposed constraints compared to the benefits of tourism business and employment. Monitoring these attitudes, and how they change both positively and negatively, will be an important responsibility of the WHS Management Agency.

Benefits to local people will similarly be encouraged by promoting tourism and tourism business development that together, create sustainable employment. Tourism promotional activities will vary from large-scale infrastructure development, such as roads and resorts, to small-scale tourism product-owning and service-providing businesses. In keeping with the nature of this niche-market in tourism, these promotional activities should be approached with caution and prioritized by indicators of demand.

The outcome of these management and monitoring activities will be presented annually in the WHS Management Authority's routine reports.

NB:: Completion of the Stakeholder Engagement programme will identify the people and activities to be monitored and how the costs and benefits to these people will be measured and / or estimated. Most importantly, this analysis must provide the insight to encourage and manage sustainable economic activity that is a benefit derived directly or indirectly from achieving WHS status. Benefits may be tangible (income) or intangible (education and pride of ownership or association). They may also be slow in coming, so raising false expectations must be guarded against.

APPENDIX 2
(Geosite Photos and other graphics)

tf/20 May, 2016

Form 601 /v2
June 2011

Official Use
File Ref:.....
Site Ref:.....
Grade 1:.....
Committee Date:.....

an agency of the
Department of Arts and Culture

111 Harrington Street
Cape Town, 8001
Tel: 021 4624502 Fax: 021 4624509 E-mail: info@sahra.org.za
Web Page: www.SAHRA.org.za

National Heritage Site Nomination Form

This form precedes the submission of the 'Nomination Document' and is designed to assist with the grading of heritage resources in terms Section 3(3) of the National Heritage Resources Act, as part of the process of declaration as a National Heritage Site (Section 27). Nominated heritage resources that are of special national significance will be graded as Grade 1 and considered for National Heritage Site status.

A. Proposed National Heritage Site:...BMML World Heritage Site - Theespruit section...

B. Brief Statement of Significance: *(A full statement of significance is required as an attachment)*

.....

The Barberton Makhonjwa Mountain Land (BMML) contains the oldest well-preserved sequence of volcanic and sedimentary rocks on Earth. These highly accessible Archaean outcrops present a continuous 350 million year geological sequence, from 3 600 million years ago. The physical and chemical characteristics of these rocks are so remarkably well preserved that they provide a globally unparalleled history of the early Earth. In particular, they provide unique evidence of the formation of the earliest oceanic and continental crusts and of the initial phase of the evolution of our biosphere. The Barberton Makhonjwa Geotrail is the principal geoheritage product within the BMML. It was planned and developed in 2012/13, and opened on 30 April 2014. With its attractive and informative roadside panels, built into vehicle laybyes on the 37km road between Barberton and the Swazi border at Bulembu, it is the only geotourism product of its kind in South Africa and probably similarly unique to the continent as a whole. *(For more detail per geosite see Appx #4.a on pg 6)*

.....

C. Proposed By: BATOBIC, Barberton ..... Date Proposed: ... June /2016

... (4/May/2006 – the first WHS planning meeting between Barberton Business Chamber, SAHRA, MTPA, et.al.)...

Contact Details: ... Rekwele Mmatli, BATOBIC Director, ...(Rekwele@batobic.co.za) ... 013 712 6490.....

D. Name of Property: BMML World Heritage Site - Theespruit Section (locality)

Street Number and Street:.....N/A ..... **Suburb:**...N/A .....

Town:...Badplaas / Elukwatini ..... **District**:... Albert Luthuli, Mpumalanga .....

E. Cadastral Information

Erf/ Farm Number:.....see # 9. DESCRIPTION OF THE ASSETS below.....

Registration Division:. In the north: JT; in the south: IT. .....

Map Ref: 1 in 50 000 series, "The Brook - 2630 BA"... **Recording Method**: Written & mapped GIS locs.

F. Type of Resource

Place	**× - no**
Structure	**× - no**
Archaeological Site	**× - no**
Palaeontological Site	**× - no**
Geological Feature	**✓ - Yes, seven (7) serial geological features**
Grave	**× - no**

Do moveable objects relating to the site form part of the Nomination? **× - no**

Serial nomination (Is more than one site being nominated as part of a 'Joint Nomination') **✓ - 7 geosites**

(For serial nominations, complete one form for each site, supply additional details about the information relating to the relation of the sites, and the management and phasing of proposed nomination be attached).

G. Sphere of Significance

	High	Med	Low	
International	**✓ Yes**	☐	☐	**(All Nationally significant sites are**
National	**✓ Yes**	☐	☐	**also significant at all other levels,**
Provincial	**✓ Yes**	☐	☐	**including International)**
Regional	**✓ Yes**	☐	☐	
Local	**✓ Yes**	☐	☐	
Specialist group or community	**✓ Yes**	☐	☐	**(Geology interest groups and learners)**

H. What other similar sites may be compared to the site?

How does the site compare to these sites?

... There are no other comparable sites or localities in SA .....

(Please expand on separate sheet)

I. Owner:

...Communal land ownership to be confirmed & elaborated soonest

(If state-owned; responsible department and official position of contact)

Postal Address:... .....

Telephone:... .....**Fax:** ... ...**Cell:** ....

E-Mail: .... **Web Page:** ...N/A .....

Contact Person: *(If different from above. Please supply contact details)* **.....** .....

.....

- ☐ **1*** Expanded statement of significance; *(Refer specifically to significance criteria listed below)*
- ☐ **2*** Motivation for declaration as a National Heritage Site, including potential heritage value, threats and vulnerabilities;
- ☐ **3*** Short history of the place;
- ☐ **4*** Physical description of the heritage resource;
- ☐ **5*** Locality plan (map) and Site Plan;
- ☐ **6*** Photographs and plans;
- ☐ ** List of moveable objects relating to site that are proposed as part of nomination, or for archaeological or palaeontological site ;list of repositories where these are housed;
- ☐ ** Bibliography of documentation relating to the heritage resource;
- ☐ ** Statement of current protections and restrictions (e.g. previous national monument; register of immoveable property; conservation area; current zoning; servitudes);
- ☐ ** List any heritage organizations consulted and their comments on the proposed nomination.
- ☐ *** Site plan (with proposed site boundaries);
- ☐ *** Conservation or management plans (send immediately if any exist);
- ☐ *** Heritage Agreement (if required).

Please supply those marked (*) with this nomination form, as well as any others that are already available. Those marked (**) will be requested when the proposal first goes to SAHRA Council for endorsement (Tentative List of National Heritage Sites). Those marked (***) will be required when the Nomination goes to the following Council Meeting for approval as a National Heritage Site). All information submitted to SAHRA will remain with SAHRA.

Type of Significance

[Comments below relate to all geosites in the BMML WHS. Each site, and the landscape as a whole, contribute in part to the overall Outstanding Universal Value of the BMML WHS.]

Indicate with a tick	*Comment where appropriate. Indicate sphere of significance: i.e. National, Provincial, Local and degree of significance: i.e. High, Mediumor Low.*

15. Historical Value ✓

a. It is important in the community, or pattern of history

i. Importance in the evolution of cultural landscapes and settlement patterns ☑

Each geosite has little or no historical value in human terms due to their extreme age. The geology as a whole has historic significance as related in the Appendix

ii. Importance in exhibiting density, richness or diversity of cultural features illustrating the human occupation and evolution of the nation, Province, region or locality. ☐

iii. 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. ☐

iv. Importance as an example for technical, creative, design or artistic excellence, innovation or achievement in a particular period ☐

b. It has strong or special association with the life or work of a person, group or organisation of importance in history

i. 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. ☐

c. It has significance relating to the history of slavery

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

16. Aesthetic Value N/A

a. It is important in exhibiting particular aesthetic characteristics valued by a community or cultural group

i. Importance to a community for aesthetic characteristics held in high esteem or otherwise valued by the community. ☐

ii. Importance for its creative, design or artistic excellence, innovation or achievement. ☐

iii. 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. ☐

iv. 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. ☐

17. Scientific Value ✓

a. It has potential to yield information that will contribute to an understanding of natural or cultural heritage

i. Importance for information contributing to a wider understanding of natural or cultural history by virtue of its use as a research site, teaching, type locality, reference or benchmark site. ☑

YES – site of oldest physical record of the evolution of the present earth's crust and biosphere, of value for research, education and tourism.

ii. Importance for information contributing to wider understanding of the origin of the universe or development of the earth. ☑

iii. 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. ☑

iv. 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. ☐

b. It is important in demonstrating a high degree of creative or technical achievement at a particular period

i. Importance for its technical innovation or achievement. ☐

18. Social Value N/A

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

i. Importance as a place highly valued by a community or cultural group for reasons of social, cultural, religious, spiritual, symbolic, aesthetic or educational associations. ☐

ii. Importance in contributing to a community's sense of place. ☐

Degrees of Significance

19. Rarity: ✓

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

i. Importance for rare, endangered or uncommon structures, landscapes or phenomena. ☑

ii. Importance in demonstrating a distinctive way of life, custom, process, land-use, function or design no longer practiced in, or in danger of being lost from, or of exceptional interest to the nation, Province, region or locality. ☐

20. Representivity: N/A

a. It is important in demonstrating the principal characteristics of a particular class of natural or cultural places or objects

i. 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. ☐

ii. 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. ☐

.....
.....
YES – as above
.....
.....
YES – location of earliest known evidence of life on earth that is visible to the naked eye.
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.....
.....
.....
YES - Such well-preserved and diverse rock types of great age (3.6 – 3.15 billion years) do not exist anywhere, let alone in such an accessible location.
.....
.....
.....

Signature:.....Rekwel Mmatli (for Batobic)..... **Date**:.....

APPENDIX 1 (as per SAHRA Grading and Declaration processes chart, 2015)

3. EXPANDED STATEMENT OF SIGNIFICANCE

The Barberton-Makhonjwa Mountain Land (BMML), situated in south-eastern Mpumalanga, contains the oldest well preserved sequence of volcanic and sedimentary rocks on Earth. These highly accessible Archaean outcrops present a continuous 350 million year sequence of rocks, from 3 600 million years BP. The physical and chemical characteristics of these rocks are so remarkably well preserved that they provide an unparalleled history of the early Earth. In particular, they provide unique evidence of the formation of the earliest oceanic and continental crusts and the evolution of ancient oceans and the atmosphere.

BMML is South Africa's largest and most scientifically well-researched and important Greenstone Belt. Its sequence of rock types display great geodiversity and most outcrops are very easy to access. Together they illustrate spectacularly some of the earliest tectonic events and formative processes of Earth's measurable history, including valuable clues as to the origin of life itself. The outstanding value of these rocks lies in the large number of sites and high quality features that, when combined, provide a unique and as yet only partially explored scientific resource. Their value for education and tourism, both leading to community benefits, have great potential.

The scientific geological value of these sites and of the BMML WHS as a whole, represent the globally Outstanding Universal Values of the area justifying WHS status. But there are also National and Provincial heritage values inherent in the historic settlement patterns of the region. The Makhonjwa Mountains have long marked the limits of Swazi influence during the so called *Difacane* conflicts among the Nguni people and their neighbours and later dominance struggles within Swaziland itself. These temporary power-driven population movements slowed and eventually halted with the advent of colonial settlers and firearms. These patterns had become virtually static by the time gold was discovered near Barberton in the 1880s. The mining that resulted announced the beginning of the industrial era in South Africa the start of a whole new pattern of economically driven migration that continues to this day.

Specifically the Theespruit locality with its seven serial geosites contributes to the BGB as a group of geosites that provide reliable information about the surface conditions of the early Earth in such a rich and diverse context. Emphasis here is on the nature of the granite-greenstone contact processes involved in the formation of the world's first proto-continent. The individual sites listed add to the overall understanding of this unique study area for defining the early history of our planet. The outcrops include:

- Large exposures of migmatites (mixing of different rock types) and xenoliths (separate fragments of one rock type within another) showing the dramatic mixing of two of the main rock-types (volcanic rock and granite) that existed at the time of the Earth's early formation;
- Cross-bedding (depositional flow lines in sediments) in sandstones that are probably the oldest sedimentary rocks in the BGB with evidence of early and somewhat different tidal conditions: very different Earth-Moon gravitational interactions from the present;
- Examples of 3 billion year old shear-zone features where rock bodies moved against each other while hot and 'plastic';
- The well known black and white 'Zebra striped' platform in the Theespruit river.

2.a MOTIVATION

The identified outcrops form part of the BMML WHS which has acknowledged Outstanding Universal Value in terms of UNESCO's guidelines for a Category (viii)World Heritage Site, viz:

> *"... be outstanding examples representing major stages of earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features;"*

By reason of the acceptance by UNESCO (6 June 2008) for Tentative WHS status, the geosites within the WHS should automatically qualify for National Heritage Status in South Africa.

2.b STATEMENT OF THREAT, VULNERABILITY AND POTENTIAL

All identified rock outcrops occur naturally in the landscape. Each is a non-living and durable natural resource that does not require manufactured protection, except possibly from the impact of human activities. Generally these outcrops have little or no commercial value, other than to geological researchers and collectors. As such they have very limited and fairly predictable VULNERABILITY. Similarly, THREATS to their protection and persistence are limited, and are readily managed by means of the Integrated Management Plan (IMP) set out below (Para 8).

The POTENTIAL of these geosites, and the WHS as a whole, is for them to become a world class scientific and educational resource for ongoing geological research, public education and geo-tourism. The geosites are set in a very attractive natural environment that is highly accessible to visitors. These features, occurring close to several large Protected Areas with abundant wildlife and similarly attractive scenery, provide a sound basis for the development of sustainable tourism. XXX geosites have been identified in the BMML, of which YYY fall within the proposed WHS boundary which has been delineated to enclose at least 60% of all high value geosites. As a basis for this delineation all geosites have been value-graded by experienced senior geologists into, 1) High Priority, 2) Priority, 3) Significant other sites. Grades 1) and 2) are the high value sites that have guided the location of the WHS boundary.

The geological component of this tourism product is somewhat specialized. It occupies the rapidly growing geo-tourism niche that is well developed in the northern hemisphere but is relatively undeveloped in South Africa. This presents exciting opportunities to learn from the northern hemisphere experience, and simultaneously benefit from their development of the global geo-tourism market.

4. SHORT HISTORY

The significance of the Barberton Greenstone Belt (BGB, geological name for the BMML) achieved scientific prominence in 1968/9, when Wits University doctoral candidate Richard Viljoen described a completely new volcanic rock that he called komatiite, named after the nearby Komati River. News of this remarkable discovery spread quickly in geo-science circles and researchers from all around the world began discovering komatiite in Greenstone Belts everywhere. Since then the highly accessible and wonderfully well-preserved BGB has become a mecca for geological researchers who, since then, have published over 3000 scientific papers in refereed journals around the world.

The Theespruit section of the WHS landscape is relatively low profile and undulating compared to most of the Barberton Mountain Land. The distribution of high value geosites occurs almost randomly across the landscape, but is most obvious where parent bedrock is exposed, most often on hillsides and in water-washed river beds. This gentle landscape being more suitable for human habitation, has a long settlement history of being used for livestock grazing and small-scale crop farming, probably for many thousands of years. From its prehistoric through to its current land-use, mainly for livestock grazing, has had little impact on the appearance and accessibility of its geological outcrops. Its brief occupation by white commercial farmers, from the 1920s to the 1970s (although some remain to this day) also relied mainly on livestock grazing on natural veld, has had little or no impact on geosites

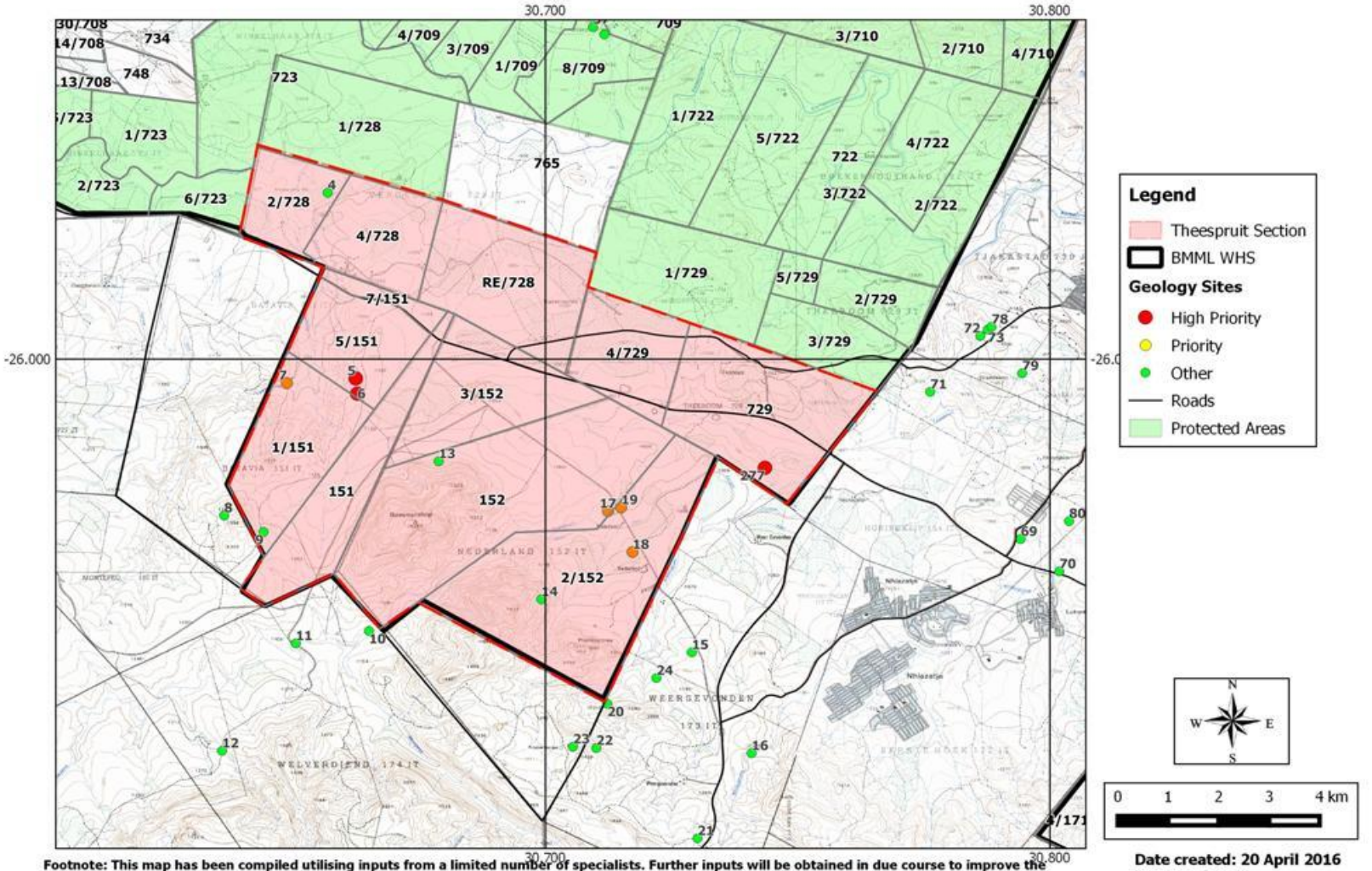
4.a PHYSICAL DESCRIPTION

In this Theespruit locality each geosite is different. The locality contains seven Serial Geosites listed in Table 1 below. They include three High Priority sites, Nos: 5, 6, & 277; and four Priority sites, Nos: 7, 17, 18 & 19. Four other significant geosites occur within the locality but are not considered of sufficient merit for registration as National Heritage. The locations of all geosites within this locality, are shown on the accompanying map below. The location of the Theespruit locality relative to the entire BMML World Heritage Site is provided in the separate overview map at a smaller scale.

Table 1 THEESPRUIT LOCALITY - SEVEN SERIAL GEOSITES			
Site No.	**Grade**	**Geological Description**	**Photo Ref**
5	HP	Large exposure of Migmatites and greenstones (chert, bif, amphibolite, serpentinite-talc schist) wedged between the Stolzburg Pluton on the east and the Badplaas Pluton (west). Exposures NW of gate to old kraal west of track.	5a
6	HP	Migmatite pavements exposed approximately 200m from gate, south of kraal (above).	
277	HP	Theeboom River migmatite exposures - TheTheeboom outcrops are located along a well-exposed river section that cuts across an amphibolite remnant located in the Stolzburg Pluton. The 'zebra stripe' exposures of note are approximately 1.4 km upstream of the bridge.	277a-e
7	P	Inyoni Shear Zone: N-S trending, in riverbed approximately 1 km west of migmatite exposures (above).	7a-b
17	P	Greenstone Xenolith (after Dziggel, 2002) - east of Boesmanskopsyenite pluton and straddling the Theespruit River (near old bridge on the now defunct Badplaas-Lochiel road). Outcrops north of the river show metamorphosed calc-silicate rocks.	
18	P	Oldest sedimentary rocks in the BGB. Greenstone Xenolith (after Dziggel, 2002) south of Theespruit River showing cross-bedding in Sandspruit Formation meta-sandstones (~ 3.5 Ga).	18a-c
19	P	Greenstone Xenolith (after Dziggel, 2002) granite-greenstone migmatite exposures in Theespruit River traverse east of old bridge.	
9	O	Tholeiitic dyke in trondhejmitic gneiss on whaleback granitic platform east of Horseshoe fold structure.	
13	O	Boesmanskop Pluton: coarse-grained syenite exposures on northern and NW rim of the main syenite body.	
14	O	Boesmanskop Pluton: medium-grained syenite on east side of main syenite body (i.e., north of the Theespruit River).	
4	O	Barite prospect shafts in felsic schists (Theespruit Formation) near southwestern end of Barberton greenstone belt.	

DRAFT MAP

Baberton Makhonjwa Mountain Lands World Heritage Site - Theespruit Section



Footnote: This map has been compiled utilising inputs from a limited number of specialists. Further inputs will be obtained in due course to improve the accuracy of the and content of the maps. It should be noted that certain knowledge gaps as well as access to specific sites may limit the accuracy of data portrayed in this map.

Date created: 20 April 2016
Map Version: 1

4.b OWNER ATTITUDES AND CONSULTATION

Engagement & consultation with owners & residents are currently underway. Results so far are entirely positive. Details will be supplied when this process is complete. Where local residents are different from land owners these will be identified in due course. (CCC assumes completion of this activity is not critical to SAHRA's Heritage Grading Process per se, although it will be essential for ultimate registration.)

9. PLANS AND PHOTOS

A selection of reference photographs as indicated in Table 1, will be provided in a separate file as **Appendix 2.**

10. LOCALITY AND MAP

The Theespruit locality includes all or part of the following properties, listed here as recorded in the Deeds Registry. For a map of the locality see above.

Table 2			
Property	**Fm Portion**	**Hectares**	**Title Deed Registered to:**
BATAVIA	151 IT	600.821 ha	Inkalane Communal Property Assoc
BATAVIA	1/151 IT	627.115 ha	Inkalane Communal Property Assoc
BATAVIA	5/151 IT	460.547 ha	Inkalane Communal Property Assoc
BATAVIA	7/151 IT	89.147 ha	Nkomazi Property Pty Ltd
NEDERLAND	152 IT	1615.789 ha	SA Government
NEDERLAND	2/152 IT	1429.039 ha	Mswati Communal Property Assoc
NEDERLAND	3/152 IT	665.094 ha	Inkalane Communal Property Assoc
VERGELEGEN	RE/728 JT	798.038 ha	Mashoba Community Trust
VERGELEGEN	2/728 JT	337.522 ha	Nkomazi Property Pty Ltd
VERGELEGEN	4/728 JT	483.050 ha	Nkomazi Property Pty Ltd
THEEBOOM	729 JT	940.713 ha	Andries Stephanus Du Plessis
THEEBOOM	4/729 JT	473.691 ha	Nkomazi Game Reserve Pty Ltd

11. EXPERT ENDORSEMENT

We have several such endorsements from senior geologists for the WHS planning region as a whole. **Do these need to be more formalized (i.e. signed documents?)**

12. INTEGRATED CONSERVATION AND MANAGEMENT PLAN (ICMP)

The identified geosites in this locality of the BGB are all naturally-occurring hard rock outcrops. Some are exposed by excavation. The vast majority present durable, naturally resistant surfaces, that have negligible rates of erosion or natural attrition. These geosites are naturally self-protecting. Such surfaces need only to be protected from human-induced physical damage and from activities that obscure them from view or interfere with legitimate human access.

These circumstances indicate that the only management and maintenance needed to protect geosites from harm will be to prevent those human activities that damage or obscure them. These activities include:

- Building with masonry;
- Mining, blasting, excavation and dumping (includes quarrying);

- Permanent impoundment or flooding;
- Road-making and extensive ground leveling; and
- Any damaging, defacement or painting of outcrops.

In addition to the need for protection from these obvious negative impacts, the activities of geologists, researchers and rock collectors will have to be controlled and/or supervised. This will ultimately be controlled by means of a permitting system for all collecting and for any research activity that requires collection of rock specimens.

The use of the BGB geosites in their natural settings as outdoor education facilities is arguably their most important value. Set in their diverse natural landscapes with multiple land-uses and socio-economic and cultural settings, makes for many richly textured narratives about science and history, culture and economics, evolution and religion. Specialized guiding and well-crafted interpretive material must be developed to get the rocks to tell their story. Building a sense of ownership and knowing among children instills pride; visitor interest builds tourism that will attract investment and ultimately create jobs.

9. **DESCRIPTION OF THE ASSETS:** THEIR LOCATION AND VALUE (as described in # 4a. above)

See above – especially Paras 4.a and 4.b. The assets in the Theespruit locality are described in Tables 1 and 2 and the map, together providing location, size, ownership and an indication of scientific value.

10. **PURPOSE AND VISION** FOR GEOSITE PROTECTION (identical for all components of BMML WHS)

The **purpose** of protecting these geosites is to safeguard their globally significant scientific and educational values, and to arrange for and provide access to them by the public. Once protected, the information content and educational value of these rocks will be presented and interpreted for easy understanding by all, especially local residents and visitors.

The **vision** involved in protecting and publicizing these sites is to maximize their combined scientific and educational value for all humanity, and through creative development of this specialized niche in the tourism market, to benefit local residents with a tourism-linked source of sustainable income.

11. **HOW TO MANAGE THE ASSETS FOR VISITORS**: VULNERABILITIES AND THREATS

The rock outcrops involved at all the listed geosites in the Theespruit locality are naturally occurring exposures of resistant bedrock that are inanimate. As such they are self-protecting, requiring only prevention of damage, defacement or concealment by human agency. They have little commercial value at present, so the most likely sources of damage and defacement are:

- Rock collectors, researchers and geologists;
- Construction: building of roads, housing and other developments;
- Mining, excavation, quarrying and land-fill;
- Impoundment with flooding;
- Defacement or painting the rock surfaces.

All these activities must be actively controlled, and most importantly at all identified and displayed geosites. Local development agencies and residents need to be made aware of these restrictions and where appropriate, they should be asked to sign agreements to that effect. In practice, these constraints will impose minimal inconvenience or costs on land-owners or residents. As pre-conditions for protection under the National Heritage Resources Act of 1999, they should therefore be readily acceptable by local people, and be

straightforward to ensure compliance by whatever administrative structures and development agencies are involved.

For larger scale developments involving infrastructure (roads; urban expansion; some forms of agriculture), the location of all geosites must be made known to the relevant municipalities and included in their LED/IDP documents. All development agencies should be alerted to these sensitivities and developers informed to avoid accidental damage. The most clearly identified threat known at present is from those who wish to collect (and therefore deface) rocks for whatever reason. Professional associations such as Geological Society of SA and relevant special-interest groups (gem and rock collecting clubs) should be alerted to avoid and prevent abuse. Local community members resident near identified geosites must be similarly alerted to these sensitivities.

12. **MAXIMIZING SUSTAINABLE BENEFITS**: AWARENESS OF VALUES AND OPPORTUNITIES

Most obvious benefits to local residents will depend on developing sustainable tourism and outdoor education programs. The former will depend on partnerships between state tourism agencies, tourism business operators and the support and co-operation of local residents. Participants in these partnerships must where possible, maximize the options for local employment and informal income generation, including a strong training component. As geotourism is currently a specialized tourism niche-market, initial goals should be conservative. The need for specialized marketing must be accepted as a pre-requisite.

The WHS Management Agency will have the responsibility for developing the interpretive material that makes the scientific value of these rocks understandable, both by local and foreign visitors and by local people with limited formal education. Reaching each of these three distinct educational targets will require its own interpretative style, level of detail and language for each very different audience; although all will be based on the same scientific information. This will be a specialized task for interpretive educational professionals.

In this setting, tourism-related employment can be both formal and informal. Formal employment will require some measure of appropriate training and/or experience, provided mainly by private sector tourism businesses. Informal employment can be encouraged by public agencies and training programs but will ultimately depend on the entrepreneurial spirit of local residents living close to the more popular geosites. In creating awareness among these local residents, their contribution to growing and sustaining tourism to the area will be important in many ways, e.g.:

- Welcoming and encouraging visitors so that they feel expected and safe on site;
- Learn about the rocks and their stories, sufficient to become local guides to inform visitors and develop pride of ownership;
- As tourism grows, develop products and services that visitors will be happy to pay for.

13. **MONITORING** OF PROTECTION AND MANAGEMENT ACTIVITIES

Activities from which all geosites require protection are listed in 11.) above. Three agencies will be separately and jointly responsible for different aspects of whatever protection is afforded:

4) At a municipal planning level, the Municipal Manager, as advised by the municipality's Town Planning division and its LED and IDP documents. These documents (and officials) will be responsible for recording the location of geosites and prohibiting any construction or other development that will damage or obscure them from public view and/or prevent or obstruct public access to them.
5) The traditional leadership in communal areas will be asked to recognize in writing the occurrence of local geosites and where possible will support their protection and encourage open access to them by the public, including local teachers in particular.

6) The WHS Management Agency will be the authority ultimately responsible for publicizing the value and location of geosites, and for obtaining the support of all I&APs to ensure their protection and accessibility to visitors, especially geological professionals and school children. This agency will in particular be responsible for reporting on the effectiveness of geosite protection and visitor use of these sites, routinely in their Annual Reports.

Management of all the assets of the BMML WHS and all activities related to tourism and education, will be the responsibility of its Management Agency. This function is not yet commissioned, but its responsibilities will be expected to include:

g) Marketing the BMML WHS and its geosites, to generate visitor interest and tourism investment;
h) Developing geosites and their access as needed, and negotiating for access with land-owners/local residents and defining their role in encouraging and informing visitors;
i) Promoting co-operation between I&APs to help visitor access to be a pleasant, informative and safe experience;
j) Developing interpretive material aimed at improving visitors' understanding of Earth's history and the evolution of the earliest biosphere as contained in the rocks at each geosite, both individually and as an integrated whole;
k) Developing school-orientated outdoor education programmes based on the geological and wider ecological features of the BMML and its geosites;
l) Monitoring of issues relating to visitor access and public understanding resulting from the interpretive material provided, in order to continuously revise and improve them.

14. **COSTS AND BENEFITS** TO LOCAL PEOPLE

A program of monitoring the costs and benefits experienced by local communities will be instituted by the WHS Management Agency. This will focus on understanding and positively influencing the attitudes of local residents towards the costs of the imposed constraints compared to the benefits of tourism business and employment. Monitoring these attitudes, and how they change both positively and negatively, will be an important responsibility of the WHS Management Agency.

Benefits to local people will similarly be encouraged by promoting tourism and tourism business development that together, create sustainable employment. Tourism promotional activities will vary from large-scale infrastructure development, such as roads and resorts, to small-scale tourism product-owning and service-providing businesses. In keeping with the nature of this niche-market in tourism, these promotional activities should be approached with caution and prioritized by indicators of demand.

The outcome of these management and monitoring activities will be presented annually in the WHS Management Authority's routine reports.

NB:: Completion of the Stakeholder Engagement programme will identify the people and activities to be monitored and how the costs and benefits to these people will be measured and / or estimated. Most importantly, this analysis must provide the insight to encourage and manage sustainable economic activity that is a benefit derived directly or indirectly from achieving WHS status. Benefits may be tangible (income) or intangible (education and pride-of-ownership or association).

APPENDIX 2
(Geosite Photos and other graphics)

tf/7 May, 2016

Form 601 /v2
June 2011

Official Use
File Ref:.....
Site Ref:.....
Grade 1:.....
Committee Date:.....

an agency of the
Department of Arts and Culture

111 Harrington Street
Cape Town, 8001
Tel: 021 4624502 Fax: 021 4624509 E-mail: info@sahra.org.za
Web Page: www.SAHRA.org.za

National Heritage Site Nomination Form

This form precedes the submission of the 'Nomination Document' and is designed to assist with the grading of heritage resources in terms Section 3(3) of the National Heritage Resources Act, as part of the process of declaration as a National Heritage Site (Section 27). Nominated heritage resources that are of special national significance will be graded as Grade 1 and considered for National Heritage Site status.

A. Proposed National Heritage Site:...BMML World Heritage Site, Tjakastadt section

B. Brief Statement of Significance: *(A full statement of significance is required as an attachment)*

.....

The Barberton Makhonjwa Mountain Land (BMML) contains the oldest well-preserved sequence of volcanic and sedimentary rocks on Earth. These highly accessible Archaean outcrops present a continuous 350 million year geological sequence, from 3 600 million years ago. The physical and chemical characteristics of these rocks are so remarkably well preserved that they provide a globally unparalleled history of the early Earth. In particular, they provide unique evidence of the formation of the earliest oceanic and continental crusts and of the initial phase of the evolution of our biosphere. The Barberton Makhonjwa Geotrail is the principal geoheritage product within the BMML. It was planned and developed in 2012/13, and opened on 30 April 2014. With its attractive and informative roadside panels, built into vehicle laybyes on the 37km road between Barberton and the Swazi border at Bulembu, it is the only geotourism product of its kind in South Africa and probably similarly unique to the continent as a whole. *(For more detail per geosite see Appx #4.a on pg 6)*

.....

C. Proposed By: BATOBIC, Barberton ..... Date Proposed: ... June /2006

(4/May/2006 – the first WHS planning meeting between Barberton Business Chamber, SAHRA, MTPA, et.al.)...

Contact Details: ... Rekwele Mmatli, BATOBIC Director, ...(Rekwele@batobic.co.za) ... 013 712 6490.....

D. Name of Property: BMML World Heritage Site - Tjakastadt section

Street Number and Street:.....N/A ..... **Suburb**.....N/A .....

Town:...Badplaas / Tjakastadt .....**District**:... Albert Luthuli, Mpumalanga .....

E. Cadastral Information

Erf/ Farm Number:.....see # 9. DESCRIPTION OF THE ASSETS below.....

Registration Division:..... 3 properties in JT, Theespruit in IT.....

Map Ref: 1 / 50 000 series, "Nelshoogte - 2530 DD"... **Recording Method**: Written & mapped GIS locs.

F. Type of Resource

Place × - no
Structure × - no
Archaeological Site × - no
Palaeontological Site × - no
Geological Feature ✓ - Yes, **thirteen (13) serial geological features**
Grave × - no
Do moveable objects relating to the site form part of the Nomination? × - no
Serial nomination (> one site nominated as part of a 'Joint Nomination'?) ✓ – 12 geosites

(For serial nominations, complete one form for each site, supply additional details about the information relating to the relation of the sites, and the management and phasing of proposed nomination be attached).

G. Sphere of Significance

	High	Med	Low
International	✓Yes	☐	☐ (All Nationally significant sites are
National	✓ Yes	☐	☐ also significant at all other levels,
Provincial	✓ Yes	☐	☐ including International)
Regional	✓ Yes	☐	☐
Local	✓ Yes	☐	☐
Specialist group or community	✓ Yes	☐	☐(Geology interest groups and learners)

H. What other similar sites may be compared to the site? How does the site compare to these sites?

There are no other comparable sites or localities in SA .....
(Please expand on separate sheet)

I. Owner:

Officially State Land. Communal ownership to be confirmed & elaborated when known.
(If state-owned; responsible department and official position of contact)

Postal Address:... .....

Telephone:... .....**Fax:** .....**Cell:** ... .

E-Mail: .... **Web Page:** ...N/A .....

Contact Person: *(If different from above. Please supply contact details)* ....
.....

- ☐ **1*** Expanded statement of significance; *(Refer specifically to significance criteria listed below)*
- ☐ **2*** Motivation for declaration as a National Heritage Site, including potential heritage value, threats and vulnerabilities;
- ☐ **3*** Short history of the place;
- ☐ **4*** Physical description of the heritage resource;
- ☐ **5*** Locality plan (map) and Site Plan;
- ☐ **6*** Photographs and plans;
- ☐ ** List of moveable objects relating to site that are proposed as part of nomination, or for archaeological or palaeontological site ;list of repositories where these are housed;
- ☐ ** Bibliography of documentation relating to the heritage resource;
- ☐ ** Statement of current protections and restrictions (e.g. previous national monument; register of immoveable property; conservation area; current zoning; servitudes);
- ☐ ** List any heritage organizations consulted and their comments on the proposed nomination.
- ☐ *** Site plan (with proposed site boundaries);
- ☐ *** Conservation or management plans (send immediately if any exist);
- ☐ *** Heritage Agreement (if required).

(Please supply those marked (*) with this nomination form, as well as any others that are already available. Those marked (**) will be requested when the proposal first goes to SAHRA Council for endorsement (Tentative List of National Heritage Sites). Those marked (***) will be required when the Nomination goes to the following Council Meeting for approval as a National Heritage Site). All information submitted to SAHRA will remain with SAHRA.

Type of Significance

[Comments below relate to all geosites in the BMML WHS. Each site, and the landscape as a whole, contribute in part to the overall Outstanding Universal Value of the BMML WHS.]

	Indicate with a tick	*Comment where appropriate. Indicate sphere of significance: i.e. National, Provincial, Local and degree of significance: i.e. High, Mediumor Low.*

21. Historical Value ✓

a. It is important in the community, or pattern of history

i.	Importance in the evolution of cultural landscapes and settlement patterns	☑
ii.	Importance in exhibiting density, richness or diversity of cultural features illustrating the human occupation and evolution of the nation, Province, region or locality.	☐
iii.	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.	☐
iv.	Importance as an example for technical, creative, design or artistic excellence, innovation or achievement in a particular period	☐

b. It has strong or special association with the life or work of a person, group or organisation of importance in history

i.	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.	☐

c. It has significance relating to the history of slavery

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

Each geosite has little or no historical value in human terms due to their extreme age. The geology as a whole has historic significance as related in the Appendix.

22. Aesthetic Value N/A

a. It is important in exhibiting particular aesthetic characteristics valued by a community or cultural group

i.	Importance to a community for aesthetic characteristics held in high esteem or otherwise valued by the community.	☐
ii.	Importance for its creative, design or artistic excellence, innovation or achievement.	☐
iii.	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.	☐
iv.	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.	☐

23. Scientific Value ✓

a. It has potential to yield information that will contribute to an understanding of natural or cultural heritage

i.	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.	☑

YES – site of oldest physical record of the evolution of the present earth's crust and biosphere, of value for research, education and tourism46

ii.	Importance for information contributing to a wider understanding of the origin of the universe or of the development of the earth.	☑	YES – as above
iii.	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.	☑	YES – location of the earliest known evidence of life on earth that is visible to the naked eye.
iv.	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.	☐	
b.	**It is important in demonstrating a high degree of creative or technical achievement at a particular period**		
i.	Importance for its technical innovation or achievement.	☐	

24. Social Value **N/A**

a.	**It has strong or special association with a particular community or cultural group for social, cultural or spiritual reasons**		
i.	Importance as a place highly valued by a community or cultural group for reasons of social, cultural, religious, spiritual, symbolic, aesthetic or educational associations.	☐	
ii.	Importance in contributing to a community's sense of place.	☐	

Degrees of Significance

25. Rarity: ✓

a.	**It possesses uncommon, rare or endangered aspects of natural or cultural heritage**		
i.	Importance for rare, endangered or uncommon structures, landscapes or phenomena.	☑	YES - Such well-preserved and diverse rock types of great age (3.6 – 3.15 billion years) do not exist anywhere, let alone in such an accessible location.
ii.	Importance in demonstrating a distinctive way of life, custom, process, land-use, function or design no longer practiced in, or in danger of being lost from, or of exceptional interest to the nation, Province, region or locality.	☐	

26. Representivity: **N/A**

a.	**It is important in demonstrating the principal characteristics of a particular class of natural or cultural places or objects**		
i.	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.	☐	
ii.	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.	☐	

Signature:..... Rekwele Mmatli (for Batobic) **Date**:.....

APPENDIX 1 (as per SAHRA Grading and Declaration processes chart, 2015)

4. EXPANDED STATEMENT OF SIGNIFICANCE

The Barberton-Makhonjwa Mountain Land (BMML), situated in south-eastern Mpumalanga, contains the oldest well preserved sequence of volcanic and sedimentary rocks on Earth. These highly accessible Archaean outcrops present a continuous 350 million year sequence of rocks, from 3 600 million years BP. The physical and chemical characteristics of these rocks are so remarkably well preserved that they provide an unparalleled history of the early Earth. In particular, they provide unique evidence of the formation of the earliest oceanic and continental crusts and the evolution of ancient oceans and the atmosphere.

BMML is South Africa's largest and most scientifically well-researched and important Greenstone Belt. Its sequence of rock types display great geodiversity and most outcrops are very easy to access. Together they illustrate spectacularly some of the earliest tectonic events and formative processes of Earth's measurable history, including valuable clues as to the origin of life itself. The outstanding value of these rocks lies in the large number of sites and high quality features that, when combined, provide a unique and as yet only partially explored scientific resource. Their value for education and tourism, both leading to community benefits, have great potential.

The scientific geological value of these sites and of the BMML WHS as a whole, represent the globally Outstanding Universal Values of the area justifying WHS status. But there are also National and Provincial heritage values inherent in the historic settlement patterns of the region. The Makhonjwa Mountains have long marked the limits of Swazi influence during the so called *Difacane* conflicts among the Nguni people and their neighbours and later dominance struggles within Swaziland itself. These temporary power-driven population movements slowed and eventually halted with the advent of colonial settlers and firearms. These patterns had become virtually static by the time gold was discovered near Barberton in the 1880s. The mining that resulted announced the beginning of the industrial era in South Africa the start of a whole new pattern of economically driven migration that continues to this day.

The Tjakastadt locality with its twelve serial geosites, includes some of the most iconic and important Geosites in the entire BGB. It is the location of the original description of komatiite, and the epicenter of the geological research that followed. This is where our learning about the early earth and the evolution of the biosphere started. It is the "Genesis Patch" that includes:

- The original type-locality for the discovery of komatiite in 1968;
- Several examples of komatiitic lava flows, pillow lavas, ocelli, spinnifex olivine crystals and their related processes;
- High quality outcrops of Buck Reef Chert on the northern ridges, the fossilized environment for the genesis of life itself;
- Traces of the earliest recordable meteorite impacts in spherule layers repeated globally;
- Exposures of the 'Middle Marker", some of the earth's first sediments separating earlier igneous deposits from later chemical and particulate sediments.

2.a MOTIVATION

The identified outcrops form part of the BMML WHS which has acknowledged Outstanding Universal Value in terms of UNESCO's guidelines for a Category (viii)World Heritage Site, viz:

"... be outstanding examples representing major stages of earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features;"

By reason of the acceptance by UNESCO (6 June 2008) for Tentative WHS status, the geosites within the WHS should automatically qualify for National Heritage Status in South Africa.

2.b STATEMENT OF THREAT, VULNERABILITY AND POTENTIAL

All identified rock outcrops occur naturally in the landscape. Each is a non-living and durable natural resource that does not require manufactured protection, except possibly from the impact of human activities. Generally these outcrops have little or no commercial value, other than to geological researchers and collectors. As such they have very limited and fairly predictable VULNERABILITY. Similarly, THREATS to their protection and persistence are limited, and are readily managed by means of the Integrated Management Plan (IMP) set out below.

The POTENTIAL of these geosites, and the WHS as a whole, is for them to become a world class scientific and educational resource for ongoing geological research, public education and geo-tourism. The geosites are set in a very attractive natural environment that is highly accessible to visitors. These features, occurring close to several large Protected Areas with abundant wildlife and very attractive scenery, provide a sound basis for the development of sustainable tourism. XXX geosites have been identified in the BMML, of which YYY fall within the proposed WHS boundary which has been delineated to enclose at least 60% of all high value geosites. As a basis for this delineation all geosites have been value-graded by experienced senior geologists into, 1) High Priority, 2) Priority, 3) Significant other sites. Grades 1) and 2) are the high value sites that have guided the location of the WHS boundary.

The geological component of this tourism product is somewhat specialized. It occupies the rapidly growing geo-tourism niche that is well developed in the northern hemisphere but is relatively undeveloped in South Africa. This presents exciting opportunities to learn from the northern hemisphere experience, and simultaneously benefit from their development of the global geo-tourism market.

5. SHORT HISTORY

The significance of the Barberton Greenstone Belt (BGB, geological name for the BMML) achieved scientific prominence in 1968/9, when Wits University doctoral candidate Richard Viljoen described a completely new volcanic rock that he called komatiite, named after the nearby Komati River. News of this remarkable discovery spread quickly in geo-science circles and researchers from all around the world began discovering komatiite in Greenstone Belts everywhere. Since then the highly accessible and wonderfully well-preserved BGB has become a mecca for geological researchers who, since then, have published over 3000 scientific papers in refereed journals around the world.

The landscape is mountainous in the north of the Tjakastadt section, where it includes the steep southern slopes of the Makhonjwa Mountains. The Komati River forms the southern boundary, with steep, north-south ridge-and-valley connections between the two. It is on these slopes and in these streambeds that some of the most iconic geosites in the BMML occur. The highlands attracted timber growing; the lowlands are suitable for farming. Nature conservation fitted in where land was largely unoccupied for many years, and mining looked for paying outcrops everywhere. For most of its land-use history, this area was used for extensive livestock grazing, hunting and some cultivation close to river-lines. None of these land uses, even in modern times has had much impact on the appearance and accessibility of geological outcrops in this section of the WHS.

4.a PHYSICAL DESCRIPTION

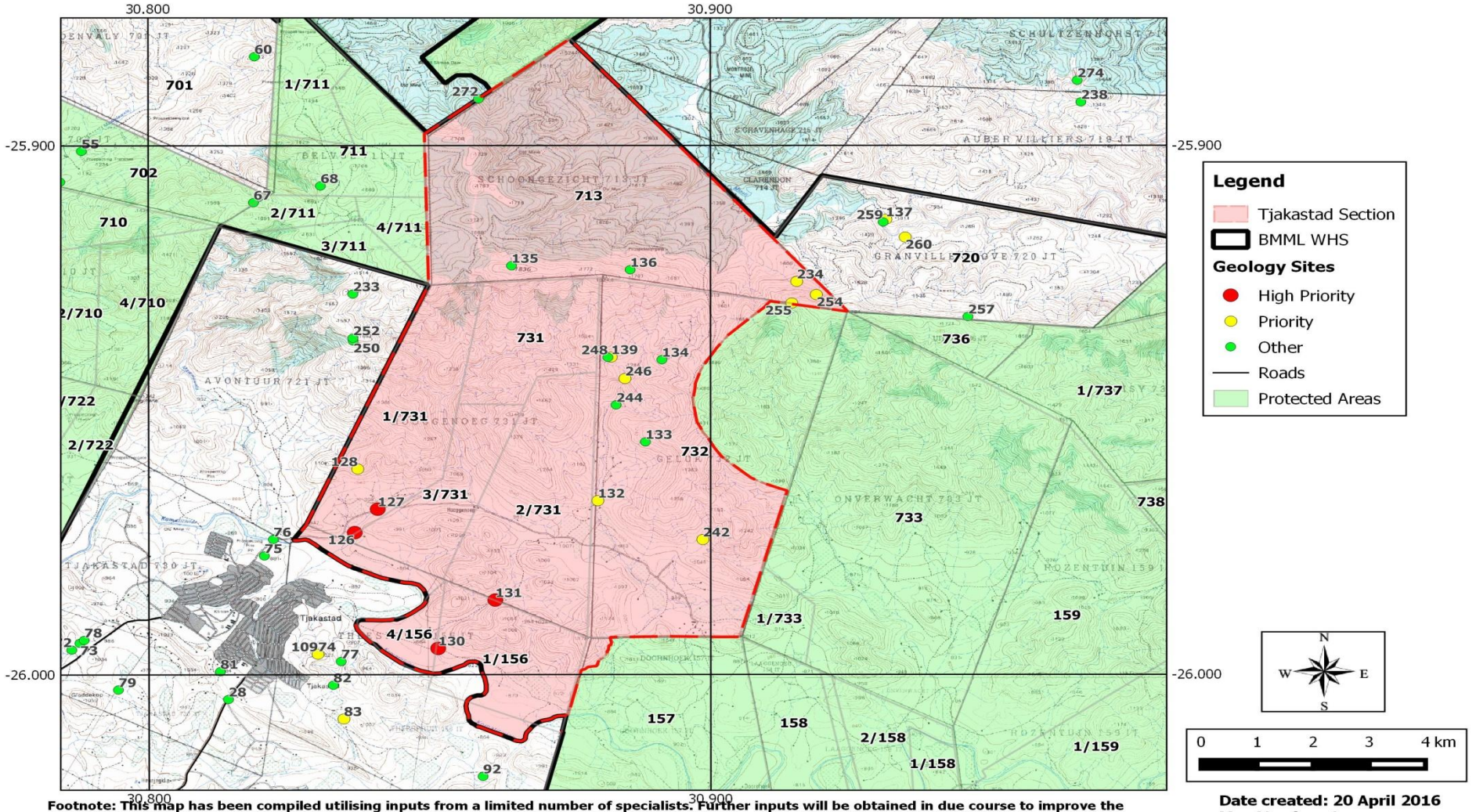
In this Tjakastad locality each geosite is different and several are continuous, occurring as linked strings of important geological outcrops. These elongate geosites typically follow stream beds and are registered only at the upstream and downstream limits of the larger geological feature. The locality contains thirteen Serial Geosites listed in Table 1 below. They include five High Priority sites Nos: 126, 127, 283, 130, 131; and eight Priority sites, Nos: 234, 254, 255, 139, 246, 132, 128, 242. Six other significant geosites occur within the locality but are not considered of sufficient merit for registration as National Heritage. The locations of all geosites within this locality, are shown on the accompanying map below. The location of the Tjakastad locality relative to the entire BMML World Heritage Site, is provided in the separate overview map at a smaller scale.

Table 1 TJAKASTAD LOCALITY - Thirteen serial geosites			
Site No.	**Grade**	**Geological Description**	**Photo Ref**
126	HP	Komati Formation: Type locality, river traverse in Hoogenoeg stream north of Komati R. Several geosites of komatiite flows, pillow lavas & related outcrops through the west limb of the Onverwacht Anticline. River section: southern-most point.	126a
127	HP	Komati Formation: Type locality river traverse in Hoogenoeg stream north of Komati R. Several geosites of komatiite flows, pillow lavas & related outcrops through the west limb of the Onverwacht Anticline. River section: northern-most point.	
130	HP	Komati Formation: Type Locality, classic exposures along Spinifex Stream showing various features of the komatiite and komatiitic basalt succession forming the main rock types of the Komati Formation (South of section).	
131	HP	Komati Formation: Type Locality, classic exposures along Spinifex Stream showing various features of the komatiite and komatiitic basalt succession forming the main rock types of the Komati Formation (North of Section).	
283	HP	200m west of road and north of nearby river traverse (nos 126 and 127). Prominent, and possibly best example of the "spinifex texture in Komatiitic rocks", outcrop showing long bladed pyroxene spinifex-textured komatiitic basalts. map	283a-c
128	P	Middle Marker (Komati Formation) in old gold prospect and waste dump (cf Site 242), with silicified ash and carbonaceous sediment unit on hillside north of road into Onverwacht Group type locality.	
132	P	Hooggenoeg Formation: Pillowed tholeiitic basalts with spherules and ocelli structures in bed of south flowing stream. Point marks the north end of a traverse, cf point 133.	
139	P	Spherule Beds (Spherule Bed S1) ca.3470 million year old meteorite impact spherules in the upper part of the Hooggenoeg Formation.	
234	P	Ironstone pods and large landslide features show portions of the upper Msauli Valley filled withlandslidedeposits, suggesting substantially different climate in recent past.	

242	P	Middle Marker,cf Site 128 (Komati Formation:perhaps the best, readily accessible section of the relatively unmetamorphosed sedimentary unit in the BGB(and one of the oldest on Earth).	
246	P	Type section of the second major chert unit in the Hooggenoeg Formation. Unlike most other chert units, this contains abundant carbonate minerals.	
254	P	Buck Reef Chert - This section of the Buck Reef Chert has yielded information on early microbial life, its ecology, and the environments within which it lived.	
255	P	Buck Reef Chertevaporite section on west limb. Section of the evaporitic member of the Buck Reef Chert. These are the oldest known evaporites that formed in small basins early during the deposition of the Buck Reef Chert.	
133	O	Hooggenoeg Formation – Traverse northwards along south-flowing stream from Middle Marker to upper parts of the Hooggenoeg Formation. A variety of excellent stops. Point marks the south end of traverse (cf point 132).	
134	O	Hooggenoeg Formation: Traverse northwards along south-flowing stream from Middle Marker to upper parts of the Hooggenoeg Formation. A variety of excellent stops. Point marks the north end of traverse	
135	O	Buck ReefChert. Upper part of the Hooggenoeg Formation, Onverwacht Group, forming a massive ridge. West- most outcrop.	
136	O	Buck ReefChert. Upper part of the Hooggenoeg Formation, Onverwacht Group, forming a massive ridge. East-most outcrop.	
244	O	Type section of the second major chert unit in the Hooggenoeg Formation. Unlike most other chert units, this contains abundant carbonate minerals (S section).	
248	O	Type section of the second major chert unit in the Hooggenoeg Formation. (N section).	

DRAFT MAP

Baberton Makhonjwa Mountain Lands World Heritage Site - Tjakastadt Section



Footnote: This map has been compiled utilising inputs from a limited number of specialists. Further inputs will be obtained in due course to improve the accuracy of the and content of the maps. It should be noted that certain knowledge gaps as well as access to specific sites may limit the accuracy of data portrayed in this map.

Date created: 20 April 2016
Map Version: 1

4.b OWNER ATTITUDES AND CONSULTATION

Communally occupied land; currently being confirmed and detailed through formal Stakeholder Engagement.

13. PLANS AND PHOTOS

A selection of photographs with some graphic/diagramatic detail will be provided for the more accessible and valuable geosites.

14. LOCALITY AND MAP

The Tjakastadt locality includes all or part of the properties listed below in Table 2, as recorded in the Deeds Registry. For a map of the locality see above.

Table 2			
Property	Registration code	Hectares	Title deed Registered to:
Geluk	732 JT		State Property
Hooggenoeg	731 JT		State Property
Theespruit	156 IT		State Property
Schoongezicht	713 JT		Sappi Manufacturing Pty. Ltd.

The first three properties above are registered as **State Owned,** which is probably the result of the enormous backlog at the Deeds Office. Stakeholder engagement is currently involved in finding out what the land tenure situation is on the ground, and will report its findings in due course. It is anticipated that this lack of detail will not hold up the grading process, as it has no effect on the merits of each geosite or the geological landscape. The northern most property, Schoongezicht, is owned by Sappi and used for timber production.

15. EXPERT ENDORSEMENT

We already have several such endorsements. Do these need to be more formalized (i.e. signed documents??)

16. INTEGRATED CONSERVATION AND MANAGEMENT PLAN (ICMP)

The identified geosites in this locality of the BGB are all naturally-occurring hard rock outcrops. Some are exposed by excavation. The vast majority present durable, naturally resistant surfaces, that have negligible rates of erosion or natural attrition. These geosites are naturally self-protecting. Such surfaces need only to be protected from human-induced physical damage and from activities that obscure them from view or interfere with legitimate human access.

These circumstances indicate that the only management and maintenance needed to protect geosites from harm will be to prevent those human activities that damage or obscure them. These activities include:

- Building with masonry;
- Mining, blasting, excavation and dumping (includes quarrying);
- Permanent impoundment or flooding;
- Road-making and extensive ground leveling; and
- Any damaging, defacement or painting of outcrops.

In addition to the need for protection from these obvious negative impacts, the activities of geologists, researchers and rock collectors will have to be controlled and/or supervised. This will ultimately be controlled by means of a permitting system for all collecting and for any research activity that requires collection of rock specimens.

The use of the BGB geosites in their natural settings as outdoor education facilities is arguably their most important value. Set in their diverse natural landscapes with multiple land-uses and socio-economic and

cultural settings, makes for many richly textured narratives about science and history, culture and economics, evolution and religion. Specialized guiding and well-crafted interpretive material must be developed to get the rocks to tell their story. Building a sense of ownership and knowing among children instills pride; visitor interest builds tourism that will attract investment and ultimately create jobs.

9. **DESCRIPTION OF THE ASSETS:** THEIR LOCATION AND VALUE

This locality north of the Komati river, comprises mostly the Tjakastad communal land encompassing all or part of the farms, Hooggenoeg 731 JT; Geluk 732 JT and Theespruit 156 IT. These are occupied and managed as small farms and grazing land by local community members. The farm Schoongezicht 713 JT on the high ground to the north, is owned by Sappi and operated as a timber plantation. The locality as a whole includes five High Priority and seven Priority geosites, as listed in the attached Table 1 and Map.

These sites are assessed as having exceptional scientific value in terms of the BMML WHS. The land on which they occur is registered as still belonging to National Government but has been occupied by community members for many years under traditional land tenure arrangements. The process of actual land tenure registration will be investigated by the Stakeholder Engagement process currently underway; details will be incorporated into this document in due course. Whatever the residents' legal status their situation requires appropriate respect from visitors for their land rights, together with common-sense awareness of local custom and security needs.

10. **PURPOSE AND VISION** FOR GEOSITE PROTECTION (identical for all components of BMML WHS)

The **purpose** of protecting these geosites is to safeguard their globally significant scientific and educational values, and to arrange for and provide access to them by the public. Once protected, the information content and educational value of these rocks will be presented and interpreted for easy understanding by all, especially local residents and visitors.

The **vision** involved in protecting and publicizing these sites is to maximize their combined scientific and educational value for all humanity, and through creative development of this specialized niche in the tourism market, to benefit local residents with a tourism-linked source of sustainable income.

11. **HOW TO MANAGE THE ASSETS FOR VISITORS**: VULNERABILITIES AND THREATS

The rock outcrops involved at all the listed geosites in the Tjakastadt locality are naturally occurring exposures of resistant bedrock that are inanimate. As such they are self-protecting, requiring only prevention of damage, defacement or concealment by human agency. They have little commercial value at present, so the most likely sources of damage and defacement are:

- Rock collectors, researchers and geologists;
- Construction: building of roads, housing and other developments;
- Mining, excavation, quarrying and land-fill;
- Impoundment with flooding;
- Defacement or painting the rock surfaces.

All these activities must be actively controlled, and most importantly at all identified and displayed geosites. Local development agencies and residents need to be made aware of these restrictions and where appropriate, they should be asked to sign agreements to that effect. In practice, these constraints will impose minimal inconvenience or costs on land-owners or residents. As pre-conditions for protection under the National Heritage Resources Act of 1999, they should therefore be readily acceptable by local people, and be straightforward to ensure compliance by whatever administrative structures and development agencies are involved.

For larger scale developments involving infrastructure (roads; urban expansion; some forms of agriculture), the location of all geosites must be made known to the relevant municipalities and included in their LED/IDP

documents. All development agencies should be alerted to these sensitivities and developers informed to avoid accidental damage. The most clearly identified threat known at present is from those who wish to collect (and therefore deface) rocks for whatever reason. Professional associations such as Geological Society of SA and relevant special-interest groups (gem and rock collecting clubs) should be alerted to avoid and prevent abuse. Local community members resident near identified geosites must be similarly alerted to these sensitivities.

12. **MAXIMIZING SUSTAINABLE BENEFITS**: AWARENESS OF VALUES AND OPPORTUNITIES

Most obvious benefits to local residents will depend on developing sustainable tourism and outdoor education programs. The former will depend on partnerships between state tourism agencies, tourism business operators and the support and co-operation of local residents. Participants in these partnerships must where possible, maximize the options for local employment and informal income generation, including a strong training component. As geotourism is currently a specialized tourism niche-market, initial goals should be conservative. The need for specialized marketing must be accepted as a pre-requisite.

The WHS Management Agency will have the responsibility for developing the interpretive material that makes the scientific value of these rocks understandable, both by local and foreign visitors and by local people with limited formal education. Reaching each of these three distinct educational targets will require its own interpretative style, level of detail and language for each very different audience; although all will be based on the same scientific information. This will be a specialized task for interpretive educational professionals.

In this setting, tourism-related employment can be both formal and informal. Formal employment will require some measure of appropriate training and/or experience, provided mainly by private sector tourism businesses. Informal employment can be encouraged by public agencies and training programs but will ultimately depend on the entrepreneurial spirit of local residents living close to the more popular geosites. In creating awareness among these local residents, their contribution to growing and sustaining tourism to the area will be important in many ways, e.g.:

- Welcoming and encouraging visitors so that they feel expected and safe on site;
- Learn about the rocks and their stories, sufficient to become local guides to inform visitors and develop pride of ownership;
- As tourism grows, develop products and services that visitors will be happy to pay for.

13. **MONITORING** OF PROTECTION AND MANAGEMENT ACTIVITIES

Activities from which all geosites require protection are listed in 11.) above. Three agencies will be separately and jointly responsible for different aspects of whatever protection is afforded:

7) At a municipal planning level, the Municipal Manager, as advised by the municipality's Town Planning division and its LED and IDP documents. These documents (and officials) will be responsible for recording the location of geosites and prohibiting any construction or other development that will damage or obscure them from public view and/or prevent or obstruct public access to them.
8) The traditional leadership in communal areas will be asked to recognize in writing the occurrence of local geosites and where possible will support their protection and encourage open access to them by the public, including local teachers in particular.
9) The WHS Management Agency will be the authority ultimately responsible for publicizing the value and location of geosites, and for obtaining the support of all I&APs to ensure their protection and accessibility to visitors, especially geological professionals and school children. This agency will in particular be responsible for reporting on the effectiveness of geosite protection and visitor use of these sites, routinely in their Annual Reports.

Management of all the assets of the BMML WHS and all activities related to tourism and education, will be the responsibility of its Management Agency. This function is not yet commissioned, but its responsibilities will be expected to include:

m) Marketing the BMML WHS and its geosites, to generate visitor interest and tourism investment;
n) Developing geosites and their access as needed, and negotiating for access with land-owners/local residents and defining their role in encouraging and informing visitors;

o) Promoting co-operation between I&APs to help visitor access to be a pleasant, informative and safe experience;
p) Developing interpretive material aimed at improving visitors' understanding of Earth's history and the evolution of the earliest biosphere as contained in the rocks at each geosite, both individually and as an integrated whole;
q) Developing school-orientated outdoor education programmes based on the geological and wider ecological features of the BMML and its geosites;
r) Monitoring of issues relating to visitor access and public understanding resulting from the interpretive material provided, in order to continuously revise and improve them.

14. **COSTS AND BENEFITS** TO LOCAL PEOPLE

A program of monitoring the costs and benefits experienced by local communities will be instituted by the WHS Management Agency. This will focus on understanding and positively influencing the attitudes of local residents towards the costs of the imposed constraints compared to the benefits of tourism business and employment. Monitoring these attitudes, and how they change both positively and negatively, will be an important responsibility of the WHS Management Agency.

Benefits to local people will similarly be encouraged by promoting tourism and tourism business development that together, create sustainable employment. Tourism promotional activities will vary from large-scale infrastructure development, such as roads and resorts, to small-scale tourism product-owning and service-providing businesses. In keeping with the nature of this niche-market in tourism, these promotional activities should be approached with caution and prioritized by indicators of demand.

The outcome of these management and monitoring activities will be presented annually in the WHS Management Authority's routine reports.

NB:: Completion of the Stakeholder Engagement programme will identify the people and activities to be monitored and how the costs and benefits to these people will be measured and / or estimated. Most importantly, this analysis must provide the insight to encourage and manage sustainable economic activity that is a benefit derived directly or indirectly from achieving WHS status. Benefits may be tangible (income) or intangible (education and pride of ownership or association). They may also be slow in coming, so raising false expectations must be guarded against.

APPENDIX 2
(Geosite Photos and other graphics)

tf/21 May, 2016