

**HERITAGE SURVEY OF THE PROPOSED HESKETH
COUNTRY ESTATE, PIETERMARITZBURG,
KWAZULU-NATAL**

**FOR THE INDEPENDENT ENVIRONMENTAL
ADVISOR**

DATE: 22 JULY 2016

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Abbreviations

HP	Historical Period
IIA	Indeterminate Iron Age
LIA	Late Iron Age
EIA	Early Iron Age
ISA	Indeterminate Stone Age
ESA	Early Stone Age
MSA	Middle Stone Age
LSA	Late Stone Age
HIA	Heritage Impact Assessment
PIA	Palaeontological Impact Assessment

INTRODUCTION

Umlando was appointed by The Independent Environmental Advisor to undertake a heritage survey of the proposed Hesketh Country Estate, Pietermaritzburg, KwaZulu-Natal. The property falls in the old Hesketh Circuit track.

Figures 1 – 3 show the location of the study area. Figure 4 shows various views of the study area.

FIG. 1 GENERAL LOCATION OF THE STUDY AREA

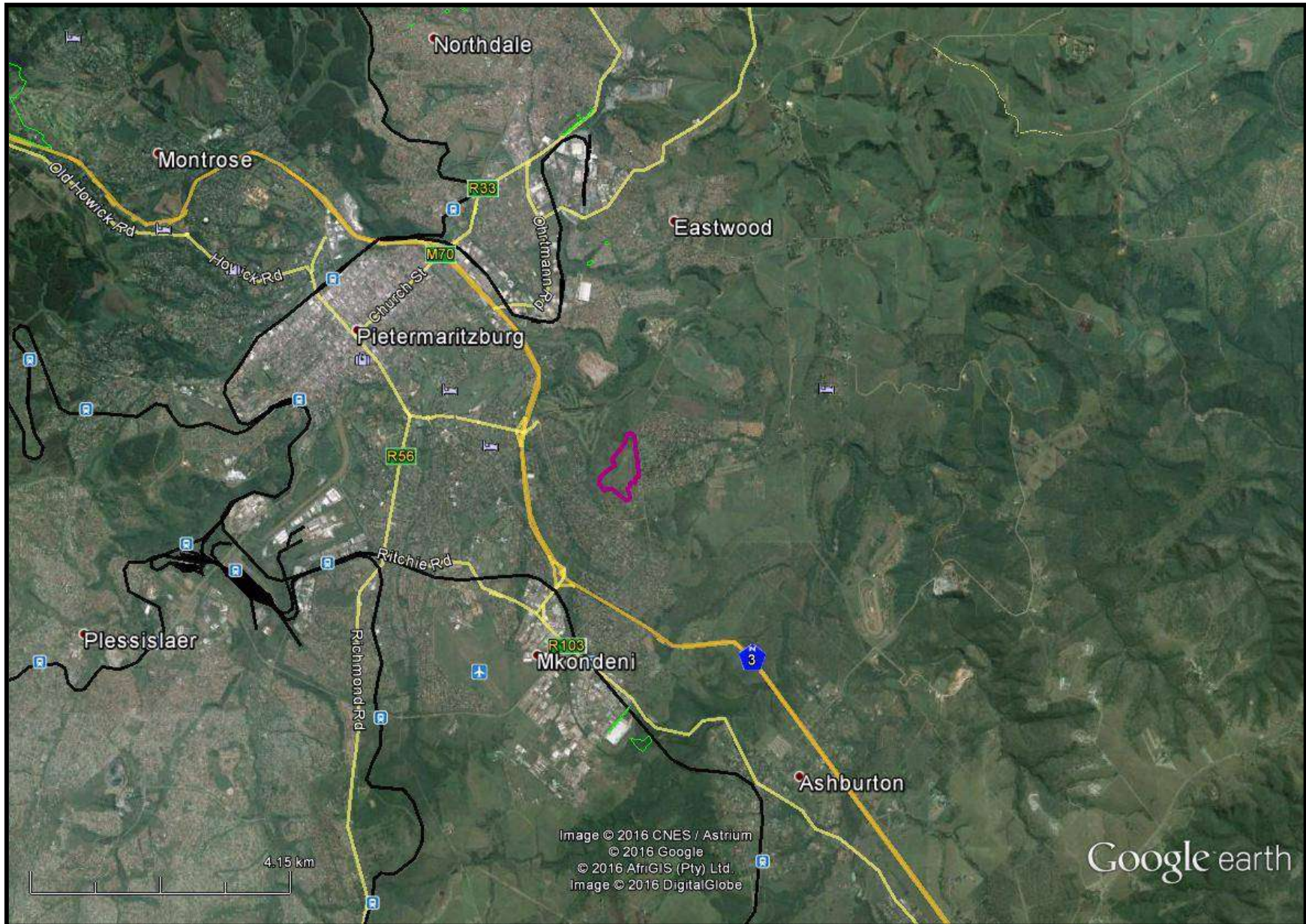


FIG. 2: AERIAL OVERVIEW OF THE STUDY AREA



FIG. 3: TOPOGRAPHICAL OVERVIEW OF THE STUDY AREA

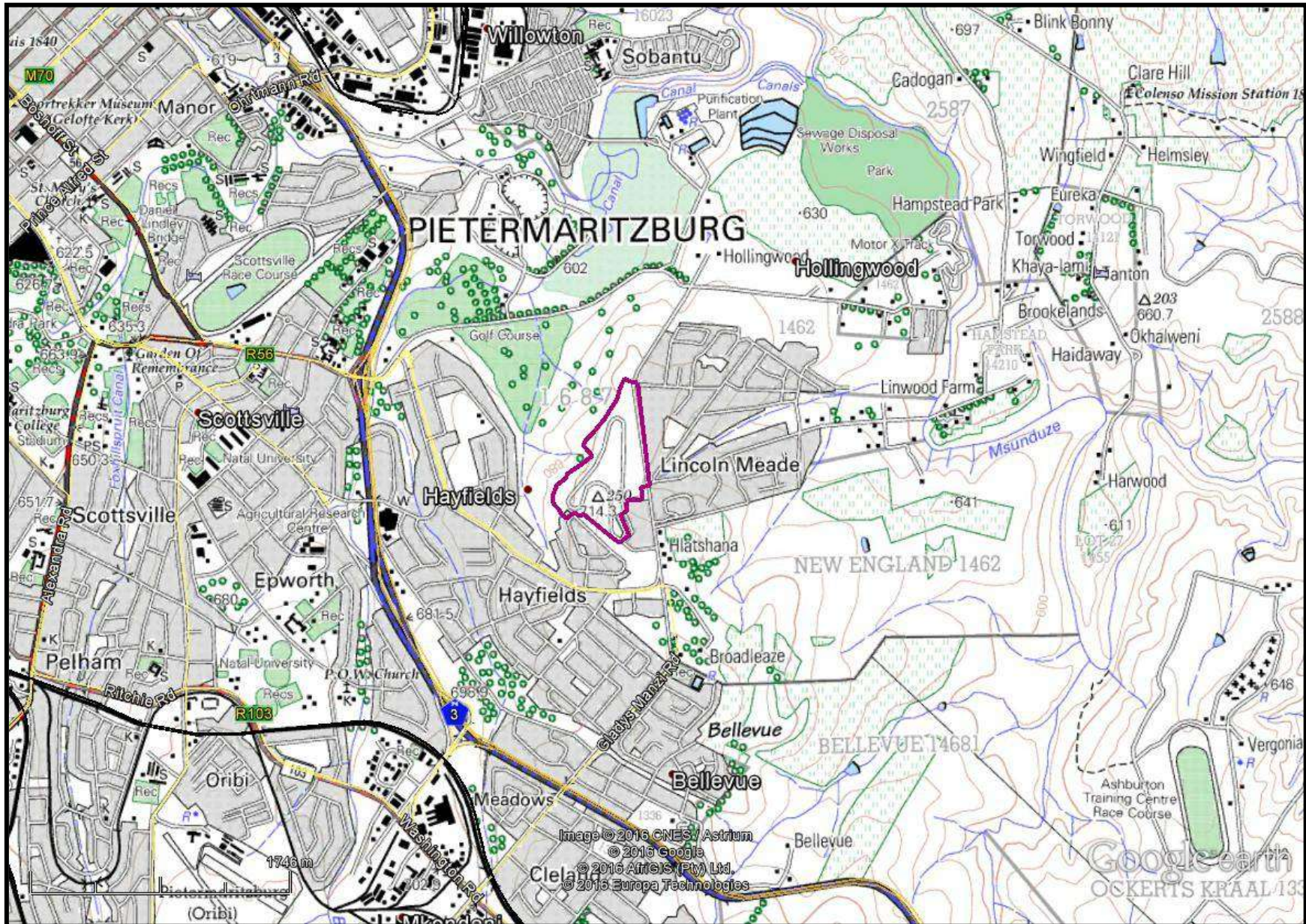


FIG. 4: SCENIC VIEWS OF THE STUDY AREA



KWAZULU-NATAL HERITAGE ACT NO. 4 OF 2008

“General protection: Structures.—

- No structure which is, or which may reasonably be expected to be older than 60 years, may be demolished, altered or added to without the prior written approval of the Council having been obtained on written application to the Council.
- Where the Council does not grant approval, the Council must consider special protection in terms of sections 38, 39, 40, 41 and 43 of Chapter 9.
- The Council may, by notice in the *Gazette*, exempt—
- A defined geographical area; or
- defined categories of sites within a defined geographical area, from the provisions of subsection where the Council is satisfied that heritage resources falling in the defined geographical area or category have been identified and are adequately protected in terms of sections 38, 39, 40, 41 and 43 of Chapter 9.
- A notice referred to in subsection (2) may, by notice in the *Gazette*, be amended or withdrawn by the Council.

General protection: Graves of victims of conflict.—No person may damage, alter, exhume, or remove from its original position—

- the grave of a victim of conflict;
- a cemetery made up of such graves; or
- any part of a cemetery containing such graves, without the prior written approval of the Council having been obtained on written application to the Council.
- General protection: Traditional burial places.—
- No grave—
- not otherwise protected by this Act; and
- not located in a formal cemetery managed or administered by a local authority, may be damaged, altered, exhumed, removed from its original position, or otherwise disturbed without the prior written approval of the Council having been obtained on written application to the Council.

The Council may only issue written approval once the Council is satisfied that—

- the applicant has made a concerted effort to consult with communities and individuals who by tradition may have an interest in the grave; and
- the applicant and the relevant communities or individuals have reached agreement regarding the grave.

General protection: Battlefield sites, archaeological sites, rock art sites, palaeontological sites, historic fortifications, meteorite or meteorite impact sites.—

- No person may destroy, damage, excavate, alter, write or draw upon, or otherwise disturb any battlefield site, archaeological site, rock art site, palaeontological site, historic fortification, meteorite or meteorite impact site without the prior written approval of the Council having been obtained on written application to the Council.
- Upon discovery of archaeological or palaeontological material or a meteorite by any person, all activity or operations in the general vicinity of such material or meteorite must cease forthwith and a person who made the discovery must submit a written report to the Council without delay.
- The Council may, after consultation with an owner or controlling authority, by way of written notice served on the owner or controlling authority, prohibit any activity considered by the Council to be inappropriate within 50 metres of a rock art site.
- No person may exhume, remove from its original position or otherwise disturb, damage, destroy, own or collect any object or material associated with any battlefield site, archaeological site, rock art site, palaeontological site, historic fortification, meteorite or meteorite impact site without the prior written approval of the Council having been obtained on written application to the Council.
- No person may bring any equipment which assists in the detection of metals and archaeological and palaeontological objects and material, or excavation equipment onto any battlefield site, archaeological site, rock art site, palaeontological site, historic fortification, or meteorite impact site, or

- use similar detection or excavation equipment for the recovery of meteorites, without the prior written approval of the Council having been obtained on written application to the Council.
- The ownership of any object or material associated with any battlefield site, archaeological site, rock art site, palaeontological site, historic fortification, meteorite or meteorite impact site, on discovery, vest in the Provincial Government and the Council is regarded as the custodian on behalf of the Provincial Government.” (KZN Heritage Act of 2008)

METHOD

The method for Heritage assessment consists of several steps. The first step forms part of the desktop assessment. Here we would consult the database that has been collated by Umlando. These databases contains archaeological site locations and basic information from several provinces (information from Umlando surveys and some colleagues), most of the national and provincial monuments and battlefields in Southern Africa (<http://www.vuvuzela.com/googleearth/monuments.html>) and cemeteries in southern Africa (information supplied by the Genealogical Society of Southern Africa). We use 1st and 2nd edition 1:50 000 topographical and 1937 aerial photographs where available, to assist in general location and dating of buildings and/or graves. The database is in Google Earth format and thus used as a quick reference when undertaking desktop studies. Where required we would consult with a local data recording centre, however these tend to be fragmented between different institutions and areas and thus difficult to access at times. We also consult with an historical architect, palaeontologist, and an historian where necessary.

The survey results will define the significance of each recorded site, as well as a management plan.

All sites are grouped according to low, medium, and high significance for the purpose of this report. Sites of low significance have no diagnostic artefacts or features. Sites of medium significance have diagnostic artefacts or features and these sites tend to be sampled. Sampling includes the collection of artefacts for future analysis. All diagnostic pottery, such as rims, lips, and decorated sherds are sampled, while bone, stone, and shell are mostly noted. Sampling usually occurs on most sites. Sites of high significance are excavated and/or extensively sampled. Those sites that are extensively sampled have high research potential, yet poor preservation of features.

Defining significance

Heritage sites vary according to significance and several different criteria relate to each type of site. However, there are several criteria that allow for a general significance rating of archaeological sites.

These criteria are:

1. State of preservation of:

- 1.1. Organic remains:
 - 1.1.1. Faunal
 - 1.1.2. Botanical
- 1.2. Rock art
- 1.3. Walling
- 1.4. Presence of a cultural deposit
- 1.5. Features:
 - 1.5.1. Ash Features
 - 1.5.2. Graves
 - 1.5.3. Middens
 - 1.5.4. Cattle byres
 - 1.5.5. Bedding and ash complexes

2. Spatial arrangements:

- 2.1. Internal housing arrangements
- 2.2. Intra-site settlement patterns
- 2.3. Inter-site settlement patterns

3. Features of the site:

- 3.1. Are there any unusual, unique or rare artefacts or images at the site?
- 3.2. Is it a type site?
- 3.3. Does the site have a very good example of a specific time period, feature, or artefact?

4. Research:

- 4.1. Providing information on current research projects
- 4.2. Salvaging information for potential future research projects

5. Inter- and intra-site variability

- 5.1. Can this particular site yield information regarding intra-site variability, i.e. spatial relationships between various features and artefacts?
- 5.2. Can this particular site yield information about a community's social relationships within itself, or between other communities?

6. Archaeological Experience:

6.1. The personal experience and expertise of the CRM practitioner should not be ignored. Experience can indicate sites that have potentially significant aspects, but need to be tested prior to any conclusions.

7. Educational:

- 7.1. Does the site have the potential to be used as an educational instrument?
- 7.2. Does the site have the potential to become a tourist attraction?
- 7.3. The educational value of a site can only be fully determined after initial test-pit excavations and/or full excavations.

8. Other Heritage Significance:

- 8.1. Palaeontological sites
- 8.2. Historical buildings

- 8.3. Battlefields and general Anglo-Zulu and Anglo-Boer sites
- 8.4. Graves and/or community cemeteries
- 8.5. Living Heritage Sites
- 8.6. Cultural Landscapes, that includes old trees, hills, mountains, rivers, etc related to cultural or historical experiences.

The more a site can fulfill the above criteria, the more significant it becomes. Test-pit excavations are used to test the full potential of an archaeological deposit. This occurs in Phase 2. These test-pit excavations may require further excavations if the site is of significance (Phase 3). Sites may also be mapped and/or have artefacts sampled as a form of mitigation. Sampling normally occurs when the artefacts may be good examples of their type, but are not in a primary archaeological context. Mapping records the spatial relationship between features and artefacts.

The above significance ratings allow one to grade the site according to SAHRA's grading scale. This is summarised in Table 1.

TABLE 1: SAHRA GRADINGS FOR HERITAGE SITES

SITE SIGNIFICANCE	FIELD RATING	GRADE	RECOMMENDED MITIGATION
High Significance	National Significance	Grade 1	Site conservation / Site development
High Significance	Provincial Significance	Grade 2	Site conservation / Site development
High Significance	Local Significance	Grade 3A / 3B	
High Medium Significance	/ Generally Protected A		Site conservation or mitigation prior to development / destruction
Medium Significance	Generally Protected B		Site conservation or mitigation / test excavation / systematic sampling / monitoring prior to or during development / destruction
Low Significance	Generally Protected C		On-site sampling monitoring or no archaeological mitigation required prior to or during development / destruction

RESULTS

DESKTOP STUDY

The desktop study consisted of analysing various maps for evidence of prior habitation in the study area, as well as for previous archaeological surveys. The archaeological database indicates that there are archaeological sites in the general area (fig. 5). These sites include all types of Stone Age and Iron Age sites, as well as historical buildings. No known sites occur in the study area.

No national monuments, battlefields, or historical cemeteries are known to occur in the study area. There are several cemeteries outside of the study area.

The 1937 aerial photographs indicate the study area was grasslands with no ploughing activity (fig. 6).

The 1968 topographical map indicates that the Roy Hesketh Circuit had already been built and that there were no built (bricked) structures in the study area (fig. 7). The original circuit appears to be longer than the current version, and the original main building occurs outside of the development. The Roy Hesketh Circuit has an official web site dedicate to the history of the circuit (<http://www.royheskethcircuit.com/>). I shall quote directly from a section of the the web page:

FIG. 5: LOCATION OF KNOWN HERITAGE SITES NEAR THE STUDY AREA

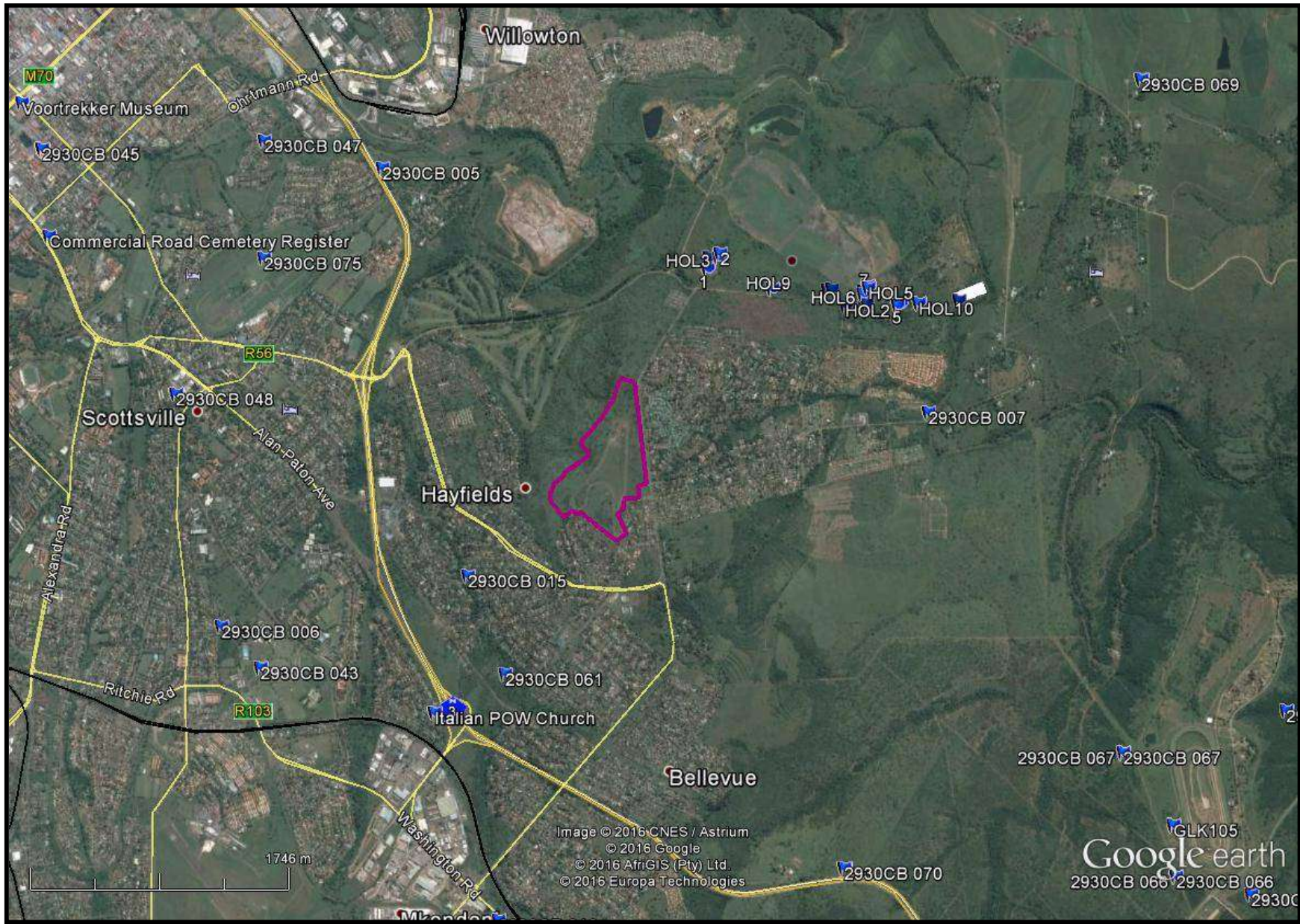


FIG. 6: STUDY AREA IN 1937

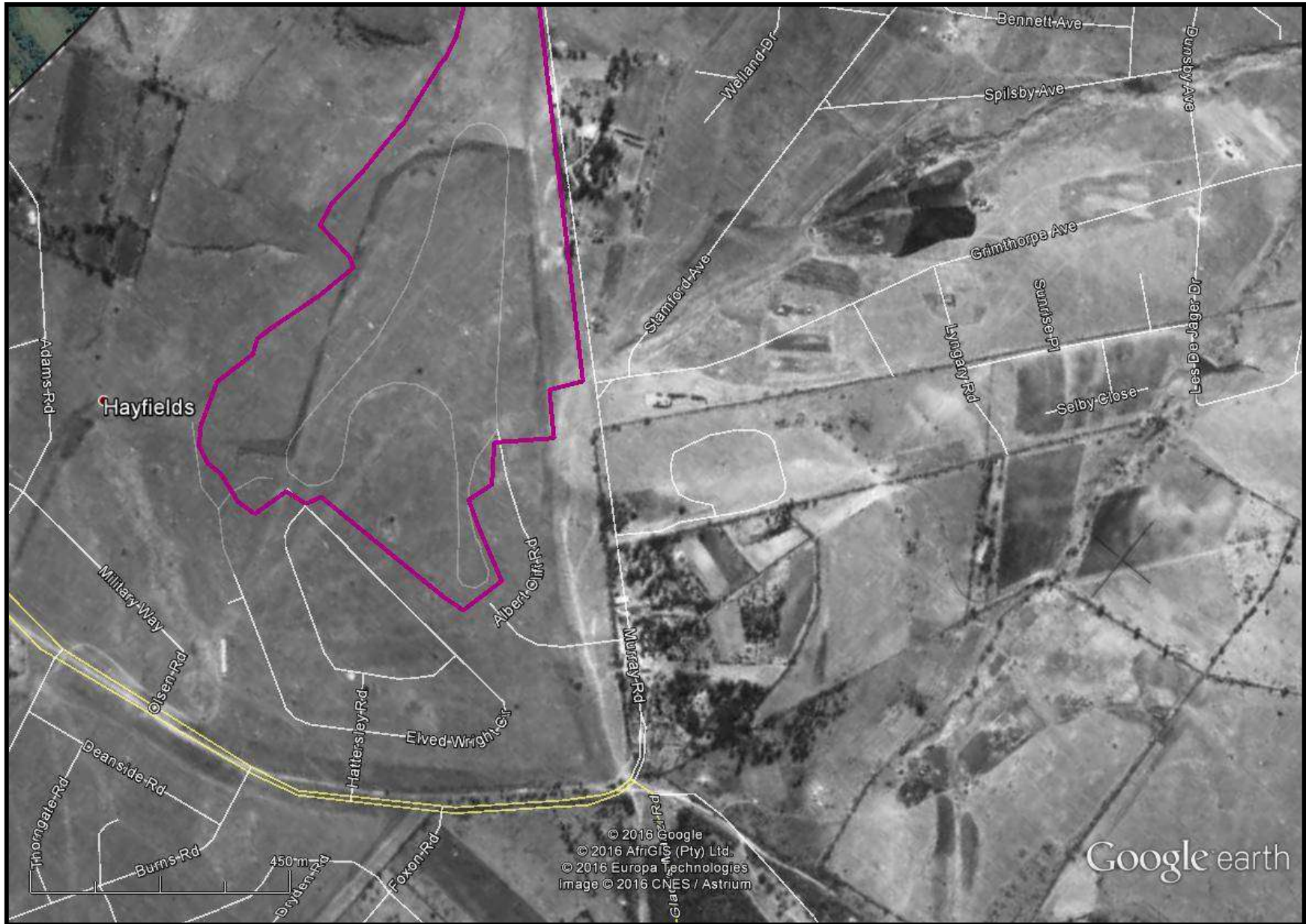
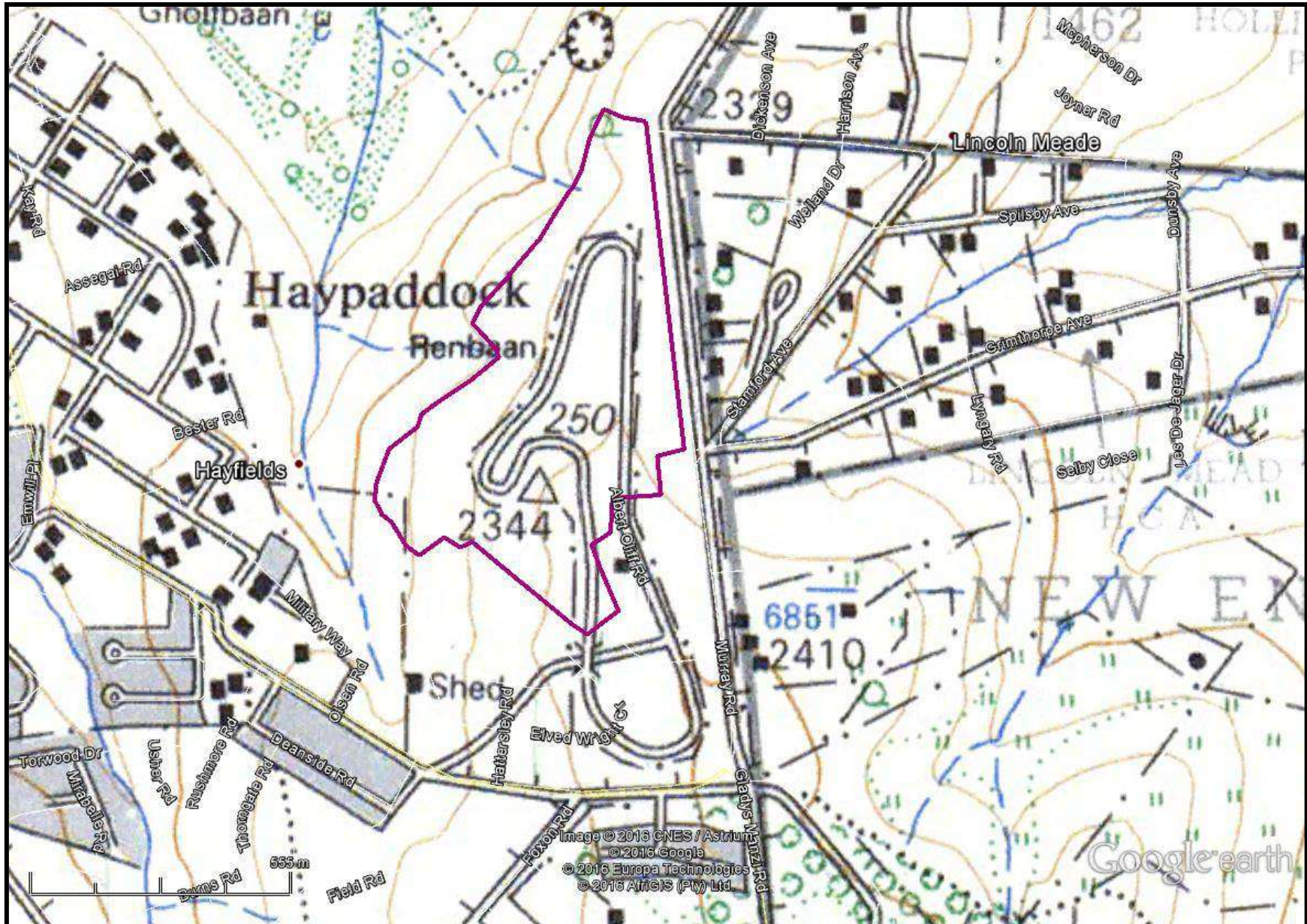


FIG. 7: STUDY AREA IN 1968



“During its period of operation it hosted rounds of the South African National Drivers Championship, the Springbok sportcar series and national Formula Atlantic races. The circuit was also like a second home to Mike Hailwood. The track was famous for hosting the Easter races as well as festival of racing over three days.

The expansion of the town of Pietermaritzburg eventually led to the redevelopment of the site as a residential and business zone after racing ceased at the end of 1981. The section from Henry's Knee to the top of Beacon still exists, and is undergoing protection from further development as an important piece of Pietermaritzburg's history. Pietermaritzburg holds a small slice of history: the circuit was the host of the first ever 3 litre F1 race in 1961, when Bruce Johnstone triumphed in a Cooper Alfa Romeo in the Pat Fairfield Trophy. The circuit is now disused....”

The circuit appears to have undergone a few small changes through time. The Roy Hesketh Circuit thus has a living heritage status, as well as a place on the cultural landscape.

FIELD SURVEY

A field survey was undertaken in June 2016. Archaeological visibility was good in most areas, except at the edge of the study area. The soil tended to be very shallow and above a shale layer. This would not be conducive for Iron Age sites, nor good material for Stone Age tools.

No artefacts were noted during the survey. Only one building occurs on the site and this is related to the race track (fig. 8). This building is less than 60 years in age and does not warrant protection.

FIG. 8: EXISTING BUILDING IN THE STUDY AREA



DESKTOP PALAEOONTOLOGICAL IMPACT ASSESSMENT

A PIA desktop was undertaken by Dr Gideon Groenewald (Appendix A). The area has been given moderate significance on the SAHRIS map (fig. 9). Excavations of more than 1.5m depth will expose black shale of the Pietermaritzburg Formation during excavation for foundations and infrastructure. Although dolerite will not contain fossils, the chances are that all metamorphic rock units associated with the contact zones of the dolerite sill with surrounding sedimentary rocks of the Pietermaritzburg Formation can expose significant fossils. Due to the fact that the recording of fossils will have a significant impact on our understanding of the palaeo-environments in this part of the basin, a Moderate Palaeontological sensitivity is allocated to the part of the study area underlain by Pietermaritzburg Formation rocks and a Very Low Sensitivity in areas with outcrops of dolerite. It is important that the ECO of the project be

aware of the fact that significant fossils can be associated with metamorphic rocks on the contacts of the dolerite sill with country rock.

FIG. 9: PALAEOONTOLOGICAL SENSITIVITY MAP



COLOUR	SENSITIVITY	REQUIRED ACTION
RED	VERY HIGH	field assessment and protocol for finds is required
ORANGE/YELLOW	HIGH	desktop study is required and based on the outcome of the desktop study, a field assessment is likely
GREEN	MODERATE	desktop study is required
BLUE	LOW	no palaeontological studies are required however a protocol for finds is required
GREY	INSIGNIFICANT/ZERO	no palaeontological studies are required
WHITE/CLEAR	UNKNOWN	these areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map.

Mitigation:

1. The EAP and ECO of the projects must be informed of the fact that significant trace and plant fossils have been described from the Pietermaritzburg Formation. Chance recording of fossils will contribute significantly to our understanding of the palaeo-environments of this region.
2. Areas where trenching or excavation for infrastructure will be deeper than 1,5m, must be identified during geotechnical surveys. Where the trenches and excavations will reach this depth, a suitably qualified Palaeontologist must be put on standby to record and collect fossils according to AMAFA and SAHRA specifications as part of a Phase 1 Palaeontological Impact Assessment during the initial stages of excavation at each individually proposed development node on this property.

MANAGEMENT PLAN

The Roy Hesketh Circuit is part of the living heritage of Pietermaritzburg, as well as the racing fraternity. The race track is no longer in use, for various reasons, however it is still of historical interest. I suggest that the existing track (shape) is kept as part of the development with minor modifications. The general shape of the existing shape should however be kept. The road could be named the Roy Hesketh Circuit as part of the development. In this manner the living heritage of the race track would be preserved.

CONCLUSION

A heritage survey was undertaken for the proposed for mixed development of retirement lifestyle and entry level middle income residential with commercial amenities and medical support facilities such as frail care

Only the Roy Hesketh Circuit was noted during the survey. The Circuit forms part of the racing history of Pietermaritzburg and its living heritage. The track should be minimally modified for the development.

**APPENDIX A
PIA DESKTOP**

**DESKTOP PALAEOLOGICAL
ASSESSMENT FOR THE PROPOSED
HESKETH COUNTRY ESTATE
DEVELOPMENT, MSUNDUZI LOCAL
MUNICIPALITY, UMGUNGUNDLOVU
DISTRICT MUNICIPALITY, KWAZULU-
NATAL PROVINCE.**

FOR

Umlando

DATE: 21 July 2016

By

Gideon Groenewald

Cell: 078 713 6377

EXECUTIVE SUMMARY

Gideon Groenewald was appointed to undertake a desktop survey, assessing the potential Palaeontological Impact of the proposed Hesketh Country Estate development, Msunduzi Local Municipality, Umgungundlovu District Municipality, Kwazulu-Natal Province.

This Palaeontological Assessment forms part of the Heritage Impact Assessment (HIA) and complies with the requirements of the South African National Heritage Resource Act No 25 of 1999 as well as the KwaZulu-Natal Heritage Act No 4 of 2008. In accordance with Section 38 of the National Resources Act No 25 of 1999 (Heritage Resources Management), a HIA is required to assess any potential impacts to palaeontological heritage within the development footprint.

The study area of the proposed Hesketh Country Estate development, Msunduzi Local Municipality, Umgungundlovu District Municipality, Kwazulu-Natal Province is underlain by sedimentary rocks of the Permian-aged Pietermaritzburg Formation of the Ecca Group and dolerite. Fossils are associated with the bedding planes of shales exposed during excavation of trenches or foundations deeper than 1,5m as well as exposure of sedimentary rocks (albeit metamorphosed) associated with the boundaries of the dolerite sill. A Moderate Palaeontological Sensitivity is allocated to the rocks of the Pietermaritzburg Formation and if trace fossils or plant fossils are noticed, a suitably qualified Palaeontologist must be appointed to record and collect a representative sample for curation at an accredited Institution.

Recommendations:

3. The EAP and ECO of the projects must be informed of the fact that significant trace and plant fossils have been described from the Pietermaritzburg Formation. Chance recording of fossils will contribute significantly to our understanding of the palaeo-environments of this region.
4. Areas where trenching or excavation for infrastructure will be deeper than 1,5m, must be identified during geotechnical surveys. Where the trenches and excavations will reach this depth, a suitably qualified Palaeontologist must be put on standby to record and collect fossils according to AMAFA and SAHRA specifications as part of a Phase 1 Palaeontological Impact Assessment during the initial stages of excavation at each individually proposed development node on this property.
5. These recommendations must form part of the EMP for the project.

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INTRODUCTION

Gideon Groenewald was appointed to undertake a desktop survey, assessing the potential Palaeontological Impact of the proposed Hesketh Country Estate development, Msunduzi Local Municipality, Umgungundlovu District Municipality, Kwazulu-Natal Province (Figure 1).



Figure 1 Locality of the proposed site for the Hesketh Country Estate development

SOUTH AFRICAN NATIONAL HERITAGE RESOURCE ACT NO 25/1999 AND KWAZULU-NATAL HERITAGE ACT NO 4/2008

This Palaeontological Assessment forms part of the Heritage Impact Assessment (HIA) and complies with the requirements of the South African National Heritage Resource Act No 25 of 1999 as well as the KwaZulu-Natal Heritage Act No 4 of 2008. In accordance with Section 38 of the National Resources Act No 25 of 1999 (Heritage Resources Management), a HIA is

required to assess any potential impacts to palaeontological heritage within the development footprint.

Categories of heritage resources recognised as part of the National Estate in Section 3 of the Heritage Resources Act, and which therefore fall under its protection, include:

- geological sites of scientific or cultural importance;
- objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens;
- objects with the potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage.

METHODOLOGY

Following the "SAHRA APM Guidelines: Minimum Standards for the Archaeological & Palaeontological Components of Impact Assessment Reports" the aims of the palaeontological impact assessment are:

- to identify exposed and subsurface rock formations that are considered to be palaeontologically significant;
- to assess the level of palaeontological significance of these formations;
- to comment on the impact of the development on these exposed and/or potential fossil resources and
- to make recommendations as to how the developer should conserve or mitigate damage to these resources.

In preparing a palaeontological desktop study the potential fossiliferous rock units (groups, formations etc) represented within the study area are determined from geological maps and Google Earth imagery. The known fossil heritage within each rock unit is inventoried from the published scientific literature, previous palaeontological impact studies in the same region and the author's field experience.

The likely impact of the proposed development on local fossil heritage is determined on the basis of the palaeontological sensitivity of the rock units concerned and the nature and scale of the development itself, most notably the extent of bedrock excavation envisaged. The different sensitivity classes used are explained in Table 1 below.

Table 1 Palaeontological sensitivity analysis outcome classification

PALAEONTOLOGICAL SIGNIFICANCE/VULNERABILITY OF ROCK UNITS	
The following colour scheme is proposed for the indication of palaeontological sensitivity classes. This classification of sensitivity is adapted from that of Almond et al (2008, 2009) (Groenewald et al.,2014).	
RED	Very High Palaeontological sensitivity/vulnerability. Development will most likely have a very significant impact on the Palaeontological Heritage of the region. Very high possibility that significant fossil assemblages will be present in all outcrops of the unit. Appointment of professional palaeontologist, desktop survey, phase I Palaeontological Impact Assessment (PIA) (field survey and recording of fossils) and phase II PIA (rescue of fossils during construction) as well as application for collection and destruction permit compulsory.
ORANGE	High Palaeontological sensitivity/vulnerability. High possibility that significant fossil assemblages will be present in most of the outcrop areas of the unit. Fossils most likely to occur in associated sediments or underlying units, for example in the areas underlain by Transvaal Supergroup dolomite where Cenozoic cave deposits are likely to occur. Appointment of professional palaeontologist, desktop survey and phase I Palaeontological Impact Assessment (field survey and collection of fossils) compulsory. Early application for collection permit recommended. Highly likely that a Phase II PIA will be applicable during the construction phase of projects.
GREEN	Moderate Palaeontological sensitivity/vulnerability. High possibility that fossils will be present in the outcrop areas of the unit or in associated sediments that underlie the unit. For example areas underlain by the Gordonia Formation or undifferentiated soils and alluvium. Fossils described in the literature are visible with the naked eye and development can have a significant impact on the Palaeontological Heritage of the area. Recording of fossils will contribute significantly to the present knowledge of the development of life in the geological record of the region. Appointment of a professional palaeontologist, desktop survey and phase I PIA (ground proofing of desktop survey) recommended.

<p>BLUE</p>	<p>Low Palaeontological sensitivity/vulnerability. Low possibility that fossils that are described in the literature will be visible to the naked eye or be recognized as fossils by untrained persons. Fossils of for example small domal Stromatolites as well as micro-bacteria are associated with these rock units. Fossils of micro-bacteria are extremely important for our understanding of the development of Life, but are only visible under large magnification. Recording of the fossils will contribute significantly to the present knowledge and understanding of the development of Life in the region. Where geological units are allocated a blue colour of significance, and the geological unit is surrounded by highly significant geological units (red or orange coloured units), a palaeontologist must be appointed to do a desktop survey and to make professional recommendations on the impact of development on significant palaeontological finds that might occur in the unit that is allocated a blue colour. An example of this scenario will be where the scale of mapping on the 1:250 000 scale maps excludes small outcrops of highly significant sedimentary rock units occurring in larger alluvium deposits. Collection of a representative sample of potential fossiliferous material is recommended.</p>
<p>GREY</p>	<p>Very Low Palaeontological sensitivity/vulnerability. Very low possibility that significant fossils will be present in the bedrock of these geological units. The rock units are associated with intrusive igneous activities and no life would have been possible during emplacement of the rocks. It is however essential to note that the geological units mapped out on the geological maps are invariably overlain by Cenozoic aged sediments that might contain significant fossil assemblages and archaeological material. Examples of significant finds occur in areas underlain by granite, just to the west of Hoedspruit in the Limpopo Province, where significant assemblages of fossils and clay-pot fragments are associated with large termite mounds. Where geological units are allocated a grey colour of significance, and the geological unit is surrounded by very high and highly significant geological units (red or orange coloured units), a palaeontologist must be appointed to do a desktop survey and to make professional recommendations on the impact of development on significant palaeontological finds that might occur in the unit that is allocated a grey colour. An example of this scenario will be where the scale of mapping on the 1:250 000 scale maps excludes small outcrops of highly significant sedimentary rock units occurring in dolerite sill outcrops. It is important that the report should also refer to archaeological reports and possible descriptions of palaeontological finds in Cenozoic aged surface deposits.</p>

When rock units of moderate to high palaeontological sensitivity are present within the development footprint, a field-based assessment by a professional palaeontologist is usually warranted.

The key assumption for this desktop study is that the existing geological maps and datasets used to assess site sensitivity are correct and reliable. However, the geological maps used were not intended for fine scale planning work and are largely based on aerial photographs alone, without ground-truthing.

These factors may have a major influence on the assessment of the fossil heritage significance of a given development and, without supporting field assessments, may lead to either:

- an underestimation of the palaeontological significance of a given study area due to ignorance of significant recorded or unrecorded fossils preserved there, or
- an overestimation of the palaeontological sensitivity of a study area, for example when originally rich fossil assemblages inferred from geological maps have in fact been destroyed by weathering, or are buried beneath a thick mantle of unfossiliferous “drift” (soil, alluvium etc).

GEOLOGY

The study area is underlain by Permian-aged rocks of the Pietermaritzburg Formation of the Ecca Group, and Jurassic aged dolerite of the Karoo Supergroup (Figure 2).



Figure 2 Geologically the site is mainly underlain by rocks of the Pietermaritzburg Formation and dolerite

Ecca Group

Pietermaritzburg Formation (Pp)

The Permian aged Pietermaritzburg Formation is a thick sequence of marine sedimentary rocks dominated by light to dark grey shale with calcareous concretions. The shale was deposited in deep marine environments during the existence of Gondwanaland (Johnson et al, 2009).

Dolerite

A small part of the study area is underlain by Jurassic aged dolerite that is part of a single major sill intrusion. The relationship of the dolerite sill with underlying and overlying sedimentary rocks will have a very important influence on the presence or absence of fossils in the boundary regions of the dolerite.

PALAEONTOLOGY

Ecca Group

Pietermaritzburg Formation (Pp)

Although very rare, good examples of trace fossils as well as significant plant fossils have been described from the upper layers of the Formation (Linstrom, 1987 and Johnson et al. 2009).

Dolerite

Dolerite is an Igneous rock and will not contain fossils.

DISCUSSION

The predicted palaeontological impact of the development is based on the initial mapping assessment and literature reviews. Trace fossils have been recorded from the Pietermaritzburg Formation whilst significant plant remains of *Glossopteris* flora is known from the Ecca Group. The recording of plant and trace fossils from this part of the Karoo Basin will contribute significantly to our understanding of the palaeo-environments that existed during the Permian times in this part of the KwaZulu-Natal Province.

MANAGEMENT PLAN

The likely impact of the proposed development on local fossil heritage is determined on the basis of the palaeontological sensitivity of the rock units concerned and the nature and scale of the development itself, most notably the extent of excavation into sedimentary rock units envisaged. The different sensitivity classes used are explained in Table 1.

The palaeontological sensitivity of the development is related to the specific geology that underlies the development footprints. For the sake of this desktop survey it is assumed that there are no significant outcrops on site, but that excavation of more than 1.5m depth will expose black shale of the Pietermaritzburg Formation during excavation for foundations and infrastructure. Although dolerite will not contain fossils, the chances are that all metamorphic rock units associated with the contact zones of the dolerite sill with surrounding sedimentary rocks of the Pietermaritzburg Formation can expose significant fossils. Due to the fact that the recording of fossils will have a significant impact on our understanding of the palaeo-environments in this part of the basin, a Moderate Palaeontological sensitivity is allocated to the part of the study area underlain by Pietermaritzburg Formation rocks and a Very Low Sensitivity in areas with outcrops of dolerite. It is important that the ECO of the project be aware of the fact that significant fossils can be associated with metamorphic rocks on the contacts of the dolerite sill with country rock.

The palaeontological sensitivity of the study area is shown in Figure 3.



Figure 3 Palaeosensitivity of the proposed development sites. Colour coding is explained in Table 1

CONCLUSION AND RECOMMENDATIONS

The study area of the proposed Hesketh Country Estate development, Msunduzi Local Municipality, Umgungundlovu District Municipality, Kwazulu-Natal Province is underlain by sedimentary rocks of the Permian-aged Pietermaritzburg Formation of the Ecca Group and dolerite. Fossils are associated with the bedding planes of shales exposed during excavation of trenches or foundations deeper than 1,5m as well as exposure of sedimentary rocks (albeit metamorphosed) associated with the boundaries of the dolerite sill. A Moderate Palaeontological Sensitivity is allocated to the rocks of the Pietermaritzburg Formation and if trace fossils or plant fossils are noticed, a suitably qualified Palaeontologist must be appointed to record and collect a representative sample for curation at an accredited Institution.

Recommendations:

1. The EAP and ECO of the projects must be informed of the fact that significant trace and plant fossils have been described from the Pietermaritzburg Formation. Chance recording of fossils will contribute significantly to our understanding of the palaeo-environments of this region.

2. Areas where trenching or excavation for infrastructure will be deeper than 1,5m, must be identified during geotechnical surveys. Where the trenches and excavations will reach this depth, a suitably qualified Palaeontologist must be put on standby to record and collect fossils according to AMAFA and SAHRA specifications as part of a Phase 1 Palaeontological Impact Assessment during the initial stages of excavation at each individually proposed development node on this property.
6. These recommendations must form part of the EMP for the project.

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QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

Dr Gideon Groenewald has a PhD in Geology from the University of Port Elizabeth (Nelson Mandela Metropolitan University) (1996) and the National Diploma in Nature Conservation from Technicon RSA (the University of South Africa) (1989). He specialises in research on South African Permian and Triassic sedimentology and macrofossils with an interest in biostratigraphy, and palaeo-ecological aspects. He has extensive experience in the locating of fossil material in the Karoo Supergroup and has more than 20 years of experience in locating, collecting and curating fossils, including exploration field trips in search of new localities in the southern, western, eastern and north-eastern parts of the country. His publication record includes multiple articles in internationally recognized journals. Dr Groenewald is accredited by the Palaeontological Society of Southern Africa (society member for 25 years).

DECLARATION OF INDEPENDENCE

I, Gideon Groenewald, declare that I am an independent specialist consultant and have no financial, personal or other interest in the proposed development, nor the developers or any of their subsidiaries, apart from fair remuneration for work performed in the delivery of palaeontological heritage assessment services. There are no circumstances that compromise the objectivity of my performing such work.



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