

**HERITAGE SURVEY OF THE UMDLOTI SANDS  
DEVELOPMENT, UMDLOTI, KWAZULU-NATAL**

**FOR TRIPLO4 SUSTAINABLE SOLUTIONS PTY  
(LTD)**

**DATE: 22 FEBRUARY 2019**

**By Gavin Anderson**

**Umlando: Archaeological Surveys and Heritage  
Management**

**PO Box 102532, Meerensee, 3901**

**Phone/fax: 035-7531785**

**Cell: 0836585362**



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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

The proposed development occurs on portion 1591 of Cotton Lands, Umdloti. The property is located across the main beach road and has an existing house. Behind the house is a large portion of East Coast Dune Forest that extends up a steep hill.

The applicant proposes the establishment of luxury apartments within either 22 or 27 units in a 6 storey building and a basement parking. Access to the property will be via the existing North Beach road. All services (including sewer, stormwater, water supply and electricity supply) will be connected to the eThekweni Municipality

Umlando was appointed by Triplo4 sustainable Solutions Pty (Ltd).

Fig.'s 1 – 4 show the location of the development.

### ***VEGETATION TYPES***

The larger proposed development's site falls into two KZN vegetation types, namely: East Coast Dune Forest on the western portion and Coastal Belt Grassland on the eastern portion of the property. These vegetation types are both Critically Endangered within KZN. It must be noted that even though the larger property falls into these vegetation types, the development footprint is restricted to only the eastern portion where the Coastal Belt Grassland is classified. From satellite imagery it is apparent that this eastern portion of the property has been historically developed and vegetation assemblage in this portion is more likely to resemble garden species. The western portion of the area appears to be relatively intact coastal dune forest.

FIG. 1 GENERAL LOCATION OF THE STUDY AREA

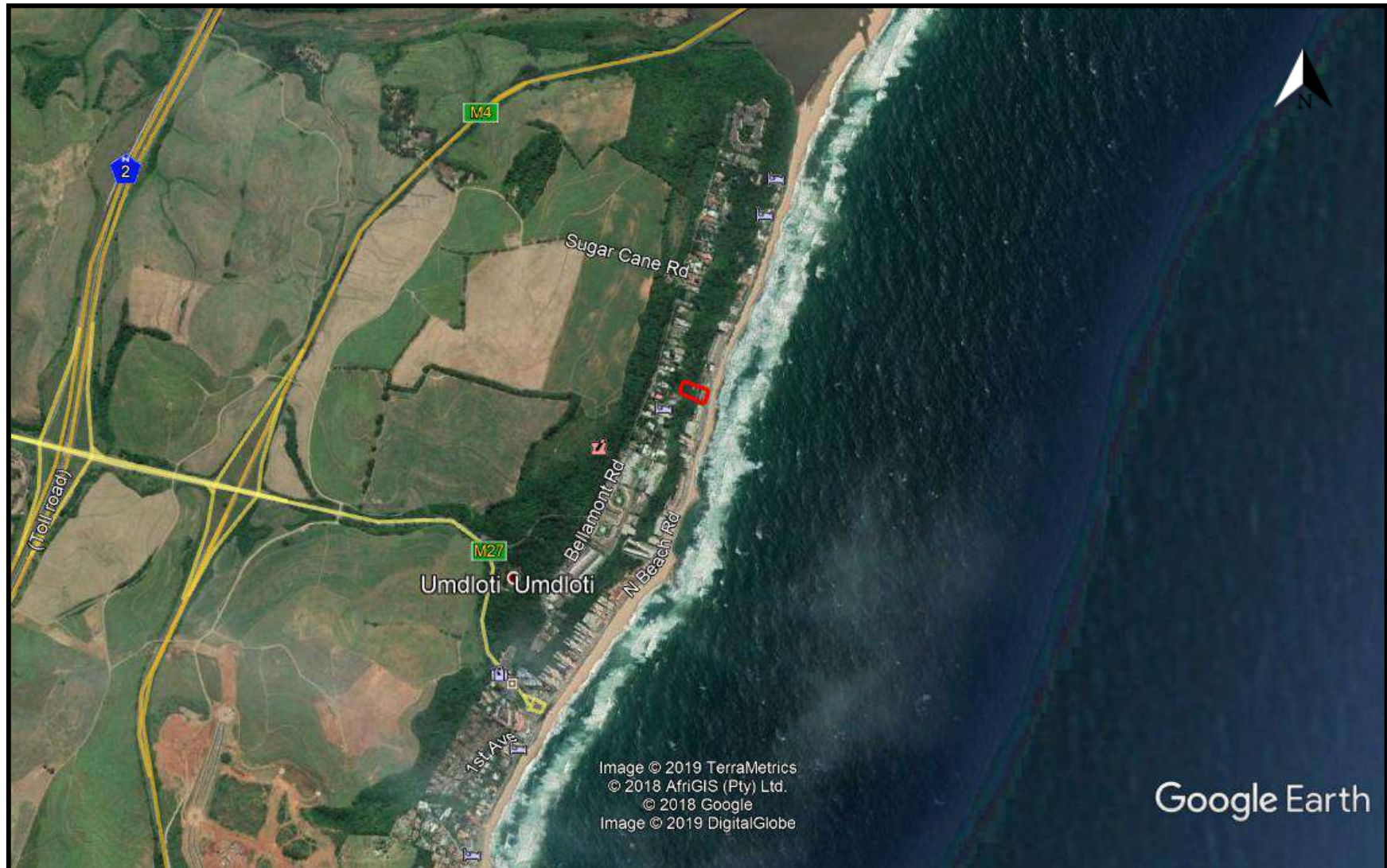


FIG. 2: AERIAL OVERVIEW OF THE STUDY AREA



FIG. 3: TOPOGRAPHICAL OVERVIEW OF THE STUDY AREA

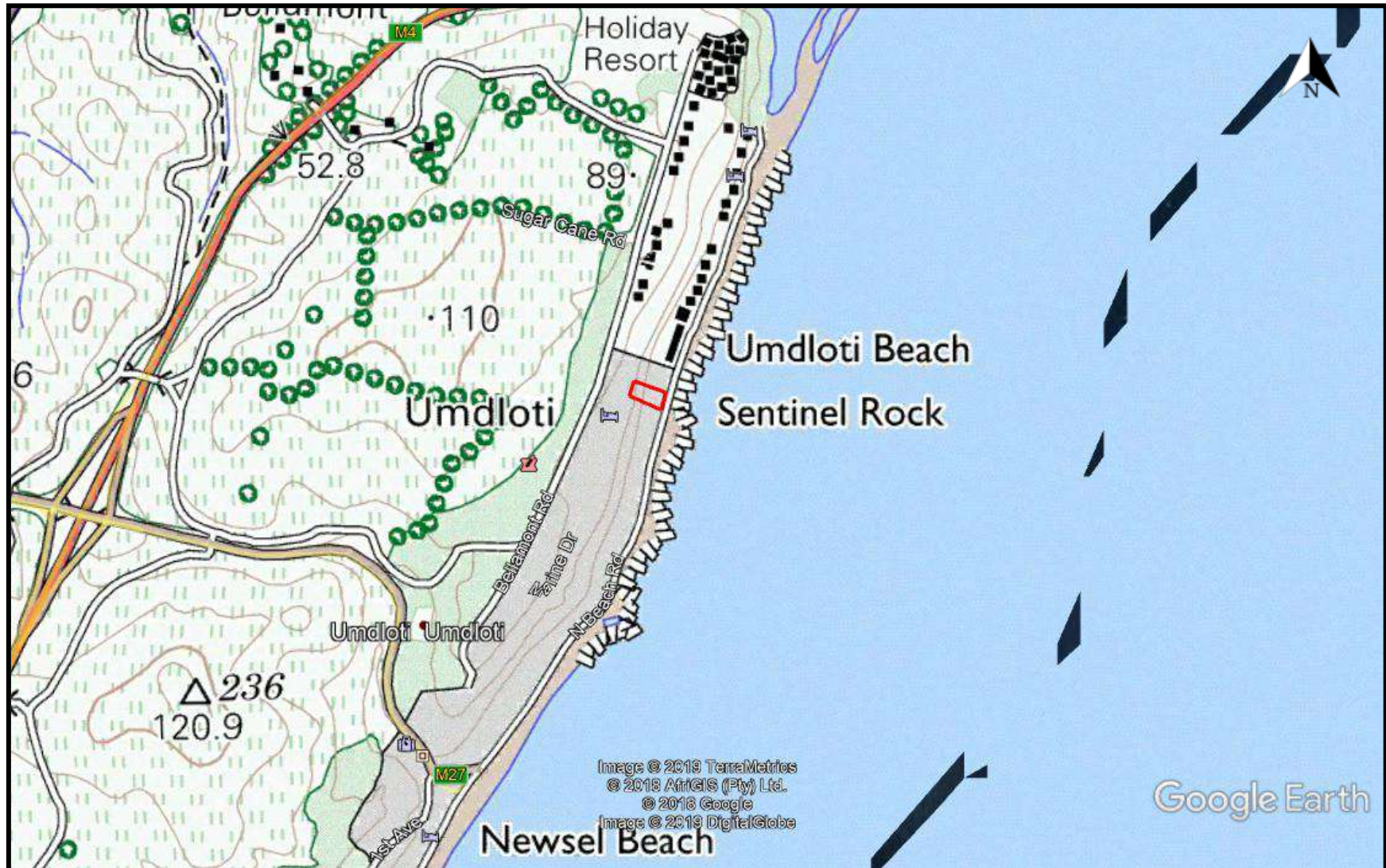


FIG. 4: SCENIC VIEWS OF THE STUDY AREA





## KWAZULU NATAL AMAFA AND RESEARCH INSTITUTE, ACT 05, 2018

“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 1<sup>st</sup> and 2<sup>nd</sup> 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**

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

## RESULTS

### DESKTOP STUDY

#### Colonial history of the general area

“Verulam inland from the Umdloti River some 26.8 km north of Durban was founded by a party of 400 Wesleyan Methodists who immigrated to Natal from Britain in 1850, and named after the Earl of Verulam, patron of the party and by 1860 had become the third largest town in the Colony.

Mount Moreland was also established at that time by Byrnes emigration agent John Moreland and named Mount Moreland in his honour. After the initial establishment of a church and other dwellings the land remained largely undeveloped due to the fact that cotton crops were unsuccessful. It was only in 1870 that Mt Moreland was established as a township.

In March 1850 the first 25 Mauritians arrived to work in the sugar mills followed, in the 1870s, by a more significant influx many of whom settled in the Verulam area bringing with them their expertise in sugar farming from Mauritius.

Amongst them was Hippolyte Lavoipierre who purchased an established sugar estate near the mouth of the Umdloti River known as Stonehenge. Unfortunately for the new owner the price of sugar dropped about 30 % into the late 1880's, outbreaks of horse and cattle sickness occurred as well as several years of drought. Some of the European population in the Verulam area left during this difficult period to find

opportunities elsewhere, but the Lavoipierres remained and would later play a role in the development of Umdlotti.

The four large agricultural plots of the Cottonlands Scheme on Umdlotti Beach, which had not been taken up by Bynre Settlers in 1850, were then consolidated into a single unit of 1,072 acres and sold to John Lake Crompton in 1864, Archibald Robertson in 1872 and to the property speculator Melidor Cheron in 1890. Umdlotti remained undeveloped during this time.

Between 1888 and 1892 the businessman and mayor of Durban, William Arbuckle, who could be said to have been the [Colonial] founder of Umdlotti Beach, purchased the 1,072 acre plot from Cheron and several neighbouring ones which created a holding of 1,301 acres. He installed a manager on the farm, known as Bellamont Estate, and signed on indentured labour to establish several hundred acres under sugarcane. In 1895 Arbuckle sub-divided the northern three quarters of the land on the Umdlotti beachfront into 16 five acre plots and a larger plot of 65 acres. He sold the first five-acre plots to Ada Dumat and Marguerite Michel in September 1895. The following year plots were sold to Morris Pollock (who bought four), Samuel Bacon (two) and Max Pinens. The remaining plots were slowly sold between 1898 and 1912 to R.M.K Chadwick, John William Moor, G Wilkinson, William Starr (two) and Edward G.A. Saunders. One five-acre plot was retained by the Arbuckles and sub-divided into four in 1921.

Early access to Umdlotti Beach area was by road from Durban along the North Coast Road to Verulam then down a farm road to the coast along a dirt track in the mangroves on the south bank of the Umdlotti Estuary.



The Lavoipierre heirs created a new road servitude to the beach through the middle of their Estate to make the beachfront lands which they owned more accessible and began selling beach plots for holiday cottages.

Formerly quite isolated Umdlotti Beach began its development into a seaside resort, Hippolyte Lavoipierre's widow, Pauline, describing the change in 1927: "Every Sunday... we go by car for a drive along our sea side which has become a fashionable beach since we had a road built in order to sell our lots. There is on Sunday a crowd of cars and bathers and under the large trees they set up small tables and chairs for tea. We leave this crowd behind and go further away and, having brought enough to read, breathe the sea air."

The old five-acre plots on the north beach were also beginning to be sub-divided by their owners and two small hotels were built on some of these sub-divisions during the 1930s....

Development of Umdlotti was slow due to the fact that early residents were entirely dependent on rainwater stored from roof run-off into storage tanks. Later provision was made to capture spring water from the sweetwater stream which runs down the small valley into Umdlotti near the Umdlotti Traffic Circle. There was also no public sewage-disposal scheme so conditions were primitive although electricity was later supplied by the Durban Corporation. The sale of new plots from the Bellamont Estate and the five-acre plots continued through the 1930s and 40s. The construction of holiday cottages seems to have started after 1919 and progressed slowly; the valuation role of 1948-49 indicates there were 50 dwellings, two hotels and one shop. 'Old-timers' will remember

how humble some of these 'dwellings' were; true fisherman's cottages under Milkwood trees, the last of which disappeared in the re-developments of the 1990s" (<https://www.emdlotiuiip.co.za/history/>)

### **Archival Maps**

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. No sites occur in the study area. The hill directly behind the development has been partially surveyed in the past in the past (Schofield 1935, 1936; Galloway 1936), and later by Davies in the 1960s (Natal Museum Site Record Forms) and myself (2018). These surveys indicate a very high concentration of Early and Late Iron Age settlements occur on the hill, as well as parts of the presumed early 1920s – 1930s camp site.

As noted in the previous section, the area was first surveyed in as Cottonlands in 1862 (fig. 6), and then further subdivided into various plots. The 1937 aerial photograph shows the eMdloti area in the late 1930's (the time the above text mentions). On this photograph (fig. 7), one can see various buildings, presumably the two hotels, to the east of the study area. There are two area of interest inside the study area. The first occurs in the northeastern corner where a road ends by a cleared area with some houses. Parts of these houses occur in the study area. Second, there area several patches of open sand to the west of the coastal forest. Some of these are irregular shaped while a few are lineal in outline. These could be old camping grounds or middens, or as the text notes "humble...fisherman cottages". Artefacts from these would have rolled down the hill into the study area. It is important to note that there are buildings in the general and/or study area (fig, 7 – 9).

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

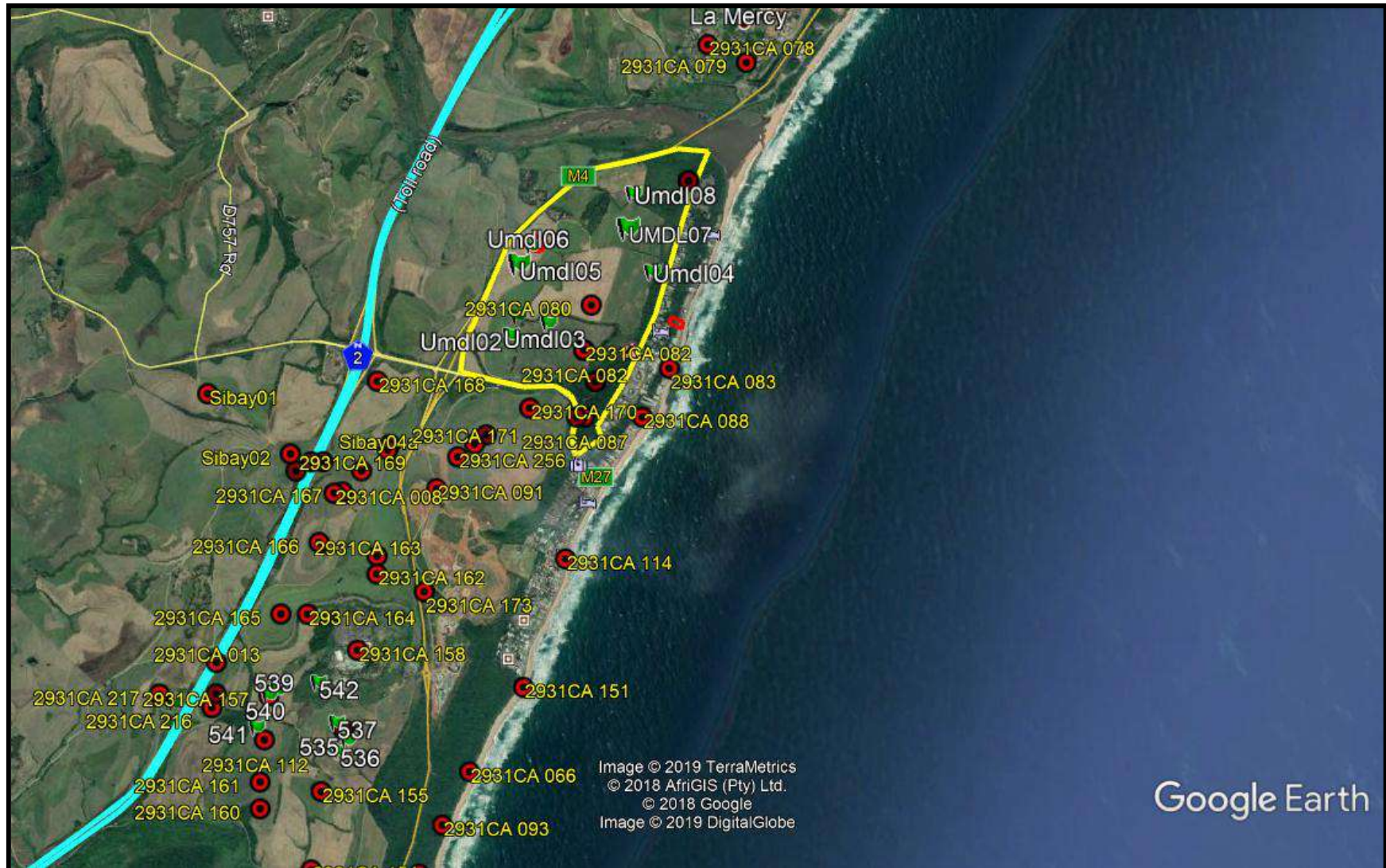


Fig. 6: SURVEYOR GENERAL MAP OF COTTONLANDS (1862)

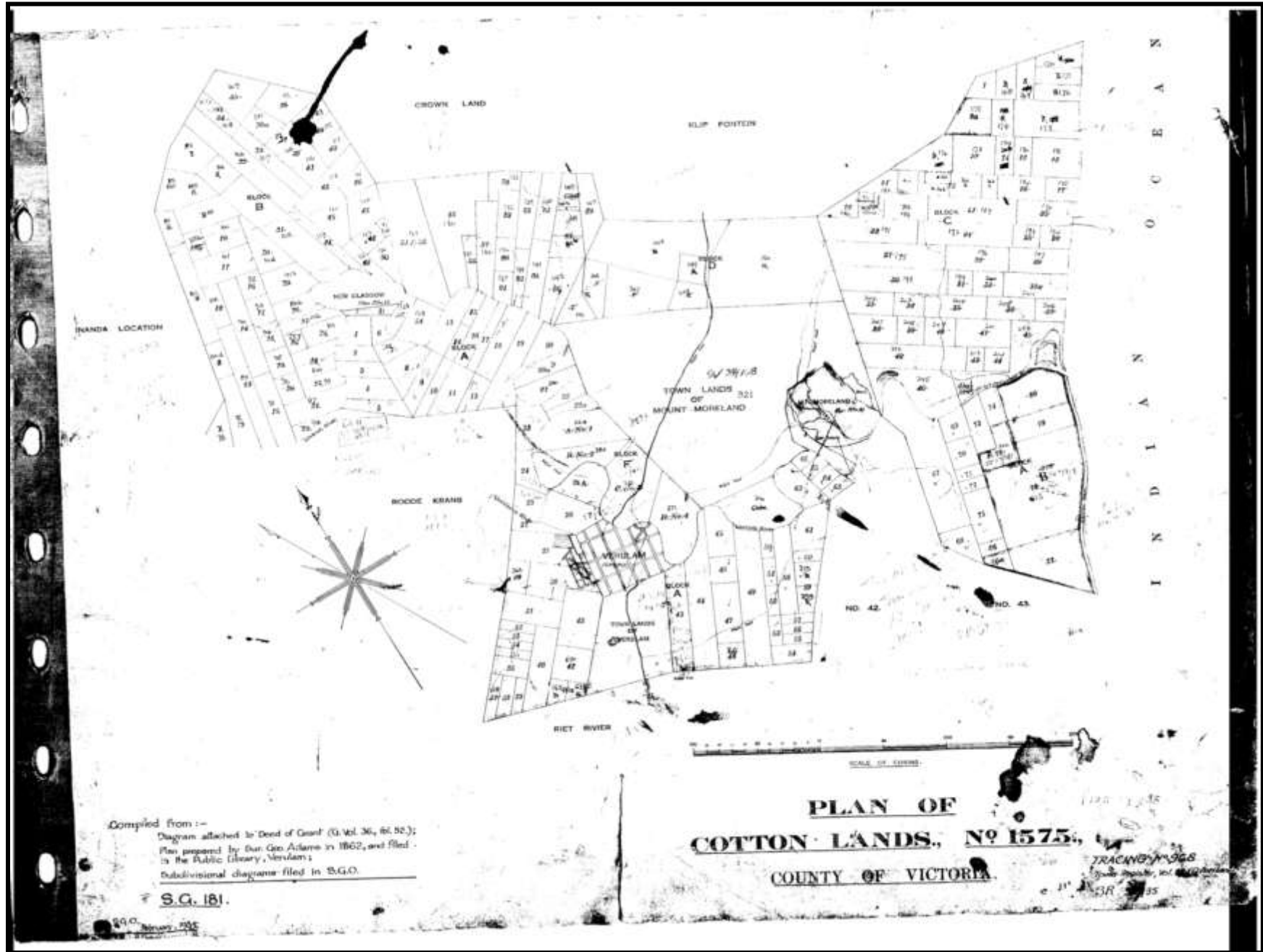


FIG. 7: 1937 AERIAL PHOTOGRAPH OF THE STUDY AREA



FIG. 8: STUDY AREA IN 1942

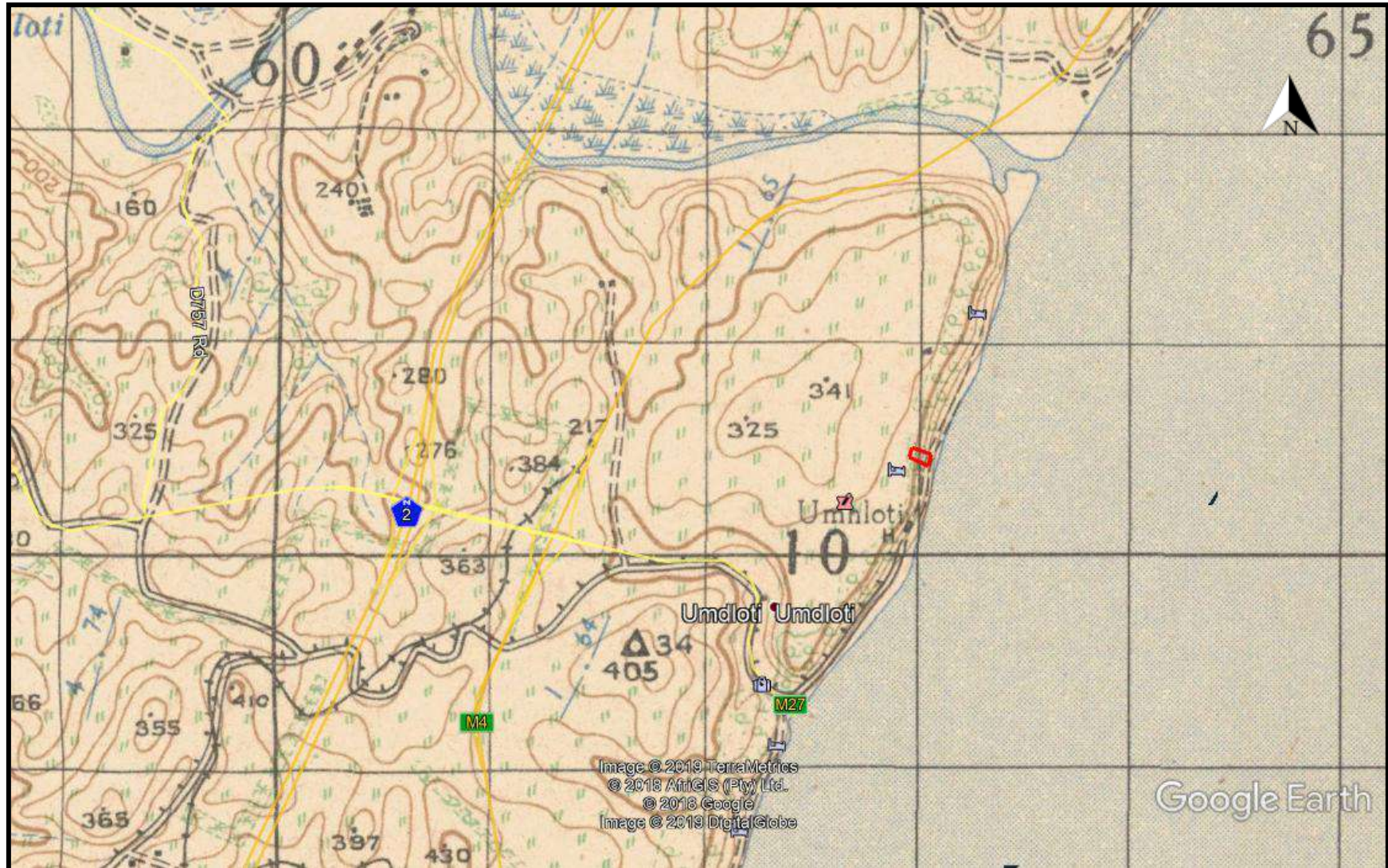
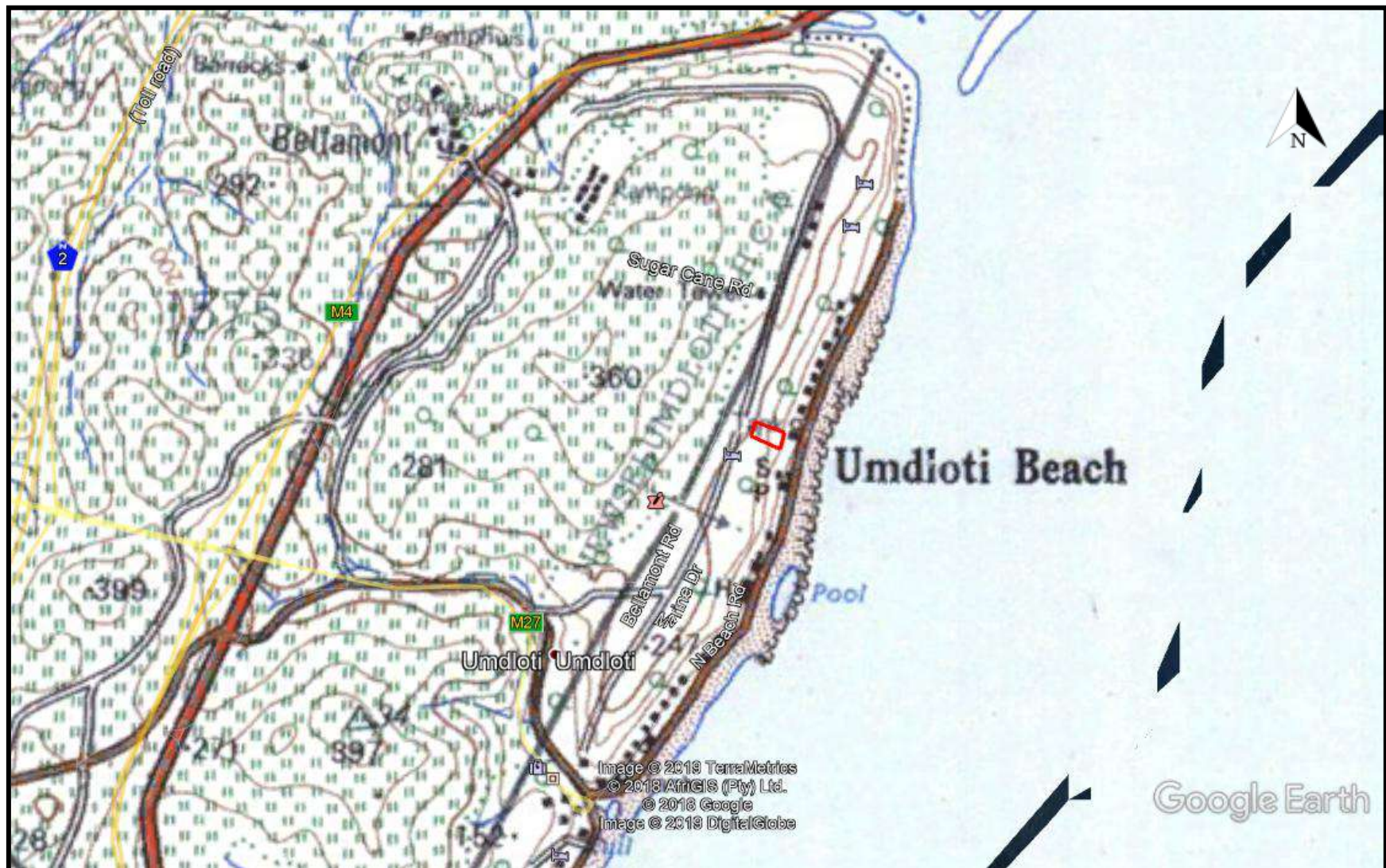


FIG. 9: STUDY AREA IN 1969



## PALAEONTOLOGICAL IMPACT ASSESSMENT

A desktop palaeontological impact assessment was undertaken by Dr Gideon Groenewald for the area above the study area and it is applicable here (Appendix A). The desktop notes:

"The development site... is underlain by Very Highly and Highly to Moderate sensitive rocks for Palaeontological Heritage...

No significant fossils are expected in any formation at this stage of the development and it is very important to note that a suitably qualified palaeontologist must visit all the sites indicated as Very Highly and Highly significant **during the first month of excavations**" (Groenewald 2018). This is shown in Fig. 10.

**FIG.10: PALAEONTOLOGICAL SENSITIVITY OF THE STUDY AREA**



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.



If excavation expose fossils, it will be very important that a suitably qualified Palaeontological Specialist be appointed to do a Phase 1 PIA and to develop a “Chance Find Protocol” document. The CFP document must then be included as part of the EMPr of this project, to record all unexpected fossils associated with the geological formations on site.

It is recommended that:

- The EAP and ECO must be informed of the fact that a Very High and High sensitivity for Palaeontological sensitivity is allocated to large parts of study area underlain by Vryheid Formation as well as a High sensitivity to the Berea Formation sediments, with a Moderate sensitivity to alluvium.
- No further mitigation for Palaeontological Heritage is recommended for this project **before excavation of deeper than 1.5m is done.**
- In areas where excavations **will exceed 1,5m** (see geotechnical reports) in the sections allocated a Very High, High and Moderate sensitivity, a suitably qualified palaeontologist must do a Phase 1 PIA and develop a “Chance Find Protocol” (CFP). This study must be done **during the first month of the planned excavation.**
- Recommendations contained in the resultant Phase 1 PIA and CFP must be approved by AMAFA and SAHRA for inclusion in the EMPr of the project.
- These recommendations must be included in the EMPr of this project.”

Since the development will be at least six stories high, one can expect the foundations to be deeper than 1.5m. A CF will thus be required as well as a site visit by a qualified palaeontologist. The client will require a permit to damage any fossils.

## FIELD SURVEY

The field survey was undertaken on 14 February 2019. The landscape had been affected by previous buildings and the existing house that had created a platform into the slope. While the front part of the property was cleared the rest was dense coastal forest allowing for very poor visibility and access.

The southern part of the property was noted for having a building in the 1937 aerial photograph. A site inspection was undertaken in this area and an old veranda or retaining wall was noted. In addition to this, several as well as 'Coronation' Bricks were noted along the slope (fig. 11). The built structure is overgrown and has a tree growing out of it. The vegetation was too dense to assess more of the built feature, but it did appear to be in good condition. The 'Coronation' brick can date anywhere from the 1920s to the 1960s as this style was in general use for that period. However, the bricks do appear to be patinated suggesting an early age. These features probably relate to the structure noted on the 1937 aerial photograph and thus they are older than 60 years in age and is automatically protected by the heritage legislation.

The area upslope from the house could not be assessed due to the dense vegetation. This is the area where it was noted that material form a possible camp site could occur.

FIG. 11: BUILT FEATURE IN THE STUDY AREA



## MITIGATION AND MANAGEMENT

The built structure will need to be assessed by a qualified architect-historian to assess the feature. Bush clearance will need to be undertaken at some stage to access the area behind the feature. A permit will be required to damage or destroy the feature and any other older built structures in the study area. The permit is available from Amafa KZN Built Environment.

The area on the western slope could have historical middens from possible historical campsites. The area should be revisited after bush clearance and ground vegetation has been removed to determine if any middens occur, and if so to what extent. Isolated finds could be sampled if necessary and it is highly unlikely that excavations would be required.

The property is an area of high palaeontological sensitivity. All excavations deeper than 1.5m will require a palaeontological assessment. This will need to be set up before construction begins.

## CONCLUSION

Umlando was contracted to undertake a Phase 1 HIA for the proposed Umdlotti Sands development. The existing property will be converted to a -6 story development. The servitudes will connect to existing servitudes at the base of the hill.

Approximately half of the property is under East Coast Dune Forest. This resulted in that area not being surveyed. This area is on a steep slope and it is highly unlikely to have archaeological settlements. However, a possible historical campsite on the just above the property have resulted in some artefacts being thrown down hill. I suggested this area is resurveyed once it has been cleared. The remains of a historical built feature occurs in this forested area and needs to be further assessed by a suitably qualified architect.

The property is an area of high palaeontological sensitivity. All excavations deeper than 1.5m will require a palaeontological assessment.

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### **EXPERIENCE OF THE HERITAGE CONSULTANT**

Gavin Anderson has a M. Phil (in archaeology and social psychology) degree from the University of Cape Town. Gavin has been working as a professional archaeologist and heritage impact assessor since 1995. He joined the Association of Professional Archaeologists of Southern Africa in 1998 when it was formed. Gavin is rated as a Principle Investigator with expertise status in Rock Art, Stone Age and Iron Age studies. In addition to this, he was worked on both West and East Coast shell middens, Anglo-Boer War sites, and Historical Period sites.

### **DECLARATION OF INDEPENDENCE**

I, Gavin Anderson, 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 heritage assessment services. There are no circumstances that compromise the objectivity of my performing such work.

A handwritten signature in black ink, appearing to read 'G. Anderson', with a horizontal line underneath.

Gavin Anderson  
Archaeologist/Heritage Impact Assessor

**APPENDIX A**  
**PALAEONTOLOGICAL IMPACT ASSESSMENT**

**DESKTOP PALAEOLOGICAL  
ASSESSMENT AND FOR THE PROPOSED  
SIBAYA NODE 6 DEVELOPMENT IN THE  
ITHEKWINI METROPOLITAN  
MUNICIPALITY IN THE KWAZULU-NATAL  
PROVINCE.**

**FOR**  
**Umlando**

**DATE: 6 June 2018**

**By**

**Gideon Groenewald**

**Cell: 078 713 6377**



## EXECUTIVE SUMMARY

Gideon Groenewald was appointed to undertake a Desktop Palaeontological Assessment Survey for the proposed Sibaya Node 6 Development in the iThekwini Metropolitan Municipality in the Kwazulu-Natal Province.

The development is a mixed residential and advanced urban development that includes a proposed new University Complex that will include several story buildings with extensive excavations for foundations.

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 (revised 2017) 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 development site applicable to the application for the proposed Sibaya Node 6 Development in the iThekwini Metropolitan Municipality in the Kwazulu-Natal Province is underlain by Very Highly and Highly to Moderate sensitive rocks for Palaeontological Heritage.

No significant fossils are expected in any formation at this stage of the development and it is very important to note that a suitably qualified palaeontologist must visit all the sites indicated as Very Highly and Highly significant **during the first month of excavations.**

If excavation expose fossils, it will be very important that a suitably qualified Palaeontological Specialist be appointed to do a Phase 1 PIA and to develop a "Chance Find Protocol" document. The CFP document must then be included as part of the EMPr of this project, to record all unexpected fossils associated with the geological formations on site.

It is recommended that:

The EAP and ECO must be informed of the fact that a Very High and High sensitivity for Palaeontological sensitivity is allocated to large parts of study area underlain by Vryheid Formation as well as a High sensitivity to the Berea Formation sediments, with a Moderate sensitivity to alluvium.

No further mitigation for Palaeontological Heritage is recommended for this project **before excavation of deeper than 1.5m is done.**

In areas where excavations **will exceed 1,5m** (see geotechnical reports) in the sections allocated a Very High, High and Moderate sensitivity, a suitably qualified palaeontologist must do a Phase 1 PIA and develop a “Chance Find Protocol” (CFP). This study must be done **during the first month of the planned excavation.**

Recommendations contained in the resultant Phase 1 PIA and CFP must be approved by AMAFA and SAHRA for inclusion in the EMPr of the project. These recommendations must be included in the EMPr of this project.

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## INTRODUCTION

Gideon Groenewald was appointed to undertake a Desktop Palaeontological Assessment Survey for the proposed Sibaya Node 6 Development in the iThekwini Metropolitan Municipality in the Kwazulu-Natal Province.

The development is a mixed residential and advanced urban development that includes a proposed new University Complex that will include several story buildings with extensive excavations for foundations.

### Legal Requirements

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 (revised 2017) 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; and
- objects with the potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage.

### Aims and Methodology

A Desktop investigation is often the only opportunity to record the fossil heritage within the development footprint. These records are very important to understand the past and form an important part of South Africa's National Estate.

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 identifying exposed and subsurface rock formations that are considered to be palaeontologically significant;
- to assessing 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.

Prior to a field investigation, a preliminary assessment (desktop study) of the topography and geology of the study area is made, using appropriate 1:250 000 geological information (2930 Durban) in conjunction with Google Earth. Potential fossiliferous rock units (groups, formations etc) are identified within the study area and 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.

Priority palaeontological areas are identified within the development footprint to focus the field investigator's time and resources. The aim of the desktop survey is to document any exposed fossil material and to assess the palaeontological potential of the region in terms of the type and extent of rock outcrop in the area.

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 minimal extent of fresh bedrock excavation envisaged. The different sensitivity classes used are explained in Table 1 below.

Table 1 Palaeontological sensitivity analysis outcome classification

<b>PALAEONTOLOGICAL SIGNIFICANCE/VULNERABILITY OF ROCK UNITS</b>	
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) and Groenewald et al., (2014)	
<b>RED</b>	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.
<b>ORANGE</b>	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.
<b>GREEN</b>	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

	<p>professional palaeontologist, desktop survey and phase I PIA (ground proofing of desktop survey) compulsory.</p>
<p><b>BLUE</b></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 dolerite sill outcrops. Collection of a representative sample of potential fossiliferous material recommended. At least a Desktop Survey and “Chance Find Protocol” is compulsory. The Chance Find Protocol must be included in the EMPr for the project.</p>

<b>GREY</b>	<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. At least a Desktop Survey and "Chance Find Protocol" document is compulsory. The Chance Find Protocol must be included in the EMPr of the project.</p>
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When rock units of Moderate to Very High Palaeontological sensitivity are present within the development footprint, palaeontological mitigation measures must be incorporated into the Environmental Management Plan. A suitably qualified Palaeontologist must clear all projects falling on Low to Very Low Palaeontological sensitive geology.

### Scope and Limitations of the Desktop Study

The study will include: i) an analysis of the area's stratigraphy, age and depositional setting of fossil-bearing units; ii) a review of all relevant palaeontological



and geological literature, including geological maps, and previous palaeontological impact reports; iii) data on the proposed development provided by the developer (e.g. location of footprint, depth and volume of bedrock excavation envisaged) and iv) where feasible, location and examination of any fossil collections from the study area (e.g. museums).

The key assumption for this scoping 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. There is also an inadequate database for fossil heritage for much of the RSA, due to the small number of professional palaeontologists carrying out fieldwork in RSA and the Kingdom of Lesotho. Most development study areas have never been surveyed by a palaeontologist.

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.).

### **Locality and Proposed Development**

The proposed proposed Sibaya Node 6 Development in the iThekweni Metropolitan Municipality in the Kwazulu-Natal Province is situated west of Umdloti to the north of Durban.

The development falls in peri-urban undisturbed terrain underlain by sandy and clayey soils of mainly weathered rocks of the Karoo Supergroup and Quaternary aged rocks of the Maputoland Group (Figure 1).

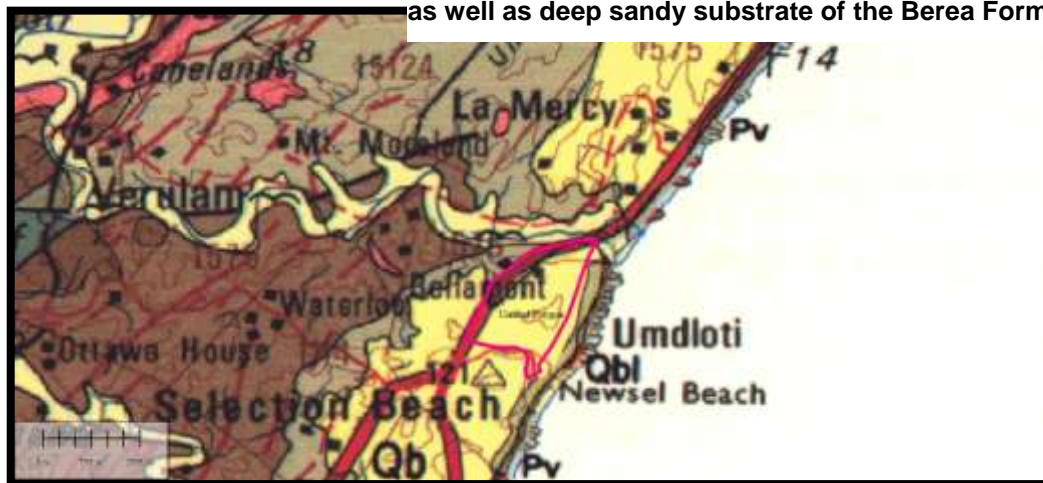


Figure 1 Locality of the Sibaya Node 6 Development site

## GEOLOGY

The site of the development falls on very deep sand and clay from either weathered rocks of Permian aged mudstone, shale and sandstone of the Vryheid Formation, Ecca Group, Karoo Supergroup as well as deep sand of the Berea Formation of the Maputland Group (Figure 2) (Johnson et al, 2009; Groenewald, 2012). The project spans a simple geology and but is dominated by very large areas that are disturbed by agriculture.

Figure 2 The study site is underlain by rocks of the Vryheid Formation (Pv) as well as deep sandy substrate of the Berea Formation (Qb) and alluvium



## **Karoo Supergroup**

### **Ecca Group**

#### *Vryheid Formation (Pv)*

The Permian aged Vryheid Formation is a dominantly coarse-grained sandstone with interbedded dark coloured shales and coal beds. The Formation is interpreted as a near-shore sandbar and in some cases deltaic deposit into the ancient Ecca sea that existed in this part of Gondwanaland (Johnson et al, 2009).

### **Maputuland Group**

#### *Berea Formation*

The Quaternary aged Berea Formation comprises dune sand and palaeosols that represent local wind-blown deposits of Cenozoic age in this part of KwaZulu-Natal (Johnson et al, 2009; Groenewald 2012). The field inspection confirmed the presence of the Berea Formation (also referred to as the “Red Berea Sand”) on site and very little true alluvial material is present on site. Most of the area is highly disturbed by agricultural activity and formal peri-urban development.

### **Alluvium**

The river valleys in the northern part of the development is underlain by recent alluvium.

## **PALAEONTOLOGY**

### **Karoo Supergroup**

### **Ecca Group**

#### **The Vryheid Formation (Pv)**

The Vryheid Formation is well-known for the occurrence of coal beds that resulted from the accumulation of plant material over long periods of time. Plant fossils described by Bamford (2011) from the Vryheid Formation are; *Azaniodendron fertile*,

*Cyclodendron leslii*, *Sphenophyllum hammanskraalensis*, *Annularia* sp., *Raniganjia* sp., *Asterotheca* spp., *Liknopetalon enigmata*, *Glossopteris* > 20 species, *Hirsutum* 4 spp., *Scutum* 4 spp., *Ottokaria* 3 spp., *Estcourtia* sp., *Arberia* 4 spp., *Lidgettonia* sp., *Noeggerathiopsis* sp. and *Podocarpidites* sp.

According to Bamford (2011) “Little data have been published on these potentially fossiliferous deposits. Around the coalmines there is most likely to be good material and yet in other areas the exposures may be too poor to be of interest. When they do occur fossil plants are usually abundant and it would not be feasible to preserve and maintain all the sites, however, in the interests of heritage and science such sites should be well recorded, sampled and the fossils kept in a suitable institution.

Although no vertebrate fossils have been recorded from the Vryheid Formation, invertebrate trace fossils have been described in some detail by Mason and Christie (1985). It should be noted, however, that the aquatic reptile, *Mesosaurus*, which is the earliest known reptile from the Karoo Basin, as well as fish (*Palaeoniscus capensis*), have been recorded in equivalent-aged strata in the Whitehill Formation in the southern part of the basin (MacRae, 1999; Modesto, 2006). Indications are that the Whitehill Formation in the main basin might be correlated with the mid-Vryheid Formation. If this assumption proves correct, there is a possibility that *Mesosaurus* could be found in the Vryheid Formation (Catuneanu et al 2005).

The late Carboniferous to early Jurassic Karoo Supergroup of South Africa includes economically important coal deposits within the Vryheid Formation of Natal. The Karoo sediments are almost entirely lacking in body fossils but ichnofossils (trace fossils) are locally abundant. Modern sedimentological and ichnofaunal studies suggest that the north-eastern part of the Karoo basin was marine. In KwaZulu-Natal a shallow basin margin accommodated a prograding fluviodeltaic complex forming a broad sandy platform on which coal-bearing sediments were deposited. Ichnofossils include U-burrows (formerly *Corophioides*) which are assigned to ichnogenus *Diplocraterion* (Mason and Christie, 1985).

## **The Maputoland Group**

### **Berea Formation**

The Bluff Formation contains very little fossil heritage. Fossils are restricted to fossil wood and casts of root structures. Any new fossil discovery will contribute significantly to the Palaeontological Heritage of South Africa.

## Alluvium

No fossils have up to date been recorded from the alluvium in this region of the KwaZulu-Natal Province.

### PALAEONTOLOGICAL IMPACT AND MITIGATION

The predicted palaeontological impact of the development is based on the initial mapping assessment and literature reviews as well as information gathered during the desktop investigation. The desktop investigation confirms that the study area is underlain by relatively deep (>2m) clay soil associated with the large range of geological formations from Permian aged highly fossiliferous rocks to most recent Quaternary sands of the Maputuland Group with varying degrees of sensitivity for Palaeontological sensitivity (Figure 3).



The areas underlain by Very Highly sensitive rocks for

**Figure 3 Palaeontological sensitivity of the Sibaya Node 6 Development site.**

For colour coding see Table 1

Palaeontological Heritage underlies the most north-western part of the development (Figure 3). The rest of the study area is underlain by Highly sensitive sands of the Berea Formation (Figure 3). The most northwestern corner is underlain by deep alluvial sand with a Moderate sensitivity for Palaeontological Heritage.

The fact that the development entails low impact excavation for the installation of pipelines and local excavation that will exceed 1,5m, parts of the development will result in deep (>1.5m) excavations into the sandy soil, for trenching for infrastructure.

It is not recommended that a phase 1 PIA be done **before** excavation exposed significant trenching deeper than 1,5m. It is important that the ECO reports any suspicious looking material for inspection by a suitably qualified HIA and/or PIA specialist.

No further mitigation for Palaeontological Heritage is recommended at this stage for this project. It is however recommended that a suitably qualified Palaeontologist be appointed to do a Phase 1 PIA during the time of excavation into the subsoils and rocks on site. The ECO must be very vigilant and the appointed Palaeontologist must be on site at least **once a month during large scale excavations** into any of the formations on site.

If any fossils are unexpectedly recorded during excavations of more than 1.5m depth, and specifically in sections allocated a red Very Highly sensitive and orange Highly sensitive geological (Figure 3) the palaeontologist must prepare a "Chance Find Protocol" (CFP) within the first week of exposure of these rocks in the entire study area. This CFP report must be included into the EMPr of the project and upgraded continuously during the construction phase where excavations of deeper than 1,5m are planned for this project.

## CONCLUSION

The development site applicable to the application for the proposed Sibaya Node 6 Development in the iThekwini Metropolitan Municipality in the Kwazulu-Natal Province is underlain by Very Highly and Highly to Moderate sensitive rocks for Palaeontological Heritage.

No significant fossils are expected in any formation at this stage of the development and it is very important to note that a suitably qualified palaeontologist must visit all the sites indicated as Very Highly and Highly significant **during the first month of excavations**.

If excavation expose fossils, it will be very important that a suitably qualified Palaeontological Specialist be appointed to do a Phase 1 PIA and to develop a "Chance Find Protocol" document. The CFP document must then be included as part of the EMPr of this project, to record all unexpected fossils associated with the geological formations on site.

It is recommended that:

The EAP and ECO must be informed of the fact that a Very High and High sensitivity for Palaeontological sensitivity is allocated to large parts of study

area underlain by Vryheid Formation as well as a High sensitivity to the Berea Formation sediments, with a Moderate sensitivity to alluvium.

No further mitigation for Palaeontological Heritage is recommended for this project **before excavation of deeper than 1.5m is done.**

In areas where excavations **will exceed 1,5m** (see geotechnical reports) in the sections allocated a Very High, High and Moderate sensitivity, a suitably qualified palaeontologist must do a Phase 1 PIA and develop a “Chance Find Protocol” (CFP). This study must be done **during the first month of the planned excavation.**

Recommendations contained in the resultant Phase 1 PIA and CFP must be approved by AMAFA and SAHRA for inclusion in the EMP of the project.

These recommendations must be included in the EMP of this 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.



Dr Gideon Groenewald  
Geologist