
**HERITAGE SURVEY OF THE DUBE TRADEPORT
SUPPORT ZONE 2**

FOR DUBE TRADEPORT

DATE: 20 November 2013

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INTRODUCTION

The Dube Tradeport Support Zone 2 is situated on Portion 11 of the Farm La Mercy No. 15124. The original EIA desktop noted that there were heritage features in this section of the Support Zone, and Umlando was contracted to undertake a Phase 1 heritage survey.

The Support Zone is located between the N2 and uShaka International Airport, and to the south of the main entrance road (figures 1 – 3). The hills in the study area have shallow soils and have been used for agricultural activity since the early 19th century. This activity consists mostly of sugarcane farming, and some cattle.

The proposed development will include the construction of:

- Roads
- Electrical lines/cables
- Sewerage pipes
- Buildings
- Related infrastructure

The survey recorded one archaeological site, occurrences of Middle Stone Age artefacts, and the remains of buildings predating 1937. Further mitigation will be required in the study area in the forms of mapping, photographs and sampling. The client will be required to obtain two permits from Amafa KZN.

FIG. 1 GENERAL LOCATION OF THE

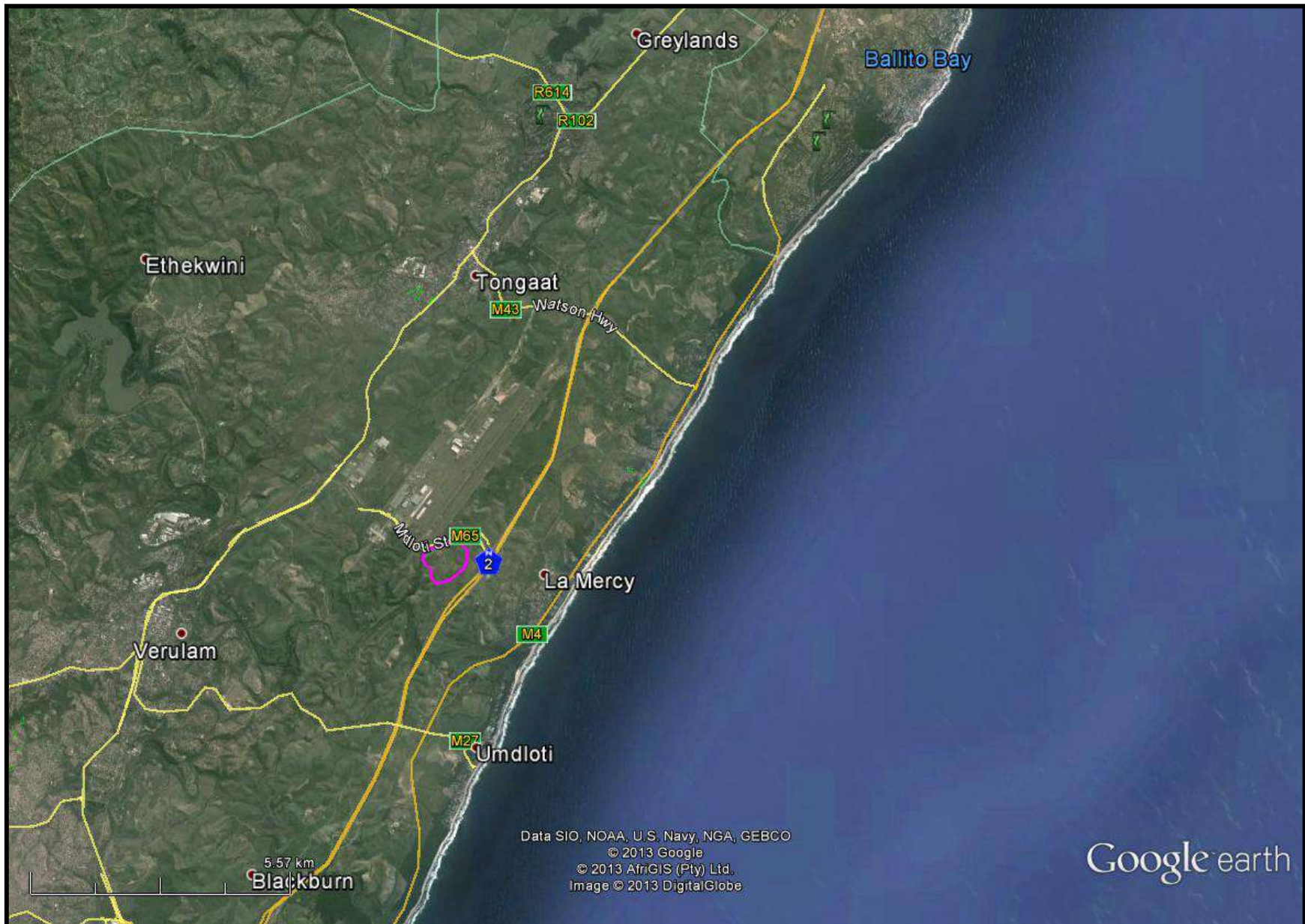


FIG. 2: AERIAL OVERVIEW OF THE

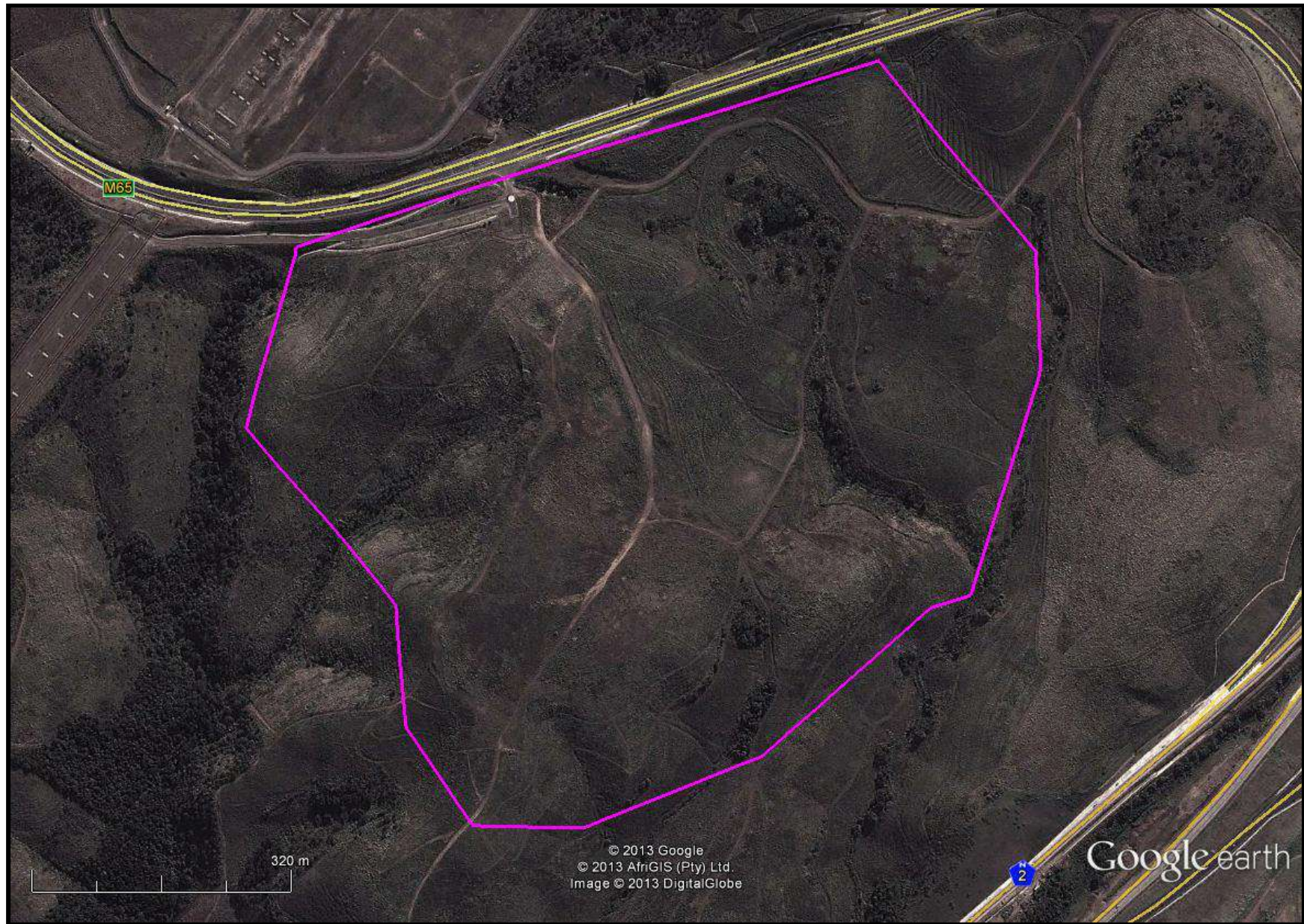
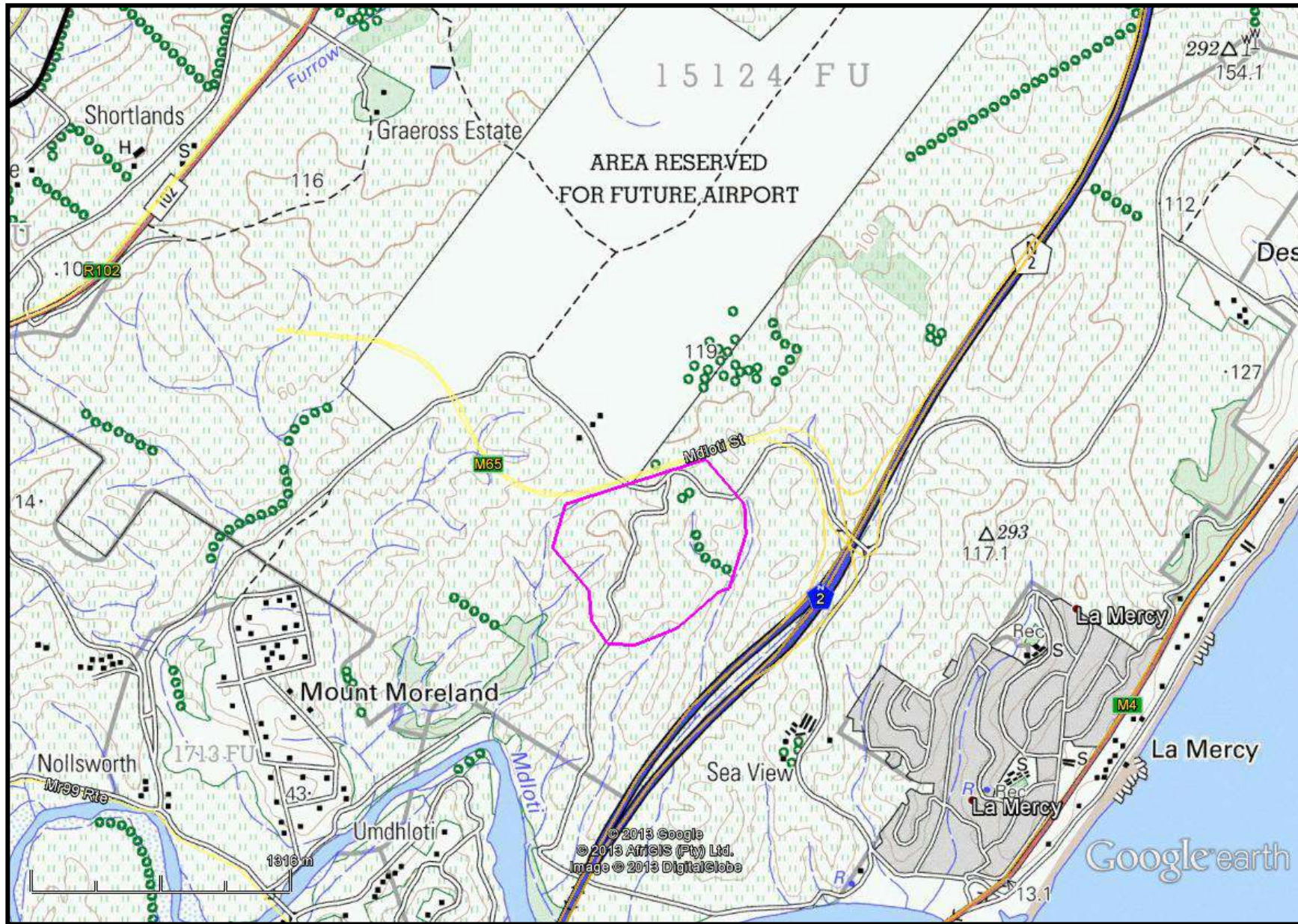


FIG. 3: TOPOGRAPHICAL MAP OF THE



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. This 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.

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. 4). These sites include all types of Stone Age and Iron Age sites. No sites occur in the study area.

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

There have been three surveys in the general area of which one survey had partially covered the study area (Anderson, 2013, eThembeni, 2007, Seliane 2012). These sites noted Middle Stone Age, Late Stone Age, Late Iron Age,

Historical Period artefacts, as well as historical buildings (fig. 4). Two studies note the occurrence of (possible) graves. The locations of these sites are summarised in Table 1.

TABLE: 1: LOCATION OF PREVIOUSLY RECORDED SITES IN THE STUDY AREA

NAME	LATITUDE	LONGITUDE	DESCRIPTION
House	-29.61022222	31.09700000	Nidd residence, dating to 1968
S29 37 55.0 E31 07 04.0	-29.63194444	31.11777778	LIA hilltop settlement, ceramic sherds <5/10m ² and very fragmented; smithing slag
S29 37 45.5 E31 06 30.5	-29.62930556	31.10847222	LIA hilltop settlement, ceramic sherds only,
S29 37 50.0 E31 06 36.5	-29.63055556	31.11013889	LIA hilltop settlement, ceramic sherds only, <2/10m ²
S29 37 45.7 E31 06 36.5	-29.62936111	31.11013889	Deflated LIA iron working midden with bloomery/smithing slag; ceramic sherds >10/m ² on surface, no artefacts in profile. Located in saddle on high point
S29 37 37.0 E31 07 18.5	-29.62694444	31.12180556	LIA hilltop settlement, ceramic sherds <5/10m ² and very fragmented; one whetstone
S29 37 17.0 E31 07 04.5	-29.62138889	31.11791667	LIA hilltop settlement, very few ceramic sherds and hammer stones.
S29 37 30.5 e31 06 47.0	-29.62513889	31.11305556	LIA hilltop settlement, with slag; flattened for construction of modern structures (?compound), also now in ruins
Compound, structures demolished	-29.63319444	31.11375000	Compound, structures demolished
S29 37 23.0 E31 06 54.0	-29.62305556	31.11500000	Farmstead, cement block and brick ruins

FIG. 4: LOCATION OF KNOWN HERITAGE SITES

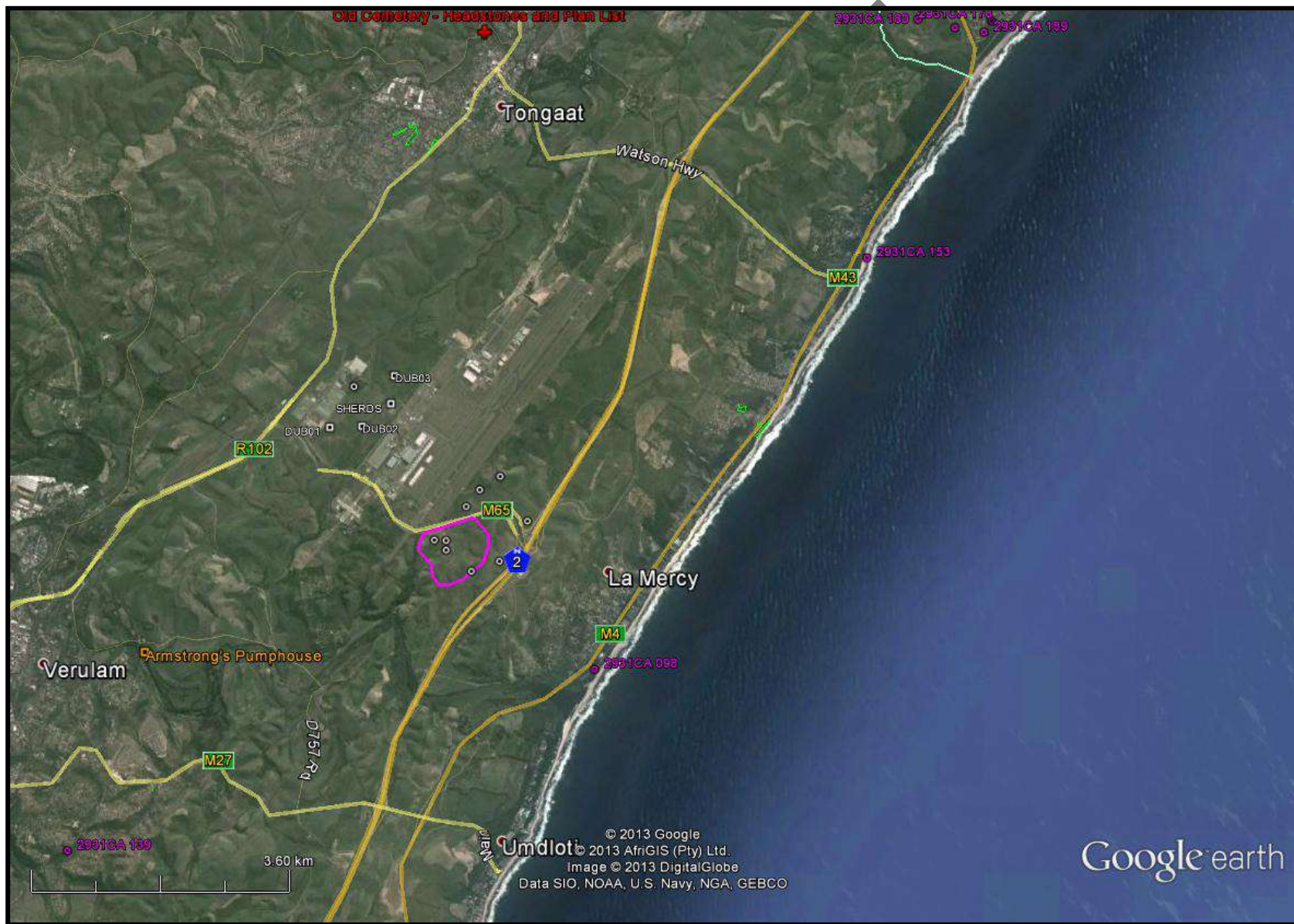
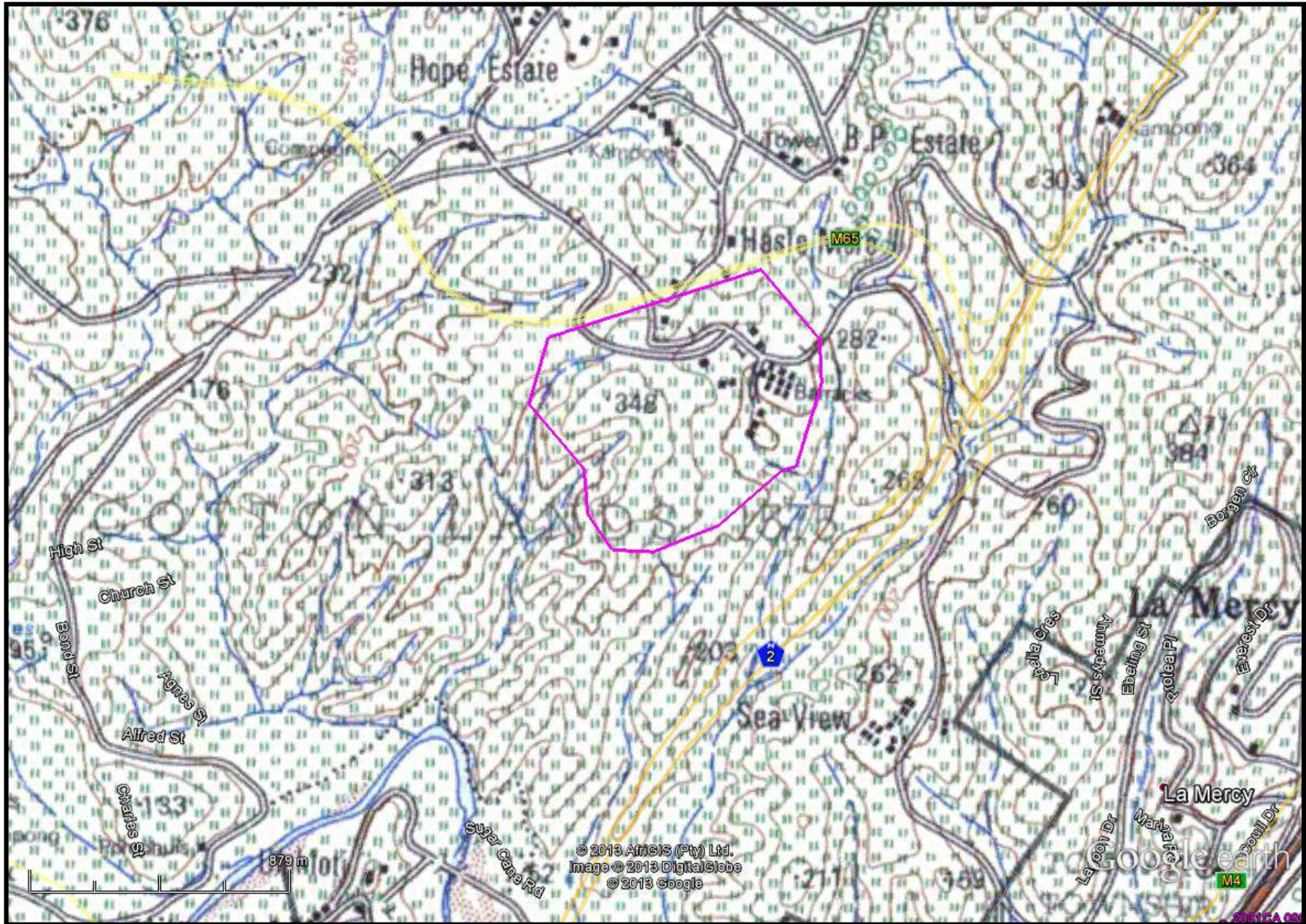


FIG. 5: STUDY AREA IN 1937



FIG. 6: STUDY AREA IN 1969



The 1937 aerial photographs indicate that there is a large farming complex in the study area that consists of farm work buildings and labourers' house (fig. 5). The study area appears to be divided into sugar cane and pasturage.

TABLE: 2: LOCATION OF BUILDINGS IN THE STUDY AREA IN 1937 & 1969

NAME	LATITUDE	LONGITUDE	DESC
C1	-29.628729668	31.113863663	Labourer's house
C2	-29.628784093	31.114052388	Labourer's house
C3	-29.628876687	31.114222643	Labourer's house
C4	-29.628942093	31.114399111	Labourer's house
C5	-29.628990832	31.113740543	Labourer's house
C6	-29.629012938	31.113909614	Labourer's house
C7	-29.629111283	31.114136302	Labourer's house
C8	-29.629253330	31.113823342	Labourer's house
C9	-29.629329979	31.114018179	Labourer's house
C10	-29.629253367	31.114395361	Labourer's house
C11	-29.629193213	31.114633994	Labourer's house
C12	-29.629401138	31.114712428	Labourer's house
c13	-29.629439634	31.113673754	Labourer's house
c14	-29.629631604	31.113882158	Labourer's house
C15	-29.629725006	31.114072094	Labourer's house
C16	-29.629835466	31.114415607	Labourer's house
C17	-29.629930115	31.114634737	Labourer's house
C18	-29.630194733	31.113640303	Labourer's house
C19	-29.630672563	31.113573385	Labourer's house
C20	-29.630611062	31.113394972	Labourer's house
C21	-29.629423302	31.113258169	Labourer's house
B1	-29.629373641	31.112527020	Farm building
B2	-29.628596839	31.112298461	Farm building
B3	-29.628477194	31.111400676	Farm building
B4	-29.628207745	31.111935366	Farm building
B5	-29.629298049	31.112113138	Farm building
B6	-29.628106969	31.113489933	Farm building

The 1969 topographical map indicates that the buildings from 1937 are still in use by 1969 and that the buildings are on the same locations. That is there are no new building locations, although this does not mean that they were not renovated or rebuilt. The 2000 topographical map indicates that these buildings are no longer in use, and they are not noted as ruins.

FIELD SURVEY

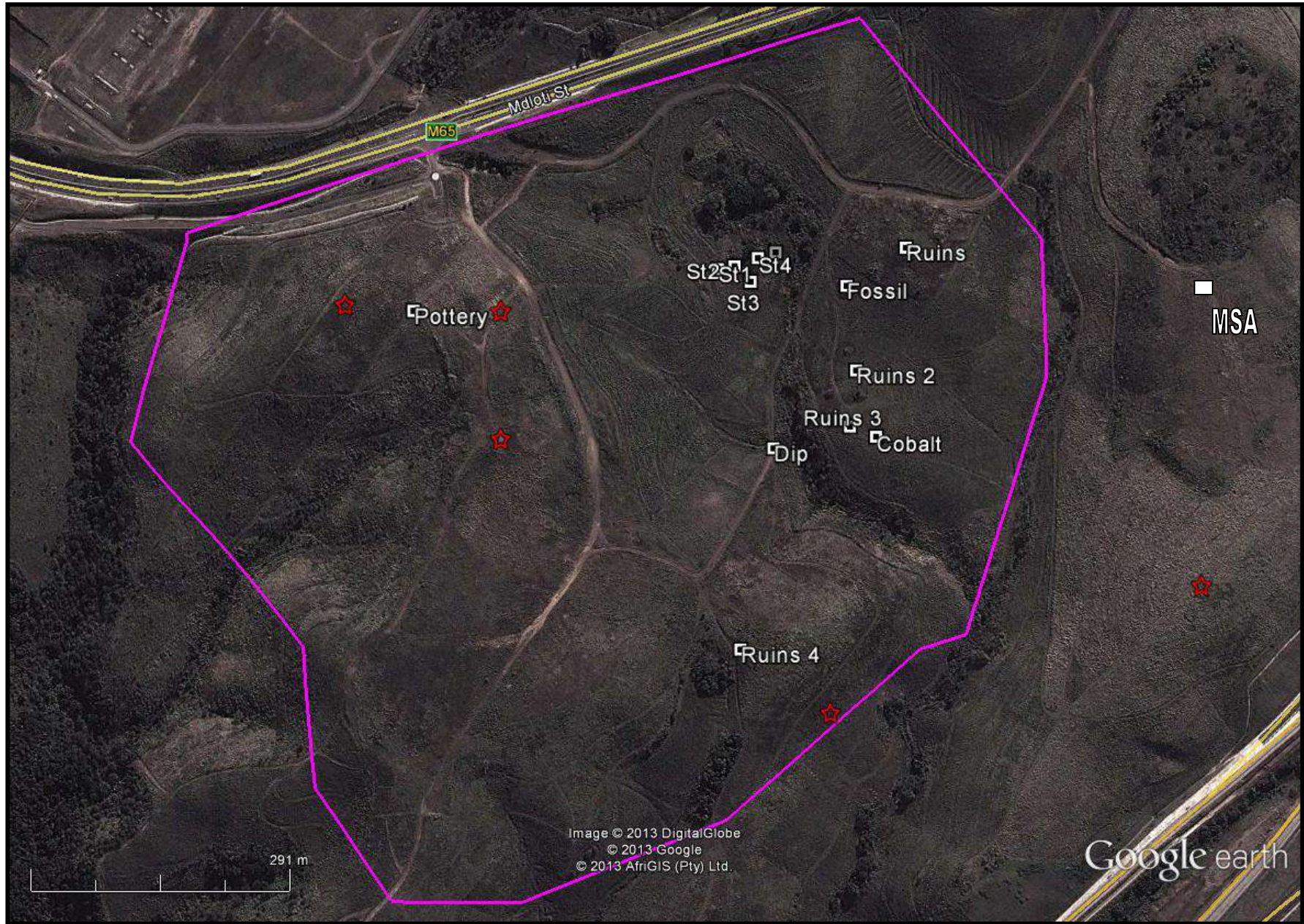
The field survey was undertaken in October 2013. The area is now used for sugar cane that had recently been cut. This resulted in good archaeological visibility. There had been recent earthmoving activity in most of the study area, especially the northwestern corner.

The survey can be divided into three main types of heritage sites: Palaeontological, Archaeological and Historical Ruins. The archaeological sites consist of scatters of artefacts on specific hills that have been severely affected by earthmoving activity: bulldozers, quarry and/or farming. The location of these sites are summarised in Table 3 and indicated in figure 7.

TABLE: 3: LOCATION OF RECORDED SITES IN THE STUDY

NAME	LATITUDE	LONGITUDE	DESCRIPTION
Dip	-29.630631041	31.113119982	1937-1969 buildings -foundations
Dip2	-29.628760032	31.113135992	1937-1969 buildings -foundations
Ruins	-29.628712952	31.114570641	1937-1969 buildings
Ruins 2	-29.629883639	31.114030544	1937-1969 buildings
Ruins 3	-29.630421609	31.113968638	1937-1969 buildings
St1	-29.628925994	31.112497039	1937-1969 buildings - foundations
St2	-29.628895987	31.112682028	1937-1969 buildings - foundations
St3	-29.629040994	31.112859976	1937-1969 buildings -foundations
St4	-29.628816023	31.112940023	1937-1969 buildings - foundations
Cobalt	-29.630518975	31.114260005	Historical Artefact
Pottery	-29.629353974	31.109215021	LIA scatter
MSA	-29.628989	31.117799	MSA occurrence
Fossil	-29.629076030	31.113920035	Palaeontological tree

FIG. 7: LOCATION OF RECORDED SITES IN THE STUDY AREA¹



¹ Red star = previous recordings

DUBSP02: 1937 -1969 BUILDINGS

The buildings that occur on the 1937 aerial (fig. 5) and 1969 topographical (fig. 6) maps have now been destroyed. Since they do not occur on the 2000 topographical maps (fig. 3), I assume that they were destroyed before 2000. I do not know if a permit for this destruction was issued. The remains of the houses (labelled as Ruins in fig 7) are now clumps of bricks across the hills and/or scatters of bricks on the slopes of the various hills (fig. 9). Artefacts are scattered throughout the area where buildings occur (fig. 10). These artefacts date from the early to late 20th century , e.g. faunal remains, cobalt blue glass, two types of Coronation Bricks, stoneware fragments, ceramics, and various types of clear bottles. There are two types of Coronation bricks at the site and these probably date to different times. There is a third brick type at the site. The brick was manufactured by Speirs, Gibb Co. (Fig. 8) Speirs Gibb was a fireclay works in Paisley, Renfrewshire, Caledonia, Scotland. They manufactured bricks between 1882 and 1915. Since Coronation bricks were only manufactured from 1902 onwards, there is a possibility that the buildings were in fact constructed before 1900. There are no formal refuse middens as earth-moving activity has spread the artefacts and disturbed the middens, especially the older middens. The buildings on the western side of the study area are mostly broken; however, the foundations remain. These are labelled as St in figure 7 and illustrated in fig. 11. These foundations are probably part of the original farm work buildings. One structure appears to be a cattle dip – labelled as Dip 2 (fig. 12). The feature labelled, as 'Dip' appears to be part of a water control/retaining system, and a similar ruined version occurs to the north of this (fig. 13).

Significance: The buildings do not appear to be of significance since they have been destroyed. If there were more foundations with intact walling, then the area may have had some significance in terms of early 20th century farm architecture. The study area has some significance in that it is one of the few areas where the original farm labourers living quarters occur, and where there are still artefacts directly associated with these quarters. There has been no

sampling of the material culture from early labourers' houses. Often these remains have been removed through time, and this is a rare chance to obtain these artefacts. I rate the site as having low-medium significance.

FIG. 8: COMPLETE SPEIRS GIBB Co. BRICKS PHOTOGRAPHED ON A BEACH, RENFREWSHIRE, SCOTLAND.



FIG. 9: CURRENT STATE OF 1937 BUILDINGS IN THE STUDY AREA



FIG. 10: ARTEFACTS ASSOCIATED WITH RUINS



FIG. 11: BUILDING FOUNDATIONS



FIG. 12 CATTLE DIP



FIG. 13: WATER RETAINER FEATURE



Mitigation: Two types of mitigation should occur in the study area: sampling and mapping. The area of the labourer's quarters should be systematically sampled for various artefacts, concentrating on the early 20th century artefacts. Those buildings that still have foundations should be mapped and photographed. The foundations are probably older than 60 years in age and are thus protected by heritage legislation. The area around the buildings will need to be cleared of vegetation before mitigation occurs. A Deeds Office survey may be required. The client will need to apply for a Built Environment permit application from Amafa KZN.

SAHRA Rating: 3b

ARCHAEOLOGICAL MATERIAL

Two types of archaeological sites occur in the study area: Late Iron Age (LIA) artefact scatter, and occurrences of Middle Stone Age (MSA) stone tools.

MSA artefacts occur throughout the entire area. Due to their age (250 000 – 30 000 years ago), most of the MSA sites are in a secondary context due to natural colluvial action, erosion and then recent farming activity. The eastern hill just outside of the study area has the highest concentration of isolated artefacts (fig.14), but this is probably due to the road cutting. Isolated stone tools were found within the study area.

The hill in the northwest corner of the study area has been severely affected by a quarry/borrow pit, heavy-duty machinery and agricultural activity. Various pottery sherds and upper grinding stones were observed on the main hill where there is still a sandy deposit (fig. 15). eThembeni recorded working activity south of the small quarry; however, this has now been cleared and was not observed during our survey. We will refer to this area as DUBSP01.

FIG. 14: MSA ARTEFACTS



FIG. 15: LIA ARTEFACTS AT DUBSP01



Significance: The MSA aspect is of low significance as it consists of isolated artefacts over a wide area. DUBSP01 is of low significance in that the archaeological deposit has been damaged and the density of artefacts is very low.

Mitigation: No further mitigation is required. The client will require a permit from Amafa KZN to destroy the site.

SAHRA Rating: 3C

PALAEONTOLOGICAL DESKTOP IMPACT ASSESMENT

Umlando undertook a desktop palaeontological impact assessment for the area just northwest of the study area in 2013 (see Appendix A for full report). The Vryheid Formation underlies the study area: Light grey, coarse-grained sandstone and carbonaceous mudstone. The Vryheid formation is known to be very rich in plant and ichnofossils and these have a high sensitivity rating. However, since the area is overgrown and has had less weathering, the PIA has given it a moderate sensitivity rating.

Dr Groenewald suggests that any excavations deeper than approximately 2m below the current surface would require a palaeontologist on site.

Umlando did not request a PIA desktop for this study area since it is 2km southeast of the previous PIA with the same geology. The results from the desktop PIA would thus hold for this area.

During the field survey, we noted one fossilised tree fragment (fig. 16). Dr Groenewald confirmed this.

Significance: The PIA desktop noted that material from the Vryheid formation would be moderately significant.

Mitigation: Communications with Dr Groenewald indicate that a paleontological survey will be required for the study area before any development occurs.

FIG. 16: FOSSILIED TREE AT RUINS²



² ~30cm in width

CONCLUSION

A heritage survey was undertaken for the Dube Support Zone 2 in November 2013. The Support Zone 2 area is marked for developments such as a garage and related infrastructure. The desktop study had indicated that there would be archaeological sites in the study area, as well as historical buildings dating to at least 1937.

The survey noted the archaeological sites, and that they were of low significance requiring no further mitigation. The buildings date from at least 1937, if not before, and most have been demolished. The demolished buildings tend to be the old labourers' houses that were used until the 1980s-1990s. There are no intact refuse middens; however, older artefacts do occur in the study area and these should be sampled. The foundations of several of the farm buildings still exist and these would be protected by the KZN heritage Act. I suggested that these be mapped and photographed.

The client will require two permits from Amafa KZN. The first will be a permit to destroy the archaeological site at DUBESP01. The second permit will be from the Amafa KZN Built Environment Committee that specifically deals with buildings and related structures older than 60 years.

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**APPENDIX A
PALAEOLOGICAL IMPACT ASSESSMENT FOR AGRIZONE 2**

DRAFT

**DESKTOP PALAEOANTHROPOLOGICAL
ASSESSMENT OF
THE AGRIZONE STUDY AREA,
KWA-ZULU NATAL**

**FOR
Umlando**

DATE: 21 August 2013

By

Gideon Groenewald

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EXECUTIVE SUMMARY

Gideon Groenewald was appointed to undertake a desktop survey, assessing the potential palaeontological impact of the Agrizone development, adjacent to the King Shaka International Airport, Durban, Kwa-Zulu Natal. The project includes the development of stands, greenhouses and general services.

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. In accordance with Section 38 (Heritage Resources Management), a HIA is required to assess any potential impacts to palaeontological heritage within the development footprint.

The Study area is underlain by Permian aged sedimentary rocks of the Vryheid Formation of the Ecca Group, Karoo Supergroup. The Vryheid Formation consists of a sequence of coarse-grained sandstone and carbonaceous shales, interpreted as deltaic sedimentary deposits in localised Graben-induced basins in this part of Kwa-Zulu Natal.

The Vryheid formation is known to be very rich in plant and ichnofossils that would, in theory, allocate a high sensitivity rating for Palaeontology. Due to the fact that areas underlain by the Vryheid Formation are presently overgrown with either sugarcane fields or patches of natural vegetation, a Moderate sensitivity for Palaeontology has been allocated to this site.

The study area is underlain by sedimentary rocks of the Vryheid Formation, Ecca Group, Karoo Supergroup. The study area is allocated a Medium palaeontological sensitivity due to the fact that the entire study area is overgrown with vegetation and exposure of fossil bearing strata is only expected during deep excavations.

Recommendations:

1. The ECO and EAP must be informed of the possibility of the occurrence of fossils during deep excavations into the Vryheid Formation. If fossils are recorded, a professional palaeontologist must be appointed to record them.

INTRODUCTION

Gideon Groenewald was appointed to undertake a desktop survey, assessing the potential palaeontological impact of the Agrizone development, adjacent to the King Shaka International Airport, Durban, Kwa-Zulu Natal. The project includes the development of stands, greenhouses and general services.



Figure 1 Location of the study area

SOUTH AFRICAN NATIONAL HERITAGE RESOURCE ACT NO 25/1999

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. In accordance with Section 38 (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 is 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 fresh bedrock excavation envisaged. The different sensitivity classes used are explained in Table 1 below.

Table 1 Palaeontological sensitivity analysis outcome classification

Sensitivity	Description
Low Sensitivity	Areas where there is likely to be a negligible impact on the fossil heritage. This category is reserved largely for areas underlain by igneous rocks. However, development in fossil bearing strata with shallow excavations or with deep soils or weathered bedrock can also form part of this category.
Moderate Sensitivity	Areas where fossil bearing rock units are present but fossil finds are localised or within thin or scattered sub-units. Pending the nature and scale of the proposed development the chances of finding fossils are moderate. A field-based assessment by a professional palaeontologist is usually warranted.
High Sensitivity	Areas where fossil bearing rock units are present with a very high possibility of finding fossils of a specific assemblage zone. Fossils will most probably be present in all outcrops and the chances of finding fossils during a field-based assessment by a professional palaeontologist are very high. Palaeontological mitigation measures need to be incorporated into the Environmental Management Plan

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 sedimentary rocks of the Vryheid Formation of the Eccca Group, Karoo Supergroup. The Vryheid Formation consists of a sequence of coarse-grained sandstone and carbonaceous shales, interpreted as deltaic sedimentary deposits in localised Graben-induced basins in this part of Kwa-Zulu Natal (Johnson et al, 2006).

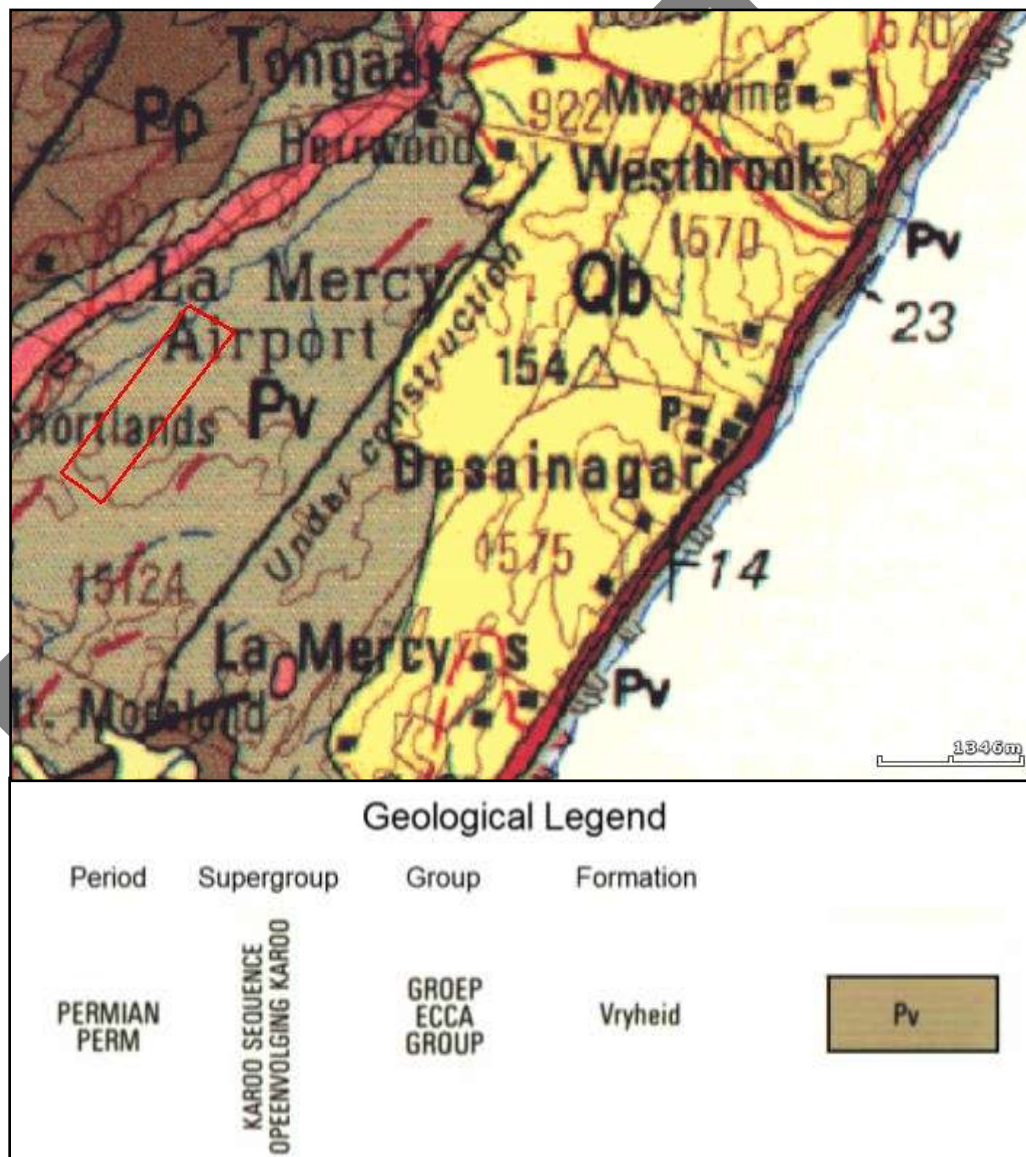


Figure 2 Geology of the study area

PALAEONTOLOGY

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 has 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.

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).

DISCUSSION

The predicted palaeontological impact of the development is based on the initial mapping assessment and literature reviews. The palaeontological significance is summarised in Table 2.

Table 2 Palaeontological significance of geological units on site

Geological Unit	Rock Type and Age	Fossil Heritage	Vertebrate Biozone	Palaeontological Sensitivity
Vryheid Formation	Light grey, coarse-grained sandstone and carbonaceous mudstone PERMIAN	<i>Azaniodendron fertile</i> , <i>Cyclodendron leslii</i> , <i>Sphenophyllum hammanskraalensis</i> , <i>Annularia</i> sp., <i>Raniganjia</i> sp., <i>Asterotheca</i> spp., <i>Liknopetalon enigmata</i> , <i>Glossopteris</i> > 20 species, <i>Hirsutum</i> 4 spp., <i>Scutum</i> 4 spp., <i>Ottokaria</i> 3 spp., <i>Estcourtia</i> sp., <i>Arberia</i> 4 spp., <i>Lidgettonia</i> sp., <i>Noeggerathiopsis</i> sp. and <i>Podocarpidites</i> sp. <i>Diplocraterion</i> burrows	None	Medium sensitivity

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 fresh bedrock excavation envisaged. The different sensitivity classes used are explained in Table 1 above.

The palaeontological sensitivity of the development is related to the specific geology that underlies the development footprints. The Vryheid formation is known to be very rich in plant and ichnofossils that would, in theory, allocate a high sensitivity rating for Palaeontology. Due to the fact that areas underlain by the Vryheid Formation are presently overgrown with either sugarcane fields or patches of natural vegetation, a Moderate sensitivity for Palaeontology has been allocated to this site (Figure 3).



Figure 3 Palaeontological sensitivity of the study area

CONCLUSION

The study area is underlain by sedimentary rocks of the Vryheid Formation, Ecca Group, Karoo Supergroup. The study area is allocated a Medium palaeontological sensitivity due to the fact that the entire study area is overgrown with vegetation and exposure of fossil bearing strata is only expected during deep excavations.

Recommendations:

1. The ECO and EAP must be informed of the possibility of the occurrence of fossils during deep excavations into the Vryheid Formation. If fossils are recorded, a professional palaeontologist must be appointed to record them.

REFERENCES

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Mason TR and Christie ADM 1986. Palaeoenvironmental significance of ichnogenus *Diplocraterion* torell from the Permian Vryheid Formation of the Karoo Supergroup, South Africa. *Palaeogeography, Palaeoclimatology, Palaeoecology* 53(3-4):249-265.

Modesto, SP. 2006. The cranial skeleton of the Early Permian aquatic reptile *Mesosaurus tenuidens* : implications for relationships and palaeobiology. *Zoological Journal of the Linnean Society* 146: 345–368.

DRAFT

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

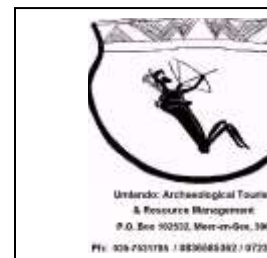
**APPENDIX A
SITE RECORD FORMS**

DRAFT

UMLANDO ARCHAEOLOGICAL SITE RECORD FORM

SITE CATEGORY: (X where applicable)

Stone Age: Early Iron Age:
Late Iron Age Historical Period: x



Recorder's Site No.: DUBSP02

Official Name: 15124 FU

Local Name:

Map Sheet: 2931CA Verulam

GPS reading: S29 37 43.4 E31 06 49.9 100 m

DIRECTIONS TO SITE: SKETCH OR DESCRIPTION.

From King Shaka International Airport turn left onto Mloti Street and drive towards the N2 freeway. After the bridge, turn right onto an unpaved road. Keep left and then veer right. Follow GPS coordinates from here.

SITE DESCRIPTION:

Type of Site: farm buildings/labourer's houses

Threats: Yes What threats: THE DUBE TRADEPORT SUPPORT ZONE 2

RECORDING:

Graphic record: Yes

Digital pictures: x

Tracings :

Re-drawings:

Recorder/Informant: Name: Gavin and Louise Anderson

Address: PO Box 102532, Meerensee, 3901 Date: 01/11/2013

Owner: Dube Trade Port

Description of site and artefactual content.

The remains of the houses are now clumps of bricks across the hills and/or scatters of bricks on the slopes of the various hills. Artefacts are scattered throughout the area where buildings occur. These artefacts date from the early to late 20th century, e.g. faunal remains, cobalt blue glass, two types of Coronation Bricks, stoneware fragments, ceramics, and various types of clear bottles. There are two types of Coronation bricks at the sites and these probably date to different times. There is a third brick type at the site, of which we are awaiting further information. There are no formal refuse middens as earth-moving activity has spread the artefacts and disturbed the middens, especially the older middens. The buildings on the western side of the study area are mostly broken; however, the foundations remain. These foundations are probably part of the original farm work buildings. One structure appears to be a cattle dip. The feature labelled, as 'Dip' appears to be part of water control/retaining system, and a similar ruined version occurs to the north of this. Merits conservation: The buildings do not appear to be of significance since they have been destroyed. If there were more foundations with intact walling, then the area may have had some significance in terms of early 20th century farm architecture. The study area has some significance in that it is one of the few areas where the original farm labourers living quarters occur, and where there are still artefacts directly associated with these quarters. There has been no sampling of the material culture from early labourers' houses. Often these remains have been removed through time, and this is a rare chance to obtain these artefacts. I rate the site as having low-medium significance.

SAHRA Rating: 3b

UMLANDO ARCHAEOLOGICAL SITE RECORD FORM



SITE CATEGORY: (X where applicable)

Stone Age: MSA
Early Iron Age:
Late Iron Age: x
Historical Period:

Recorder's Site No.: DUBSP01

Official Name: 15124 FU

Local Name:

Map Sheet: 2931CA Verulam

GPS reading: S29 37 45.7 E31 06 33.2

DIRECTIONS TO SITE: SKETCH OR DESCRIPTION.

From King Shaka International Airport turn left onto Mloti Street and drive towards the N2 freeway. After the bridge, turn right onto an unpaved road. Keep left and then veer right. Follow GPS coordinates from here.

SITE DESCRIPTION:

Type of Site: LIA Artefact scatter and MSA stone tools

Merits conservation: The MSA aspect is of low significance as it consists of isolated artefacts over a wide area. DUBSP01 is of low significance in that the archaeological deposit has been damaged and the density of artefacts is very low.

Mitigation: No further mitigation is required. The client will require a permit from Amafa KZN to destroy the site.

SAHRA Rating: 3C

Threats: Yes

What threats: THE DUBE TRADEPORT SUPPORT ZONE 2

RECORDING:

Graphic record: Yes

Digital pictures: x

Tracings :

Re-drawings:

Recorder/Informant: Name: Gavin and Louise Anderson

Address: PO Box 102532, Meerensee, 3901

Date: 01/11/2013

Owner: Dube Trade Port

Description of site and artefactual content.

Two types of archaeological sites occur in the study area: Late Iron Age (LIA) artefact scatter, and occurrences of Middle Stone Age (MSA) stone tools. MSA artefacts occur throughout the entire area. Due to their age (250 000 – 30 000 years ago), most of the MSA sites are in a secondary context due to natural colluvial action, erosion and then recent farming activity. The eastern hill just outside of the study area has the highest concentration of isolated artefacts, but this is probably due to the road cutting. Isolated stone tools were found within the study area. The hill in the northwest corner of the study area has been severely affected by a quarry/borrow pit, heavy-duty machinery and agricultural activity. Various pottery sherds and upper grinding stones were observed on the main hill where there is still a sandy deposit. eThembeni recorded in working activity south of the small quarry; however, this has now been cleared and was not observed during our survey. We will refer to this area as DUBSP01.