

**HERITAGE SURVEY OF THE PROPOSED
ESTABLISHMENT OF IRRIGATED LANDS AND
INFRASTRUCTURE, EL RANCHITO FARM, REM OF
FARM LOT FP198 NO. 8759, UNDERBERG, KWA-
ZULU NATAL**

**FOR THE INDEPENDENT ENVIRONMENTAL
ADVISOR**

DATE: 24 JUNE 2017

By Gavin Anderson

**Umlando: Archaeological Surveys and Heritage
Management**

PO Box 102532, Meerensee, 3901

Phone/fax: 035-7531785 Fax: 0865445631

Cell: 0836585362



TABLE OF CONTENT

INTRODUCTION	4
KWAZULU-NATAL HERITAGE ACT NO. 4 OF 2008	9
METHOD	11
Defining significance.....	12
RESULTS	15
DESKTOP STUDY	15
PALAEONTOLOGICAL DESKTOP IMPACT ASSESSMENT	20
FIELD SURVEY.....	21
AH1.....	23
AH2.....	24
QUARRY	25
CAIRN	26
CEMETERY.....	27
CONCLUSION.....	28
REFERENCES	28
EXPERIENCE OF THE HERITAGE CONSULTANT	29
DECLARATION OF INDEPENDENCE	29
APPENDIX A	30
PALAEONTOLOGICAL DESKTOP IMPACT ASSESSMENT	30

TABLE OF FIGURES

FIG. 1 GENERAL LOCATION OF THE STUDY AREA.....	5
FIG. 2: AERIAL OVERVIEW OF THE STUDY AREA	6
FIG. 3: TOPOGRAPHICAL OVERVIEW OF THE STUDY AREA.....	7
FIG. 4: SCENIC VIEWS OF THE AREA	8
TABLE 1: SAHRA GRADINGS FOR HERITAGE SITES	14
FIG. 5: LOCATION OF KNOWN HERITAGE SITES NEAR THE STUDY AREA.....	16
FIG. 6: ORIGINAL SURVEYOR GENERAL MAP (1915).....	17
FIG. 7: STUDY AREA IN 1953	18
FIG. 8: STUDY AREA IN 1968	19
FIG. 9: PALAEONTOLOGICAL SENSITIVITY OF THE STUDY AREA	20
TABLE 2: LOCATION OF RECORDED FEATURES	21
FIG. 10: LOCATION OF RECORDED SITES	22
FIG. 11: BRICK AND MORTAR FROM AH1	23
FIG. 12: BRICK AND MORTAR FROM AH2.....	24
FIG. 13: QUARRY	25
FIG. 14: STONE CAIRN	26
FIG. 15: UNDERBERG CEMETERY.....	27

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

DRAFT

INTRODUCTION

The Farm El Ranchito (FP 198, 8759) is located ~10km east of Underberg, KwaZulu0Natal. The proposal is to make the farm more viable by optimizing the utilization of the property through the establishment of approximately 100 ha pasture and crops (rye/maize/wheat/soya/dry beans). Preference will be given to extending existing lands where possible, and utilizing north-facing slopes. It is possible that the western lands near the dam may be irrigated using the existing rights attached to Minay's Dam.

Additional sheds and other farm outbuildings may be needed for storage in the existing farm yard.

New lands will be established to be farmed using no/minimum till method as has been practiced on the other part of the farm for 17 years.

Further it is proposed that all alien plants (gum /wattle trees and bramble) be removed on the proposed land and surrounding area.

Umlando was appointed by The Independent Environmental Advisor to undertake the heritage survey of the farm.

FIG. 1 GENERAL LOCATION OF THE STUDY AREA



FIG. 2: AERIAL OVERVIEW OF THE STUDY AREA

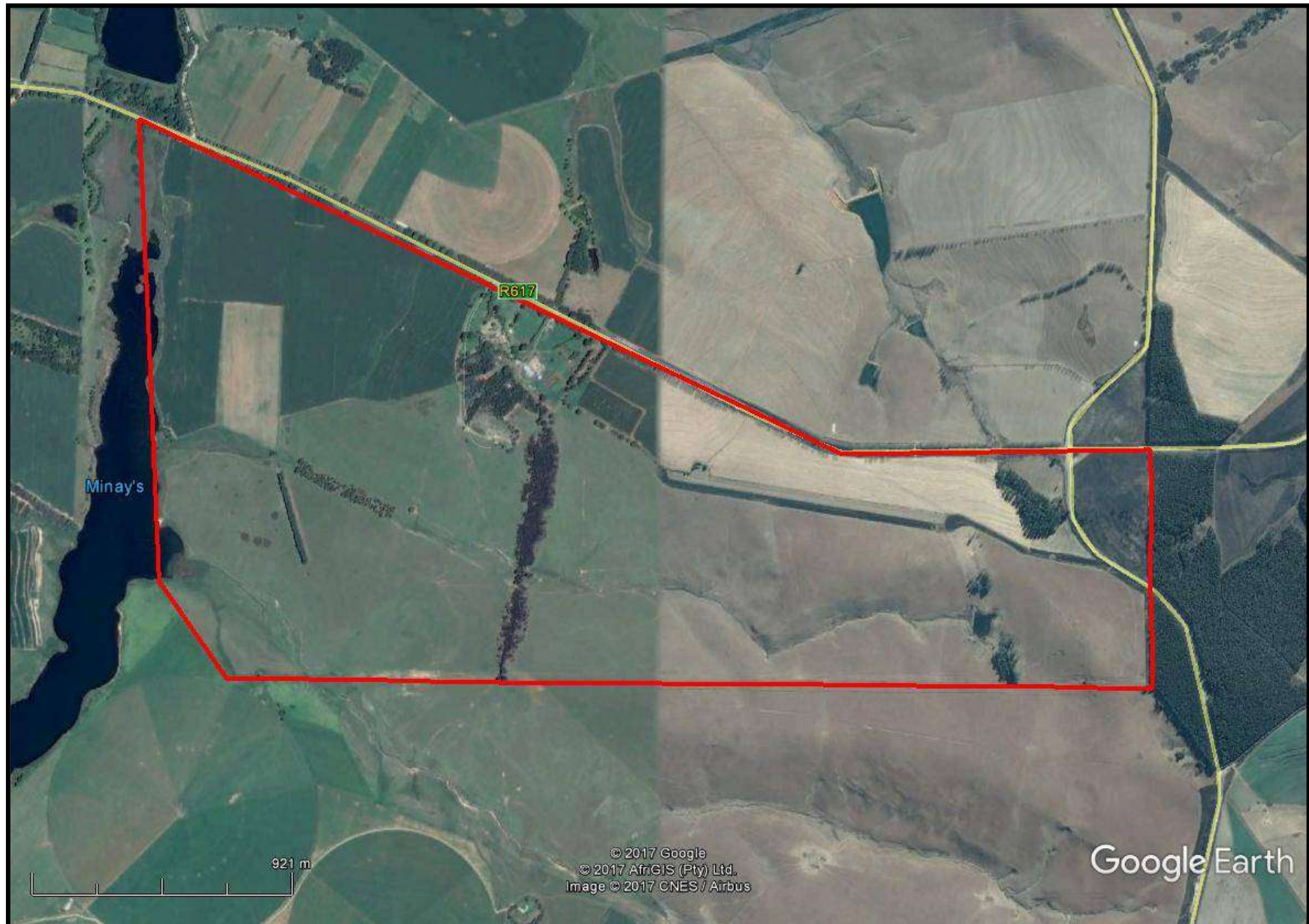


FIG. 3: TOPOGRAPHICAL OVERVIEW OF THE STUDY AREA

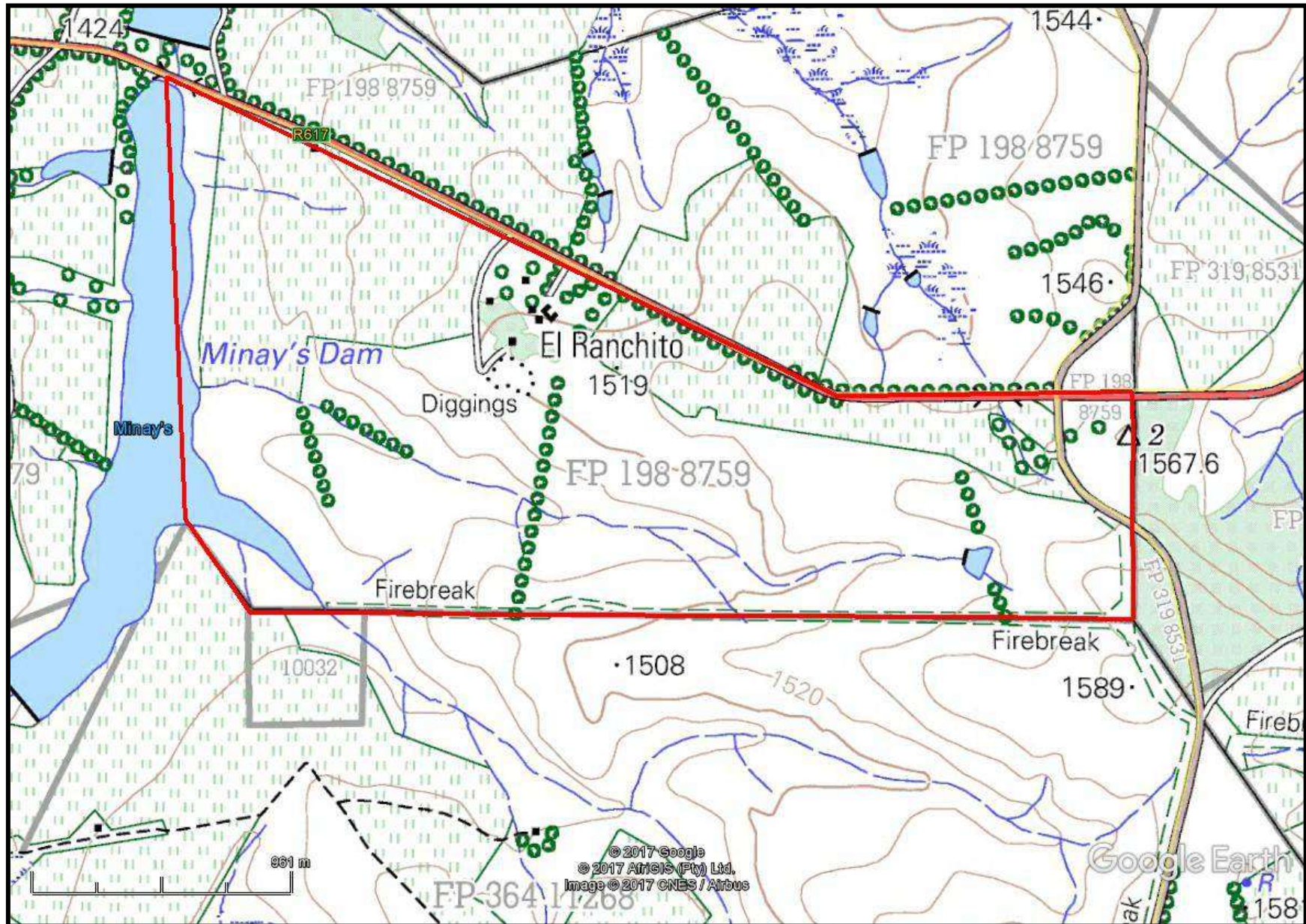


FIG. 4: SCENIC VIEWS OF THE AREA



KWAZULU-NATAL HERITAGE ACT NO. 4 OF 2008

“General protection: Structures.—

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

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

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

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

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

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

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

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

METHOD

The method for Heritage assessment consists of several steps.

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

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

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

Defining significance

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

These criteria are:

1. State of preservation of:

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

2. Spatial arrangements:

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

3. Features of the site:

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

4. Research:

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

5. Inter- and intra-site variability

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

6. Archaeological Experience:

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

7. Educational:

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

8. Other Heritage Significance:

- 8.1. Palaeontological sites
- 8.2. Historical buildings

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

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

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

TABLE 1: SAHRA GRADINGS FOR HERITAGE SITES

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

RESULTS

DESKTOP STUDY

The desktop study consisted of analysing various maps for evidence of prior habitation in the study area, as well as for previous archaeological surveys. The archaeological database indicates that there are archaeological sites in the general area (fig. 4). These sites include MSA, LSA, Rock art, LIA, HP colonial historical sites. No known sites occur in the study area; however, the main farmhouse and some of the associated buildings are older than 60 years and are thus protected.

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

The Surveyor General map indicates that the farm was surveyed in 1915 (fig. 6). This is much later than adjacent land of Richenau that was surveyed in 1886. Fig. 6 does however indicate that El Ranchito is a sub-portion in 1915, and that a house occurs on the original part of the farm.

The 1953 aerial photographs indicate that there are several features on the landscape (fig. 7). These features include the main building (ah3), a quarry (ah1), possible building (ah2), and four areas interest. These latter areas are circles in the field or spaces in the forest.

By 1986, several lines of trees have been grown (fig. 8). This is important to note as they did not exist before 1953 and are thus not of historical value.

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

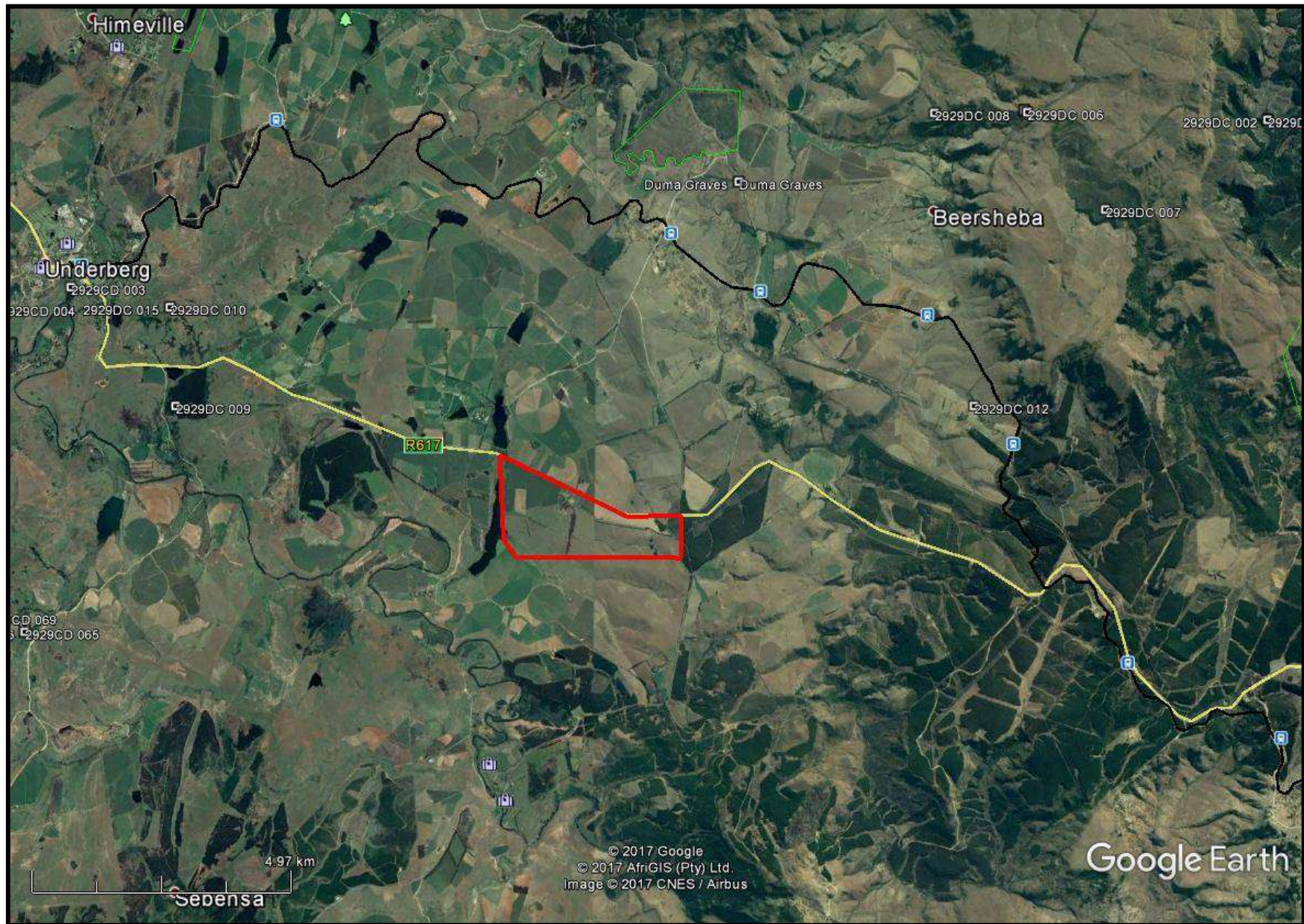
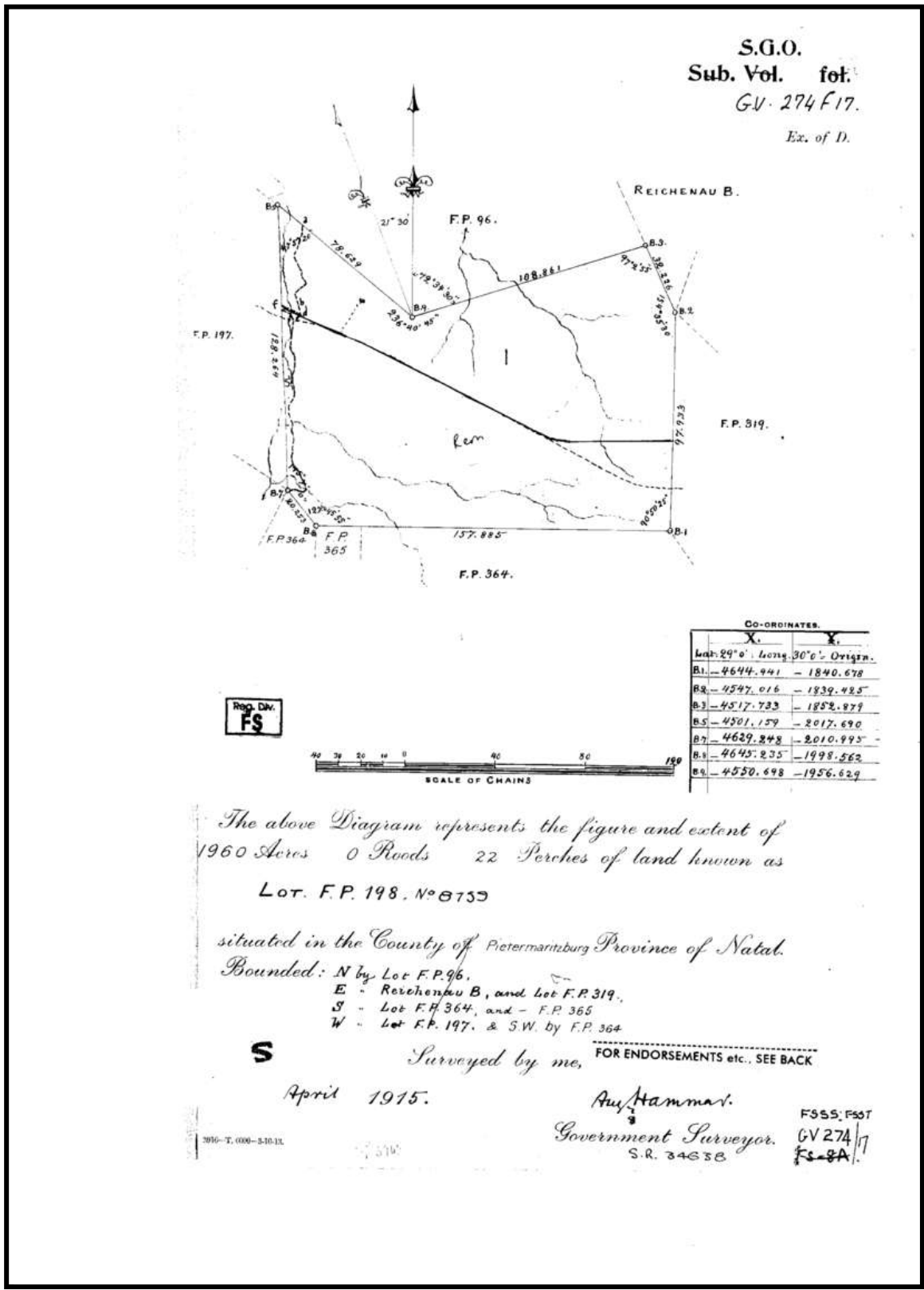
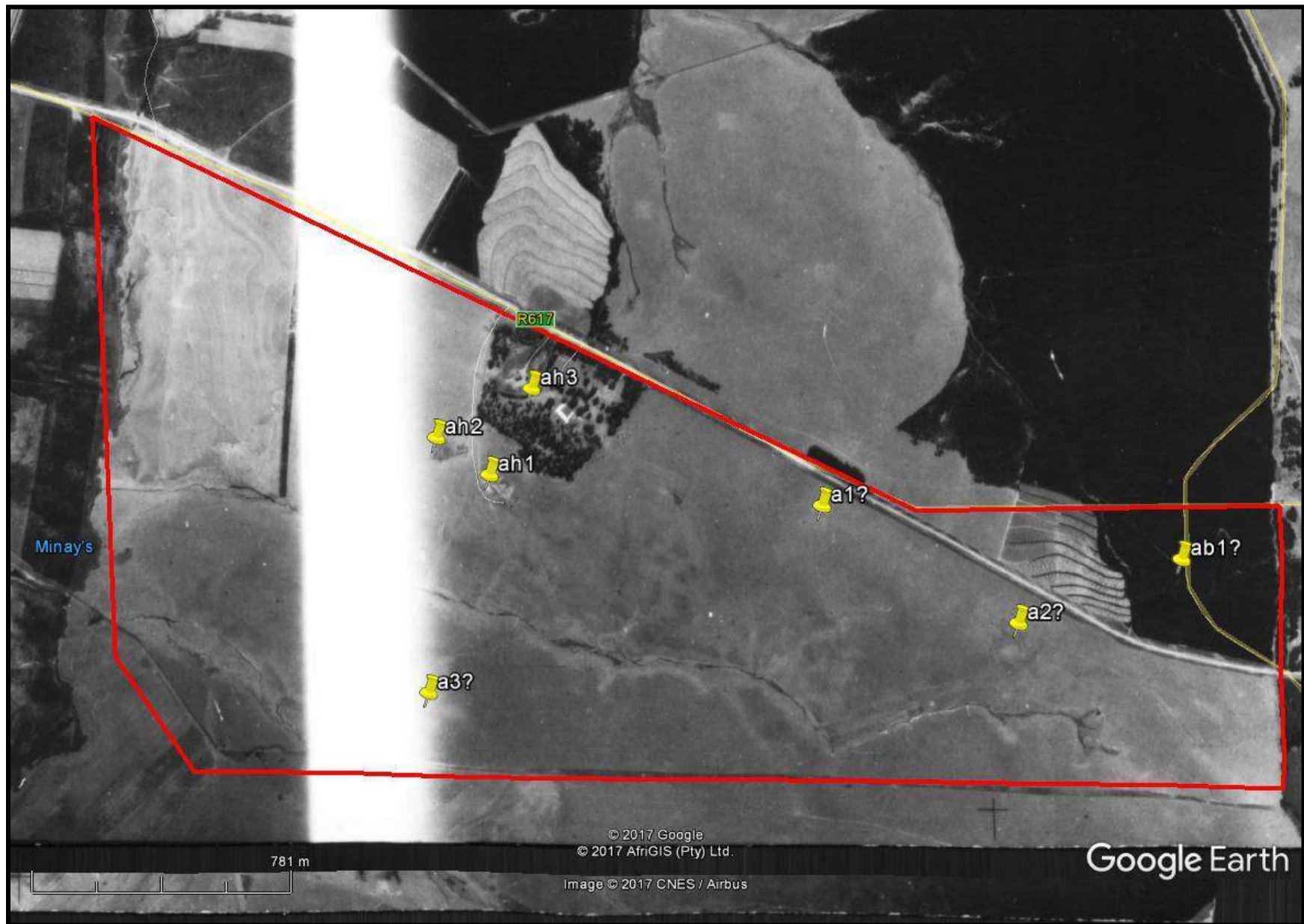


FIG. 6: ORIGINAL SURVEYOR GENERAL MAP (1915)¹



¹ 10187997

FIG. 7: STUDY AREA IN 1953



PALAEONTOLOGICAL DESKTOP IMPACT ASSESSMENT

Fig. 9 indicates that much of the farm is in an area of very high palaeontological significance. For this reason a desktop PIA was undertaken (Appendix A).

FIG. 9: 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.

The PIA desktop assessment indicates that the Tarkastad Subgroup will contain significant palaeontological fossils. The dolerite formations will not contain fossils.

The PIA desktop notes that any excavations deeper than 1.5m will require some form of monitoring and/or mitigation.

The proposed project will not be deeper than 50cm and thus it is highly unlikely to effect the Tarkastad subgroup. No further mitigation is expected.

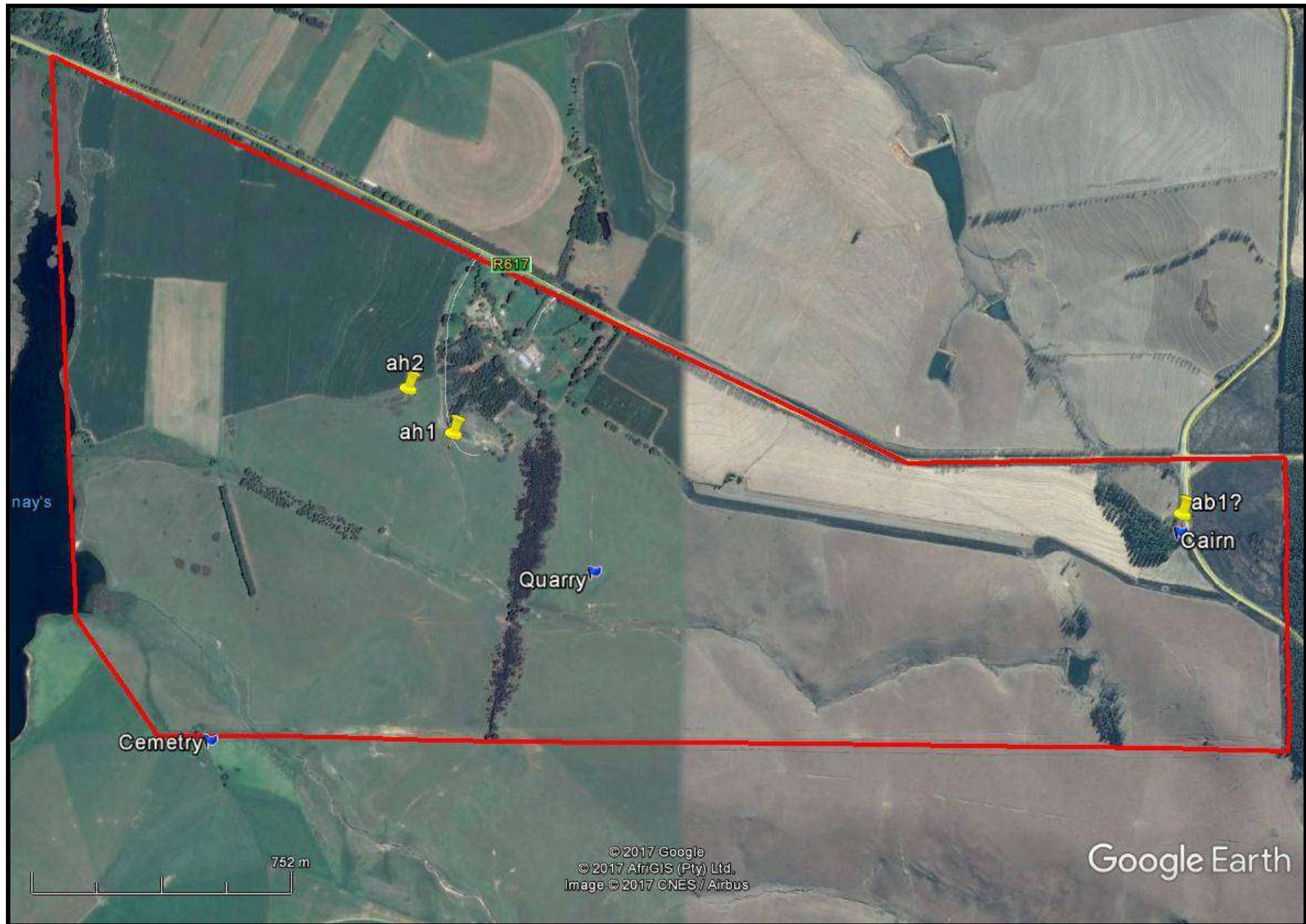
FIELD SURVEY

The field survey was undertaken on the 19 June 2017. All the areas identified on the various maps were visited in addition to other areas known by the landowner. The proposal had changed to include only the north-facing slopes. Only those features from the 1953 map that were indeed features are noted. Fig. 10 shows the locations of the various features, and Table 2 lists the locations.

TABLE 2: LOCATION OF RECORDED FEATURES

NAME	LATITUDE	LONGITUDE
Cairn	-29.837604	29.613739
Quarry	-29.838644	29.596804
Cemetery	-29.843054	29.585313
ab1?	-29.83747988	29.6136671
ah1	-29.83545068	29.59255645
ah3	-29.83302332	29.59415217
ah2	-29.83430677	29.59122727

FIG. 10: LOCATION OF RECORDED SITES



AH1

AH1 occurs east of the old quarry. The area is a cleared area similar to that used for a settlement, and an old apple tree (fig. 11). No artefacts or other features were noted.

Significance: The area is of low significance

Mitigation: No further mitigation is required

FIG. 11: BRICK AND MORTAR FROM AH1



AH2

AH2 was identified on the 1953 map as a possible building or feature. The area currently has no buildings or ruins and only two Coronation brick fragments and one piece of plaster was noted in the ground (fi8g. 12).

Significance: The area is of low significance

Mitigation: No further mitigation is required

FIG. 12: BRICK AND MORTAR FROM AH2²



² GPS is 11cm long

QUARRY

This is a small quarry used for its sandstone (fig. 13). A few of the rocks have impact points. According to the landowner, this quarry was not used by his family.

Significance: The quarry is of low significance

Mitigation: No further mitigation is required.

FIG. 13: QUARRY



CAIRN

A small stone cairn was noted in the eastern corner of the property – the area noted as 'ab1?' in fig. 7. The cairn consists of small rocks placed on top of each other with a radius of ~1m x 0.5m (fig. 14). A larger rock has been moved away from the cairn. The cairn is probably a marker of sort, and not a human grave.

Significance: The cairn is of low significance

Mitigation: No further mitigation is required, as it will not be effected.

FIG. 14: STONE CAIRN



CEMETERY

There is a small historical cemetery just outside the study area (fig. 15). Apparently, this is the original Underberg cemetery. The original Underberg Town Hall, made from wattle and daub, is supposed to occur nearby the cemetery. This cemetery has been recorded for a previous HIA, but it is not on yet SAHRIS.

Significance: The cemetery, and location of the Town hall, is of high significance.

Mitigation: No further mitigation is required, as these will not be affected by this development.

FIG. 15: UNDERBERG CEMETERY



CONCLUSION

A heritage survey was undertaken for the proposed El Ranchito agricultural fields. The initial proposal included both north and south facing fields; however this was changed to only the north facing fields. This means that the features recorded during the survey will not be affected. The cemetery occurs outside of the proposed footprint and is already fenced.

The palaeontology of the area is very sensitive. The significant formations will only occur below depths of 1.5m and thus will not be effected by the proposed change of land use.

No further HIA mitigation is required.

REFERENCES

220 Flight path 3, photos 53496 - 53497
2929DC Underberg 1:50 000 topographical map 1968, 1986
Natal Museum Site Record Database

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 'Anderson', with a large, stylized initial 'A'.

Gavin Anderson
Archaeologist/Heritage Impact Assessor

APPENDIX A
PALAEONTOLOGICAL DESKTOP IMPACT ASSESSMENT

**DESKTOP PALAEOLOGICAL
ASSESSMENT FOR THE PROPOSED
ELRANCHITO DEVELOPMENT, KWA SANI
LOCAL MUNICIPALITY, SISONKE
DISTRICT MUNICIPALITY, KWAZULU-
NATAL PROVINCE**

**FOR
Umlando**

DATE: 23 June 2017

By

**Gideon Groenewald
Cell: 078 713 6377**

EXECUTIVE SUMMARY

Gideon Groenewald was appointed by Umlando to undertake a Desktop Survey, assessing the Potential Palaeontological Impact related to the El Ranchito Development, Kwa Sani Local Municipality, Sisonke District Municipality, KwaZulu-Natal Province.

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 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 for the proposed El Ranchito Development, Kwa Sani Local Municipality, Sisonke District Municipality, KwaZulu-Natal Province is underlain by Triassic aged sediments of the Tarkastad Subgroup and dolerite.

The dolerite will not contain any fossils.

No significant fossils are expected before deep excavation (>1.5m) are done, but if fossils are recorded during excavations into the rocks of the Tarkastad Subgroup, it will contribute significantly to our knowledge of the Palaeontological Heritage of the KwaZulu-Natal Province.

It is recommended that:

The EAP and ECO must be informed of the fact that a Very High Palaeontological Sensitivity is allocated to part of the study site underlain by Tarkastad Subgroup sediments. A Phase 1 PIA document is only applicable if significant exposures (>1.5m) of rocks from this subgroup are foreseen.

If excavations of deeper than 1.5m is planned, a suitably qualified Palaeontologist must be appointed to visit the sites of excavation within the first week of construction, to produce a "Chance Find Protocol" for these sites.

No further mitigation for Palaeontological Heritage is needed for the rest of the proposed sites in this study as they fall on dolerite terrains. The ECO must however be vigilant and report any unexpected exposure of deep (>1.5m) red sediments of the Masotcheni Formation (overburden) during initial excavations at these sites.

If significant fossils are exposed, a "Chance Find Protocol" must be compiled and included in the EMPr of the Project.

TABLE OF CONTENT

EXECUTIVE SUMMARY	32
Legal Requirements	32
TABLE OF CONTENT	34
INTRODUCTION	35
Legal Requirements	35
Aims and Methodology	35
Scope and Limitations of the Desktop Study	40
Locality and Proposed Development	40
GEOLOGY	41
Karoo Supergroup	42
Beaufort Group	42
Tarkastad Subgroup	42
Dolerite	42
PALAEOLOGY	42
Karoo Supergroup	42
Beaufort Group. Tarkastad Subgroup	42
Dolerite	43
PALAEOLOGICAL IMPACT AND MITIGATION	43
CONCLUSION	44
REFERENCES	44
QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR	46
DECLARATION OF INDEPENDENCE	46

TABLE OF FIGURES

Figure 1 Locality of the Elranchito Project	41
Figure 2 Geology underlying the Elranchito Project	41
Figure 3 Palaeontological sensitivity of the study area. For colour coding see Table 1	43

LIST OF TABLES

Table 1 Palaeontological sensitivity analysis outcome classification .	37
--	----

INTRODUCTION

Gideon Groenewald was appointed by Umlando to undertake a Desktop Survey, assessing the Potential Palaeontological Impact related to the El Ranchito Development, Kwa Sani Local Municipality, Sisonke District Municipality, KwaZulu-Natal Province.

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 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 maps (2928 Drakensberg) 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

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

	<p>professional palaeontologist, desktop survey and phase I PIA (ground proofing of desktop survey) compulsory.</p>
<p>BLUE</p>	<p>Low Palaeontological sensitivity/vulnerability. Low possibility that fossils that are described in the literature will be visible to the naked eye or be recognized as fossils by untrained persons. Fossils of for example small domal Stromatolites as well as micro-bacteria are associated with these rock units. Fossils of micro-bacteria are extremely important for our understanding of the development of Life, but are only visible under large magnification. Recording of the fossils will contribute significantly to the present knowledge and understanding of the development of Life in the region. Where geological units are allocated a blue colour of significance, and the geological unit is surrounded by highly significant geological units (red or orange coloured units), a palaeontologist must be appointed to do a desktop survey and to make professional recommendations on the impact of development on significant palaeontological finds that might occur in the unit that is allocated a blue colour. An example of this scenario will be where the scale of mapping on the 1:250 000 scale maps excludes small outcrops of highly significant sedimentary rock units occurring in 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>

GREY	<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>
-------------	---

When rock units of moderate to high palaeontological sensitivity are present within the development footprint, palaeontological mitigation measures must be incorporated into the Environmental Management Plan. All projects falling on Low to Very Low Palaeontological sensitivity geology must be discussed in either a Phase 1 PIA or Chance Find Protocol (CFP) document that must form part of the EMPr of the project.

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 Project area falls just south of the R617 route in the vicinity of Underberg which is located in the Sani Local Municipal area, Sisonke District Municipality in KwaZulu-Natal Province (Figure 1).



Figure 1 Locality of the Elranchito Project

GEOLOGY

The study area is underlain predominantly by Triassic aged sediments of the Tarkastad Subgroup, Beaufort Group, Karoo Supergroup in South Africa (Figure 2) and Jurassic aged dolerites.



Figure 2 Geology underlying the Elranchito Project

Karoo Supergroup

Beaufort Group

Tarkastad Subgroup

The Triassic aged Tarkastad Subgroup represents a deposition of braided river sandstones and overlying red mudstone of the mostly fluvial and lacustrine sediments of the Tarkastad Subgroup (Groenewald 1996; Groenewald 2012, Johnson et al, 2009).

The lower part of the Tarkastad Subgroup is highly arenaceous and the upper part more argillaceous. The sediments underlying the proposed site consists mostly thick to very thick sandstones of the Katberg Formation, whilst the upper mudstone rich zone of the Burgersdorp Formation represents as slowly flowing meandering river environment (Figure 2).

Dolerite

A small part of the study area is underlain by dolerite. In this area the dolerite is normally deeply weathered, leading to red coloured highly clay-rich Hutton form soils.

PALAEONTOLOGY

Karoo Supergroup

Beaufort Group. Tarkastad Subgroup

The sediments of the Tarkastad Subgroup, if well-exposed, can contain significant vertebrate fossils of the *Lystrosaurus* and *Cynognathus* Assemblage zones (MacRae, 1999; McCarthy and Rubidge, 2005). Due to very deep weathering in the study area, very few fossils have been described from these beds (Groenewald, 1996) but the fossils are abundantly present to the north of the study site. If excavations for this development will exceed 1.5m, the potential to discover significant fossils in the red-coloured mudstone of the Tarkastad Subgroup is very high.

Dolerite

No fossil are expected in areas underlain by dolerite.

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 Triassic aged highly Fossiliferous sediments of the Tarkastad Subgroup and Jurassic aged dolerite. Due to the extremely deep weathering in this region (personal experience of the author) the chance find of significant fossils in excavations less than 1.5m deep is very low.

Dolerite will not contain fossils.

The Palaeontological sensitivity of Very Highly sensitive in the areas underlain by Tarkastad Subgroup rocks are retained for this desktop survey and if any excavations of deeper than 1.5m are planned in these areas, a suitably qualified Palaeontologist must be appointed to inspect these excavations for possible fossils. A very Low sensitivity for Palaeontological Heritage is allocated for areas underlain by Dolerite (Figure 3).



Figure 3 Palaeontological sensitivity of the study area. For colour coding see Table 1

CONCLUSION

The development site for the proposed El Ranchito Development, Kwa Sani Local Municipality, Sisonke District Municipality, KwaZulu-Natal Province is underlain by Triassic aged sediments of the Tarkastad Subgroup and dolerite.

The dolerite will not contain any fossils.

No significant fossils are expected before deep excavation (>1.5m) are done, but if fossils are recorded during excavations into the rocks of the Tarkastad Subgroup, it will contribute significantly to our knowledge of the Palaeontological Heritage of the KwaZulu-Natal Province.

It is recommended that:

The EAP and ECO must be informed of the fact that a Very High Palaeontological Sensitivity is allocated to part of the study site underlain by Tarkastad Subgroup sediments. A Phase 1 PIA document is only applicable if significant exposures (>1.5m) of rocks from this subgroup are foreseen.

If excavations of deeper than 1.5m is planned, a suitably qualified Palaeontologist must be appointed to visit the sites of excavation within the first week of construction, to produce a "Chance Find Protocol" for these sites.

No further mitigation for Palaeontological Heritage is needed for the rest of the proposed sites in this study as they fall on dolerite terrains. The ECO must however be vigilant and report any unexpected exposure of deep (>1.5m) red sediments of the Masotcheni Formation (overburden) during initial excavations at these sites.

If significant fossils are exposed, a "Chance Find Protocol" must be compiled and included in the EMP of the Project.

REFERENCES

Almond J.E. and Pether J. 2008. *Palaeontological Heritage of the Western Cape.* Internal Report Heritage Western Cape.

Almond J.E., De Klerk B. and Gess R., 2009. *Palaeontological Heritage of the Eastern Cape.* Internal Report, SAHRA.

Bamford M. 2011. Desktop study Palaeontology Ermelo to Empangeni – Eskom powerline. Internal report Bernard Price Institute for Palaeontological Research, University of the Witwatersrand.

Cairncross, B., Beukes, NJ., Coetzee, LL. and Rehfeld, U. 2005. The Bivalve *Megadesmus* from the Permian Volksrust Shale Formation (Karoo Supergroup), northeastern Karoo Basin, South Africa: implications for late Permian Basin development. *South African Journal of Geology* 108: 547-556

Groenewald GH., 2012. *Palaeontological Technical Report for Kwazulu-Natal. Internal Report, AMAFA.*

Groenewald G.H., Groenewald D.P. and Groenewald S.M., 2014. *Palaeontological Heritage of the Free State, Gauteng, Limpopo, Mpumalanga and North West Provinces.* Internal Palaeotechnical Reports, SAHRA.

Johnson MR , Anhaeusser CR and Thomas RJ (Eds). 2009. *The Geology of South Africa.* GSSA, Council for Geoscience, Pretoria.

Linstrom W. 1987 Die Geologie van die gebied Durban.. Explanation Sheet 2930 (1:250 000). Geological Survey of South. Africa.

MacRae C. 1999. *Life Etched in Stone.* Geological Society of South Africa, Linden, South Africa.

McCarthy T and Rubidge BS. 2005. *Earth and Life.* 333pp. Struik Publishers, Cape Town.

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.

Van der Walt, M., Day, M., Rubidge, B., Cooper, A.K. & Netterberg, I. 2010. A new GIS-based biozone map of the Beaufort Group (Karoo Supergroup), South Africa. *Palaeontologia Africana* 45, 1–5.

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