

**HERITAGE SURVEY OF THE THREE BORROW PITS
FOR ROAD UPGRADES, UMTATHA, EASTERN
CAPE.**

FOR EOH COSTAL ENVIRONMENTAL SERVICES

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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 |
| ECPHRA | Eastern Cape Provincial Heritage Agency |

INTRODUCTION

“Jeffares and Green (Pty) Ltd (J&G) were appointed by SANRAL to undertake the design, contract documentation and construction monitoring for the regravelling of roads, maintenance to existing culverts and where required the installation of stormwater infrastructure on certain municipal gravel roads as part of the Rural Roads Regravelling Programme

The roads to upper Centuli School and Kwa-Saba were inspected in February 2016. From the inspection it was established that the road serving the Upper Centuli School required regravelling, side drains and erosion protection. The road to the Kwa-Saba also required regravelling, side drains and erosion protection. Sections of the road to the Kwa-Saba community are very steep and longitudinal erosion has taken place. Longitudinal drainage on the steep sections is poor and can be addressed by constructing mitre drains to divert the stormwater away from the road. Side drains for this road require attention, eroded areas must be attended to and erosion protection installed. The road joining Sandmen with Sixhotyeni was inspected and it was established that the road surface was in a poor condition and required regravelling. Most of the stormwater culverts were completely silted, the inlet and outlet structures were either badly damaged or non-existent, and eroded areas were encountered.

Both the roads to Upper Centuli School and to Kwa-Saba require regravelling. The existing stormwater culverts along the road to Kwa-Saba appeared to have functioned satisfactorily. Silting-up of the stormwater structures is visible and requires attention. All silt must be removed from the stormwater pipe barrels and inlet and outlet 3 structures. Erosion in the vicinity of the stormwater culverts must be addressed and erosion protection installed. The road joining Sandleni with Sixhotyeni requires regravelling. Most of the existing stormwater culverts along this road are silted up, inlet and outlet structures of the

culverts are either badly damaged or non-existent, and are not functional, resulting in erosion to the road.

Three existing borrow pits were identified as potential sources of gravel wearing course material. Borrow Pit 1 is situated alongside the Kwa-Saba access road and is approximately 8.5km from the intersection of the access road to Upper Centuli School and DR08282. It is proposed to use this source for the regravelling of the Kwa-Saba and Centuli Access Roads. Borrow Pit 2 is located 6.7km further down the Kwa-Saba access road towards DR08033 and it is proposed as only a back-up source. Borrow Pit 3 is 1.6km to the south-east of the end point of the road joining Sandleni with Sixhotyeni and is proposed for the regravelling of this road. All of these borrow pits are currently in the process of being licenced. The materials encountered in the borrow pits consists of a mixture of sandstone and weathered shale” (Jeffares & Green 2016 Preliminary Design report)

Umlando as requested to undertake a field survey of three proposed borrow pits that will be used as part road upgrades. The borrow pits are located 20km – 32km southwest of Umthatha. Figures 1 – 3 show the location of the borrow pits. Fig. 4 shows the scenic view of each borrow pit.

FIG. 1 GENERAL LOCATION OF THE BORROW PITS

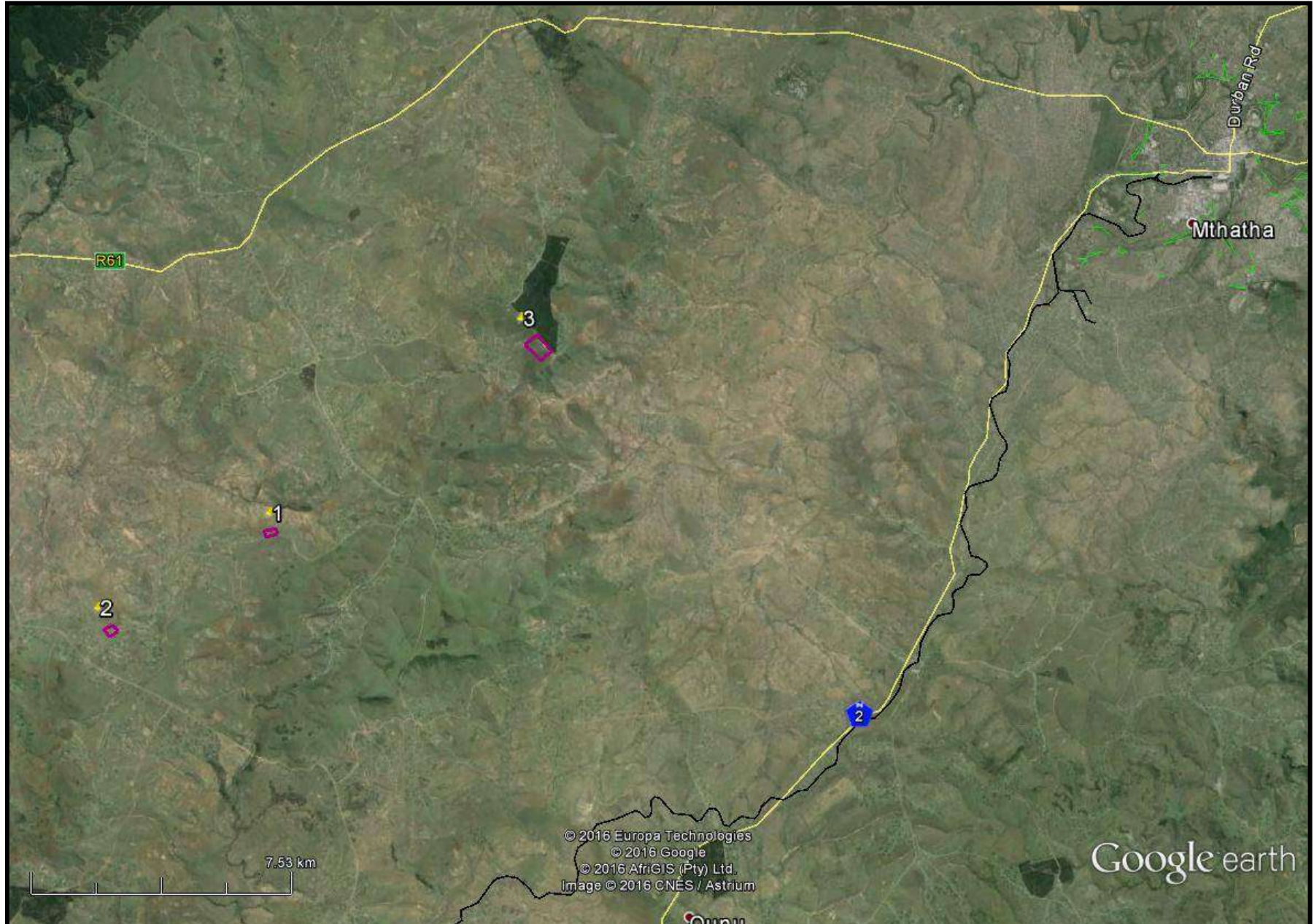


FIG. 2A: AERIAL OVERVIEW OF THE BORROW PIT 1



FIG. 2B: AERIAL OVERVIEW OF THE BORROW PIT 2



FIG. 2C: AERIAL OVERVIEW OF THE BORROW PIT 3



FIG. 3: TOPOGRAPHICAL MAP OF THE BORROW PITS

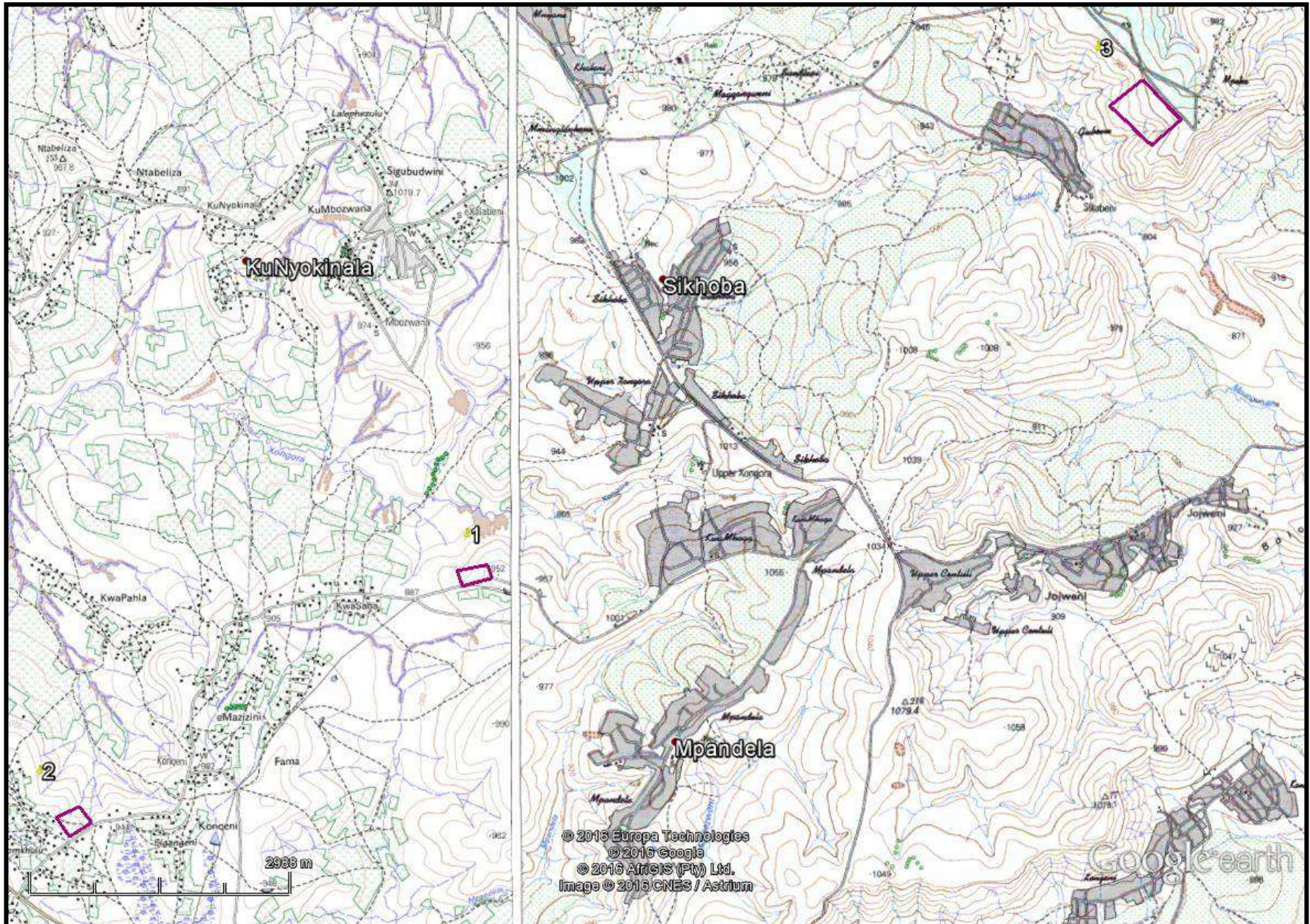


FIG. 4: VIEW OF BORROW PIT 1



FIG. 5: VIEW OF BORROW PIT 2



FIG. 6: VIEW OF BORROW PIT 3



NATIONAL HERITAGE RESOURCES ACT OF 1999

The National Heritage Resources Act of 1999 (pp 12-14) protects a variety of heritage resources. These resources are defined as follows:

1. “For the purposes of this Act, those heritage resources of South Africa which are of cultural significance or other special value for the present community and for future generations must be considered part of the national estate and fall within the sphere of operations of heritage resources authorities.
2. Without limiting the generality of subsection (1), the national estate may include—
 - 2.1. Places, buildings, structures and equipment of cultural significance;
 - 2.2. Places to which oral traditions are attached or which are associated with living heritage;
 - 2.3. Historical settlements and townscapes;
 - 2.4. Landscapes and natural features of cultural significance;
 - 2.5. Geological sites of scientific or cultural importance;
 - 2.6. Archaeological and palaeontological sites;
 - 2.7. Graves and burial grounds, including—
 - 2.7.1. Ancestral graves;
 - 2.7.2. Royal graves and graves of traditional leaders;
 - 2.7.3. Graves of victims of conflict;
 - 2.7.4. Graves of individuals designated by the Minister by notice in the Gazette;
 - 2.7.5. Historical graves and cemeteries; and
 - 2.7.6. Other human remains which are not covered in terms of the Human Tissue Act, 1983 (Act No. 65 of 1983);
3. Sites of significance relating to the history of slavery in South Africa;
 - 3.1. Movable objects, including—

4. Objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens;
 - 4.1. Objects to which oral traditions are attached or which are associated with living heritage;
 - 4.2. Ethnographic art and objects;
 - 4.3. Military objects;
 - 4.4. objects of decorative or fine art;
 - 4.5. Objects of scientific or technological interest; and
 - 4.6. books, records, documents, photographic positives and negatives, graphic, film or video material or sound recordings, excluding those that are public records as defined in section 1(xiv) of the National Archives of South Africa Act, 1996 (Act No. 43 of 1996).
5. Without limiting the generality of subsections (1) and (2), a place or object is to be considered part of the national estate if it has cultural significance or other special value because of—
 - 5.1. Its importance in the community, or pattern of South Africa's history;
 - 5.2. Its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
 - 5.3. Its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
 - 5.4. Its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;
 - 5.5. Its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;
 - 5.6. Its importance in demonstrating a high degree of creative or technical achievement at a particular period;
 - 5.7. Its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;
 - 5.8. Its strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa; and

5.9. sites of significance relating to the history of slavery in South Africa”

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 database contain 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 |

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. I also used various sources for historical information.

PREVIOUS ACHAEOLOGICAL & HERITAGE SURVEYS

There have been no systematic surveys within the study area (fig. 7). However, there have been systematic surveys undertaken in the general area. These sites include Stone Age, Rock Art and Historical Period settlements and buildings.

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

The 1954 aerial photographs of the borrow pits indicate that Borrow Pit 1 was mostly under cultivated land with an agricultural field and houses along the eastern side (fig. 8). Human graves related to this site are visible on the Google Earth Imagery. Google Earth imagery also shows another settlement in the middle of the study area. Borrow Pit 2 is surrounded by five settlements and one settlement inside the southern end of the study area (fig. 9). Borrow Pit 3 does not have any settlements near it (fig. 10).

The oldest available 1:50 000 map for 2832CB dates to 1982. The map indicates that the settlement from 1954 still exists at Borrow Pit 1. The settlement observed in the centre of the study area is not shown on this map. Borrow Pit 2 does not have any settlements on this map. The 1958 topographical map for Borrow Pit 2 indicates that there are no settlements in this study area. This is shown in Figures 11 - 12.

FIG. 7: KNOWN HERITAGE SITES IN THE GENERAL AREA

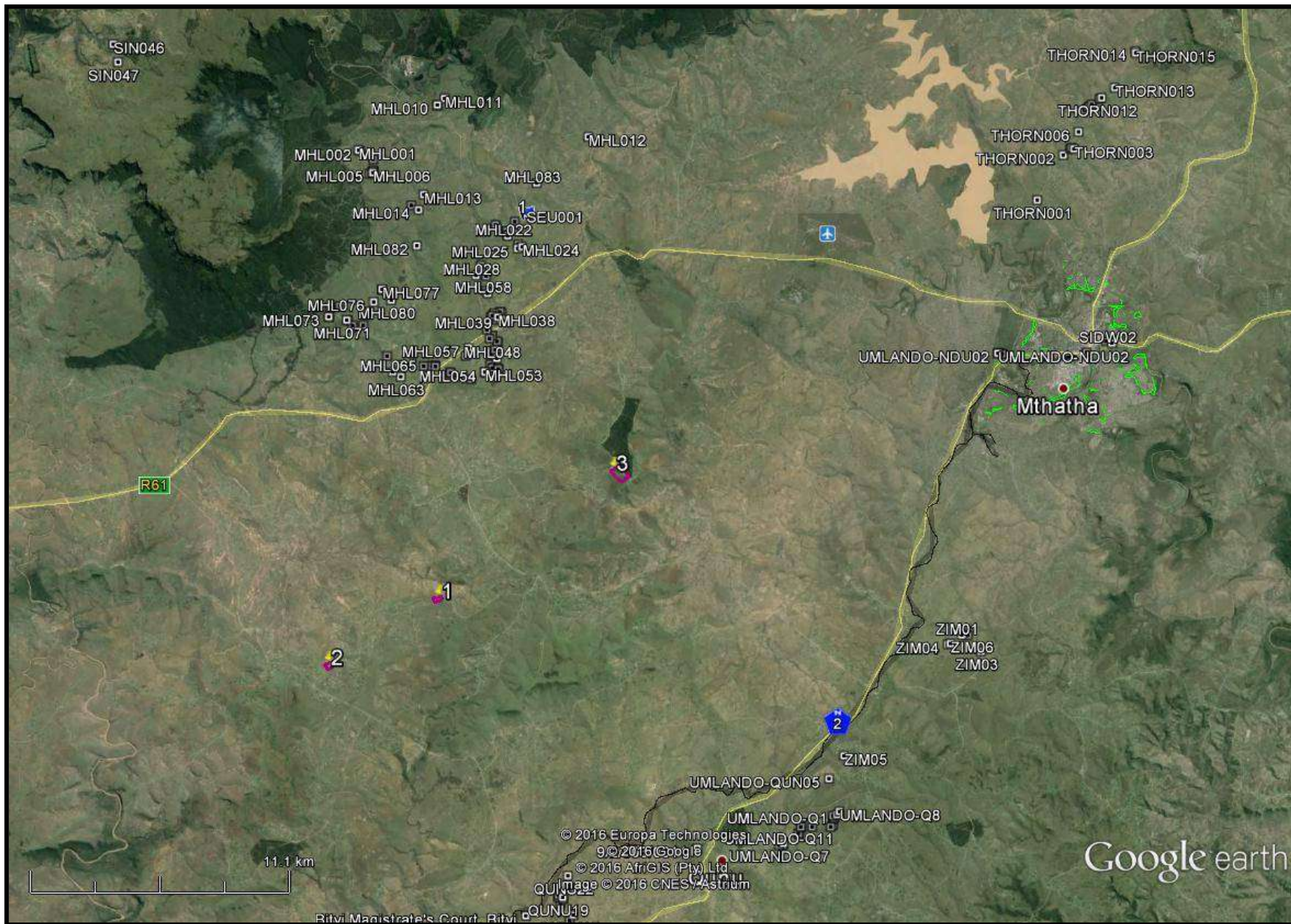


FIG. 8: AERIAL PHOTOGRAPH OF BORROW PIT 1 IN 1954



FIG. 9: AERIAL PHOTOGRAPH OF BORROW PIT 2 IN 1954



FIG. 10: AERIAL PHOTOGRAPH OF BORROW PIT 3 IN 1954

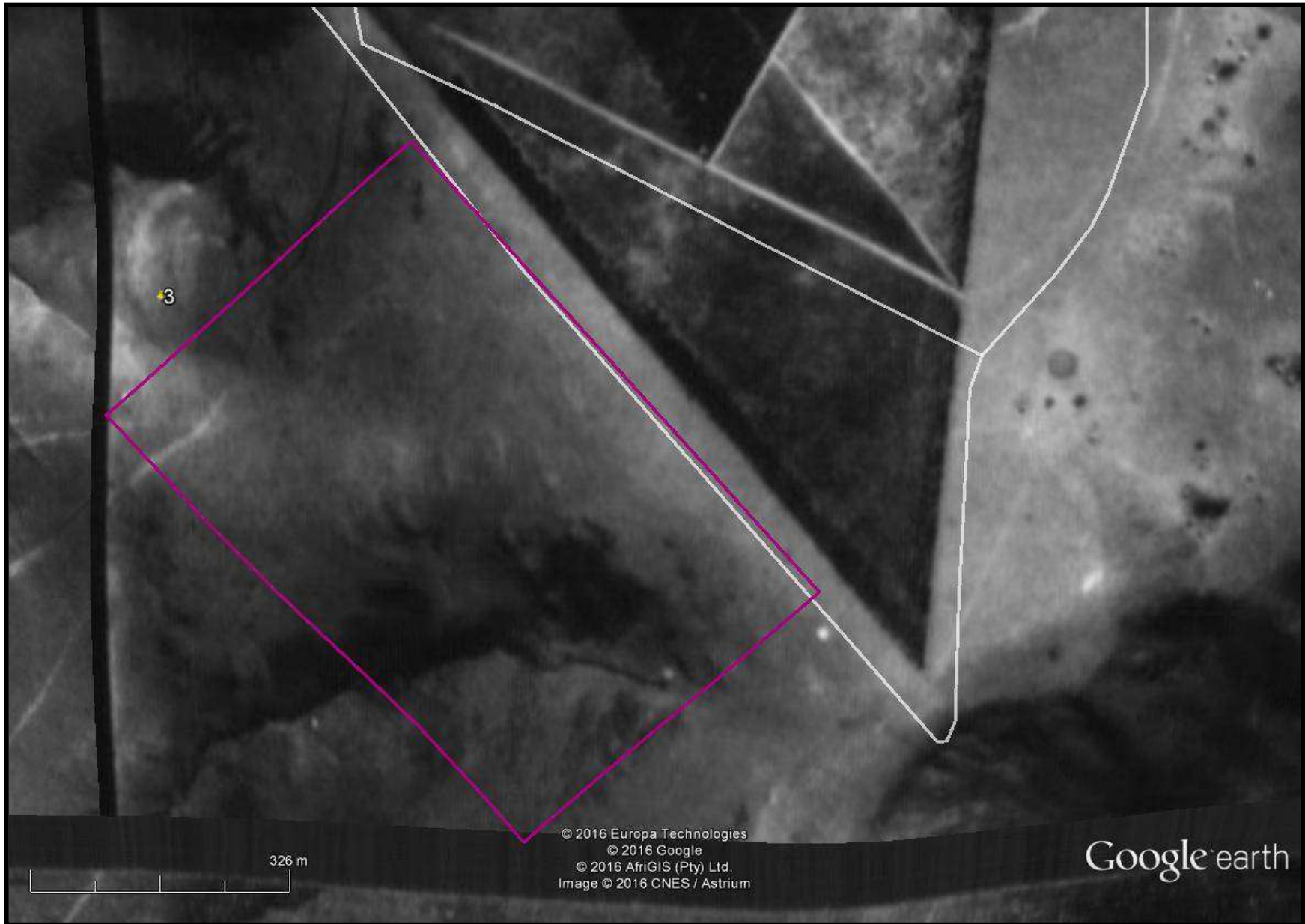


FIG. 11: LOCATION OF BORROW PITS IN 1982

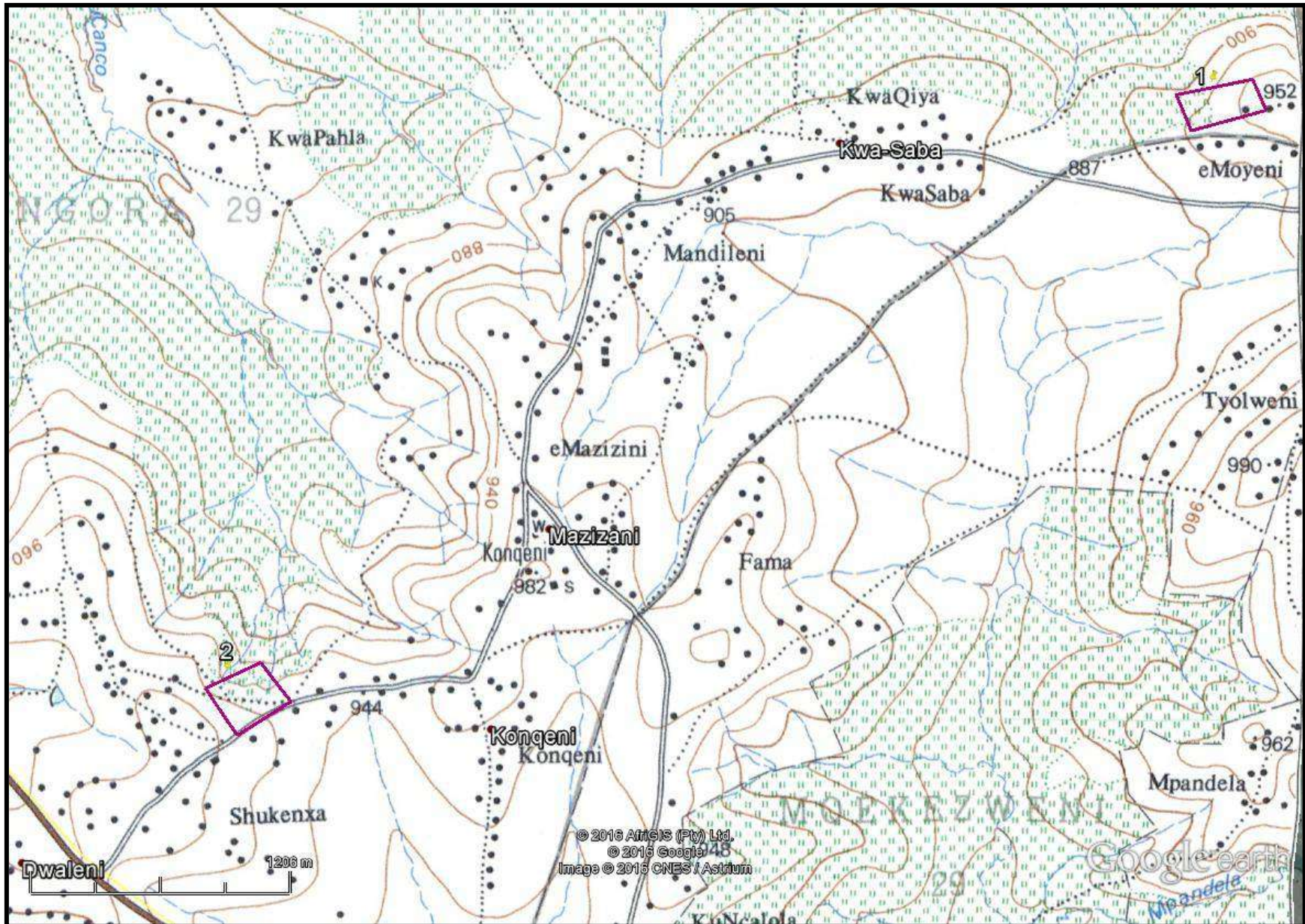
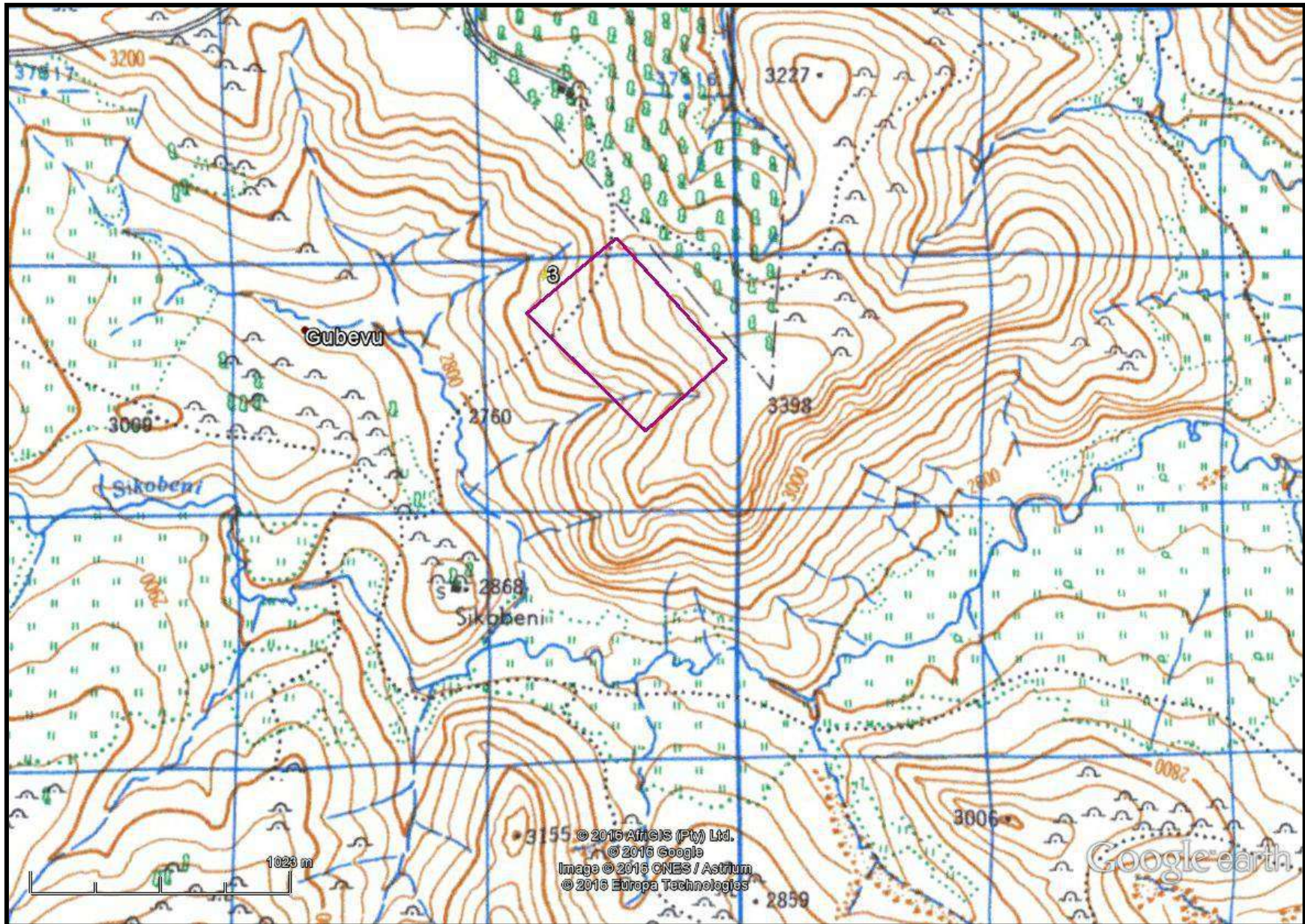


FIG. 12: LOCATION OF BORROW PITS IN 1959



FIELD SURVEY

A field survey was undertaken in May 2016 and archaeological visibility was very good. All borrow pits are existing borrow pits that will be extended.

BORROW PIT 1

Borrow Pit 1 is located at the top of a hill besides a gravel road. The proposed Borrow Pit is approximately 370m x 170m in size. The upper part of the study area consist of several features that include graves, houses foundations and cattle byres, while the middle consist of three features (fig. 13). These latter features may contain graves. There is one cemetery of six graves within the study area, while a further nine graves occur ~70m to the east. There are two possible graves to the north of the existing borrow pit: these have headstones and footstones. Table 2 lists the locations of the features at the borrow pits.

The features are as follows:

- Group of 6 graves (fig. 14)
- Group of 9 graves (fig. 15)
- House floors (fig. 16)
- House walls (fig. 17)
- Cattle byre foundations (fig. 18)
- General foundations (fig. 19)
- Possible graves with headstone/footstone (fig. 20)

Stone tools occur throughout the site as a general scatter of artefacts. The tools date to the MSA and LSA (fig. 21).

Significance: The graves are of high significance, while the foundations are of low significance.

Mitigation: There should be a 20m buffer between the edge of the graves and any development. A visible fence/barrier should be erected around the

graves at a distance of 5m. The settlement in the middle of the proposed quarry should be noted as sensitive for possible graves. Community participation should occur to get approval of having a quarry near these graves. The community should also be approached regarding the settlement in the middle of the proposed quarry.

SAHRA Rating: 3A

The graves might be a fatal flaw to this borrow pit as they occur inside the study area at three (possible) locations. Community participation may lessen the effect if the community can confirm/deny the possible graves. If any graves are uncovered during the course of the borrow pit, then the Local police and ECHPRA need to be informed immediately while all work at the borrow pit ceases.

TABLE 2: LOCATION OF RECORDED FEATURES

| MAP REFERENCE | LATITUDE | LONGITUDE | DESCRIPTION | BORROW PIT |
|----------------------|-----------------|------------------|--------------------|-------------------|
| Grave 1 | -31.713875961 | 28.445708966 | Possible grave | 2 |
| Grave 2 | -31.713859029 | 28.445722042 | Possible grave | 2 |
| 078 | -31.687522000 | 28.496697005 | House floor | 1 |
| 079 | -31.687674969 | 28.496675966 | House floor | 1 |
| 080 | -31.687796004 | 28.496682001 | House floor | 1 |
| 081 | -31.687725009 | 28.496823991 | House floor | 1 |
| 082 | -31.687865993 | 28.496957012 | House floor | 1 |
| 083 | -31.687882002 | 28.497375017 | Grave | 1 |
| 084 | -31.687875967 | 28.497370994 | Grave | 1 |
| 085 | -31.687857024 | 28.497372000 | Grave | 1 |
| 086 | -31.687842021 | 28.497366970 | Grave | 1 |
| 087 | -31.687818971 | 28.497377029 | Grave | 1 |
| 088 | -31.687794998 | 28.497380968 | Grave | 1 |
| 089 | -31.687712017 | 28.497827975 | Cattle Byre? | 1 |
| 091 | -31.687189993 | 28.497970970 | Grave | 1 |
| 092 | -31.687184963 | 28.497988991 | Grave | 1 |
| 093 | -31.687181024 | 28.498003995 | Grave | 1 |
| 094 | -31.687160991 | 28.498058980 | Grave | 1 |
| 095 | -31.687165014 | 28.498079013 | Grave | 1 |
| 096 | -31.687174989 | 28.498085970 | Grave | 1 |
| 097 | -31.687174989 | 28.498099968 | Grave | 1 |
| 098 | -31.687158979 | 28.498121006 | Grave | 1 |
| 099 | -31.687157974 | 28.498141961 | Grave | 1 |
| 100 | -31.687578997 | 28.496185038 | Possible grave | 1 |
| 101 | -31.687595006 | 28.496173974 | Possible grave | 1 |
| 102 | -31.687903963 | 28.495367970 | House floor | 1 |
| 103 | -31.688222978 | 28.495275015 | House floor | 1 |
| 103a | -31.688210551 | 28.495567384 | House floor | 1 |

FIG. 13: LOCATION OF RECORDED FEATURES AT BORROW PIT 1



FIG. 14: GROUP OF 6 GRAVES



FIG. 15: GROUP OF 9 GRAVES



FIG. 16: HOUSE FLOORS



FIG. 17: HOUSE WALLS



FIG. 18: CATTLE BYRE FOUNDATIONS



FIG. 19: GENERAL FOUNDATIONS



FIG. 20: POSSIBLE GRAVES WITH HEADSTONE/FOOTSTONE

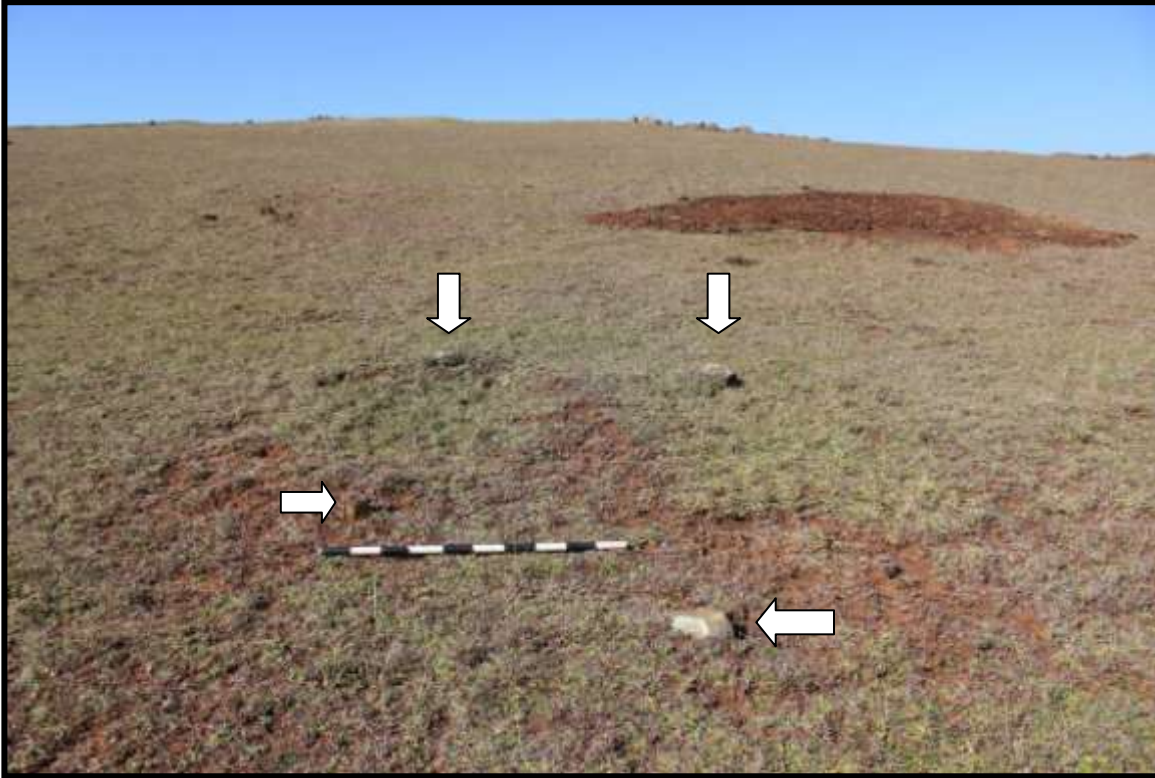


FIG. 21: STONE TOOLS



BORROW PIT 2

The cattle byre and houses noted in the 1954 aerial photo was not visible at the time of the survey. However, two possible headstones were noted (fig. 22). The headstones appear to be in the correct location for them to be graves. The agricultural fields from these photos were visible. Two Late Stone Age stone tools were observed in an eroded area (fig. 23). The one is an irregular core, while the other appears to be a single platform core. The tools do not constitute a site. Fig. 24 shows the locations of these features.

Significance: The tools are of low significance.

Mitigation: The two possible headstones should be treated as graves until proven otherwise. The client could apply to have test pit excavations undertaken to determine if they are graves. This would involve an undertaker and an archaeologist since the graves are older than 60 years.

SHARA Rating: 3A

FIG. 22: POSSIBLE HEADSTONES AT BORROW PIT 2



FIG. 23: LSA CORES AT BORROW PIT 2



FIG. 24: LOCATION OF POSSIBLE GRAVES AT BORROW PIT 2



No features or artefacts were noted at Borrow Pit 3.

PALAEONTOLOGICAL IMPACT ASSESSMENT

A Phase 1 PIA was undertaken at the same time as the HIA survey. All three Borrow Pits are of high palaeontological sensitivity. Excavations for the new developments will expose mostly siltstone and mudstone of the Burgersdorp Formation and in some places possibly weathered dolerite. However, all three areas are highly weathered and the upper 1.5m of deposit is unlikely to contain fossils.

The most of Borrow Pit 1 will be effected by excavations (fig 25). The southeastern section Borrow Pit 2 will be effected by excavations (fig. 26). Only the upper eastern part of Borrow pit 3 will be effected by excavations (fig. 27).

Significance: There is a high probability of palaeontological material being exposed beyond 1.5m from the surface in those areas with the Burgersdorp Formation.

- Mitigation: The EAP and ECO must be informed of the fact that a Very High Palaeontological Sensitivity was allocated to all three the proposed sites for the development and due to highly weathered state of the rocks, no fossils were recorded during the Phase 1 field investigation.
- A suitably qualified palaeontologist must be appointed to inspect all areas where excavation of deeper than 1,5m is made into sediments of the Burgersdorp Formation. A protocol for the chance find of fossils must be developed and discussed with the contractor on site.
- These recommendations must be included in the EMP of this project.

FIG. 25: PALAEOANTHROPOLOGICAL SENSITIVE AREAS AT BORROW PIT 1



FIG. 26: PALAEOANTHROPOLOGICAL SENSITIVE AREAS AT BORROW PIT 2



FIG. 27: PALAEOANTHROPOLOGICAL SENSITIVE AREAS AT BORROW PIT 3

MANAGEMENT PLAN

Human Graves

Human graves should not be affected by the quarry and its related activities. There must be a 20m buffer between any activity and the grave and the grave must be adequately demarcated. In addition to this, the relevant communities need to be consulted regarding the graves and the proposed activity, and some form of agreement should be reached. The community may consider relocation of graves, however this is a lengthy process and can take a minimum of six months to complete. All communications with the communities should be documented.

The results of the field trip were given to EOH CES and SANRAL prior to the completion of the report. All graves have been omitted from Borrow Pit 1. Those

features designated as being house floors may also contain human remains underneath the house floor or nearby them.

If any graves are uncovered during the course of quarrying activity, then ECPHRA, the police and the existing community structures need to be informed immediately. All activity around the remains will need to cease and the area needs to be demarcated as per normal grave. That is, a minimum of a 5m buffer between the grave and the demarcation.

All excavations that are deeper than 1.5m below the current surface will require some form of palaeontological mitigation. This mitigation entails regular palaeontological visits to assess and sample possible fossil remains. A permit for this will be required by SANRAL and the palaeontologist. It is important that this aspect is part of the EMP and that the palaeontologist is appointed timeously before any work commences.

CONCLUSION

A heritage survey was undertaken for the gravel road upgrades for three roads near Mthatha. Borrow Pit 1 has three areas with (potential human) remains. While the upper cemetery can be avoided, the location of potential human graves could be a fatal flaw for this borrow pit. Borrow Pit 2 has two potential human graves in the southern section of the proposed quarry. These can be demarcated. Borrow Pit 3 has no heritage features.

If the possible graves are to be tested, or moved, then an undertaker and a registered archaeologist will need to begin the process of grave removal. This could take up to six months or more to complete.

The palaeontology is sensitive for Borrow Pits 1 and 2 and will require some form of monitoring by a registered palaeontologist.

APPENDIX A
PHASE 1 PALAEOLOGICAL IMPACT ASSESSMENT

**PHASE 1 PALAEOLOGICAL
ASSESSMENT FOR THE PROPOSED
BURROW PITS NEAR ENGCOBO IN THE
KING SABATA DALINDYEBO LOCAL
MUNICIPALITY, OR TAMBO DISTRICT
MUNICIPALITY, EASTERN CAPE
PROVINCE.**

**FOR
Umlando**

DATE: 20 June 2016

By

**Gideon Groenewald
Cell: 078 713 6377**

EXECUTIVE SUMMARY

Gideon Groenewald was appointed to undertake a Phase 1 Palaeontological Field Survey, assessing the potential Palaeontological Impact of the proposed burrow pits near Engcobo in the King Sabata Dalindyebo Local Municipality, OR Tambo District Municipality, Eastern Cape Province.

The purpose of this Phase 1 Palaeontological Impact Assessment is to identify exposed and potential Palaeontological Heritage on the site of the proposed development, to assess the impact the development may have on this resource, and to make recommendations as to how this impact might be mitigated.

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 amended 2014). 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.

Dr Gideon Groenewald, experienced fieldworker, and Gavin Anderson visited the site of the proposed burrow pits near Engcobo in the King Sabata Dalindyebo Local Municipality, OR Tambo District Municipality, Eastern Cape Province on Tuesday 31st May 2016.

The development site for the proposed burrow pits near Engcobo in the King Sabata Dalindyebo Local Municipality, OR Tambo District Municipality, Eastern Cape Province, is underlain by Triassic aged sedimentary rocks of the Burgersdorp Formation, Tarkastad Subgroup, Beaufort Group and Dolerite of the Karoo Supergroup.

Several poorly defined trace and highly weathered vertebrate fossils were observed during the field investigation. The potential for finding significant fossils in any excavation into sediments of the Burgersdorp Formation is Very High. No fossils will be associated with areas underlain by dolerite.

It is recommended that:

The EAP and ECO must be informed of the fact that a Very High Palaeontological Sensitivity was allocated to all three the proposed sites for the development and due to highly weathered state of the rocks, no fossils were recorded during the Phase 1 field investigation.

A suitably qualified palaeontologist must be appointed to inspect all areas where excavation of deeper than 1,5m is made into sediments of the Burgersdorp Formation. A protocol for the chance find of fossils must be developed and discussed with the contractor on site.

These recommendations must be included in the EMPr of this project.

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INTRODUCTION

Gideon Groenewald was appointed to undertake a Phase 1 Palaeontological Field Survey, assessing the potential Palaeontological Impact of the proposed burrow pits near Engcobo in the King Sabata Dalindyebo Local Municipality, OR Tambo District Municipality, Eastern Cape Province.

The purpose of this Phase 1 Palaeontological Impact Assessment is to identify exposed and potential Palaeontological Heritage on the site of the proposed development, to assess the impact the development may have on this resource, and to make recommendations as to how this impact might be mitigated.

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 amended 2014). 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 Phase 1 investigation is often the last 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 the field investigation a preliminary assessment (desktop study) of the topography and geology of the study area was made using appropriate 1:250 000 geological maps (3128 Umtata) in conjunction with Google Earth. Potential fossiliferous rock units (groups, formations etc) were identified within the study area and the known fossil heritage within each rock unit was inventoried from the published scientific literature, previous palaeontological impact studies in the same region and the author's field experience.

Priority palaeontological areas were identified within the development footprint to focus the field investigator's time and resources. The aim of the fieldwork was 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 was 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, 2009) (Groenewald et al., 2014). | |
| RED | Very High Palaeontological sensitivity/vulnerability. Development will most likely have a very significant impact on the Palaeontological Heritage of the region. Very high possibility that significant fossil assemblages will be present in all outcrops of the unit. Appointment of professional palaeontologist, desktop survey, phase I Palaeontological Impact Assessment (PIA) (field survey and recording of fossils) and phase II PIA (rescue of fossils during construction) as well as application for collection and destruction permit compulsory. |
| ORANGE | High Palaeontological sensitivity/vulnerability. High possibility that significant fossil assemblages will be present in most of the outcrop areas of the unit. Fossils most likely to occur in associated sediments or underlying units, for example in the areas underlain by Transvaal Supergroup dolomite where Cenozoic cave deposits are likely to occur. Appointment of professional palaeontologist, desktop survey and phase I Palaeontological Impact Assessment (field survey and collection of fossils) compulsory. Early application for collection permit recommended. Highly likely that a Phase II PIA will be applicable during the construction phase of projects. |
| GREEN | Moderate Palaeontological sensitivity/vulnerability. High possibility that fossils will be present in the outcrop areas of the unit or in associated sediments that underlie the unit. For example areas underlain by the Gordonia Formation or undifferentiated soils and alluvium. Fossils described in the literature are visible with the naked eye and development can have a significant impact on the Palaeontological Heritage of the area. Recording of fossils will contribute significantly to the present knowledge of the development of life in the geological record of the region. Appointment of a professional palaeontologist, desktop survey and phase I PIA (ground proofing of desktop survey) recommended. |
| BLUE | 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 |

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

When rock units of moderate to high palaeontological sensitivity are present within the development footprint, palaeontological mitigation measures should be incorporated into the Environmental Management Plan.

Scope and Limitations of the Phase 1 Investigation

The scope of a phase 1 Investigation includes:

- an analysis of the area's stratigraphy, age and depositional setting of fossil-bearing units;
- a review of all relevant palaeontological and geological literature, including geological maps, and previous palaeontological impact reports;
- data on the proposed development provided by the developer (e.g. location of footprint, depth and volume of bedrock excavation envisaged) and

- where feasible, location and examination of any fossil collections from the study area (e.g. museums).
- an on-site investigation to assess the identified palaeontological sensitive areas within the development footprint/study area rather than formal palaeontological collection. The investigation focussed on the bedrock exposure where excavations would most probably require palaeontological monitoring.

The results of the field investigation are used to predict the potential of buried fossil heritage within the development footprint. In some investigations, this involves the examination of similar accessible bedrock exposures, such as road cuttings and quarries, along roads that run parallel to or across the development footprint.

Locality and Proposed Development

The study area is located to the east of Engcobo and is an extension of the present burrow pits for supplying of road building material to upgrade and regravell of service roads off DR08282.



Figure 1 Locality of study areas indicated by flags at Burrow Pit sites 1 to 3

The upgrading is to upper Centuli School, Majola School situated on the road serving the Kwa-Saba community and the road between Sandleni and Sixhotyeni that services the Isikhobeni School in the King Sabata Dalindyebo Local Municipality, OR Tambo District Municipality, Eastern Cape Province (Figure 1).

This is part of Project ID 11: Centuli Clinic Replacement of the Rural Road Access Programme. The proposal for this development includes the extension of the present activities of the three burrow pits at these localities.

GEOLOGY

The study area is underlain predominantly by Triassic aged sedimentary rocks of the Burgersdorp Formation, Tarkastad Subgroup of the Beaufort Group and Jurassic aged Dolerite of the Karoo Supergroup (Figure 2).

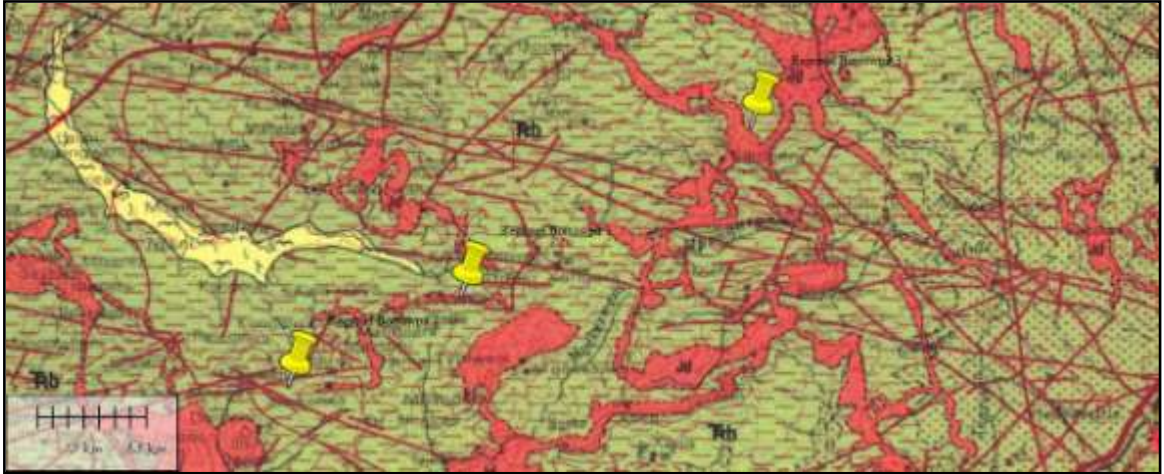


Figure 2 Geology of the study area

Beaufort Group

Tarkastad Subgroup, Burgersdorp Formation (Trb)

The Triassic aged Burgersdorp Formation is an assemblage of fine-grained sediments, consisting mainly of red and maroon mudstone and yellow to light grey sandstone. The deposits represent Tertiary aged fluvial meandering river and lacustrine deposits that were deposited in terrestrial marsh and river system environments in this part of Gondwanaland. The upper part of the formation becomes more sandstone rich and is indicative of a northward migration of an inland deltaic and most probably fluvial alluvial fan system into the predominantly lacustrine environments that existed during the early Triassic in this part of the Karoo Basin (Groenewald, 1996; Johnson et al, 2009).

Dolerite (Jd)

Jurassic aged dolerite dykes and sills represent a volcanic episode that occurred during the breakup of Gondwanaland.

PALAEONTOLOGY

Beaufort Group

Tarkastad Subgroup, Burgersdorp Formation (Trb)

Very rich and varied vertebrate, invertebrate, plant and trace fossils have been described from this Formation (Johnson et al. 2009; Rubidge et al, 1995; Groenewald, 1996; MacRae, 1999; McCarthy and Rubidge, 2005; Van der Walt, et al, 2010).

The Burgersdorp Formation is basically representative of most of the Cynognathus Assemblage Zone of the Karoo Supergroup and contains examples of petrified wood, tetrapod faunas (dicynodonts, cynodonts, therocephalians, procolophonids, archosaurs etc.), including rich lacustrine biotas of amphibians, fish; trace fossils including vertebrate burrows, coprolites. vertebrates ranging from amphibians to mammal-like reptiles. Fossils described from this formation include seven fish genera, 16 amphibian genera, six parareptile genera, six diapsid reptile genera, four dicynodont genera, two therocephalian genera and 11 cynodont genera (Smith et al, 2012; Groenewald et al. 2014). One of the most spectacular finds are casts of vertebrate burrows containing fossils of the cynodont *Trirachodon* near the town Clarens (Groenewald et al, 2001). Other burrows from the *Cynognathus* Assemblage Zone have been found associated with procolophonid parareptiles in the main Karoo Basin (Jennifer Botha-Brink, pers. Comm. 2012, National Museum in Bloemfontein).

Dolerite

Due to its igneous character dolerite will not contain fossils.

PRELIMINARY ASSESSMENT RESULTS

The palaeontological sensitivity was predicted after identifying potentially fossiliferous rock units; ascertaining the fossil heritage from the literature and evaluating the nature and scale of the development itself. The palaeontological sensitivity was predicted as highly significant, due to the potential abundance of Triassic aged fossils, including trace and plant fossils, in the Burgersdorp Formation.

FIELD INVESTIGATION

Dr Gideon Groenewald, experienced fieldworker, and Gavin Anderson visited the site of the proposed burrow pits near Engcobo in the King Sabata Dalindyebo Local Municipality, OR Tambo District Municipality, Eastern Cape Province on

Tuesday 31st May 2016. The topography of the area is mostly gentle undulating in the river valleys, and rolling hills of grassland away from the deeper valleys. The site of the proposed developments of all three Burrow Pits (Figure 1) is on the crests and middle-slopes of a hills and partly or completely altered by human development, including existing burrow pit activities.

The soil cover vary from shallow to very shallow Westleigh to vertic Arcadia soil forms underlain by either dolerite or weathered red mudstone stone as well as exposed siltstone.





Excavations for the new developments will expose mostly siltstone and mudstone of the Burgersdorp Formation and in some places possibly weathered dolerite. In some cases it is possible that extensive dolerite might be present in the profiles as this investigation did not include drilling of test boreholes.





Observations were recorded at different GPS stations (Figure 3 and Table 2).



Figure 3 Observations for Palaeontological heritage

Table 2 Record of Photographic Observations

| Photo | (GPS station) Coordinates | Comments | Photographic Record |
|-------|-------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 1 | (Regravel 1) -31° 41' 16.4" 28° 29' 45.8" | Excavation onto upper part of Burgersdorp Formation and weathered dolerite at quarry site 1. Deeply weathered mudstone on contact with dolerite, no fossils observed |  |
| 2 | (Regravel 1) -31° 41' 16.4" 28° 29' 45.8" | Deeply weathered Burgersdorp Formation mudstone – no fossils observed |  |
| 3 | (Regravel 1) -31° 41' 16.4" 28° 29' 45.8" | Red coloured mudstone of the Burgersdorp Formation with calcareous concretions and pseudo bone fragments. Highly likely that more vertebrate fossils will be exposed during development |  |
| 4 | (Regravel 1) -31° 41' 16.4" 28° 29' 45.8" | Red coloured mudstone of the Burgersdorp Formation with calcareous concretions and pseudo bone fragments. Highly likely that more vertebrate fossils will be exposed during development |  |

| | | | |
|---|-------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 5 | (Regravel 2) -31° 42' 48.9" 28° 26' 47.7" | Red and maroon coloured mudstone of the Burgersdorp Formation. Very high possibility of exposing fossils. No fossils were however recorded during this site visit. |  |
| 6 | (Regravel 3) -31° 38' 20.9" 28° 34' 44.5" | Deeply weathered red mudstone of the Burgersdorp Formation on dolerite. Very high potential for fossils however no fossils observed during this field visit. |  |
| 7 | (Regravel 3) -31° 38' 20.9" 28° 34' 44.5" | Rock samples out of situ with small scale trace fossils, indicating potential fossils in sandstone on site of development |  |
| 8 | (Regravel 3) -31° 38' 20.9" 28° 34' 44.5" | Variable sandstone mudstone and dolerite at Burrow Pit 3 site |  |

PALAEONTOLOGICAL IMPACT AND MITIGATION

The predicted palaeontological impact of the developments are based on the initial mapping assessment and literature reviews as well as information gathered during the field investigation. The field investigation confirms that the study area is underlain by fine-grained sandstone and khaki-coloured to dark grey shale beds of the Volksrust Formation of the Ecca Group and Dolerite of the Karoo Supergroup, weathering into a dark vertic soil.

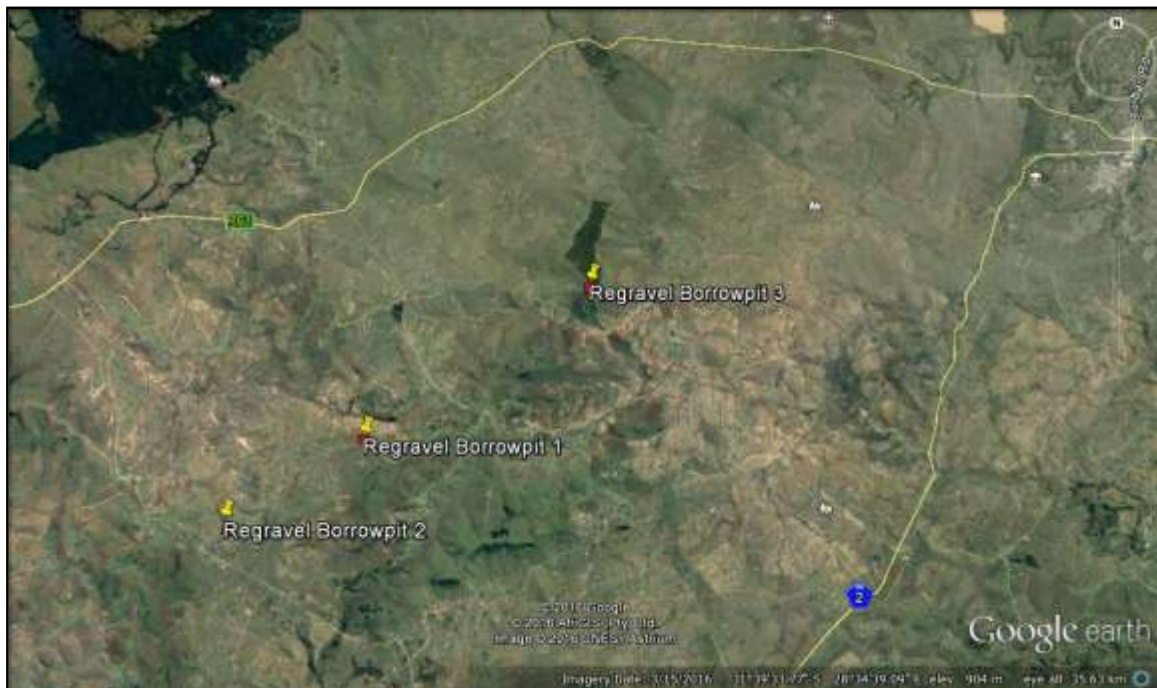


Figure 4. All three potential borrow pit sites are allocated Very High Palaeontological sensitivity. For explanation of colour code see Table 1

The excavation of the three borrow pits for this development will expose some sediments of the Burgersdorp Formation. Due to weathering, no well-preserved fossils were observed during the field investigation. Exposure of bedrock during excavation might however result in the exposure of significant plant, trace and possibly vertebrate fossils and the Very High palaeontological sensitivity of the sites are restricted to areas underlain by Burgersdorp mudstone and fine-grained sandstone or siltstone (Figure 4). Areas underlain by dolerite has no significant impact on palaeontological heritage.

CONCLUSION

The development site for the proposed burrow pits near Engcobo in the King Sabata Dalindyebo Local Municipality, OR Tambo District Municipality, Eastern Cape Province, is underlain by Triassic aged sedimentary rocks of the Burgersdorp Formation, Tarkastad Subgroup, Beaufort Group and Dolerite of the Karoo Supergroup.

Several poorly defined trace and highly weathered vertebrate fossils were observed during the field investigation. The potential for finding significant fossils in any excavation into sediments of the Burgersdorp Formation is Very High. No fossils will be associated with areas underlain by dolerite.

It is recommended that:

The EAP and ECO must be informed of the fact that a Very High Palaeontological Sensitivity was allocated to all three the proposed sites for the development and due to highly weathered state of the rocks, no fossils were recorded during the Phase 1 field investigation.

A suitably qualified palaeontologist must be appointed to inspect all areas where excavation of deeper than 1,5m is made into sediments of the Burgersdorp Formation. A protocol for the chance find of fossils must be developed and discussed with the contractor on site.

These recommendations must be included in the EMPr 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