

**HERITAGE SURVEY OF THE PROPOSED LANDFILL
SITE, FOR THE GREATER KOKSTAD MUNICIPALITY
KWA-ZULU NATAL**

FOR ICANDO

DATE: 5 OCTOBER 2012

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INTRODUCTION

“The Greater Kokstad Municipality has recognised the need to rehabilitate and close the existing Kokstad Landfill site. However, in so doing, arrangements must also be made to deal with the waste that will still be generated in Kokstad and its surrounds. A new landfill will therefore be required once the old site stops receiving waste.

The site will only accept general waste that includes domestic refuse, non-hazardous industrial waste, commercial waste, garden refuse and builders’ rubble. The site will not accept any hazardous waste i.e. waste which has toxic, chemical or long-lasting properties which may have a negative effect on human health or the environment” (Icando BID 2012)

The proposed landfill site occurs east of Kokstad and the Mzintlava River, on an area that is old pasturage (fig. 1 – 3)

The impacts will be:

- Remedial design to address identified problem areas
- Final shaping, landscaping and re-vegetation
- Final landfill cover or cap design
- Permanent storm water diversion measures, run off control and anti-erosion measures
- Any infrastructure relating to the end-use plan

The heritage survey was undertaken by Umlando in September 2012. Only the preferred option was surveyed. The survey noted old structures related to a farm complex, as well as smaller kraals within and just outside of the footprint. The geology of the area may yield fossils.

FIG. 1 GENERAL LOCATION OF THE PROPOSED LANDFILL SITE

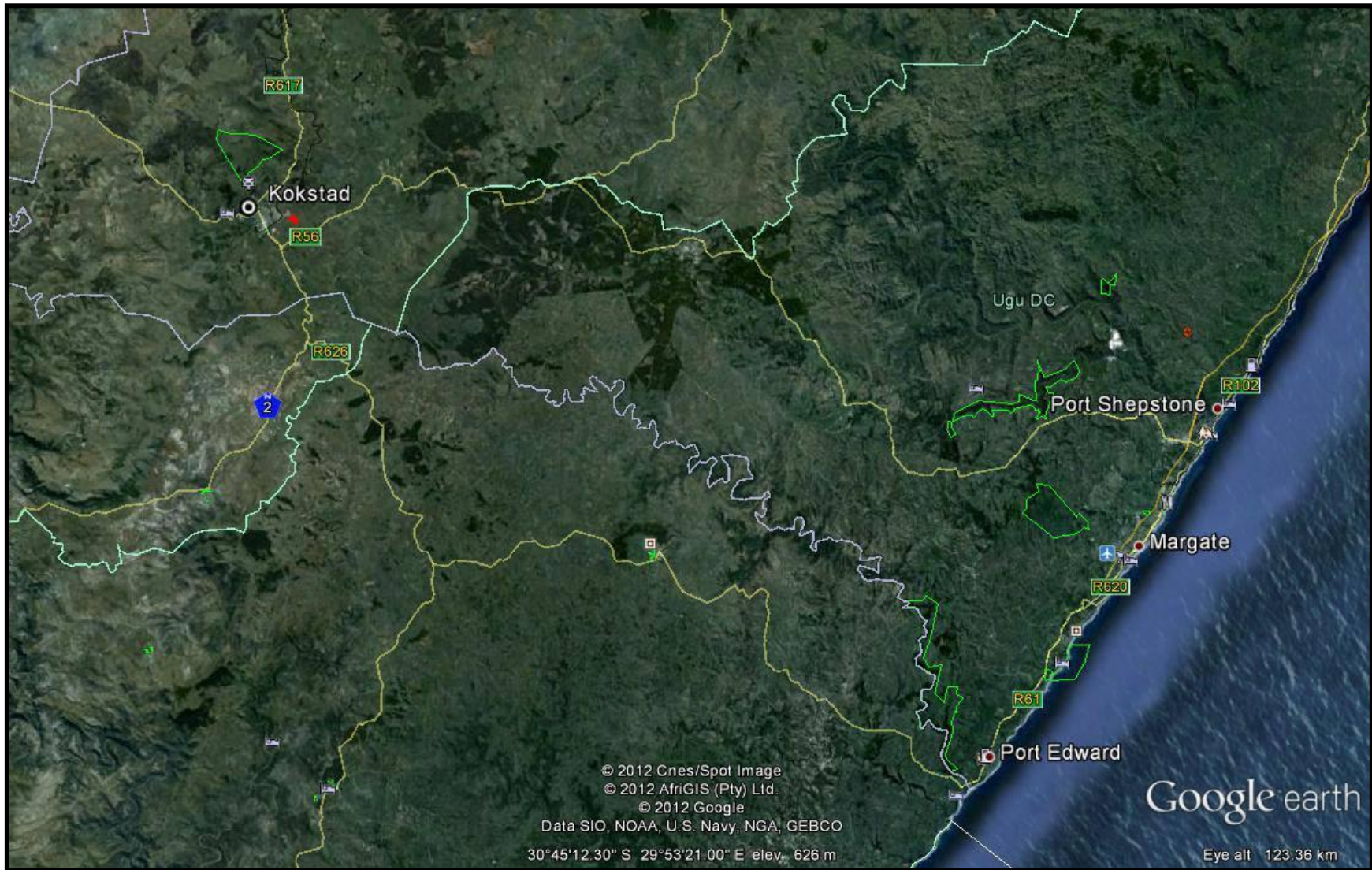
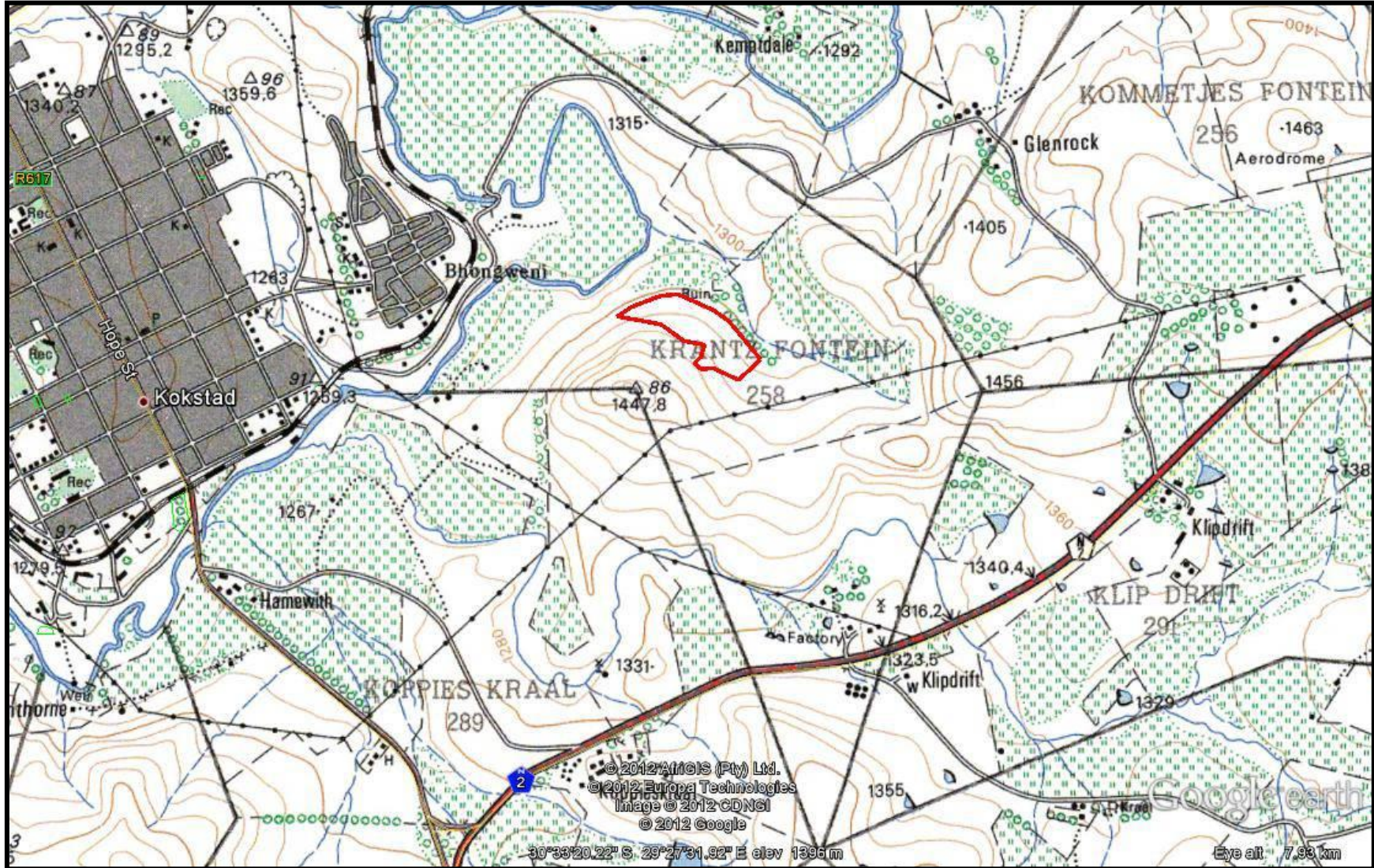


FIG. 2: AERIAL OVERVIEW OF THE PROPOSED LANDFILL SITE



FIG. 3: TOPOGRAPHICAL MAP OF THE PROPOSED LANDFILL SITE



KWAZULU-NATAL HERITAGE ACT NO. 4 OF 2008

1. “ General protection: Structures.—
 - a. 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.
 - b. 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.
2. The Council may, by notice in the *Gazette*, exempt—
 - a. a defined geographical area; or
 - b. 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.
 - c. A notice referred to in subsection (2) may, by notice in the *Gazette*, be amended or withdrawn by the Council.
3. General protection: Graves of victims of conflict.—No person may damage, alter, exhume, or remove from its original position—
 - a. the grave of a victim of conflict;
 - b. a cemetery made up of such graves; or
 - c. 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.
4. General protection: Traditional burial places.—
 - a. No grave—
 - b. not otherwise protected by this Act; and
 - c. 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.

5. The Council may only issue written approval once the Council is satisfied that—
 - a. the applicant has made a concerted effort to consult with communities and individuals who by tradition may have an interest in the grave; and
 - b. the applicant and the relevant communities or individuals have reached agreement regarding the grave.
 - c. 36. General protection: Battlefield sites, archaeological sites, rock art sites, palaeontological sites, historic fortifications, meteorite or meteorite impact sites.—
6. 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.
7. 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.
8. 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.
9. 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.

10. 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.
11. The ownership of any object or material associated with any battlefield site, archaeological site, rock art site, palaeontological site, historic fortification, meteorite or meteorite impact site, on discovery, vest in the Provincial Government and the Council is regarded as the custodian on behalf of the Provincial Government.” (KZN Heritage Act of 2008)

METHOD

The method for Heritage assessment consists of several steps.

The first step forms part of the desktop assessment. Here we would consult the database that has been collated by Umlando. This databases contains archaeological site locations and basic information from several provinces (information from Umlando surveys and some colleagues), most of the national and provincial monuments and battlefields in Southern Africa (<http://www.vuvuzela.com/googleearth/monuments.html>) and cemeteries in southern Africa (information supplied by the Genealogical Society of Southern Africa). We use 1st and 2nd edition 1:50 000 topographical and 1937 aerial photographs where available, to assist in general location and dating of buildings and/or settlements with 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 use of historical maps allows us to note the locations of potential heritage sites in areas where the vegetation is too dense, or where there is no physical evidence of a settlement. That is, some areas have a high rate of deterioration of archaeological/organic remains, and human graves are generally ephemerally marked or demarcated with organic remains. By using these maps, we can indicate sensitive areas and suggest appropriate management plans.

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

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

Defining significance

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

1. State of preservation of:

1.1. Organic remains:

1.1.1. Faunal

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

2. Spatial arrangements:

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

3. Features of the site:

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

4. Research:

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

5. Inter- and intra-site variability

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

6. Archaeological Experience:

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

7. Educational:

7.1. Does the site have the potential to be used as an educational instrument?

7.2. Does the site have the potential to become a tourist attraction?

7.3. The educational value of a site can only be fully determined after initial test-pit excavations and/or full excavations.

8. Other Heritage Significance:

8.1. Palaeontological sites

8.2. Historical buildings

8.3. Battlefields and general Anglo-Zulu and Anglo-Boer sites

8.4. Graves and/or community cemeteries

8.5. Living Heritage Sites

8.6. Cultural Landscapes, that includes old trees, hills, mountains, rivers, etc related to cultural or historical experiences.

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

RESULTS

DESKTOP STUDY

The desktop study consisted of analysing various maps for evidence of prior habitation in the study area, as well as for previous archaeological surveys. The Natal Museum database indicates that several archaeological sites have been recorded in the general area (fig. 4). These sites are Middle and Late Stone age sites, with some shelters containing rock art. There has been no systematic archaeological survey of this area, and the database excludes sites related to Khoikhoi pastoralists and early colonial traders such as Donald Strachan. The early colonial trade routes that were most likely based on pre-colonial trade routes are not noted in this database. Part of the database notes the site of Adam Kok's Lager. There are no previously recorded heritage sites in the study area.

I use older maps to determine relative ages of buildings. This is however reliant on the maps made available by the surveyor general. While there are several 1937 aerial photography maps of KZN, some areas only have 1975 photographs, despite a topographical map being produced before that date. The earliest available 1:50 000 topographical map for this area dates to 1963 (fig. 5). The footprint has a "ruin" on the outskirts of the study area, and is probably part of the original buildings of Krantzfontein. The term "ruins" is general sign for a colonial ruin, and it represents a set of buildings. This suggests that the buildings are more than 50 years in age. Since they are demarcated as ruins, one can assume that they may be years older and thus predate the 60-year period for the KZN Heritage Act.

The earliest available aerial photograph dates to 1975 (fig. 6). The ruins are not that visible on the aerial photograph, but would have existed.

FIG. 4: LOCATION OF KNOWN HERITAGE SITES IN THE GENERAL AREA

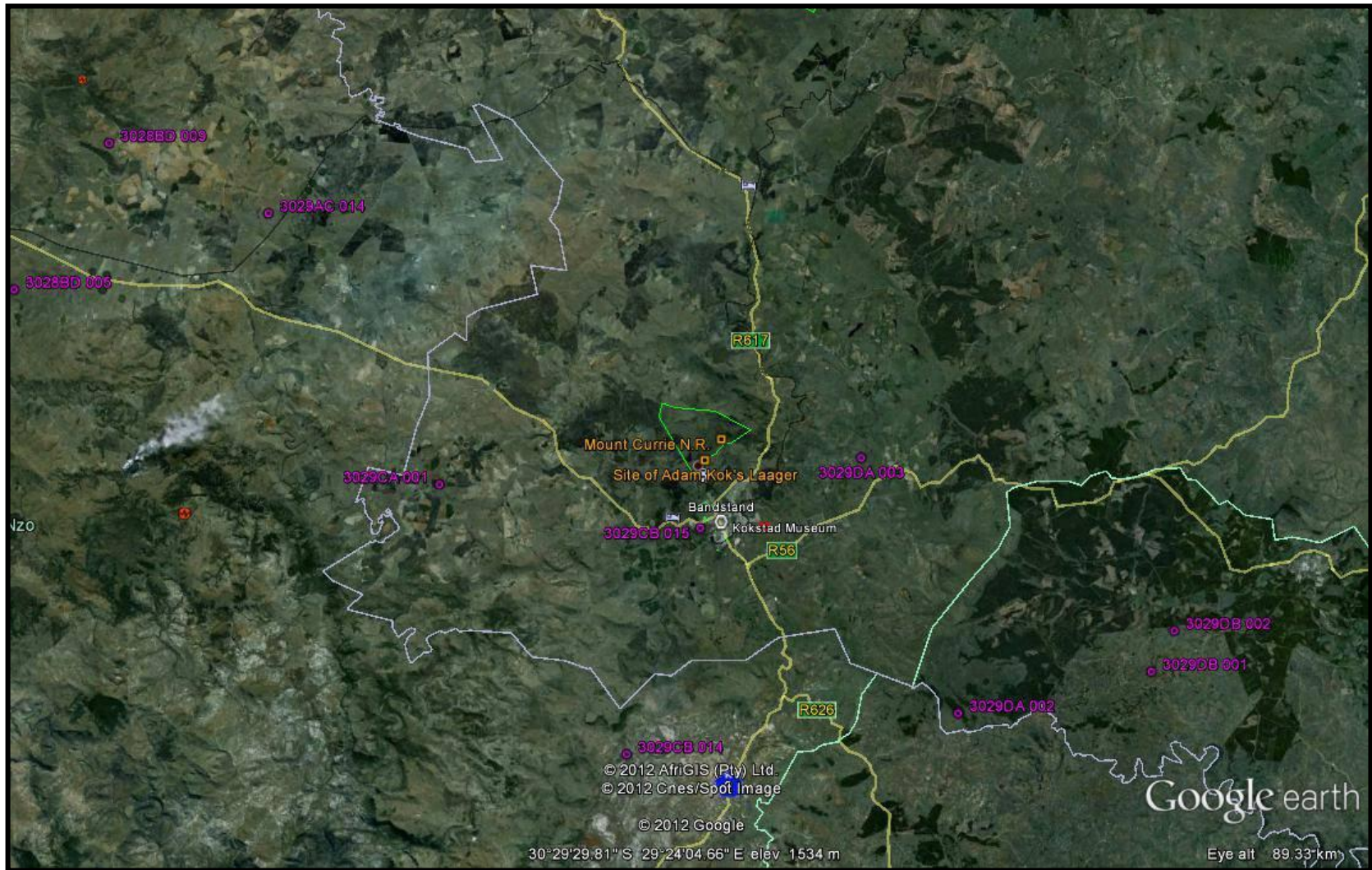


FIG. 5: LOCATION OF SITE IN 1963

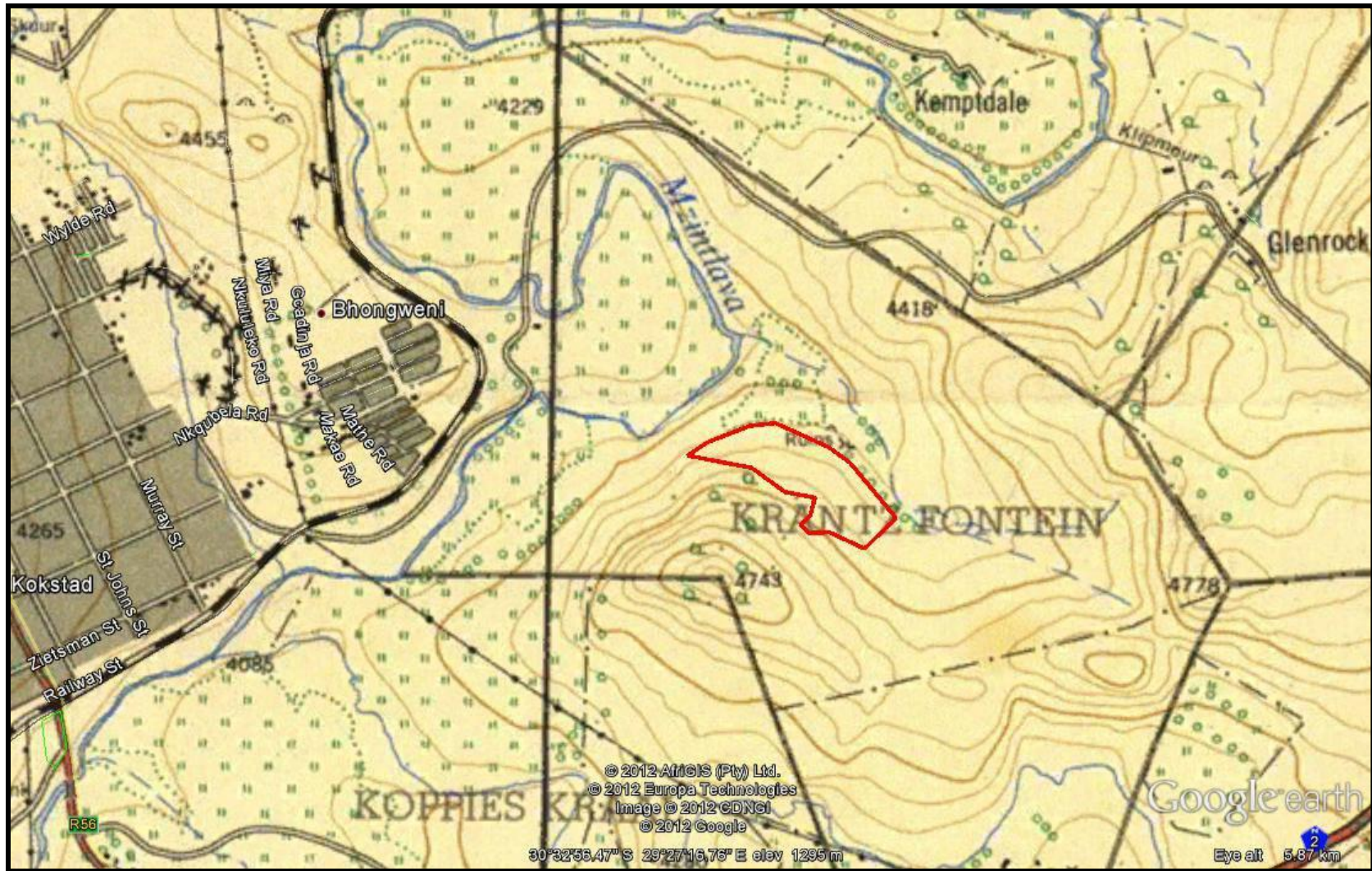


FIG. 6: LOCATION OF SITE IN 1975



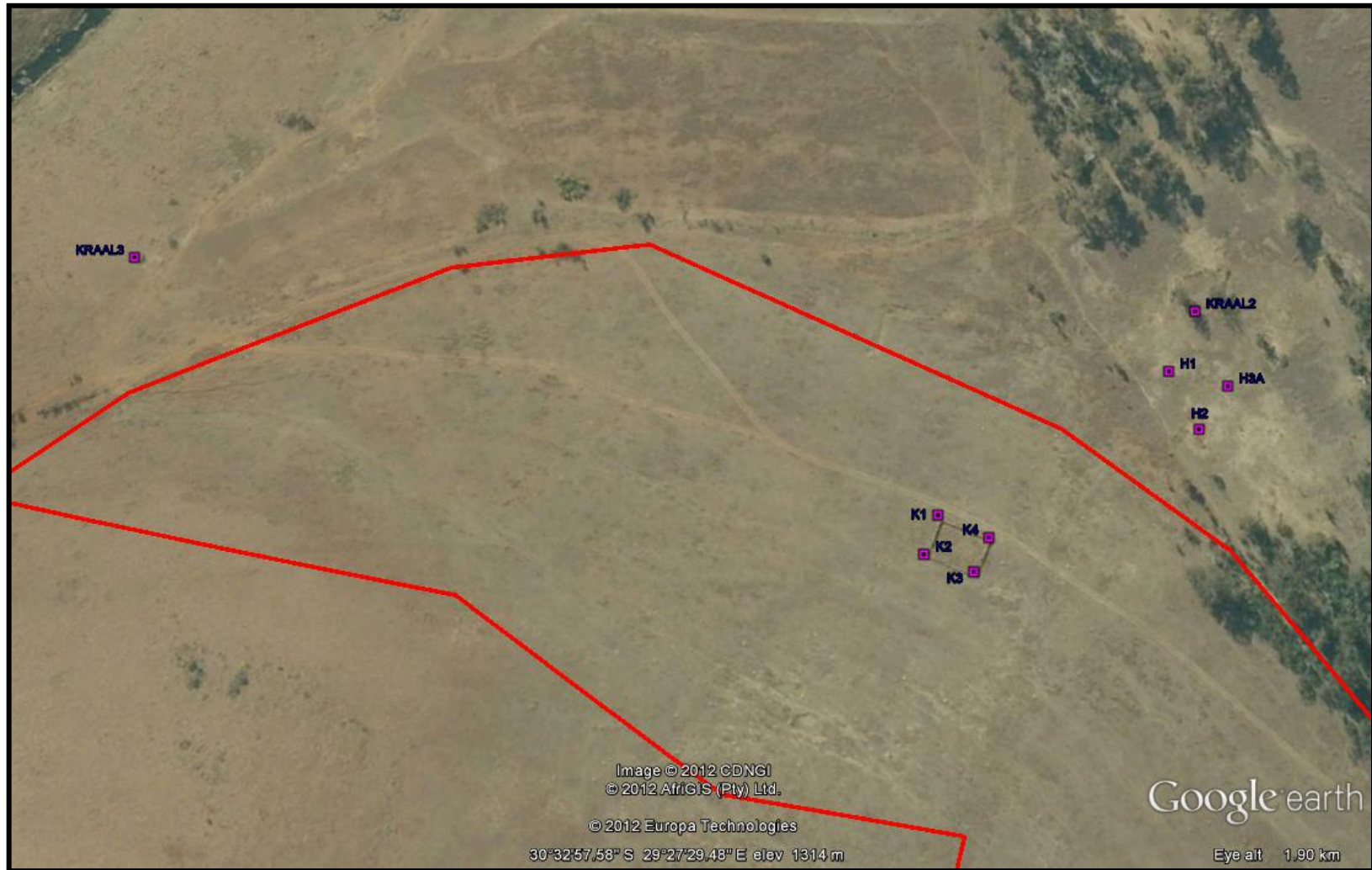
FIELD SURVEY

The field survey located one farm complex and two isolated stone walled kraals (fig. 7). Table 1 gives the locations and brief description of these features.

TABLE 1: LOCATION AND DESCRIPTION OF FEATURES

	NAME	LATITUDE	LONGITUDE	ALTITUDE (M)	DESCRIPTION
	H1	-30.5490190	29.4606760	1308.4	Rectangular house foundation
	H2	-30.5492800	29.4608230	1310.8	Area of circular mudbrick houses
	H3A	-30.5490850	29.4609850	1308.7	Rectangular house foundation - southeast end
	H3B	-30.5489880	29.4608710	1308.7	Rectangular house foundation - northwest end
	ENT3	-30.5497760	29.4593940	1318.4	Side entrance to main kraal
KTF01	K1	-30.5496600	29.4594450	1317.0	NW corner of main kraal
	K2	-30.5498310	29.4593670	1318.9	SW corner of main kraal
	K3	-30.5499080	29.4596210	1319.7	SE corner of main kraal
	K4	-30.5497590	29.4597040	1317.5	NE corner of main kraal
	821	-30.5497294	29.4596143	1315.7	Eastern entrance of main kraal
	822	-30.5497090	29.4595780	1316.6	Western entrance of main kraal
	KRAAL2	-30.5487460	29.4608260	1306.1	Kraal below farm house amongst willow trees
KTF02	KRAAL3	-30.5484870	29.4551970	1299.3	Dry stone walled kraal

FIG. 7: LOCATION OF RECORDED SITES AND FEATURES



KTF01

KTF01 appears to be part of the original farm buildings for the farm Krantzfontein. The site consists of several ruined buildings and trees. Most of the buildings occur outside of the footprint. The complex consists of the following features:

- a main kraal uphill of the house (and inside the footprint) (fig. 8)
 - The kraal consists of dry stone walling
 - The kraal is made up of two exterior rows of large boulders, with smaller rocks as infill (fig. 9)
 - There is a main entrance facing downhill, or northeast, and a smaller side entrance on the western wall (fig. 10 - 11)
 - There are two drainage holes along the northern wall (fig. 12)
- two rectangular house foundations (fig. 13)
- circular mudbrick foundations (fig. 14)
- large irregular kraal of dry stone walling (fig. 15)
- “gardens” (fig. 16)

The state of the buildings and the size of the trees suggest that these ruins may date to late 19th century or early 20th century. No immediate information is available for this farm and a deeds search will be required. My main concern is that these ruins may part of the original farm buildings, or even original farms from Kokstad.

Significance: The site needs to be further assessed

Mitigation: A deeds search relating to land ownership needs to be undertaken for these ruins. The ruins need to be assessed by an architect historian to determine:

- The age of the farm
- The age of the buildings
- Who the original owners were
- The significance of the kraal

I have already photographed the main kraal extensively, noting corner views, entrances, architecture, etc. I believe this is sufficient mitigation, if the rest of the farmhouse is found to have low significance.

FIG. 8: MAIN VIEW OF THE KRAAL



FIG. 9: KRAAL WALLING ARCHITECTURE



FIG. 10: NORTH ENTRANCE OF KRAAL



FIG. 11: WEST ENTRANCE OF KRAAL



FIG. 12: DRAINAGE HOLES ALONG NORTH WALL



FIG. 13: HOUSE FOUNDATIONS¹



FIG. 14: MUDBRICK FOUNDATIONS



¹ Arrow indicates location of main kraal

FIG. 15: KRAAL 2



FIG. 16: "GARDENS"



KTF02

KFT is located halfway up the hill, and just below the road amongst a natural rock outcrop. The site consists of a roughly made dry stone walled kraal (fig. 16). The kraal is rectangular and ~3m x 2m in size. It consists of large boulders packed to form a rectangle. It was probably used for sheep or goats. I cannot date the kraal.

Significance: The kraal is of low significance

Mitigation: The kraal occurs ~60m north from the road. It is unlikely to be affected, however its location should be noted for future road widening. Although it is of low significance unnecessary damage should be avoided.

FIG. 17: STONE WALLING OF KRAAL AT KTF02



PALAEONTOLOGY

According to the Palaeontological Impact assessment (Appendix B) the planned landfill site will probably impact on the Adelaide Subgroup. The Adelaide Subgroup is highly productive as far as fossils are concerned. Fossils include plant fossils of *Glossopteris* and vertebrate fossils of the *Dicynodon* and *Lystrosaurus* Assemblage zones.

Due to the igneous character of dolerite it does not contain fossils.

It is recommended that, if the Geo-technical report for the site indicates shallow soils and that bedrock will be uncovered during the construction phase, a qualified Palaeontologist must be on site to complete further assessments for all areas underlain by rocks of the Adelaide Subgroup during excavations into bedrock.

MANAGEMENT PLAN

The main site of KTF01 appears to be the original farmstead of Krantzfontein. The foundations of the houses still exist, as do the dry stone walling of two kraals. A deeds office search and basic historical architectural assessment would be required before the main kraal is destroyed. This would allow a final assessment of the farmstead.

KTF02 is not directly affected and is of low significance. However, if the road occurs within 50m of the kraal, then it should be fenced off, to prevent accidental damage.

A qualified palaeontologist will need to be on site during the construction phase if the Adelaide Subgroup is exposed and affected. This will most likely occur.

If the main kraal is older than 60 years, the development will require a permit from Amafa KZN Built Environment to destroy it. If the fossil bearing formations are affected, then a permit to destroy palaeontological material will be required from Amafa KZN.

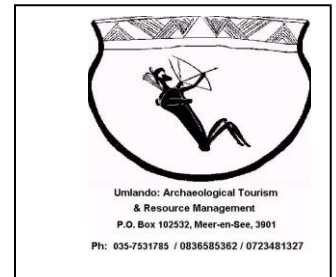
CONCLUSION

A heritage survey was undertaken for the proposed Kokstad landfill site. Two heritage sites were observed in the general area of the footprint. The one site extends into the landfill site, and it forms part of a farmstead. The buildings are poorly preserved except for the main kraal; that occurs in the development footprint. Since the buildings and ruins appear to be part of the original farmstead, further investigation will be required. This investigation would be in terms of a deeds search to determine who owned the farm and when it was first established.

The construction phase will require a palaeontologist to be on site to salvage fossil remains.

APPENDIX A: SITE RECORD FORMS

UMLANDO ARCHAEOLOGICAL SITE RECORD FORM



SITE CATEGORY: (X where applicable)

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

Recorder's Site No.: KFT01

Official Name: Krantzfontein 258

Local Name: N/A

Map Sheet: 3029CB Kokstad

GPS reading: S30 32.990 E29 27.562

DIRECTIONS TO SITE: SKETCH OR DESCRIPTION.

Take R56 into Kokstad and turn right into Dower street. Continue with Dower Street over the river where it becomes Nkqubela Rd. Turn right into Nkululeko Rd, and continue downhill to a T-Junction. Turn left here, and cross railway and follow road on left. Take first right where bridge cross the Mzintlava River. Follow dirt road between farm buildings that veers left. This road takes you to the site.

SITE DESCRIPTION:

KTF01 appears to be part of the original farm buildings for the farm Krantzfontein. The site consists of several ruined buildings and trees. Most of the buildings occur outside of the footprint. The complex consists of the following features: a main kraal uphill of the house. The kraal consists of dry stone walling. The kraal is made up of two exterior rows of large boulders, with smaller rocks as infill. There is a main entrance facing downhill, or northeast, and a smaller side entrance on the western wall. There are two drainage holes along the northern wall. Downhill are two rectangular house foundations, circular mudbrick foundations, large irregular kraal of dry stone walling and "gardens". The state of the buildings and the size of the trees suggest that these ruins may date to late 19th century or early 20th century. No immediate information is available for this farm and a deeds search will be required. My main concern is that these ruins may part of the original farm buildings, or even original farms from Kokstad.

Type of Site: Farmstead buildings

Merits conservation: pending

Threats: Yes

What threats: Landfill site

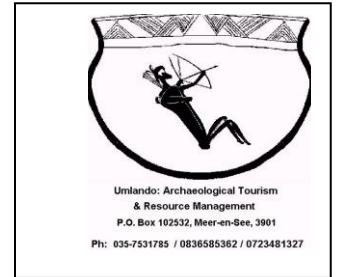
RECORDING:

Graphic record: Yes Digital pictures: x

Recorder/Informant: Name: Gavin Anderson 25/9/21012

Owner: State?Kokstad Municipality

UMLANDO ARCHAEOLOGICAL SITE RECORD FORM



SITE CATEGORY: (X where applicable)

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

Recorder's Site No.: KFT01

Official Name: Krantzfontein 258

Local Name: N/A

Map Sheet: 3029CB Kokstad

GPS reading: S30 32.909 E29 27.312

DIRECTIONS TO SITE: SKETCH OR DESCRIPTION.

Take R56 into Kokstad and turn right into Dower street. Continue with Dower Street over the river where it becomes Nkqubela Rd. Turn right into Nkululeko Rd, and continue downhill to a T-Junction. Turn left here, and cross railway and follow road on left. Take first right where bridge cross the Mzintlava River. Follow dirt road between farm buildings that veers left. This road takes you to the site. The site is about 100m before the main kraal on your left.

SITE DESCRIPTION:

KFT is located halfway up the hill, and just below the road amongst a natural rock outcrop. The site consists of a roughly made dry stone walled kraal (fig. 16). The kraal is rectangular and ~3m x 2m in size. It consists of large boulders packed to form a rectangle. It was probably used for sheep or goats. I cannot date the kraal.

Type of Site: Farmstead buildings

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Threats: Yes

What threats: Landfill site

RECORDING:

Graphic record: Yes Digital pictures: x

Recorder/Informant: Name: Gavin Anderson 25/9/21012

Owner: State?Kokstad Municipality

APPENDIX B: PALAEOLOGICAL IMPACT DESKTOP ASSESSMENT:

**PALAEONTOLOGICAL DESKTOP
ASSESSMENT FOR**

Proposed new Solid Waste Disposal Site at
Kokstad, KwaZulu-Natal Province.

FOR

Umlando

DATE: 08 October 2012

By

Gideon Groenewald

**Metsi Metseng Geological and Environmental
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Cell: 082 829 4978

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EXECUTIVE SUMMARY

Metsi-Metseng Geological and Environmental Services CC was appointed to undertake a desktop survey, assessing the potential palaeontology impact of the proposed new Solid Waste Disposal site at Kokstad within the Greater Kokstad Local Municipality that forms part of the Sisonke District Municipality, KwaZulu Natal.

The potential palaeontology of a rock unit relates directly to the geology of the area. The desktop survey includes the comparison of relevant referenced geological maps and locality maps and/or waypoints provided for the development project. The potential impact and significance of the palaeontology for a specific rock unit is determined through comparison of existing geological and palaeontology database information.

The planned new Solid Waste disposal site is geologically underlain by Sedimentary deposits and igneous intrusive dolerite of the Karoo Supergroup.

The Adelaide Subgroup is highly productive as far as fossils are concerned. Fossils include plant fossils of *Glossopteris* and vertebrate fossils of the *Dicynodon* and *Lystrosaurus* Assemblage zones.

Due to the igneous character of dolerite it does not contain fossils.

It is recommended that, if the Geo-technical report for the site indicates shallow soils and that bedrock will be uncovered during the construction phase, a qualified Palaeontologist must be on site to complete further assessments for all areas underlain by rocks of the Adelaide Subgroup during excavations into bedrock.

INTRODUCTION

Metsi-Metseng Geological and Environmental Services CC was appointed to undertake a desktop survey, assessing the potential palaeontology impact of the proposed new Solid Waste Disposal site at Kokstad within the Greater Kokstad Local Municipality that forms part of the Sisonke District Municipality, KwaZulu Natal.

SAHRA ACT OR KWAZULU-NATAL HERITAGE ACT NO. 4 OF 2008

The National Heritage Resources Act of 1999 (pp 12-14) and the KwaZulu heritage Act of 2008 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—
 - 2.8. Ancestral graves;
 - 2.9. Royal graves and graves of traditional leaders;

- 2.10. Graves of victims of conflict;
- 2.11. Graves of individuals designated by the Minister by notice in the Gazette;
- 2.12. Historical graves and cemeteries; and
- 2.13. 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, -
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”

METHODOLOGY

The potential palaeontology of a rock unit relates directly to the geology of the area. The desktop survey includes the comparison of relevant referenced geological maps and locality maps and/or waypoints provided for the development project. The potential impact and significance of the palaeontology for a specific rock unit is determined through comparison of existing geological and palaeontology database information.

The only limitation on this methodology is the scale of mapping, which restricts comparison of the geology to a scale of 1:250 000. This restriction only applies in areas where major changes in the geological character of the area occur over very short distances.

RESULTS

The planned new Solid Waste disposal site is geologically underlain by sedimentary deposits of the Adelaide Subgroup and intrusive, igneous dolerite of the Karoo Supergroup (Figure 1).

GEOLOGY

The planned new Solid Waste disposal site is underlain by Permian aged sedimentary rocks of the Adelaide Subgroup (Pa) which forms part of the Beaufort Group of the Karoo Supergroup. A very small portion of the site is underlain by Jurassic aged dolerite, which is an intrusive igneous rock.

Adelaide Subgroup

The sequence of interbedded fine-grained sandstone and siltstone with carbonaceous shale is interpreted as a fluvio-deltaic deposit and the thickness of sandstone lenses increase in upward coarsening cycles. The upper part of the Adelaide Subgroup is interpreted as a fluvial sequence of sandstone and siltstone, grading upwards into a lacustrine environment (Groenewald, 1996).

Karoo Dolerite

A very small section (Northwestern part) of the proposed new Solid Waste disposal site is underlain by a dolerite sill. Dolerite is a very hard, intrusive igneous rock.

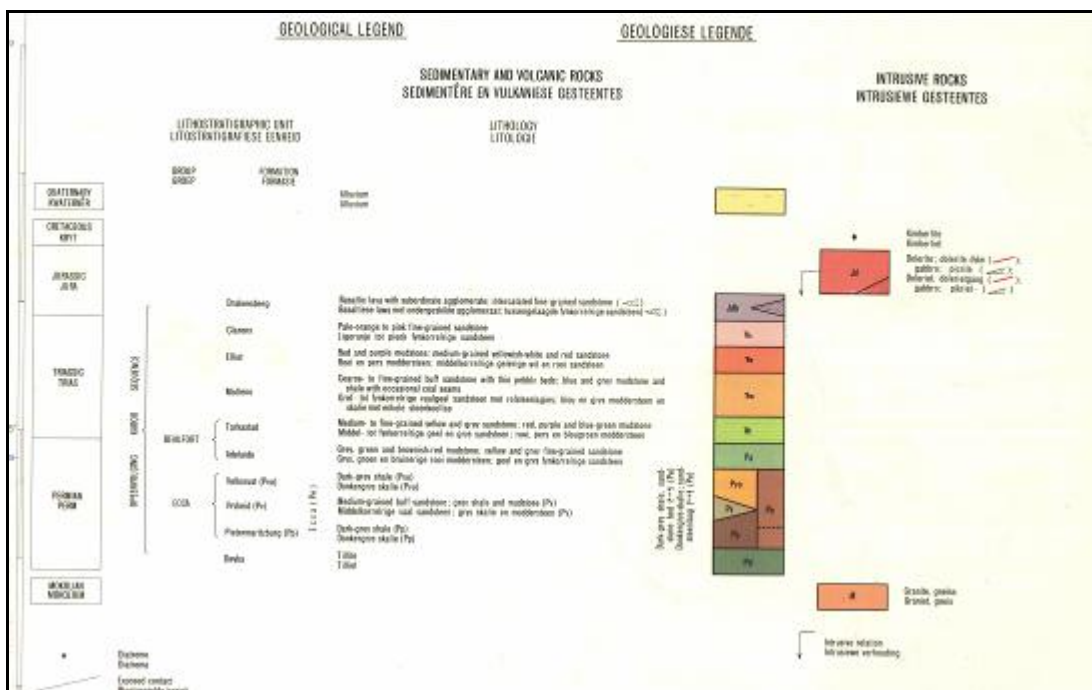
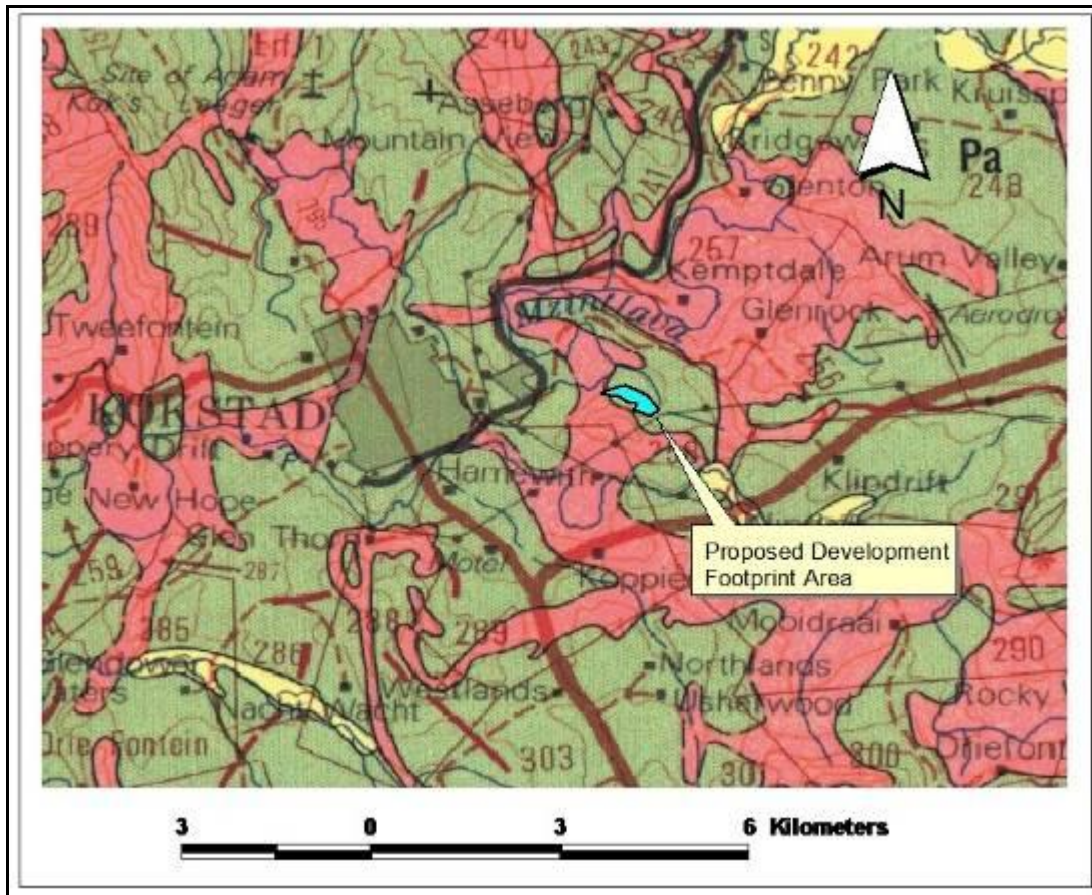


Figure 1 Geological Map of proposed new Solid Waste disposal site

PALAEONTOLOGY

The potential palaeontology of a rock unit relates directly to the geology of the area. The desktop survey includes the comparison of relevant referenced geological maps and locality maps and/or waypoints provided for the development project.

Adelaide Subgroup / Formation (Pa)

The Adelaide Subgroup is highly productive as far as fossils are concerned. Fossils include plant fossils of *Glossopteris* and vertebrate fossils of the *Dicynodon* and *Lystrosaurus* Assemblage zones have been recorded from these rock units in KwaZulu-Natal (Rubidge ed, 1995; Groenewald, 1996; Johnson et al, 2006).

Karoo Dolerite

Due to the igneous character of these rocks they do not contain fossils.

DISCUSSION

The desktop survey indicates that the planned new Solid Waste disposal site is underlain by sedimentary rocks of the Adelaide Subgroup and igneous rocks of the Karoo Supergroup. The potential impact and significance of the palaeontology for a specific rock unit is determined through comparison of existing geological and palaeontology database information.

The Adelaide Subgroup is known to contain abundant plant fossils of *Glossopteris* and vertebrate fossils of both the *Dicynodon* and *Lystrosaurus* Assemblage zones have been recorded from these units.

The dolerite units will not contain any fossil material.

MANAGEMENT PLAN

The desktop survey indicates that the proposed new Solid Waste disposal site is underlain by sedimentary rocks of the Adelaide Subgroup of the Beaufort Group and igneous dolerite of the Karoo Supergroup.

For management purposes, a colour scheme is proposed (Figure 2) with the following interpretations:

- Green areas indicate that the chances of finding fossils are too low to warrant any management action.
- Orange areas within the area cuts geology with a significant chance of finding fossils and these areas will have to be subjected to a Phase 1 Palaeontological Impact Assessment if the geotechnical reports indicate that bedrock will be uncovered during excavations.

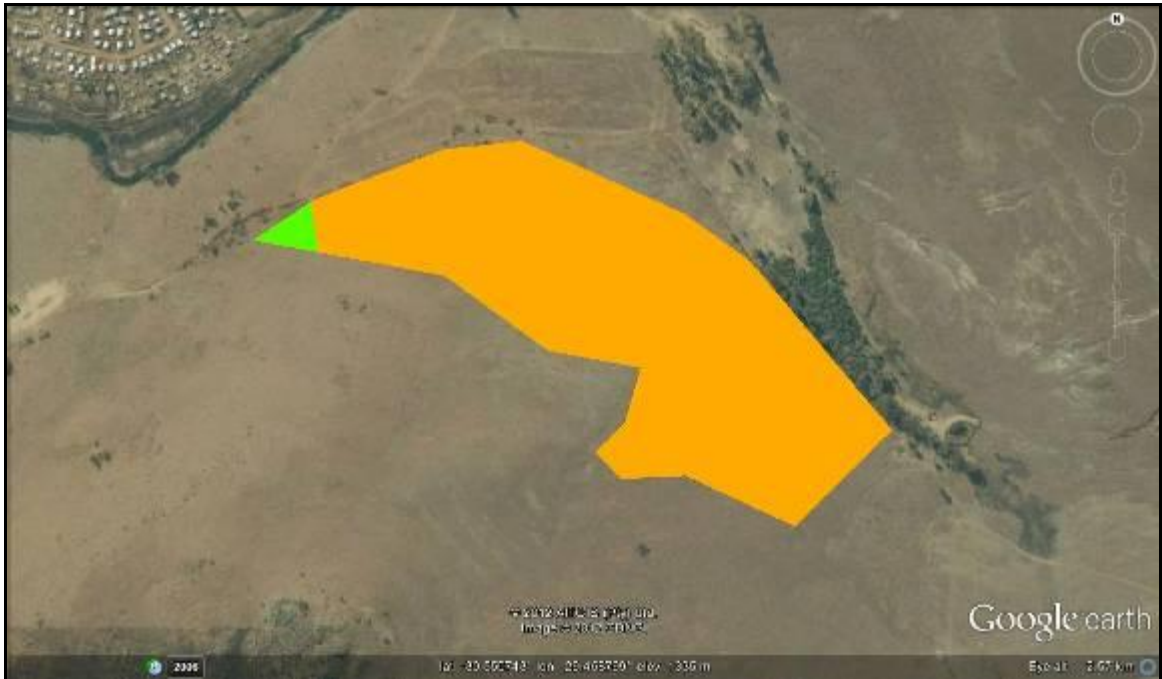


Figure 2 Sensitivity Map for proposed new Solid Waste disposal site

CONCLUSION

The proposed new Solid Waste disposal site is located on sedimentary and igneous rocks of the Karoo Supergroup.

It is recommended that, if the Geo-technical report for the site indicates shallow soils and that bedrock will be uncovered during the construction phase, a qualified Palaeontologist must be on site to complete further assessments for all areas underlain by rocks of the Adelaide Subgroup.

REFERENCES

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QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

Dr Gideon Groenewald has a PhD in Geology from the Nelson Mandela Metropolitan University (1996) and the National Diploma in Nature Conservation from the University of South Africa (1990). He specialises in research on South African Permian and Triassic sedimentology and macrofossils with an interest in biostratigraphy, and palaeoecological 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.

A handwritten signature in black ink, reading "Gideon Groenewald", with a horizontal line underneath.

Dr Gideon Groenewald
Geologist