



**PGS**  
**HERITAGE & GRAVE**  
**RELOCATION CONSULTANTS**

**PROPOSED ESTABLISHMENT OF A NEW SOLID WASTE  
LANDFILL SITE, ROSSOUW, SENQU MUNICIPALITY, JOE GQABI  
DISTRICT MUNICIPALITY, EASTERN CAPE PROVINCE**

**Heritage Impact Report**

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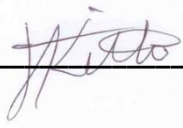
**Declaration of Independence**

*The report has been compiled by PGS Heritage, an appointed Heritage Specialist for Terreco Environmental cc. The views stipulated in this report are purely objective and no other interests are displayed during the decision making processes discussed in the Heritage Impact Assessment Process, which includes the Baseline Information report as well as this final report.*

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<b>Report Title</b>	<i>the proposed development of a New Solid Waste Landfill Site at Rossouw, near Barkley East, by Senqu Local Municipality in the Joe Gqabi District Municipality, Eastern Cape Province – Heritage Impact Assessment</i>		
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## EXECUTIVE SUMMARY

PGS Heritage (PGS) was appointed by Terreco Environmental cc to undertake a Heritage Impact Assessment (HIA) that forms part of the Basic Environmental Impact Report (BAR) for the waste management license application process for the proposed development of a New Solid Waste Landfill Site at Rossouw, near Barkley East, by Senqu Local Municipality in the Joe Gqabi District Municipality, Eastern Cape Province.

During the heritage study no heritage sites of significance were identified in the study area foot print. Adjacent to the study area a large cemetery as well as a historical settlement were identified that will not be directly impacted by the development.

Specific management and mitigation measures with regards to the heritage resources occurring adjacent to the site and possible palaeontological finds that can be made during construction activities are:

### *Historical structure and cemeteries*

1. It is recommended that the cemetery to the west of the proposed development be buffered with a 10 meter buffer during construction.
2. Demarcate the construction access road to make sure that no traffic affects the graves in the cemetery directly;
3. The construction activity area also needs to be demarcated and movement of personnel and vehicles be controlled to ensure no impact on the cemetery or structure on top of hill;
4. Demarcate the cemetery and historical structures as no-go areas during construction.

### *Palaeontology*

The study area is underlain by Triassic aged sedimentary rocks of the Elliot Formation, Karoo Supergroup. In general the Elliot Formation is globally recognized for its abundance of early dinosaur and mammal remains, including dinosaur eggs containing embryos from the Golden Gate Highlands National Park in the Free State Province, which represent the oldest dinosaur embryos in the world. At present, one fish genus, two amphibian genera, 10 non-dinosaurian reptiles, at least 17 dinosaur genera, seven cynodont genera and two

mammalian genera are known from this formation. Importantly, *Australochelys*, the oldest known fossil turtle is also known from the Elliot Formation.

The Elliot Formation also contains the Triassic-Jurassic boundary, an important marker, which represents the end-Triassic mass extinction.

Remote sensing indicates that the mudstone is most probably covered by relatively thin sandy soils with sparse vegetation cover and, due to its richness in fossils, it is likely that fossils will be found in the footprint of the development. Due to the fact that numerous types of fossil remains have been described from this formation, a high palaeontological sensitivity is allocated to the site.

#### Recommendations:

1. The EAP as well as the ECO for this project must be made aware of the fact that the Elliot Formation in the Karoo Basin of South Africa is world renowned for the number and diversity of fossils discovered in these sediments.
2. It is recommended that a palaeontologist must be appointed to undertake a Phase 1 PIA to record any fossils according to SAHRA specifications.
3. The EAP and ECO of the project must be notified of the high possibility of the occurrence of fossils as well as the possible requirement of a Phase 2 PIA during excavation of the proposed cells.

#### *Cultural landscape*

The establishment of the proposed new solid waste landfill site will not have a negative influence on the cultural landscape or characteristics of the area in the long term. Short term impacts will only be during construction and will be for the duration of the construction timeframe. Screening of construction activities as per usual construction requirements is recommended.

#### **General**

Further to these recommendations, the general Heritage Management Guidelines in Section 6 need to be incorporated into the EMP for the project.

The overall impact of the development on heritage resources is seen as acceptably low and impacts can be mitigated to acceptable levels.

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## **1 INTRODUCTION**

PGS Heritage (PGS) was appointed by Terreco Environmental cc to undertake a Heritage Impact Assessment (HIA) that forms part of the Basic Environmental Impact Report (BAR) for the waste management license application process for the proposed development of the New Solid Waste Landfill Site at Rossouw, near Barkley East, by Senqu Local Municipality, Joe Gabi District Municipality, Eastern Cape Province.

### **1.1 Scope of the Study**

The aim of the study is to identify possible heritage sites and finds that may occur in the proposed development area. The Heritage Impact Assessment aims to inform the S&EIA in the development of a comprehensive EMP to assist the developer in managing the discovered heritage resources in a responsible manner, in order to protect, preserve, and develop them within the framework provided by the National Heritage Resources Act of 1999 (Act 25 of 1999) (NHRA).

### **1.2 Specialist Qualifications**

This Heritage Impact Report was compiled by PGS Heritage (PGS).

The staff at PGS has a combined experience of nearly 40 years in the heritage consulting industry. PGS and its staff have extensive experience in managing HIA processes. PGS will only undertake heritage assessment work where its staff has the relevant expertise and experience to undertake that work competently.

Henk Steyn, Principal Archaeologist for this project, is registered with the Association of Southern African Professional Archaeologists (ASAPA) and has CRM accreditation within said organisation.

Jennifer Kitto, Heritage Specialist for this project, has 15 years' experience in the heritage sector, a large part of which involved working for a government department responsible for administering the National Heritage Resources Act, No 25 of 1999. She is therefore well-versed in the legislative requirements of heritage management. She holds a BA in Archaeology and Social Anthropology and a BA (Hons) in Social Anthropology.



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).

### **1.3 Assumptions and Limitations**

Not detracting in any way from the comprehensiveness of the fieldwork undertaken, it is necessary to realise that the heritage resources located during the fieldwork do not necessarily represent all the possible heritage resources present within the area. Various factors account for this, including the subterranean nature of some archaeological sites. As such, should any heritage features and/or objects not included in the present inventory be located or observed, a heritage specialist must immediately be contacted.

Such observed or located heritage features and/or objects may not be disturbed or removed in any way, until such time that the heritage specialist has been able to make an assessment as to the significance of the site (or material) in question. This applies to graves and cemeteries as well. In the event that any graves or burial places are located during the development, the procedures and requirements pertaining to graves and burials will apply as set out below.

### **1.4 Legislative Context**

The identification, evaluation and assessment of any cultural heritage site, artefact or find in the South African context is required and governed by the following legislation:

- i. National Environmental Management Act (NEMA), Act 107 of 1998
- ii. National Heritage Resources Act (NHRA), Act 25 of 1999
- iii. Mineral and Petroleum Resources Development Act (MPRDA), Act 28 of 2002
- iv. Development Facilitation Act (DFA), Act 67 of 1995

The following sections in each Act refer directly to the identification, evaluation and assessment of cultural heritage resources.

- i. National Environmental Management Act (NEMA) Act 107 of 1998
  - a. Basic Environmental Assessment (BEA) – Section (23)(2)(d)
  - b. Environmental Scoping Report (ESR) – Section (29)(1)(d)
  - c. Environmental Impact Assessment (EIA) – Section (32)(2)(d)
  - d. Environmental Management Plan (EMP) – Section (34)(b)
- ii. National Heritage Resources Act (NHRA) Act 25 of 1999
  - a. Protection of Heritage Resources – Sections 34 to 36; and
  - b. Heritage Resources Management – Section 38
- iii. Mineral and Petroleum Resources Development Act (MPRDA) Act 28 of 2002
  - a. Section 39(3)
- iv. Development Facilitation Act (DFA) Act 67 of 1995
  - a. The GNR.1 of 7 January 2000: Regulations and rules in terms of the Development Facilitation Act, 1995. Section 31.

The NHRA stipulates that cultural heritage resources may not be disturbed without authorization from the relevant heritage authority. Section 34(1) of the NHRA states that, “no person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority...”. The NHRA is utilized as the basis for the identification, evaluation and management of heritage resources and in the case of CRM those resources specifically impacted on by development as stipulated in Section 38 of NHRA, and those developments administered through NEMA, MPRDA and the DFA legislation. In the latter cases, the feedback from the relevant heritage resources authority is required by the State and Provincial Departments managing these Acts before any authorizations are granted for development. The last few years have seen a significant change towards the inclusion of heritage assessments as a major component of Environmental Impacts Processes required by NEMA and MPRDA. This change requires us to evaluate the Sections of these Acts relevant to heritage (Fourie, 2008).

The NEMA 23(2)(b) states that an integrated environmental management plan should, “...identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage”.

A study of subsections (23)(2)(d), (29)(1)(d), (32)(2)(d) and (34)(b) and their requirements reveals the compulsory inclusion of the identification of cultural resources, the evaluation of the impacts of the proposed activity on these resources, the identification of alternatives and the management procedures for such cultural resources for each of the documents noted in the Environmental Regulations. A further important aspect to be taken account of in the Regulations under NEMA is the Specialist Report requirements laid down in Section 33 of the regulations (Fourie, 2008).

## **1.5 Terminology and Abbreviations**

### *Archaeological resources*

This includes:

- i. material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years including artefacts, human and hominid remains and artificial features and structures;
- ii. rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation;
- iii. wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the republic as defined in the Maritimes Zones Act, and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation;
- iv. features, structures and artefacts associated with military history which are older than 75 years and the site on which they are found.

### *Cultural significance*

This means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance

### *Development*

This means any physical intervention, excavation, or action, other than those caused by natural forces, which may in the opinion of the heritage authority in any way result in a change to the nature, appearance or physical nature of a place or influence its stability and future well-being, including:

- i. construction, alteration, demolition, removal or change in use of a place or a structure at a place;
- ii. carrying out any works on or over or under a place;
- iii. subdivision or consolidation of land comprising a place, including the structures or airspace of a place;
- iv. constructing or putting up for display signs or boards;
- v. any change to the natural or existing condition or topography of land; and
- vi. any removal or destruction of trees, or removal of vegetation or topsoil

#### *Early Stone Age*

The archaeology of the Stone Age, between 700 000 and 2 500 000 years ago.

#### *Fossil*

Mineralised bones of animals, shellfish, plants and marine animals. A trace fossil is the track or footprint of a fossil animal that is preserved in stone or consolidated sediment.

#### *Heritage*

That which is inherited and forms part of the National Estate (historical places, objects, fossils as defined by the National Heritage Resources Act 25 of 1999).

#### *Heritage resources*

This means any place or object of cultural significance

#### *Holocene*

The most recent geological time period which commenced 10 000 years ago.

#### *Late Stone Age*

The archaeology of the last 20 000 years associated with fully modern people.

#### *Late Iron Age (Early Farming Communities)*

The archaeology of the last 1000 years up to the 1800's, associated with iron-working and farming activities such as herding and agriculture.

#### *Middle Stone Age*

The archaeology of the Stone Age between 20-300 000 years ago, associated with early modern humans.

### *Palaeontology*

Any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace.

<b>ABBREVIATIONS</b>	<b>DESCRIPTION</b>
<b>AIA</b>	Archaeological Impact Assessment
<b>ASAPA</b>	Association of South African Professional Archaeologists
<b>CRM</b>	Cultural Resource Management
<b>DEA</b>	Department of Environmental Affairs
<b>DWA</b>	Department of Water Affairs
<b>ECO</b>	Environmental Control Officer
<b>EIA practitioner</b>	Environmental Impact Assessment Practitioner
<b>EIA</b>	Environmental Impact Assessment
<b>ESA</b>	Early Stone Age
<b>GPS</b>	Global Positioning System
<b>HIA</b>	Heritage Impact Assessment
<b>I&amp;AP</b>	Interested & Affected Party
<b>LSA</b>	Late Stone Age
<b>LIA</b>	Late Iron Age
<b>MSA</b>	Middle Stone Age
<b>MIA</b>	Middle Iron Age
<b>NEMA</b>	National Environmental Management Act
<b>NHRA</b>	National Heritage Resources Act
<b>PHRA</b>	Provincial Heritage Resources Authority
<b>PSSA</b>	Palaeontological Society of South Africa
<b>SADC</b>	Southern African Development Community
<b>SAHRA</b>	South African Heritage Resources Agency

Refer to **Appendix A** for further discussions on heritage management and legislative frameworks

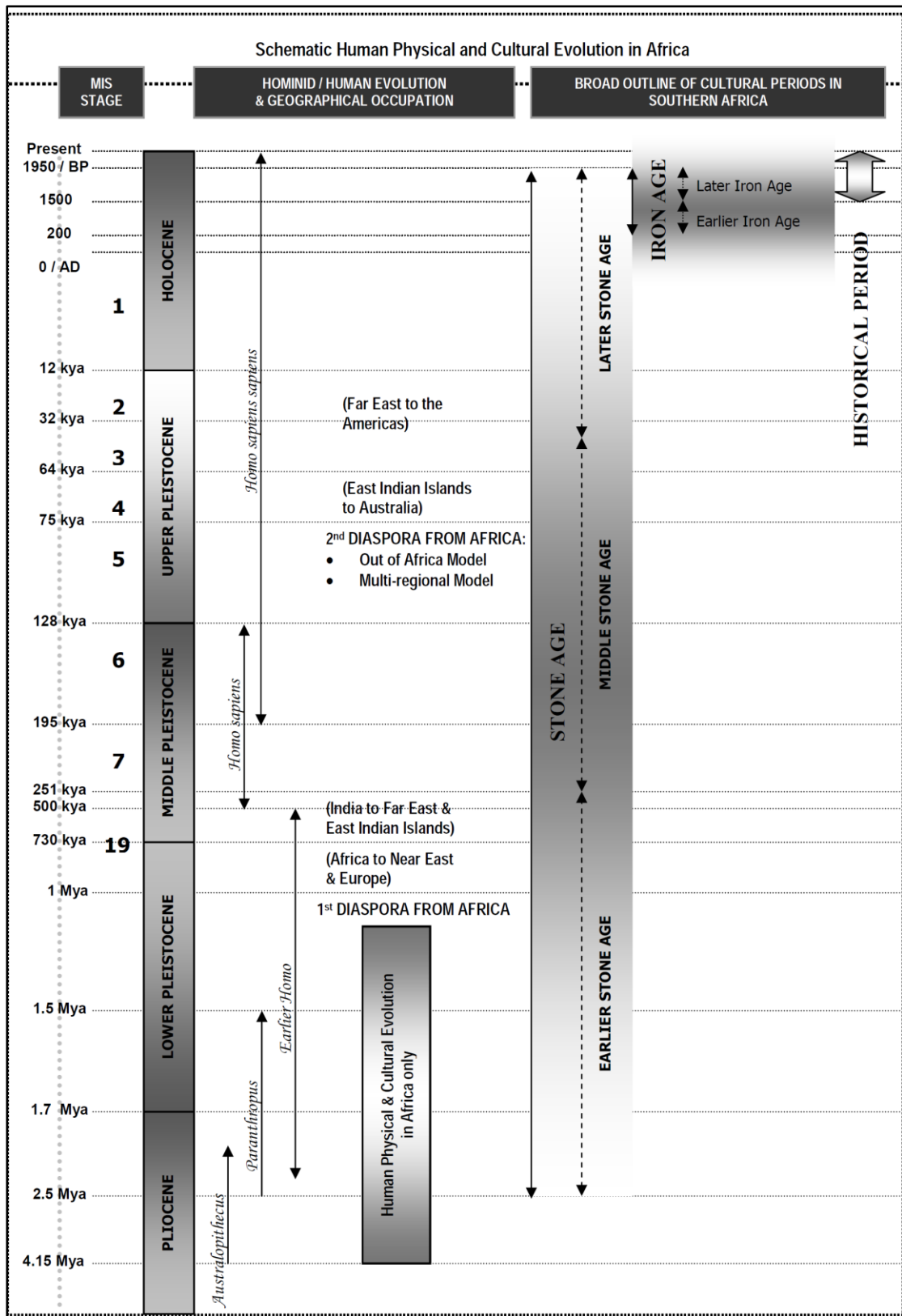


Figure 1 – Human and Cultural Timeline in Africa (Morris, 2008)

## 2 TECHNICAL DETAILS OF THE PROJECT

### 2.1 Site Location and Description

The small town of Rossouw is part of the Joe Gqabi District Municipality, which is situated in the northern part of the Eastern Cape Province, and is bordered by Lesotho in the east, the Free State in the north and the Northern Cape in the west. The Joe Gqabi District Municipality consists of four local municipalities: Gariiep, Maletswai, Elundini, and Senqu (Nortje, 2006). Rossouw is located in the Senqu Municipality. The project involves the establishment of a new Solid Waste Landfill Site by the Senqu Local Municipality, Joe Gqabi District Municipality, Eastern Cape Province. (Figure 2).

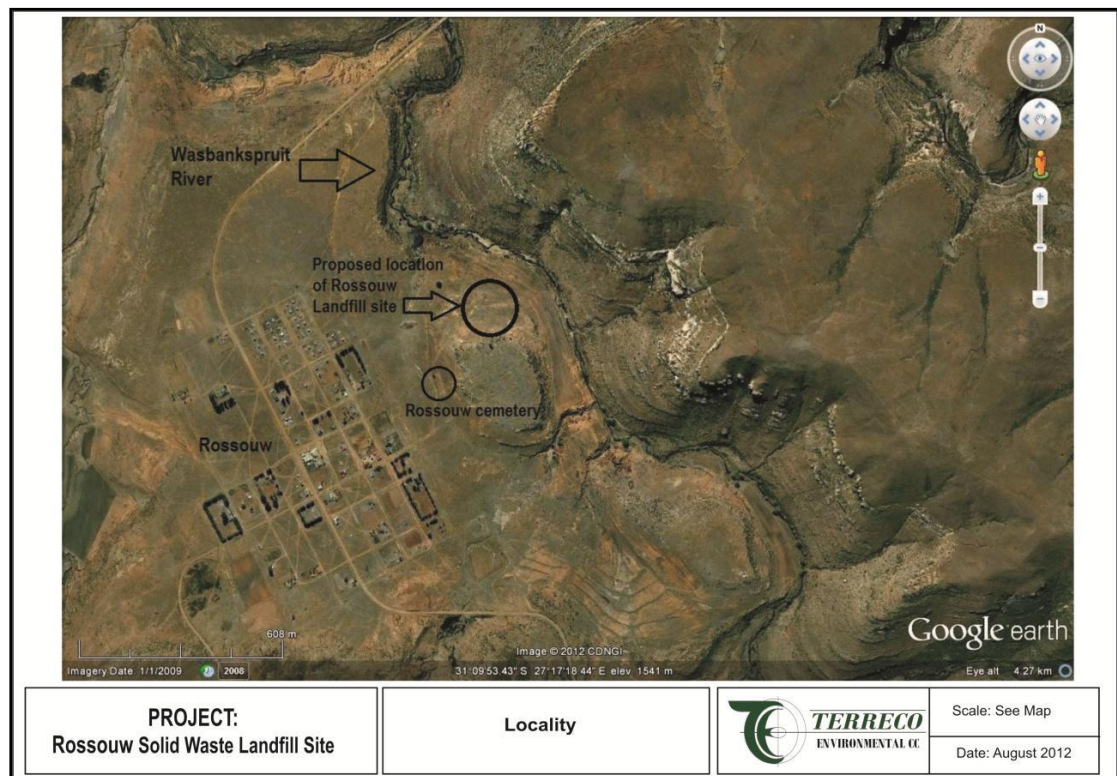


Figure 2 – Location of the proposed new solid waste landfill site, Rossouw (from Terreco Environmental)

### 2.2 Site Description

The Project is located on the northern slope of a small hill approximately 400 meters to the north-east of Rossouw – see Figure 2. The village cemetery is situated on the western slope side of the same hill, and is not visible from the landfill site due to the elevated land between the two areas.

The site incorporating the Project comprises vacant land currently used for grazing. The Wasbankspruit River runs approximately 120 meters to the east of the project site. Vegetation on the proposed project site is limited to a few species of grass and small, woody shrubs. A small hill is located just to the south of the project site. The proposed project site is not visible from Rossouw.

### **2.3 Technical Project Description**

Terreco Environmental cc have been appointed by Sektor Consulting Engineers (Pty) Ltd., on behalf of the Senqu Municipality, to undertake the legally required waste management license application process for the proposed development of the **Rossouw Solid Waste Landfill Site** (the Project). The Project is a component of the strategic development of long term waste management capacity for the Senqu Municipality.

The basic site is proposed to consist of several excavated dumping areas, called cells. These excavated areas will equal the available air space. The proposed cell sizes is 25m long, 2.5m wide with 1:2 ratio side slopes and a 1:5 ratio entrance slope, 10m long, considering the cells at 2m deep. The entrance slope will also be considered as available air space. The total airspace per cell is 225m<sup>3</sup>. Depending on the final site selected, the excavated material will be used as cover material. (**Figure 3**).

## **3 ASSESSMENT METHODOLOGY**

The section below outlines the assessment methodologies utilised in the study.

### **3.1 Methodology for Assessing Heritage Site significance**

This Heritage Impact Assessment (HIA) report was compiled by PGS Heritage (PGS) for the proposed establishment of a new solid waste landfill site at Rossouw near Barkly East. The applicable maps, tables and figures, are included as stipulated in the NHRA (no 25 of 1999), the National Environmental Management Act (NEMA) (no 107 of 1998). The HIA process consisted of three steps:





- High - >50/50m2
- Uniqueness; and
- Potential to answer present research questions.

Management actions and recommended mitigation, which will result in a reduction in the impact on the sites, will be expressed as follows:

A - No further action necessary;

B - Mapping of the site and controlled sampling required;

C - No-go or relocate development activity position;

D - Preserve site, or extensive data collection and mapping of the site; and

E - Preserve site.

Impacts on these sites by the development will be evaluated as follows:

#### *Site Significance*

Site significance classification standards prescribed by the SAHRA (2006) and approved by the ASAPA for the Southern African Development Community (SADC) region, were used for the purpose of this report.

*Table 1: Site significance classification standards as prescribed by SAHRA.*

FIELD RATING	GRADE	SIGNIFICANCE	RECOMMENDED MITIGATION
National Significance (NS)	Grade 1	-	Conservation; National Site nomination
Provincial Significance (PS)	Grade 2	-	Conservation; Provincial Site nomination
Local Significance (LS)	Grade 3A	High Significance	Conservation; Mitigation not advised
Local Significance (LS)	Grade 3B	High Significance	Mitigation (Part of site should be retained)
Generally Protected A (GP.A)	-	High / Medium Significance	Mitigation before destruction
Generally Protected B (GP.B)	-	Medium Significance	Recording before destruction
Generally Protected C (GP.A)	-	Low Significance	Destruction

### 3.2 Methodology for Impact Assessment

In order to ensure uniformity, a standard impact assessment methodology has been utilised so that a wide range of impacts can be compared. The impact assessment methodology makes provision for the assessment of impacts against the following criteria:

- Significance;
- Spatial scale;
- Temporal scale;
- Probability; and
- Degree of certainty.

A combined quantitative and qualitative methodology was used to describe impacts for each of the aforementioned assessment criteria. A summary of each of the qualitative descriptors along with the equivalent quantitative rating scale for each of the aforementioned criteria is given in **Table 2**.

*Table 2: Quantitative rating and equivalent descriptors for the impact assessment criteria*

<b>RATING</b>	<b>SIGNIFICANCE</b>	<b>EXTENT SCALE</b>	<b>TEMPORAL SCALE</b>
1	VERY LOW	<i>Isolated site</i>	<u>Incidental</u>
2	LOW	<i>Study area</i>	<u>Short-term</u>
3	MODERATE	<i>Local</i>	<u>Medium-term</u>
4	HIGH	<i>Regional / Provincial</i>	<u>Long-term</u>
5	VERY HIGH	<i>Global / National</i>	<u>Permanent</u>

A more detailed description of each of the assessment criteria is given in the following sections.

#### *Significance Assessment*

Significance rating (importance) of the associated impacts embraces the notion of extent and magnitude, but does not always clearly define these since their importance in the rating scale is very relative. For example, the magnitude (i.e. the size) of area affected by atmospheric pollution may be extremely large (1000 km<sup>2</sup>) but the significance of this effect is dependent on the concentration or level of pollution. If the concentration is great, the significance of the impact would be HIGH or VERY HIGH, but if it is diluted it would be VERY LOW or LOW. Similarly, if 60 ha of a grassland type are destroyed, the impact would be VERY

HIGH if only 100 ha of that grassland type were known. The impact would be VERY LOW if the grassland type was common. A more detailed description of the impact significance rating scale is given in **Table 3** below.

*Table 3: Description of the significance rating scale*

RATING		DESCRIPTION
5	VERY HIGH	Of the highest order possible within the bounds of impacts which could occur. In the case of adverse impacts: there is no possible mitigation and/or remedial activity which could offset the impact. In the case of beneficial impacts, there is no real alternative to achieving this benefit.
4	HIGH	Impact is of substantial order within the bounds of impacts which could occur. In the case of adverse impacts: mitigation and/or remedial activity is feasible but difficult, expensive, time-consuming or some combination of these. In the case of beneficial impacts, other means of achieving this benefit are feasible but they are more difficult, expensive, time-consuming or some combination of these.
3	MODERATE	Impact is real but not substantial in relation to other impacts, which might take effect within the bounds of those which could occur. In the case of adverse impacts: mitigation and/or remedial activity are both feasible and fairly easily possible. In the case of beneficial impacts: other means of achieving this benefit are about equal in time, cost, effort, etc.
2	LOW	Impact is of a low order and therefore likely to have little real effect. In the case of adverse impacts: mitigation and/or remedial activity is either easily achieved or little will be required, or both. In the case of beneficial impacts, alternative means for achieving this benefit are likely to be easier, cheaper, more effective, less time consuming, or some combination of these.
1	VERY LOW	Impact is negligible within the bounds of impacts which could occur. In the case of adverse impacts, almost no mitigation and/or remedial activity is needed, and any minor steps which might be needed are easy, cheap, and simple. In the case of beneficial impacts, alternative means are almost all likely to be better, in one or a number of ways, than this means of achieving the benefit. Three additional categories must also be used where relevant. They are in addition to the category represented on the scale, and if used, will replace the scale.
0	NO IMPACT	There is no impact at all - not even a very low impact on a party or system.

### *Spatial Scale*

The spatial scale refers to the extent of the impact i.e. will the impact be felt at the local, regional, or global scale. The spatial assessment scale is described in more detail in **Table 4**.

*Table 4: Description of the significance rating scale*

RATING		DESCRIPTION
5	Global/National	The maximum extent of any impact.
4	Regional/Provincial	The spatial scale is moderate within the bounds of impacts possible, and will be felt at a regional scale (District Municipality to Provincial Level). The impact will affect an area up to 50 km from the proposed site.
3	Local	The impact will affect an area up to 5 km from the proposed site.
2	Study Area	The impact will affect a route corridor / site not exceeding the boundary of the site.
1	Isolated Sites / proposed site	The impact will affect an area no bigger than the site.

### *Duration Scale*

In order to accurately describe the impact it is necessary to understand the duration and persistence of an impact in the environment. The temporal scale is rated according to criteria set out in **Table 5**.

*Table 5: Description of the temporal rating scale*

RATING		DESCRIPTION
1	Incidental	The impact will be limited to isolated incidences that are expected to occur very sporadically.
2	Short-term	The environmental impact identified will operate for the duration of the construction phase or a period of less than 5 years, whichever is the greater.
3	Medium term	The environmental impact identified will operate for the duration of life of the project.
4	Long term	The environmental impact identified will operate beyond the life of operation.
5	Permanent	The environmental impact will be permanent.

### *Degree of Probability*

The probability or likelihood of an impact occurring will be described as shown in **Table 6** below.

Table 6: Description of the degree of probability of an impact occurring

RATING	DESCRIPTION
1	Practically impossible
2	Unlikely
3	Could happen
4	Very Likely
5	It's going to happen / has occurred

#### *Degree of Certainty*

As with all studies it is not possible to be 100% certain of all facts, and for this reason a standard “degree of certainty” scale is used, as discussed in **Table 7**. The level of detail for specialist studies is determined according to the degree of certainty required for decision-making. The impacts are discussed in terms of affected parties or environmental components.

Table 7: Description of the degree of certainty rating scale

RATING	DESCRIPTION
Definite	More than 90% sure of a particular fact.
Probable	Between 70 and 90% sure of a particular fact, or of the likelihood of that impact occurring.
Possible	Between 40 and 70% sure of a particular fact, or of the likelihood of an impact occurring.
Unsure	Less than 40% sure of a particular fact or the likelihood of an impact occurring.
Can't know	The consultant believes an assessment is not possible even with additional research.

#### *Quantitative Description of Impacts*

To allow for impacts to be described in a quantitative manner, in addition to the qualitative description given above, a rating scale of between 1 and 5 was used for each of the assessment criteria. Thus the total value of the impact is described as the function of significance, spatial and temporal scale as described below:

$$\text{Impact Risk} = \frac{(\text{SIGNIFICANCE} + \text{Spatial} + \text{Temporal}) \times \text{Probability}}{3 \quad 5}$$

An example of how this rating scale is applied is shown below:

Table 8: Example of Rating Scale

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	LOW	Local	Medium Term	Could Happen	
Impact to heritage	2	3	3	3	1.6

**Note:** The significance, spatial and temporal scales are added to give a total of 8, that is divided by 3 to give a criterion rating of 2.67. The probability (3) is divided by 5 to give a probability rating of 0.6. The criteria rating of 2.67 is then multiplied by the probability rating (0,6) to give the final rating of 1,6.

The impact risk is classified according to 5 classes as described in the table below.

Table 9: Impact Risk Classes

RATING	IMPACT CLASS	DESCRIPTION
0.1 – 1.0	1	Very Low
1.1 – 2.0	2	Low
2.1 – 3.0	3	Moderate
3.1 – 4.0	4	High
4.1 – 5.0	5	Very High

Therefore with reference to the example used for air quality above, an impact rating of 1.6 will fall in the Impact Class 2, which will be considered to be a low impact.

## 4 CURRENT STATUS QUO

### 4.1 Archival findings

The aim of the archival background research is to identify possible heritage resources that could be encountered during the field work, as summarised in **Table 10**.

Table 10: Summary of History of Barkly East Area

DATE	DESCRIPTION
2.5 million to 250 000 years ago	The Earlier Stone Age (ESA). No recorded sites were located during the desktop study.
250 000 to 40 000 years ago	The Middle Stone Age (MSA). No recorded sites were located during the desktop study.

<b>40 000 years ago to the historic past</b>	<p>The Later Stone Age (LSA). An article by Lewis (2005), discusses unconsolidated sediments that were deposited by fluvial processes and which occur in river valleys that drain northwards down the dip of the slope of the escarpment of the Drakensburg to enter the Kraai River in Barkley East. In rare cases palaeosols are present, which are suitable for radio carbon dating and critical for understanding Later Stone age habitation (Lewis, 2005). Palaeosols were identified in the Dinorben headwaters of the Langkloof and at a number of sites in the Sterk Spruit drainage systems (Glenmore, Tantallon, Kilchurn, and Athol) (Lewis, 2005).</p> <p>Human occupation of the Langkloof-Sterk Spruit region by LSA hunter gatherers is first evidenced by artifacts and charcoal remains from fires dating to 11,853 BP at Ravenscraig. Opperman (1982) notes that excavations have been undertaken in the Barkly East district at the sites Colwinton, Prospect, Wartrail and Ravenscraig.</p>
<b>Rock Art</b>	<p>A large number of rock art sites have been recorded in the Barkly-East area (Lewis-Williams, 1983). Thirty-eight shelters were recorded in this area. These shelters are situated on, or on tributaries of, the Kraai and Bell rivers. In this area, around three-quarters of the painted sites contain surface scatters of stone artefacts referable to a Later Stone Age industry (Lewis Williams, 1974). Sites in the area include Cullen’s Wood, Septon Cave and Dinorben (between Barkly East and Elliott) (<a href="http://www.quovadis-southern-africa.co.za/content/9/2532/en/barkly-east-and-rhodes-attractions-drakensberg-eastern-cape.html">http://www.quovadis-southern-africa.co.za/content/9/2532/en/barkly-east-and-rhodes-attractions-drakensberg-eastern-cape.html</a>.)</p> <p>The farm Dinorben, located close to the Colwinton site, contains a rock shelter with a rock art panel more than 40m long (Steele, 2001).</p>
<b>AD 200 - 900</b>	Early Iron Age (EIA). No recorded sites were located during the desktop study.
<b>AD 900 - 1300</b>	Middle Iron Age (MIA). No recorded sites were located during the desktop study.
<b>AD 900 - 1840</b>	<p>Late Iron Age (LIA). Opperman’s excavations at Colwinton and Bonawe in the Barkly East district have accounted for some of the oldest known ceramics discovered in the Eastern Cape escarpment (Opperman, 1987). By 775 BP pottery had been introduced at Colwinton (Lewis 2005; citing Opperman (1987)).</p>
<b>AD 1873</b>	<p>Historical period.</p> <p>No information was obtained on the town of Rossouw.</p> <p>Barkly East was established in 1873, and was named after Sir Henry Barkly, who was the Governor and High Commissioner to the Cape from 1870-1877. During the Anglo-Boer War of 1899-1902 the town and district of Barkly East was used by both sides as a military centre (Nortje, 2006).</p>



During the Colonial expansion, the little town of Barkly East and its surrounding farming districts became one of the foremost sheep farming and wool producing districts in the country (Nortje, 2006).

#### 4.2 Palaeontology of the area

The following section is an extract from the Palaeontological Desktop Study, attached as **Appendix B**.

The study area is underlain by Triassic aged sedimentary rocks of the Elliot Formation, Karoo Supergroup. The Elliot Formation comprises a sequence of interbedded red to reddish brown coloured mudstone, siltstone with lenses of very fine-grained yellow-grey sandstone. The depositional environment is interpreted as lacustrine to highly meandering fluvial environments (**Figure 4**).

In general the Elliot Formation is globally recognized for its abundance of early dinosaur and mammal remains, including dinosaur eggs containing embryos from the Golden Gate Highlands National Park in the Free State Province, which represent the oldest dinosaur embryos in the world. At present, one fish genus, two amphibian genera, 10 non-dinosaurian reptiles, at least 17 dinosaur genera, seven cynodont genera and two mammalian genera are known from this formation. Importantly, *Australochelys*, the oldest known fossil turtle, is also known from the Elliot Formation.

The Elliot Formation also contains the Triassic-Jurassic boundary, an important marker, which represents the end-Triassic mass extinction.



### 4.3 Fieldwork findings

Due to the nature of cultural remains, with the majority of artefacts occurring below the surface, a controlled-exclusive surface survey was conducted over a period of 1 day by vehicle and on foot by an archaeologist from PGS (on 31 May 2013) (**Appendix C – Tracklogs**).

The survey focussed directly on the proposed study area for the establishment of the new solid waste landfill site. The general area was documented by means of various photographs (**Figure 6** and **Figure 7**) and, where sites of heritage significance were identified, a GPS coordinate was taken, as well as a more detailed site recording (**Figure 5**).

The study area is situated on a small plateau to the north-east of the town of Rossouw. It is obscured from view by a small hill. The site is directly bordered by an informal cemetery containing approximately 200 graves (**Figure 8** and **Figure 9**). The cemetery is currently in use and may be adversely impacted by the proposed development. This cemetery should not be confused with the municipal cemetery, which is situated comfortably to the south of the study area.

The hill to the south of the study area contains the remnants of a large number of historical structures (**Figure 10**). These should not be affected by the development, however.

No heritage sites or material were located within the study area, however to preserve the heritage resources encountered close by, management of the construction activities will be required.

#### *Impact rating (No Mitigation)*

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	HIGH	Study Area	Permanent	Very Likely	Low
Impact on heritage resources adjacent to the project	MODERATE	Isolated Sites / proposed site	Permanent	Could happen	

The impact on heritage resources will **very likely** be of a MODERATE negative significance, affecting *isolated sites*. The impact will be *permanent* and could happen. The impact risk class is thus **Low**.

*Impact rating (Mitigated)*

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	VERY LOW	Isolated Sites / proposed site	Permanent	Unlikely	Very Low
Impact on heritage resources adjacent to the project	1	1	5	2	0.93

With the implementing of the recommendations this impact can be mitigated and reduced and the impact on heritage resources on the boundary of the development will **very likely** be of a VERY LOW negative significance, affecting *Isolated sites*. The impact will be *permanent* but unlikely to happen. The impact risk class is then **Very Low**.

*Mitigation recommendations:*

1. It is recommended that the cemetery to the west of the proposed development be buffered with a 10 meter buffer during construction.
2. Demarcate the construction access road to make sure that no traffic affects the graves in the cemetery directly;
3. The construction activity area also needs to be demarcated and movement of personnel and vehicles be controlled to ensure no impact on the cemetery or structure on top of hill;
4. Demarcate the cemetery and historical structures as no-go areas during construction.



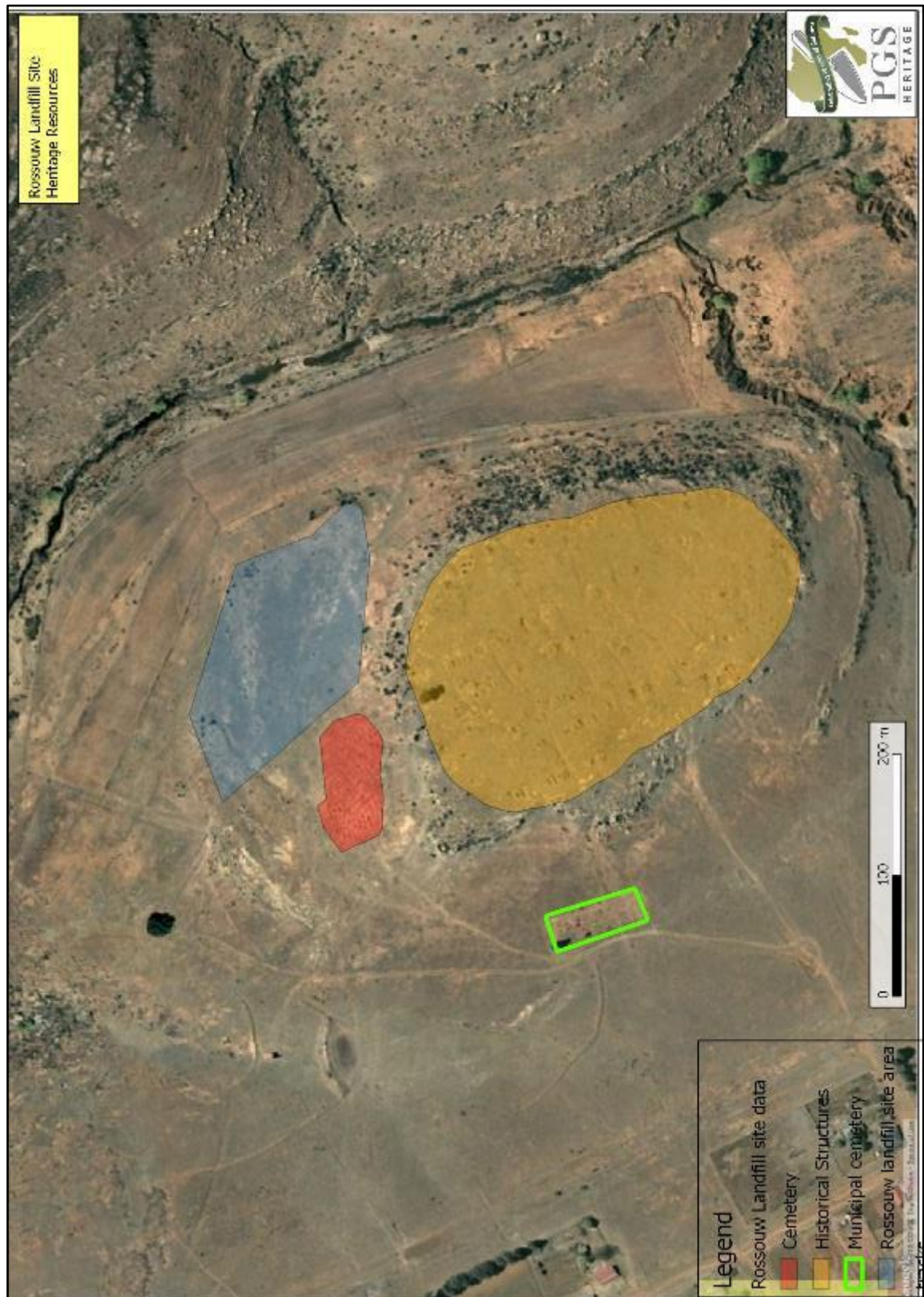


Figure 5 – Map indicating locality of surrounding heritage resources



*Figure 6 – View of site looking north. The study area is situated on the plateau in the centre of the photograph*



*Figure 7 – Stone fence post situated in the centre of the site.*





*Figure 8 – View of the cemetery bordering the site.*



*Figure 9 – Cemetery bordering the site*



*Figure 10 – The remnants of several stone structures located on the small hill directly to the south of the site.*

#### **4.3.1 Palaeontology**

The following colour coding method is used to classify a development area's palaeontological impact as illustrated in **Figure 11** :

- **Red colouration** indicates a very high possibility of finding fossils of a specific assemblage zone. Fossils will most probably be present in all outcrops on the site/route and the chances of finding fossils during the construction phase are very high.
- **Orange colouration** indicates a possibility of finding fossils of a specific assemblage zone either in outcrops or in bedrock on the site/route. Fossils will probably be present on the site/route and the chances of finding fossils during the excavation phase are high.
- **Green colouration** indicates that there is no possibility of finding fossils in that section of the site/route development.





Figure 11 – Palaeontological Sensitivity Map

*Impact rating (No Mitigation)*

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	HIGH	Study Area	Permanent	Very Likely	Moderate
Impact on palaeontology	4	2	5	4	2.93

The impact on palaeontological resources will **very likely** be of a HIGH negative significance, affecting *the study area*. The impact will be *permanent* and *very likely to occur*. The impact risk class is thus **Moderate**.

*Impact rating (Mitigated)*

With the implementing of the recommendations this impact can be mitigated and reduced and the impact on palaeontological resources will **very likely** be of a MODERATE negative significance, affecting *Isolated sites*. The impact will be *permanent* and *could happen*. The impact risk class is then **Low**.

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	MODERATE	Isolated Sites	Permanent	Could happen	Low
Impact on palaeontology	3	1	5	3	1.80

#### Recommendations:

1. The EAP as well as the ECO for this project must be made aware of the fact that the Elliot Formation in the Karoo Basin of South Africa is world renowned for the number and diversity of fossils discovered in these sediments.
2. It is recommended that a palaeontologist must be appointed to undertake a Phase 1 PIA to record any fossils according to SAHRA specifications.
3. The EAP and ECO of the project must be notified of the high possibility of the occurrence of fossils as well as the possible requirement of a Phase 2 PIA during excavation of the proposed cells.

#### 4.4 Cultural Landscape

Heritage significance of the cultural landscape is derived from the interaction between the natural landscape, and that landscape as created and changed by man and influenced by his construction of roads, bridges, farming landscapes (such as grazing fields, farmsteads, etc.) and townscapes. Also interacting with these physical entities are intangible and historic landscapes and events that are known to have added to the cultural fabric of a place or area.

The evaluation of the study area and surrounds as demarcated, has shown the general area to be rich in heritage resources spanning the archaeological to historical timeframe. The town of Rossouw has evolved as part of the landscape over the past 100 years. However, since the area where the proposed solid waste landfill site is to be established is located approximately 400 meters to the north-east of Rossouw on mainly undeveloped land, no long term impact is foreseen. Short term impacts will only be during construction and will be for the duration of the construction timeframe.

### Impact rating

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	VERY LOW	Isolated Sites	Short-term	Unlikely	Very Low
Impact on heritage landscape	1	1	2	2	0.53

With the implementing of the recommendations this impact can be mitigated and reduced and the impact on heritage landscape will **very likely** be of a VERY LOW negative significance, affecting *isolated sites*. The impact will be *short-term* but unlikely to happen. The impact risk class is then **Very Low**

#### Mitigation:

Screening of construction activities as per usual construction requirements is recommended.

## 5 CONCLUSIONS AND RECOMMENDATIONS

During the heritage study no heritage sites of significance were identified in the study area foot print. Adjacent to the study area a large cemetery as well as a historical settlement were identified that will not be directly impacted by the development.

Specific management and mitigation measures with regards to the heritage resources occurring adjacent to the site and possible palaeontological finds that can be made during construction activities are:

#### Historical structure and cemeteries

5. It is recommended that the cemetery to the west of the proposed development be buffered with a 10 meter buffer during construction.
6. Demarcate the construction access road to make sure that no traffic affects the graves in the cemetery directly;
7. The construction activity area also needs to be demarcated and movement of personnel and vehicles be controlled to ensure no impact on the cemetery or structure on top of hill;
8. Demarcate the cemetery and historical structures as no-go areas during construction.

### *Palaeontology*

The study area is underlain by Triassic aged sedimentary rocks of the Elliot Formation, Karoo Supergroup. In general the Elliot Formation is globally recognized for its abundance of early dinosaur and mammal remains, including dinosaur eggs containing embryos from the Golden Gate Highlands National Park in the Free State Province, which represent the oldest dinosaur embryos in the world. At present, one fish genus, two amphibian genera, 10 non-dinosaurian reptiles, at least 17 dinosaur genera, seven cynodont genera and two mammalian genera are known from this formation. Importantly, *Australochelys*, the oldest known fossil turtle is also known from the Elliot Formation.

The Elliot Formation also contains the Triassic-Jurassic boundary, an important marker, which represents the end-Triassic mass extinction.

Remote sensing indicates that the mudstone is most probably covered by relatively thin sandy soils with sparse vegetation cover and, due to its richness in fossils, it is likely that fossils will be found in the footprint of the development. Due to the fact that numerous types of fossil remains have been described from this formation, a high palaeontological sensitivity is allocated to the site.

#### Recommendations:

4. The EAP as well as the ECO for this project must be made aware of the fact that the Elliot Formation in the Karoo Basin of South Africa is world renowned for the number and diversity of fossils discovered in these sediments.
5. It is recommended that a palaeontologist must be appointed to undertake a Phase 1 PIA to record any fossils according to SAHRA specifications.
6. The EAP and ECO of the project must be notified of the high possibility of the occurrence of fossils as well as the possible requirement of a Phase 2 PIA during excavation of the proposed cells.

### *Cultural landscape*

The establishment of the proposed new solid waste landfill site will not have a negative influence on the cultural landscape or characteristics of the area in the long term. Short term impacts will only be during construction and will be for the duration of the construction timeframe. Screening of construction activities as per usual construction requirements is recommended.

## General

Further to these recommendations, the general Heritage Management Guidelines in Section 6 need to be incorporated into the EMP for the project.

The overall impact of the development on heritage resources is seen as acceptably low and impacts can be mitigated to acceptable levels.

## 6 HERITAGE MANAGEMENT GUIDELINES

### 6.1 General Management Guidelines

1. The National Heritage Resources Act (Act 25 of 1999) states that, any person who intends to undertake a development categorised as-
  - (a) the construction of a road, wall, transmission line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;
  - (b) the construction of a bridge or similar structure exceeding 50m in length;
  - (c) any development or other activity which will change the character of a site-
    - (i) exceeding 5 000 m<sup>2</sup> in extent; or
    - (ii) involving three or more existing erven or subdivisions thereof; or
    - (iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or
    - (iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;
  - (d) the re-zoning of a site exceeding 10 000 m<sup>2</sup> in extent; or
  - (e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

**In the event that an area previously not included in an archaeological or cultural resources survey is to be disturbed, the SAHRA needs to be contacted. An enquiry must be lodged with them into the necessity for a Heritage Impact Assessment.**

2. In the event that a further heritage assessment is required it is advisable to utilise a qualified heritage practitioner, preferably registered with the Cultural Resources Management Section (CRM) of the Association of Southern African Professional Archaeologists (ASAPA).

This survey and evaluation must include:

- (a) The identification and mapping of all heritage resources in the area affected;
  - (b) An assessment of the significance of such resources in terms of the heritage assessment criteria set out in section 6 (2) or prescribed under section 7 of the National Heritage Resources Act;
  - (c) An assessment of the impact of the development on such heritage resources;
  - (d) An evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development;
  - (e) The results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources;
  - (f) If heritage resources will be adversely affected by the proposed development, the consideration of alternatives; and
  - (g) Plans for mitigation of any adverse effects during and after the completion of the proposed development.
3. It is advisable that an information section on cultural resources be included in the SHEQ training given to contractors involved in surface earthmoving activities. These sections must include basic information on:
    - a. Heritage;
    - b. Graves;
    - c. Archaeological finds; and
    - d. Historical Structures.

This module must be tailor made to include all possible finds that could be expected in that area of construction.
  4. In the event that a possible find is discovered during construction, all activities must be halted in the area of the discovery and a qualified archaeologist contacted.
  5. The archaeologist needs to evaluate the finds on site and make recommendations towards possible mitigation measures.

6. If mitigation is necessary, an application for a rescue permit must be lodged with SAHRA.
7. After mitigation, an application must be lodged with SAHRA for a destruction permit. This application must be supported by the mitigation report generated during the rescue excavation. Only after the permit is issued may such a site be destroyed.
8. If during the initial survey sites of cultural significance are discovered, it will be necessary to develop a management plan for the preservation, documentation or destruction of such a site. Such a program must include an archaeological/palaeontological monitoring programme, timeframe and agreed upon schedule of actions between the company and the archaeologist.
9. In the event that human remains are uncovered, or previously unknown graves are discovered, a qualified archaeologist needs to be contacted and an evaluation of the finds made.
10. If the remains are to be exhumed and relocated, the relocation procedures as accepted by SAHRA need to be followed. This includes an extensive social consultation process.

***The purpose of an archaeological/palaeontological monitoring programme<sup>1</sup> is:***

- To allow, within the resources available, the preservation by recording of archaeological/palaeontological deposits, the presence and nature of which could not be established (or established with sufficient accuracy) in advance of development or other potentially disruptive works
- To provide an opportunity, if needed, for the watching archaeologist to signal to all interested parties, before the destruction of the material in question, that an archaeological/palaeontological find has been made for which the resources allocated to the watching brief itself are not sufficient to support treatment to a satisfactory and proper standard.

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<sup>1</sup> The definition of an archaeological/palaeontological monitoring programme is a formal program of observation and investigation conducted during any operation carried out for non-archaeological reasons. This will be within a specified area or site on land, in the inter-tidal zone or underwater, where there is a possibility that archaeological deposits may be disturbed or destroyed. The programme will result in the preparation of a report and ordered archive.

- A monitoring programme is not intended to reduce the requirement for excavation or preservation of known or inferred deposits, and it is intended to guide, not replace, any requirement for contingent excavation or preservation of possible deposits.
- The objective of the monitoring programme is to establish and make available information about the archaeological resource existing on a site.

PGS can be contacted on the way forward in this regard.

*Table 11: Roles and responsibilities of archaeological and heritage management*

ROLE	RESPONSIBILITY	IMPLEMENTATION
A responsible specialist needs to be allocated and should attend all relevant meetings, especially when changes in design are discussed, and liaise with SAHRA.	The client	Archaeologist and a competent archaeology support team
If chance finds and/or graves or burial grounds are identified during construction or operational phases, a specialist must be contacted in due course for evaluation.	The client	Archaeologist and a competent archaeology support team
Comply with defined national and local cultural heritage regulations on management plans for identified sites.	The client	Environmental Consultancy and the Archaeologist
Consult the managers, local communities and other key stakeholders on mitigation of archaeological sites.	The client	Environmental Consultancy and the Archaeologist
Implement additional programs, as appropriate, to promote the safeguarding of our cultural heritage. (i.e. integrate the archaeological components into the employee induction course).	The client	Environmental Consultancy and the Archaeologist,
If required, conservation or relocation of burial grounds and/or graves according to the applicable regulations and legislation.	The client	Archaeologist, and/or competent authority for relocation services
Ensure that recommendations made in the Heritage Report are adhered to.	The client	The client
Provision of services and activities related to the management and monitoring of	The client	Environmental Consultancy and the Archaeologist



significant archaeological sites.		
After the specialist/archaeologist has been appointed, comprehensive feedback reports should be submitted to relevant authorities during each phase of development.	Client and Archaeologist	Archaeologist

## 6.2 All phases of the project

### 6.2.1 Archaeology

Based on the findings of the HIA, all stakeholders and key personnel should undergo an archaeological induction course during this phase. Induction courses generally form part of the employees' overall training and the archaeological component can easily be integrated into these training sessions. Two courses should be organised – one aimed more at managers and supervisors, highlighting the value of this exercise and the appropriate communication channels that should be followed after chance finds, and the second targeting the actual workers and getting them to recognize artefacts, features and significant sites. This needs to be supervised by a qualified archaeologist. This course should be reinforced by posters reminding operators of the possibility of finding archaeological/palaeontological sites.

The project will encompass a range of activities during the construction phase, including ground clearance, establishment of construction camps area and small scale infrastructure development associated with the project/operations.

It is possible that cultural material will be exposed during operations and may be recoverable, but this is the high-cost front of the operation, and so any delays should be minimised. Development surrounding infrastructure and construction of facilities results in significant disturbance, but construction trenches do offer a window into the past and it thus may be possible to rescue some of the data and materials. It is also possible that substantial alterations will be implemented during this phase of the project and these must be catered for. Temporary infrastructure is often changed or added to during the subsequent history of the project. In general these are low impact developments as they are superficial, resulting in little alteration of the land surface, but still need to be catered for.

During the construction/operational phase, it is important to recognise any significant material being unearthed, and to make the correct judgment on which actions should be taken. A responsible archaeologist/palaeontologist must be appointed for this commission. This person does not have to be a permanent employee, but needs to attend relevant meetings, for example when changes in design are discussed, and notify SAHRA of these changes. The archaeologist would inspect the site and any development on a recurrent basis, with more frequent visits to the actual workforce and operational areas.

In addition, feedback reports can be submitted by the archaeologist to the client and SAHRA to ensure effective monitoring. This archaeological monitoring and feedback strategy should be incorporated into the Environmental Management Plan (EMP) of the project. Should an archaeological/palaeontological site or cultural material be discovered during construction (or operation), such as burials or grave sites, the project needs to be able to call on a qualified expert to make a decision on what is required and if it is necessary to carry out emergency recovery. SAHRA would need to be informed and may give advice on procedure. The developers therefore should have some sort of contingency plan so that operations could move elsewhere temporarily while the material and data are recovered. The project thus needs to have an archaeologist/palaeontologist available to do such work. This provision can be made in an archaeological/palaeontological monitoring programme.

### **6.2.2 Graves**

In the case where a grave is identified during construction the following measures must be taken:

- Upon the accidental discovery of graves, a buffer of at least 20 meters should be implemented.
- If graves are accidentally discovered during construction, activities must cease in the area and a qualified archaeologist be contacted to evaluate the find. To remove the remains a permit must be applied for from SAHRA and other relevant authorities. The local South African Police Services must immediately be notified of the find.
- Where it is recommended that the graves be relocated, a full grave relocation process that includes comprehensive social consultation must be followed.

The grave relocation process must include:

- i. A detailed social consultation process, that will trace the next-of-kin and obtain their consent for the relocation of the graves, that will be at least 60 days in length;
- ii. Site notices indicating the intent of the relocation;
- iii. Newspaper notices indicating the intent of the relocation;
- iv. A permit from the local authority;
- v. A permit from the Provincial Department of Health;
- vi. A permit from the South African Heritage Resources Agency, if the graves are older than 60 years or unidentified and thus presumed older than 60 years;
- vii. An exhumation process that keeps the dignity of the remains intact;
- viii. The whole process must be done by a reputable company that is well versed in relocations;
- ix. The exhumation process must be conducted in such a manner as to safeguard the legal rights of the families as well as that of the developing company.

## **7 REFERENCES**

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## **7.2 Internet Resources**

<http://durban-tourism.co.za/BarklyEast.html>

<http://www.jstor.org>

<http://www.quovadis-southern-africa.co.za/content/9/2532/en/barkly-east-and-rhodes-attractions-drakensberg-eastern-cape.html>.

## LEGISLATIVE REQUIREMENTS – TERMINOLOGY AND ASSESSMENT CRITERIA

### 1 General principles

In areas where there has not yet been a systematic survey to identify conservation worthy places, a permit is required to alter or demolish any structure older than 60 years. This will apply until a survey has been done and identified heritage resources are formally protected.

Archaeological and palaeontological sites, materials, and meteorites are the source of our understanding of the evolution of the earth, life on earth and the history of people. In the NHRA, permits are required to damage, destroy, alter, or disturb them. People who already possess material are required to register it. The management of heritage resources is integrated with environmental resources and this means that before development takes place heritage resources are assessed and, if necessary, rescued.

In addition to the formal protection of culturally significant graves, all graves, which are older than 60 years and are not in a formal cemetery (such as ancestral graves in rural areas), are protected. The legislation protects the interests of communities that have an interest in the graves: they should be consulted before any disturbance takes place. The graves of victims of conflict and those associated with the liberation struggle are to be identified, cared for, protected and memorials erected in their honour.

Anyone who intends to undertake a development must notify the heritage resource authority and if there is reason to believe that heritage resources will be affected, an impact assessment report must be compiled at the construction company's cost. Thus, the construction company will be able to proceed without uncertainty about whether work will have to be stopped if an archaeological or heritage resource is discovered.

According to the National Heritage Act (Act 25 of 1999 section 32) it is stated that:

An object or collection of objects, or a type of object or a list of objects, whether specific or generic, that is part of the national estate and the export of which SAHRA deems it necessary to control, may be declared a heritage object, including –

- objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects, meteorites and rare geological specimens;
- visual art objects;
- military objects;
- numismatic objects;
- objects of cultural and historical significance;
- objects to which oral traditions are attached and which are associated with living heritage;
- objects of scientific or technological interest;
- books, records, documents, photographic positives and negatives, graphic material, film or video 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), or in a provincial law pertaining to records or archives; and
- any other prescribed category.

Under the National Heritage Resources Act (Act No. 25 of 1999), provisions are made that deal with, and offer protection to, all historic and pre-historic cultural remains, including graves and human remains.

## **2 Graves and cemeteries**

Graves younger than 60 years fall under Section 2(1) of the Removal of Graves and Dead Bodies Ordinance (Ordinance no. 7 of 1925) as well as the Human Tissues Act (Act 65 of 1983) and are under the jurisdiction of the National Department of Health and the relevant Provincial Department of Health and must be submitted for final approval to the Office of the relevant Provincial Premier. This function is usually delegated to the Provincial MEC for Local Government and Planning, or in some cases the MEC for Housing and Welfare. Authorisation for exhumation and reinterment must also be obtained from the relevant local or regional council where the grave is situated, as well as the relevant local or regional council to where the grave is being relocated. All local and regional provisions, laws and by-laws must also be adhered to. In order to handle and transport human remains, the institution conducting the relocation should be authorised under Section 24 of Act 65 of 1983 (Human Tissues Act).

Graves older than 60 years, but younger than 100 years, fall under Section 36 of Act 25 of 1999 (National Heritage Resources Act) as well as the Human Tissues Act (Act 65 of 1983) and are under the jurisdiction of the South African Heritage Resource Agency (SAHRA). The procedure for Consultation Regarding Burial Grounds and Graves (Section 36(5) of Act 25 of 1999) is applicable to graves older than 60 years that are situated outside a formal cemetery administered by a local authority. Graves in the

category located inside a formal cemetery administered by a local authority will also require the same authorisation as set out for graves younger than 60 years, over and above SAHRA authorisation.

If the grave is not situated inside a formal cemetery but is to be relocated to one, permission from the local authority is required and all regulations, laws and by-laws set by the cemetery authority must be adhered to.

**PALAEONTOLOGICAL DESKTOP ASSESSMENT**



**PALAEONTOLOGICAL DESKTOP ASSESSMENT FOR THE  
ROSSOUW SOLID WASTE LANDFILL SITE, SENQU LOCAL  
MUNICIPALITY, JOE GQABI DISTRICT MUNICIPALITY,  
EASTERN CAPE**

**For:**

**HIA CONSULTANTS**



**DATE: 25 JULY 2013**

**By**

**GIDEON GROENEWALD**

Gideon Groenewald was appointed by PGS Heritage and Grave Relocation Consultants to undertake a desktop survey, assessing the potential palaeontological impact of the proposed Solid Waste Landfill Site outside the town of Rossouw, Senqu Local Municipality, Joe Gqabi District Municipality, Eastern Cape Province.

This report forms part of the Environmental Impact Assessment and complies with the requirements of the South African National Heritage Resource Act No 25 of 1999. In accordance with Section 38 (Heritage Resources Management), a Heritage Impact Assessment (HIA) is required to assess any potential impacts to palaeontological heritage within the development footprint of the development.

The development is located on the northern slope of a small hill located approximately 400m north-east of the town Rossouw, Eastern Cape province. The village cemetery is located on the western slope of the same hill, but cannot be seen from the development area due to the elevated land between them. The development area is also not visible from Rossouw.

The site incorporating the development comprises vacant land currently used for grazing. The Wasbankspruit runs approximately 120m to the east of the development site. Vegetation on the proposed project site is limited to a few species of grass and small woody shrubs.

The study area is underlain by Triassic aged sedimentary rocks of the Elliot Formation, Karoo Supergroup. The Elliot Formation comprises a sequence of interbedded red to reddish brown coloured mudstone, siltstone with lenses of very fine-grained yellow-grey sandstone. The depositional environment is interpreted as lacustrine to highly meandering fluvial environments.

In general the Elliot Formation is globally recognized for its abundance of early dinosaur and mammal remains, including dinosaur eggs containing embryos from the Golden Gate Highlands National Park in the Free State Province, which represent the oldest dinosaur embryos in the world. At present, one fish genus, two amphibian genera, 10 non-dinosaurian reptiles, at least 17 dinosaur genera, seven cynodont genera and two mammalian genera are known from this formation. Importantly, *Australochelys*, the oldest known fossil turtle is also known from the Elliot Formation. The Elliot Formation also contains the Triassic-Jurassic boundary, an important marker, which represents the end-Triassic mass extinction.

Remote sensing indicates that the mudstone is most probably covered by relatively thin sandy soils with sparse vegetation cover and, due to its richness in fossils, it is likely that fossils will be found in the footprint of the development. Due to the fact that numerous types of fossil remains have been described from this formation, a high palaeontological sensitivity is allocated to the site.

#### Recommendations:

7. The EAP as well as the ECO for this project must be made aware of the fact that the Elliot Formation in the Karoo Basin of South Africa is world renowned for the number and diversity of fossils discovered in these sediments.
8. It is recommended that a palaeontologist must be appointed to undertake a Phase 1 PIA to record any fossils according to SAHRA specifications.
9. The EAP and ECO of the project must be notified of the high possibility of the occurrence of fossils as well as the possible requirement of a Phase 2 PIA during excavation of the proposed cells.

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## 1 INTRODUCTION

### 1.1. Background

Gideon Groenewald was appointed by PSG Heritage to undertake a desktop survey, assessing the potential palaeontological impact of the proposed Solid Waste Landfill Site outside the town of Rossouw, Senqu Local municipality, Joe Gqabi District Municipality, Eastern Cape Province.

This report forms part of the Environmental Impact Assessment and complies with the requirements of the South African National Heritage Resource Act No 25 of 1999. In accordance with Section 38 (Heritage Resources Management), a Heritage Impact Assessment (HIA) is required to assess any potential impacts to palaeontological heritage within the development footprint of the development.

Categories of heritage resources recognised as part of the National Estate in Section 3 of the Heritage Resources Act, and which therefore fall under its protection, include:

- geological sites of scientific or cultural importance;
- objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens;
- objects with the potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage.

### 1.2. Aims and Methodology

Following the *“SAHRA APM Guidelines: Minimum Standards for the Archaeological & Palaeontological Components of Impact Assessment Reports”*, the aims of the palaeontological impact assessment are:

- to identify exposed and subsurface rock formations that are considered to be palaeontologically significant;
- to assess the level of palaeontological significance of these formations;
- to comment on the impact of the development on these exposed and/or potential fossil resources and
- to make recommendations as to how the developer should conserve or mitigate damage to these resources.

In preparing a palaeontological desktop study the potential fossiliferous rock units (groups, formations etc.) represented within the study area are determined from geological maps. The known fossil heritage within each rock unit is inventoried from the published scientific literature and previous palaeontological impact studies in the same region.

The likely impact of the proposed development on local fossil heritage is determined on the basis of the palaeontological sensitivity of the rock units concerned and the nature and scale of the development itself, most notably the extent of fresh bedrock excavation envisaged. The different sensitivity classes used are explained in Table 1.1 below.

**Table 1.1 Palaeontological Sensitivity Analysis Outcome Classification**

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

### **1.3. 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. 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.).

## 2 DESCRIPTION OF THE PROPOSED DEVELOPMENT

The development is located on the northern slope of a small hill located approximately 400m north-east of the town Rossouw, Eastern Cape province (Figure 2.1). The village cemetery is located on the western slope of the same hill, but cannot be seen from the development area due to the elevated land between them. The development area is also not visible from Rossouw.

The site incorporating the development comprises vacant land currently used for grazing. The Wasbankspruit runs approximately 120m to the east of the development site. Vegetation on the proposed project site is limited to a few species of grass and small woody shrubs.



Figure 2.1 Locality of the study area

## 3 GEOLOGY

The study area is underlain by Triassic aged sedimentary rocks of the Elliot Formation, Karoo Supergroup (Figure 3.1). The Elliot Formation comprises a sequence of interbedded red to reddish brown coloured mudstone, siltstone with lenses of very fine-grained yellow-grey sandstone. The depositional environment is interpreted as lacustrine to highly meandering fluvial environments (Johnson et al, 2006).



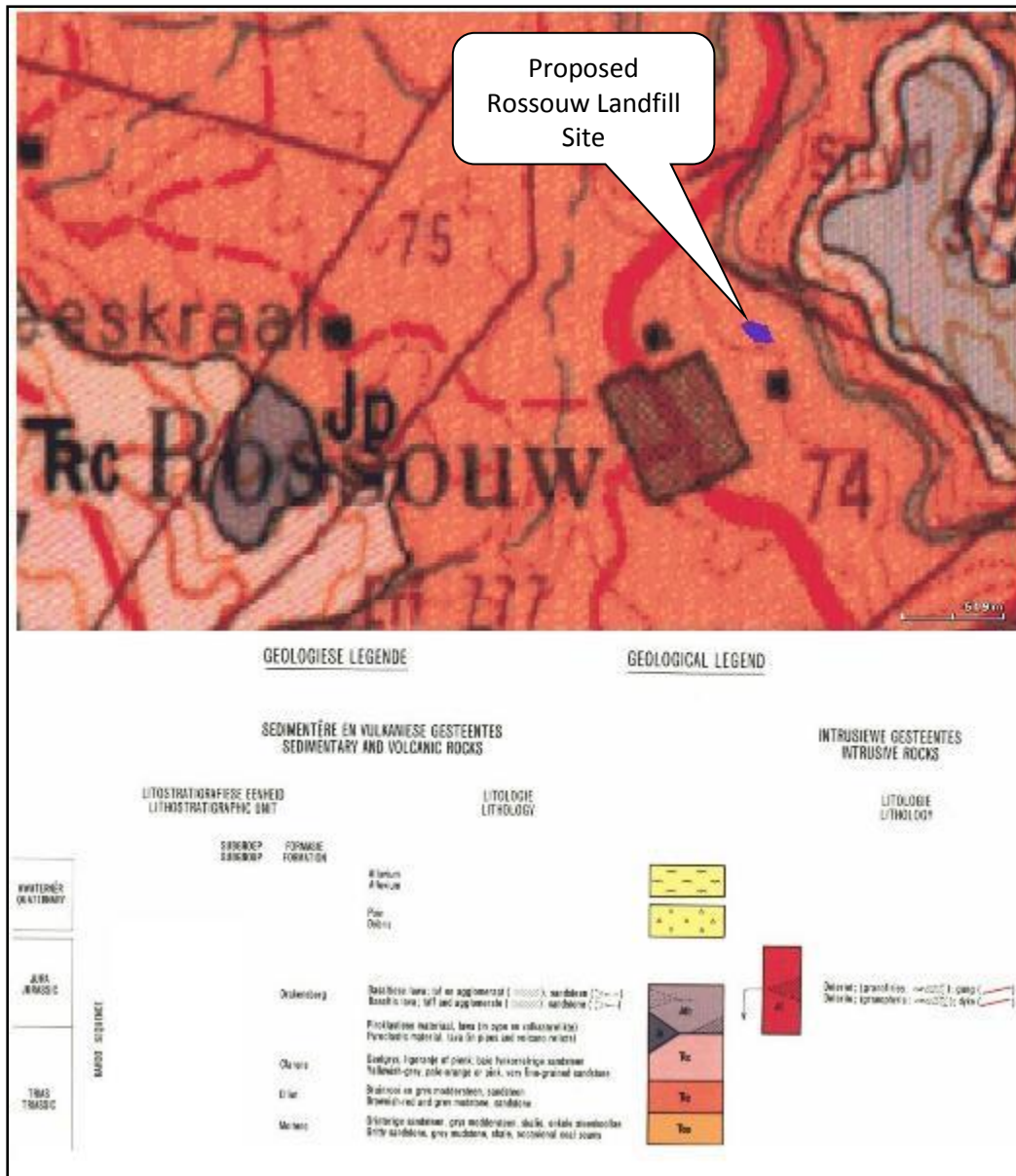


Figure 3.1 Geology of the study area (1:250 000 geological map sheet 3126 Aliwal North)

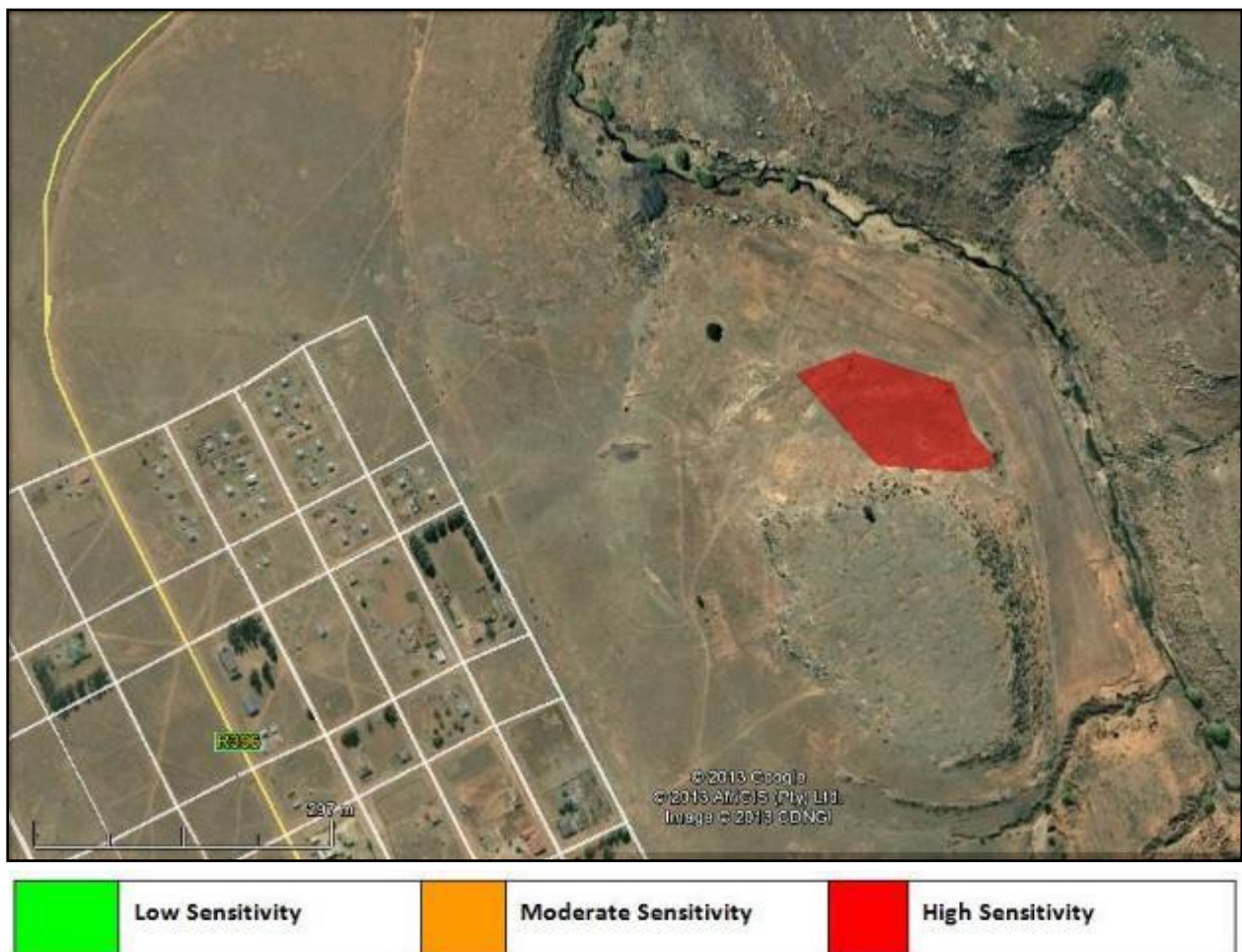
#### 4 PALAEOONTOLOGY OF THE AREA

In general the Elliot Formation is globally recognized for its abundance of early dinosaur and mammal remains (MacRae, 1999; McCarthy and Rubidge, 2005), including dinosaur eggs containing embryos from the Golden Gate Highlands National Park in the Free State Province, which represent the oldest dinosaur embryos in the world (Reisz et al, 2005, 2012). At present, one fish genus, two amphibian genera, 10 non-dinosaurian reptiles, at least 17 dinosaur genera, seven cynodont genera and two mammalian genera are known from this formation. Importantly, *Australochelys*, the oldest known fossil turtle is also known from the Elliot Formation (Smith et al, 2012).

The Elliot Formation also contains the Triassic-Jurassic boundary, an important marker, which represents the end-Triassic mass extinction. This extinction resulted in a massive faunal turnover (Tanner et al, 2004), the reasons for which are still under debate.

## 5 PALAEOLOGICAL SENSITIVITY

Following the interpretation of Google Earth images as well as information gathered from the BID document, it can be concluded that the proposed area for the development of the Rossouw Solid Waste Landfill Site will probably have shallow soils associated with sparse vegetation, typical of the hill slopes underlain by Elliot Formation mudstone. Due to the high productivity in terms of fossil remains in the Elliot Formation, it is highly likely that fossils might be present in the footprint of this development. For this reason, a high palaeontological sensitivity rating is allocated to this site (Figure 5.1).



*Figure 5.1 Palaeontological sensitivity of the Rossouw Landfill Site*

## 6 CONCLUSION AND RECOMMENDATIONS

The study area for the proposed Rossouw Solid Waste Landfill Site is underlain by red mudstone, siltstone and fine-grained sandstone of the Triassic aged Elliot Formation, Karoo Supergroup. Remote sensing indicates that the mudstone is most probably covered by relatively thin sandy soils with sparse vegetation cover and, due to its richness in fossils, it is likely that fossils will be found in the footprint of the development. Due to the fact that numerous types of fossil remains have been described from this formation, a high palaeontological sensitivity is allocated to the site.



Recommendations:

1. The EAP as well as the ECO for this project must be made aware of the fact that the Elliot Formation in the Karoo Basin of South Africa is world renowned for the number and diversity of fossils discovered in these sediments.
2. It is recommended that a palaeontologist must be appointed to undertake a Phase 1 PIA to record any fossils according to SAHRA specifications.
3. The EAP and ECO of the project must be notified of the high possibility of the occurrence of fossils as well as the possible requirement of a Phase 2 PIA during excavation of the proposed cells.

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## **8 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 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).

## **9 DECLARATION OF INDEPENDENCE**

I, Gideon Groenewald, declare that I am an independent specialist consultant and have no financial, personal or other interest in the proposed development, nor the developers or any of their subsidiaries, apart from fair remuneration for work performed in the delivery of palaeontological heritage assessment services. There are no circumstances that compromise the objectivity of my performing such work.



**Dr Gideon Groenewald**  
**Geologist**

APPENDIX C  
SURVEY TRACKLOG

