

Phase 1 Heritage Impact Assessment Report

BUSINGATHA BRIDGE UPGRADE PROJECT, NEAR
WINTERTON, KWA ZULU NATAL PROVINCE

PREPARED BY:



PREPARED FOR:



**ENVIRONMENTAL
CONSULTING**

CREDIT SHEET

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Disclaimer; Although all possible care is taken to identify all sites of cultural importance during the investigation of study areas, it is always possible that hidden or sub-surface sites could be overlooked during the study. G&A Heritage and its personnel will not be held liable for such oversights or for costs incurred as a result of such oversights.

SIGNED OFF BY: STEPHAN GAIGHER



MANAGEMENT SUMMARY

Site name and location: Busingatha Bridge Upgrade Project, Kwa Zulu Natal.

Municipal Area: Uthukela District Municipality.

Developer: South African National Roads Agency.

Consultant: G&A Heritage, PO Box 522, Louis Trichardt, 0920, South Africa. 38A Vorster St, Louis Trichardt, 0920

Date of Report: 16 August 2014

The purpose of the management summary is to distil the information contained in the report into a format that can be used to give specific results quickly and facilitate management decisions. It is not the purpose of the management summary to repeat in shortened format all the information contained in the report, but rather to give a statement of results for decision making purposes.

This study focuses on the upgrade of the low-water bridge at the village of Busingatha in the Uthukela Province of Kwa-Zulu Natal.

A preliminary design has been drawn to lead the study; however this could be altered to a limited extent to avoid any identified heritage sites.

The purpose of this heritage impact assessment is to outline the cultural heritage sensitivity of the proposed development area and to advise on mitigation should any heritage sites or landscapes be affected.

Findings

The development site is within a high value palaeontological area. A palaeontological study indicated that the development will have to be monitored by a qualified palaeontologist who will give advice on the specific mitigation and conservation steps that will need to be taken.

Although the area is home to rich archaeological sites, especially rock-art, the development will be restricted to a small footprint around the existing bridge site and as such it is not anticipated that any other heritage sites will be affected.

Recommendations

Palaeontological monitoring will be needed during the excavation phase of the project.

Fatal Flaws

No fatal flaws were identified.

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LIST OF ABBREVIATIONS

Bp.....	Before Present
EIA.....	Early Iron Age
ESA.....	Early Stone Age
Fm.....	Femtometre (10^{-15} m)
GPS.....	Geographic Positioning System
HIA.....	Heritage Impact Assessment
LIA.....	Late Iron Age
LSA.....	Late Stone Age
MYA.....	Million Years Ago
MSA.....	Middle Stone Age
NHRA.....	National Heritage Resources Act no 22 of 1999
SAHRA.....	South African Heritage Resource Agency
S&EIR.....	Scoping & Environmental Impact Reporting
Um.....	Micrometre (10^{-6} m)
WGS 84.....	World Geodetic System for 1984

HERITAGE IMPACT REPORT

HERITAGE IMPACT ASSESSMENT REPORT FOR THE PROPOSED BUSINGATHA BRIDGE UPGRADE, KWA ZULU NATAL.

INTRODUCTION

Legislation and methodology

G&A Heritage was appointed by GBS Environmental Consultants to undertake a heritage impact assessment for the proposed upgrade of the Busingatha low water bridge near the village of Busingatha in the Kwa-Zulu Natal Province. Section 38(1) of the South African Heritage Resources Act (25 of 1999) requires that a heritage study is undertaken for:

- (a) construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;
- (b) construction of a bridge or similar structure exceeding 50 m in length; and
- (c) any development, or other activity which will change the character of an area of land, or water –
 - (1) exceeding 10 000 m² in extent;
 - (2) involving three or more existing erven or subdivisions thereof; or
 - (3) involving three or more erven, or subdivisions thereof, which have been consolidated within the past five years; or
 - (d) the costs of which will exceed a sum set in terms of regulations; or
 - (e) any other category of development provided for in regulations.

While the above describes the parameters of developments that fall under this Act., Section 38 (8) of the NHRA is applicable to this development. This section states that;

- (8) *The provisions of this section do not apply to a development as described in subsection (1) if an evaluation of the impact of such development on heritage resources is required in terms of the Environment Conservation Act, 1989 (Act 73 of 1989), or the integrated environmental management guidelines issued by the Department of Environment Affairs and Tourism, or the Minerals Act, 1991 (Act 50 of 1991), or any other legislation: Provided that the consenting authority must ensure that the evaluation fulfils the requirements of the relevant heritage resources authority in terms of subsection (3), and any comments and recommendations of the relevant heritage resources authority with regard to such development have been taken into account prior to the granting of the consent.*

In regards to a development such as this that falls under Section 38 (8) of the NHRA, the requirements of Section 38 (3) applies to the subsequent reporting, stating that;

- (3) *The responsible heritage resources authority must specify the information to be provided in a report required in terms of subsection (2) (a): Provided that the following must be included:*
 - (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;*
 - (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.

- (1) ancestral graves,
 - (2) royal graves and graves of traditional leaders,
 - (3) graves of victims of conflict (iv) graves of important individuals,
 - (4) historical graves and cemeteries older than 60 years, and
 - (5) other human remains which are not covered under the Human Tissues Act, 1983 (Act No.65 of 1983 as amended);
- (h) movable objects, including ;
- (1) objects recovered from the soil or waters of South Africa including archaeological and paleontological objects and material, meteorites and rare geological specimens;
 - (2) ethnographic art and objects;
 - (3) military objects;
 - (4) objects of decorative art;
 - (5) objects of fine art;
 - (6) objects of scientific or technological interest;
 - (7) books, records, documents, photographic positives and negatives, graphic, film or video material or sound recordings; and
 - (8) any other prescribed categories, but excluding any object made by a living person;
- (i) battlefields;
- (j) traditional building techniques.

A **'place'** is defined as:

- (a) A site, area or region;
- (b) A building or other structure (which may include equipment, furniture, fittings and articles associated with or connected with such building or other structure);
- (c) a group of buildings or other structures (which may include equipment, furniture, fittings and articles associated with or connected with such group of buildings or other structures); and (d) an open space, including a public square, street or park; and in relation to the management of a place, includes the immediate surroundings of a place.

'Structures' means any building, works, device, or other facility made by people and which is fixed to land and any fixtures, fittings and equipment associated therewith older than 60 years.

'Archaeological' means:

- (a) material remains resulting from human activity which are in a state of disuse and are in or on land and are older than 100 years, including artefacts, human and hominid remains and artificial features and structures;
- (b) rock art, being a 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 is older than 100 years including any area within 10 m of such representation; and
- (c) wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land or in the maritime cultural zone referred to in section 5 of the Maritime Zones Act 1994 (Act 15 of 1994), and any cargo, debris or artefacts found or associated therewith, which are older than 60 years or which in terms of national legislation are considered to be worthy of conservation;
- (d) features, structures and artefacts associated with military history which are older than 75 years and the sites on which they are found.

'Paleontological' means 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.

'Grave' means a place of interment and includes the contents, headstone or other marker of and any other structures on or associated with such place. The South African Heritage Resources Agency (SAHRA) will only issue a permit for the alteration of a grave if it is satisfied that every reasonable effort has been made to contact and obtain permission from the families concerned.

The removal of graves is subject to the following procedures as outlined by the SAHRA:

- Notification of the impending removals (using English, Afrikaans and local language media and notices at the grave site);

- Consultation with individuals or communities related or known to the deceased;
- Satisfactory arrangements for the curation of human remains and / or headstones in a museum, where applicable;
- Procurement of a permit from the SAHRA;
- Appropriate arrangements for the exhumation (preferably by a suitably trained archaeologist) and re-interment (sometimes by a registered undertaker, in a formally proclaimed cemetery);
- Observation of rituals or ceremonies required by the families.

The limitations and assumptions associated with this heritage impact assessment are as follows;

- Limited field investigations were performed on foot and by vehicle where access was readily available.
- Sites were evaluated by means of description of the cultural landscape, direct observations and analysis of written sources and available databases.
- It was assumed that the site layout as provided by GBS Environmental Consultants is accurate.
- We assumed that the public participation process performed as part of the Scoping and Environmental Impact Reporting (S&EIR) process was sufficiently encompassing not to be repeated in the Heritage Assessment Phase.

Table 1. Impacts on the NHRA Sections

Act	Section	Description	Possible Impact	Action
National Heritage Resources Act (NHRA)	34	Preservation of buildings older than 60 years	No impact	None
	35	Archaeological, paleontological and meteor sites	No impact	None
	36	Graves and burial sites	No impact	None
	37	Protection of public monuments	No impact	None
	38	Does activity trigger a HIA?	Yes	HIA

Table 2. NHRA Triggers

Action Trigger	Yes/No	Description
Construction of a road, wall, power line, pipeline, canal or other linear form of development or barrier exceeding 300m in length.	Yes	Busingatha Bridge
Construction of a bridge or similar structure exceeding 50m in length.	No	N/A
Development exceeding 5000 m ²	No	N/A
Development involving more than 3 erven or sub divisions	No	N/A
Development involving more than 3 erven or sub divisions that have been consolidated in the past 5 years	No	N/A
Re-zoning of site exceeding 10 000 m ²	No	N/A
Any other development category, public open space, squares, parks or recreational grounds	No	N/A

BACKGROUND INFORMATION

PROPOSED BUSINGATHA BRIDGE UPGRADE PROJECT

PROJECT DESCRIPTION

The upgrade of the existing low-water bridge at Busingatha Villae in Kwa-Zulu Natal Province. The current low-water bridge is often inundated during the rainy season and since the road serviced by it is the only access road to this area, this results in several villages being cut –off.

It is proposed that the new bridge design will be above the flood water levels, without inhibiting the flow of run-off water. Erosion measures such as gabions could also be implemented here.



Figure 1. Existing low-water bridge

SITE LOCATION

The proposed development site is located to the south of the village of *Busingatha Village*. The village is located approximately 20km southwest (by road) from the R74 tar road between Langkloof and Winterton.

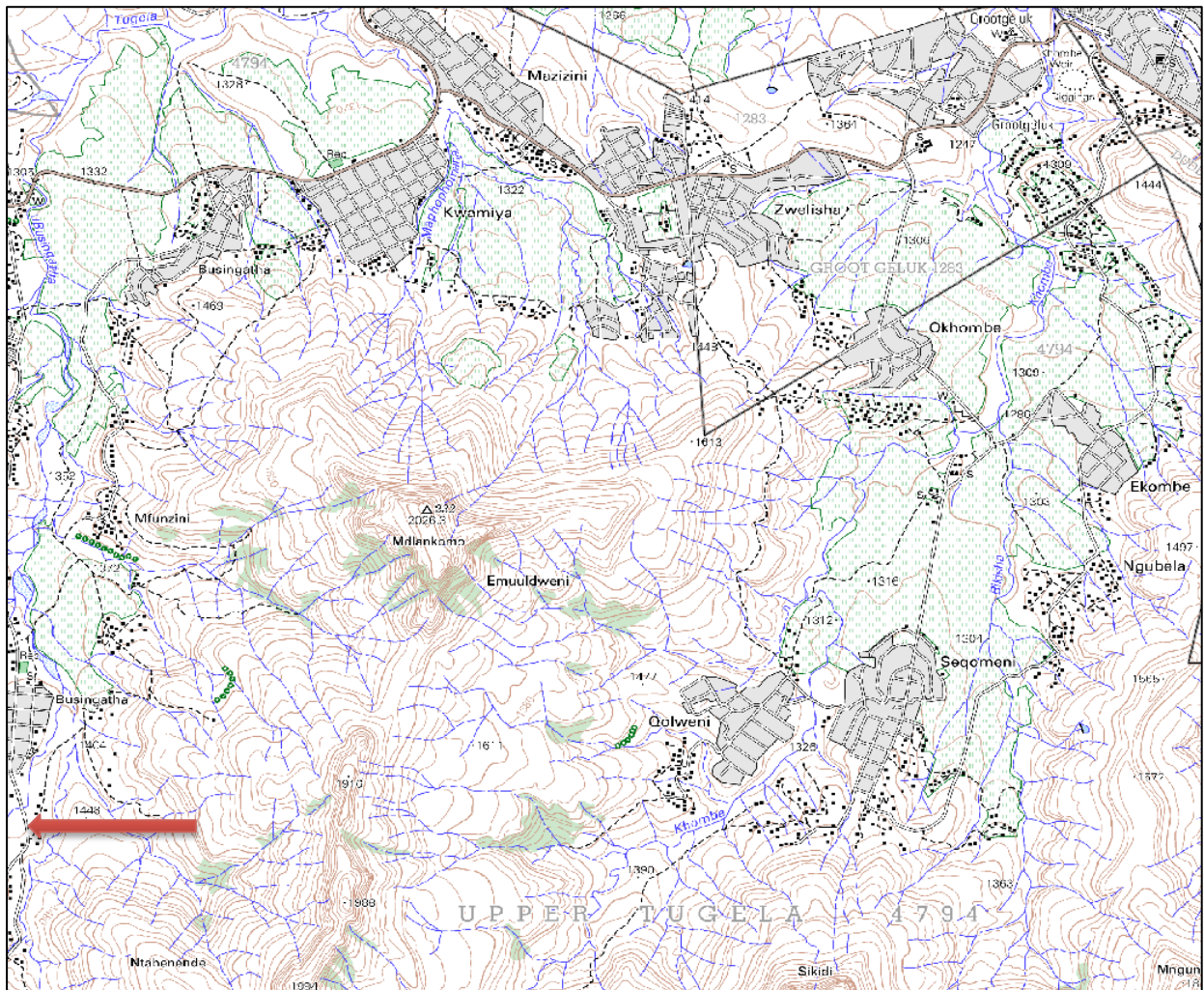


Figure 2. Site location

ALTERNATIVES CONSIDERED

One alternative was considered

- No-go option where no development takes place.

METHODOLOGY

This study defines the heritage component of the S&EIR process being undertaken for the Busingatha Bridge upgrade. It is described as a first phase (HIA). This report attempts to evaluate both the accumulated heritage knowledge of the area as well as information derived from direct physical observations.

EVALUATING HERITAGE IMPACTS

A combination of document research as well as the determination of the geographic suitability of areas and the evaluation of aerial photographs determined which areas could and should be accessed.

After plotting of the site on a GPS the areas were accessed using suitable combinations of vehicle access and access by foot.

Sites were documented by digital photography and geo-located with GPS readings using the WGS 84 datum.

Further techniques (where possible) included interviews with local inhabitants, visiting local museums and information centers and discussions with local experts. All this information was combined with information

from an extensive literature study as well as the result of archival studies based on the SAHRA provincial databases.

This Heritage Impact Assessment relies on the analysis of written documents, maps, aerial photographs and other archival sources combined with the results of site investigations and interviews with effected people. Site investigations are not exhaustive and often focus on areas such as river confluence areas, elevated sites or occupational ruins.

The following documents were consulted in this study;

- South African National Archive Documents
- SAHRIS Database of Heritage Studies
- Talana Museum Information
- Internet Search
- Historic Maps
- 1936 and 1952 Surveyor General Topographic Map series
- 1952 1:10 000 aerial photo survey
- Google Earth 2011 & 2003 imagery
- Published articles and books
- JSTOR Article Archive

FIELDWORK

Fieldwork for this study was performed on the 31st of July 2014. The area was found to be accessible by vehicle. Areas of possible significance were investigated on foot (such as the graves). The survey was tracked using GPS and a track file in GPX format is available on request.

MEASURING IMPACTS

In 2003 the SAHRA compiled the following guidelines to evaluate the cultural significance of individual heritage resources:

TYPE OF RESOURCE

- Place
- Archaeological Site
- Structure
- Grave
- Paleontological Feature
- Geological Feature

TYPE OF SIGNIFICANCE

HISTORIC VALUE

It is important in the community, or pattern of history

- o Important in the evolution of cultural landscapes and settlement patterns
- o Important in exhibiting density, richness or diversity of cultural features illustrating the human occupation and evolution of the nation, province, region or locality.
- o Important for association with events, developments or cultural phases that have had a significant role in the human occupation and evolution of the nation, province, region or community.
- o Important as an example for technical, creative, design or artistic excellence, innovation or achievement in a particular period.

It has strong or special association with the life or work of a person, group or organisation of importance in history

- o Importance for close associations with individuals, groups or organisations whose life, works or activities have been significant within the history of the nation, province, region or community.

It has significance relating to the history of slavery

- Importance for a direct link to the history of slavery in South Africa.

AESTHETIC VALUE

It is important in exhibiting particular aesthetic characteristics valued by a community or cultural group.

- Important to a community for aesthetic characteristics held in high esteem or otherwise valued by the community.
- Importance for its creative, design or artistic excellence, innovation or achievement.
- Importance for its contribution to the aesthetic values of the setting demonstrated by a landmark quality or having impact on important vistas or otherwise contributing to the identified aesthetic qualities of the cultural environs or the natural landscape within which it is located.
- In the case of an historic precinct, importance for the aesthetic character created by the individual components which collectively form a significant streetscape, townscape or cultural environment.

SCIENTIFIC VALUE

It has potential to yield information that will contribute to an understanding of natural or cultural heritage

- Importance for information contributing to a wider understanding of natural or cultural history by virtue of its use as a research site, teaching site, type locality, reference or benchmark site.
- Importance for information contributing to a wider understanding of the origin of the universe or of the development of the earth.
- Importance for information contributing to a wider understanding of the origin of life; the development of plant or animal species, or the biological or cultural development of hominid or human species.
- Importance for its potential to yield information contributing to a wider understanding of the history of human occupation of the nation, Province, region or locality.
- It is important in demonstrating a high degree of creative or technical achievement at a particular period
- Importance for its technical innovation or achievement.

SOCIAL VALUE

- It has strong or special association with a particular community or cultural group for social, cultural or spiritual reasons
- Importance as a place highly valued by a community or cultural group for reasons of social, cultural, religious, spiritual, symbolic, aesthetic or educational associations.
- Importance in contributing to a community's sense of place.

DEGREES OF SIGNIFICANCE

RARITY

It possesses uncommon, rare or endangered aspects of natural or cultural heritage.

- Importance for rare, endangered or uncommon structures, landscapes or phenomena.

REPRESENTIVITY

- It is important in demonstrating the principal characteristics of a particular class of natural or cultural places or objects.
- Importance in demonstrating the principal characteristics of a range of landscapes or

environments, the attributes of which identify it as being characteristic of its class.

- Importance in demonstrating the principal characteristics of human activities (including way of life, philosophy, custom, process, land-use, function, design or technique) in the environment of the nation, province, region or locality.

The table below illustrates how a site's heritage significance is determined

Spheres of Significance	High	Medium	Low
International			
National			
Provincial			
Regional			
Local			
Specific Community			

What other similar sites may be compared to this site?

IMPACT STATEMENT

ASSESSMENT OF IMPACTS

Direct, indirect and cumulative impacts of the issues identified through the EIA phase are assessed in terms of the following criteria:

- The nature, which shall include a description of what causes the effect, what will be affected and how it will be affected.
- The extent, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 will be assigned as appropriate (with 1 being low and 5 being high):
- The duration, wherein it will be indicated whether:
 - the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
 - the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
 - medium-term (5–15 years) – assigned a score of 3;
 - long term (> 15 years) - assigned a score of 4; or
 - permanent - assigned a score of 5;
- The magnitude, quantified on a scale from 0-10, where 0 is small and will have no effect on the environment, 2 is minor and will not result in an impact on processes, 4 is low and will cause a slight impact on processes, 6 is moderate and will result in processes continuing but in a modified way, 8 is high (processes are altered to the extent that they temporarily cease), and 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
- The probability of occurrence, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale of 1–5, where 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but low likelihood), 3 is probable (distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures).
- The significance, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high; and
- The status, which will be described as either positive, negative or neutral.
- The degree to which the impact can be reversed.
- The degree to which the impact may cause irreplaceable loss of resources.
- The degree to which the impact can be mitigated.

The significance is calculated by combining the criteria in the following formula:

$$S = (E+D+M)P$$

S = Significance weighting

E = Extent

D = Duration

M = Magnitude

P = Probability

The significance weightings for each potential impact are as follows:

- < 30 points: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
- 30-60 points: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
- > 60 points: High (i.e. where the impact must have an influence on the decision process to develop in the area).

ASSESSING VISUAL IMPACT

Visual impacts of developments result when sites that are culturally celebrated are visually affected by a development. The exact parameters for the determination of visual impacts have not yet been rigidly defined and are still mostly open to interpretation. CndV Architects and The Department of Environmental Affairs and Development Planning (2006) have developed some guidelines for the management of the visual impacts of wind turbines in the Western Cape, although these have not yet been formalised. In these guidelines they recommend a buffer zone of 1km around significant heritage sites to minimise the visual impact.

ASSUMPTIONS AND RESTRICTIONS

- It is assumed that the SAHRIS database locations are correct
- It is assumed that the paleontological information collected for the project is comprehensive.
- It is assumed that the social impact assessment and public participation process of the S&EIR will result in the identification of any intangible sites of heritage potential.

"FOR THE EARLIER PERIODS OF HUMAN PREHISTORY NATAL, OWING TO ITS SPECIAL GEOGRAPHICAL AND GEOLOGICAL CONDITIONS, CAN PROVIDE A PATTERN FOR STUDIES IN ALL PARTS OF AFRICA SOUTH OF THE EQUATOR. TO STUDENTS IN THE NORTHERN HEMISPHERE ITS IMPORTANCE IS NATURALLY LESS; BUT THE CORRELATIONS WITH ALGERIA AND MOROCCO, LANDS OF SOMEWHAT SIMILAR FORMATION, PROVIDE A LINE, WHICH ARCHAEOLOGISTS THROUGHOUT AFRICA MAY GRASP. ONE SMALL PROVINCE CANNOT YIELD ALL THE EVIDENCE; BUT THIS SMALL PROVINCE IS ABLE TO GIVE AN UNUSUALLY COMPLETE AND CLEAR RECORD FROM DAYS WHEN MAN, AS A TOOL-MAKING ANIMAL, FIRST BECAME RECOGNISABLY HUMAN, TO THE TIME WHEN, WITH THE INVENTION OF THE BOW, HE ROSE ABOVE HIS BRUTE-SURROUNDINGS AND DONNED COMPLETE HUMANITY." O. DAVIES (1953).

HERITAGE INDICATORS WITHIN THE RECEIVING ENVIRONMENT

REGIONAL CULTURAL CONTEXT

PALEONTOLOGY

The palaeontology of this area will be discussed in detail in the dedicated report accompanying this report.

STONE AGE

This area is home to all three of the known phases of the Stone Age, namely: the Early- (2.5 million – 250 000 years ago), Middle- (250 000 – 20 000 years ago) and Late Stone Age (22 000 – 200 years ago). The Late Stone Age in this area also contains sites with rock art from the San and Khoekhoen cultural groups. Early to Middle Stone Age sites are uncommon in this area, however rock-art sites and Late Stone Age sites are much better known.

During the Middle Stone Age, 200 000 years ago, modern man or Homo sapiens emerged, manufacturing a wider range of tools, with technologies more advanced than those from earlier periods. This enabled skilled hunter-gatherer bands to adapt to different environments. From this time onwards, rock shelters and caves were used for occupation and reoccupation over very long periods of time.

The Middle Stone Age (MSA), as defined by Goodwin and Van Riet Lowe (1929), was viewed as a switch in technology from core tools to flake tools, and was thought to represent an intermediate technology between the Earlier and Later Stone Age (LSA). Triangular flakes with convergent dorsal scars and faceted butts distinguished the MSA, and radial and discoidal types, along with single and double platform examples, dominated cores. The 'type fossil' was considered to be the worked flake point. Due to both the relatively long time span encompassed by the MSA (c. 250 000-20 000BP) and the high degree of regional variation, it has proved difficult to include all MSA assemblages within Goodwin and Van Riet Lowe's criteria. More recent attempts have been made to revise the definition of the MSA (Klein 1970; Beaumont & Vogel 1972; Volman 1984) and to establish a cultural sequence but with limited success. As a result identifying and understanding the end of the MSA is still difficult. Disagreement concerning the MSA/LSA transition in southern Africa centres on four issues: 1) the definition of what constitutes final MSA technology; 2) the existence of a transitional MSA/LSA industry; 3) the dating of the MSA/LSA transition; and 4) the existence of an Early LSA (ELSA) which represents a distinct industry that is not part of the earliest recognized LSA, the Robberg (Clark, 1997).

1985 excavation at Umhlatuzana rock shelter in Natal by Kaplan yielded a long and detailed sequence of stone artefacts, which covered the time range from the Middle Stone Age (MSA) to the Later Stone Age (LSA), including the MSA/LSA transition, and early LSA microlithic bladelet assemblages. The change from the MSA to the beginning of the LSA took place between 35 000 and 25 000 BP. Robberg-like assemblages recovered from Umhlatuzana are the first to be positively identified in Natal. Pre-dating 18

000 BP and post-dating 12 000 BP, they show that assemblages of this nature were produced earlier and later in Natal than elsewhere in the country. Changes in the Umhlatuzana stone artefact assemblages were not the result of the introduction from elsewhere of new types of tools, but took place locally, as the result of a single evolving cultural tradition in a trajectory of cultural and social change (Kaplan, 1986).

Recent research by Wadley on the Middle Stone Age of Sibudu Cave north of Durban indicated that distinctions between the Middle Stone Age and the Late Stone Age based on backed blades could be misleading (Wadley, 2005). Although research on MSA sites is limited, this research illustrates the potential value of investigating Stone Age sites in KZN closer.

The Late Stone Age, considered to have started some 20 000 years ago, is associated with the predecessors of the San and Khoi Khoi. Stone Age hunter-gatherers lived well into the 19th century in some places in SA. Stone Age sites may occur all over the area where an unknown number may have been obliterated by mining activities, urbanisation, industrialisation, agriculture and other development activities during the past decades.

A large representation of Rock-Art sites is located in this area. During 1981 Mazel completed a survey of the Drakensberg and Southern Natal and documented over 400 rock art sites with more than 20 000 paintings (Mazel, 1981). The occurrence of these sites is however subject to very specific environmental parameters, none of which are present in the study area.

IRON AGE

During the third century AD, several groups of farming peoples from eastern and south central Africa began to settle along the east coast and river valleys that drain into the Indian Ocean (Maggs 1984a, 1989; Mitchell 2002). In eastern South Africa, these early farmers display a strong preference for settling a savannah environment along major water bodies where annual precipitation from 400 to over 1000mm provided adequate moisture for grain production. Over thirty EIA identified settlements in the Thukela Basin are clustered on discontinuous patches of rich colluvial soils within a short distance of the edge of the Thukela River or its tributaries. EIA settlements were initially established in the coastal forest in the fifth century AD and later in the savannah woodland belt alongside rivers in the (seventh century AD). The opening of riverine forest and woodlands by EIA farmers is apparent from the palaeobotanical record, current vegetation distribution (Hall 1981) and settlement distribution in the Thukela Basin. All documented sites are found within 100m of the relic canopy fringe (van Schalkwyk 1992).

EIA sites averaging 7 hectares in size are consistently located on the most productive nodes of soils confined to confluences and colluvial slip-off slopes along the major drainage courses, which comprise only about 9 per cent of the landscape (Maggs 1980: 7).

“Interpretations of the internal spatial organization of EIA sites in southern Africa are complicated by the relatively long use and frequent reoccupation of sites, often over several hundred years (Maggs 1984b, 1989). These reoccupations of the same places have created a palimpsest of flat, expansive settlements, with both superimposed and laterally displaced stratigraphy (Greenfield et al. 2000). Despite this situation, several large-scale horizontal excavations of settlements in the region have demonstrated a spatial layout of features that are similar to homestead spatial organization derived from nineteenth- and twentieth-century Nguni and Sotho-Tswana ethnography (Kuper 1982), called the Central Cattle Pattern (CCP). This pattern is characterized by domestic residences of the senior man's wives placed in ranked order in an arc or circle around a central area containing livestock pens, the burials of high-status individuals and a court or assembly area where men gather to discuss political matters (Huffman 2001). Archaeologically, a similar pattern is represented by a series of domestic complexes (hut floors, grain bins or pits, ash and other refuse middens) surrounding a series of non-domestic activity areas, including livestock enclosures and specialist activity areas separated by an open space devoid of cultural materials. There is some variation in the size of the open space. At Broederstroom in north-eastern South Africa, the distance between hut floors and a livestock enclosure was as little as 10m (Huffman 1993). At KwaGandaganda in the Mngeni valley in KwaZulu-Natal, the open space was 90m across (Whitelaw 1994), and at Ndondondwane this open space was 60-100m” (Greenfield and van Schalkwyk 2003) (Huskel J, Greenfield, Kent, D, Fowler, & Leonard O, van Schalkwyk, 2005).

As well, faunal evidence suggests that certain species, such as nyala antelope, were forced to shift the range of their habitat after the woodland was opened (Maggs 1995:175). A considerable number of Late Iron Age, stone walled sites, dating from the 18th and the 19th centuries (some of which may have been occupied as early as the 16th century), occur along and on top of the rocky ridges here These settlements

and features in these sites, such as huts, were built with dry stone, reed and clay.

Stone walled settlements are concentrated in clusters of sites and sometimes are dispersed over large areas making them vulnerable to developments of various kinds. A site consists of a circular or elliptical outer wall that is composed of a number of scalloped walls facing inwards towards one or more enclosures. Whilst the outer scalloped walls served as dwelling quarters for various family groups, cattle, sheep and goat were stock in the centrally located enclosures. Huts with clay walls and floors were built inside the dwelling units. Pottery and metal items are common on the sites. However, iron and copper were not produced locally on these sites.

Many of the Iron Age sites are also associated with Zulu encampments. Due to the often semi-nomadic nature of these and the use of removable huts, these sites are often difficult to identify and short term occupational sites might only manifest in some stone circles, use to anchor these structures to the ground.

THE HISTORIC ERA

British settlers first arrived at Port Natal (Durban) in 1824 when Shaka, King of the Zulu was firmly in charge of the hinterland. Thirteen years later a party of Boer families trekked in from the Free State. Between 1860 and 1911 shiploads of Indians arrived to work in the coastal sugar plantations. Since then, immigrants from around the world have brought with them different cultures, enriching the character of the province in many ways.

Northern and central KwaZulu-Natal is strewn with sites of battles between the Zulu, Boer and British during the 1800's and 1900's. The British finally conquered the Zulu in the Anglo-Zulu War of 1879 and later the Boers in the First and Second Anglo-Boer wars. These conflicts are now collectively known as the South African War. A result of these conflicts was the construction of many forts in the area. Several grave sites, monuments, stone cairns and statues are the legacy of this violent time in our history. These remains are found scattered throughout the study area.

CULTURAL LANDSCAPE

The cultural landscape in the study area is strongly associated with rural living and subsistence farming. There is still a strong community feeling here with many ancient traditions still surviving. The landscape of high, enclosing mountains and spectacular views also results in a feeling of isolation.

MALOTI-DRAKENSBURG PARK WORLD HERITAGE SITE (WHS)

The Maloti-Drakensberg Park is a transboundary site composed of the uKhahlamba Drakensberg National Park in South Africa and the Sehlabathebe National Park in Lesotho. The site has exceptional natural beauty in its soaring basaltic buttresses, incisive dramatic cutbacks, and golden sandstone ramparts as well as visually spectacular sculptured arches, caves, cliffs, pillars and rock pools. The site's diversity of habitats protects a high level of endemic and globally important plants. The site harbors endangered species such as the Cape vulture (*Gyps coprotheres*) and the bearded vulture (*Gypaetus barbatus*). Lesotho's Sehlabathebe National Park also harbors the Maloti minnow (*Pseudobarbus quathlambae*), a critically endangered fish species only found in this park. This spectacular natural site contains many caves and rock-shelters with the largest and most concentrated group of paintings in Africa south of the Sahara. They represent the spiritual life of the San people, who lived in this area over a period of 4,000 years (<http://whc.unesco.org/en/list/985>).

Although the study area does not fall within either the uKhahlamba Drakensberg National Park or the Royal Natal National Park it is within the buffer zone for this World Heritage Site. Developments should therefore adhere to the development guidelines as set out in the World Heritage Site charter. There have also been suggestions that the upper Tugela area should also be introduced to the WHS.

Of main concern from a heritage point of view is the large amount of rock-art sites that have been identified within these areas. Generally, though the rock art is located higher up within rock-shelters and caves. No such sites were identified within the study area.



Figure 3. Rock-art shelter (<http://www.pbs.org/wnet/nature/episodes/drakensberg-barrier-of-spears/san-rock-art-of-the-drakensberg/4634/>)



Figure 4. Rock Art Panel (<http://www.places.co.za/accommodation/cathedral-peak-drakensberg.html>)

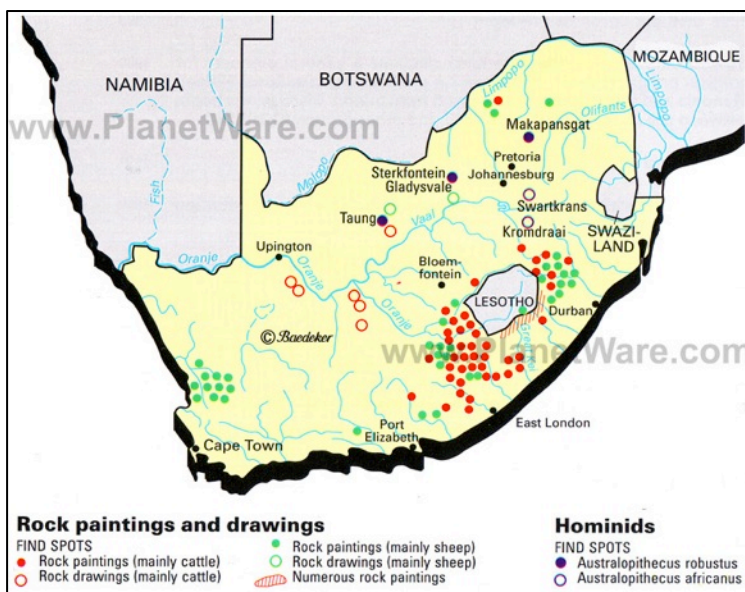


Figure 5. <http://www.planetware.com/i/map/SAF/south-africa-rock-paintings-and-drawings-map.jpg>

PREVIOUS STUDIES

G&A Heritage performed several similar studies on road upgrades in this general area in 2012 and 2013 for the same client. These were referenced as follows;

- Busani Road Upgrade HIA
- Chibide Road Upgrade HIA
- Graig Millar Road Upgrade HIA
- Emahashini Road upgrade HIA
- Fahlaza Road Upgrade HIA
- Gazaneni Road Upgrade HIA
- Gidamasoka Road Upgrade HIA
- Haladu Road Upgrade HIA
- Jikijiki Road Upgrade HIA
- Khuthalani Road Upgrade HIA
- Kwa Shishi Road Upgrade HIA
- Kwavumbu Road Upgrade HIA
- Lethithema Road Upgrade HIA
- Machibini Road Upgrade HIA
- Mevane Road Upgrade HIA
- Mgazini Road Upgrade HIA
- Mngwenya Road Upgrade HIA
- Ncence Road Upgrade HIA
- Nembeni Road Upgrade HIA
- Ngqungqula Road Upgrade HIA
- Nomafu Road Upgrade HIA
- Nsimbini Road Upgrade HIA
- Ntabampisi Road Upgrade HIA
- Nyoka Road Upgrade HIA
- Okhalweni Road Upgrade HIA
- Sigidisabeth Road Upgrade HIA
- Sinayi Road Upgrade HIA
- Songela Road Upgrade HIA
- Sthozini Road Upgrade HIA
- Zitende Road Upgrade HIA

FINDINGS

No archaeologically significant sites were identified within the proposed study area. Palaeontological findings were the subject of the attached palaeontological specialist report.

MEASURING AND EVALUATING THE CULTURAL SENSITIVITY OF THE STUDY AREA

In 2003 the SAHRA compiled the following guidelines to evaluate the cultural significance of individual heritage resources:

TYPE OF RESOURCE

- Place
- Archaeological Site
- Structure
- Grave
- Paleontological Feature
- Geological Feature

TYPE OF SIGNIFICANCE

1. HISTORIC VALUE

It is important in the community, or pattern of history

- Important in the evolution of cultural landscapes and settlement patterns
- Important in exhibiting density, richness or diversity of cultural features illustrating the human occupation and evolution of the nation, province, region or locality.
- Important for association with events, developments or cultural phases that have had a significant role in the human occupation and evolution of the nation, province, region or community.
- Important as an example for technical, creative, design or artistic excellence, innovation or achievement in a particular period.

It has strong or special association with the life or work of a person, group or organisation of importance in history

- Importance for close associations with individuals, groups or organisations whose life, works or activities have been significant within the history of the nation, province, region or community.

It has significance relating to the history of slavery

- Importance for a direct link to the history of slavery in South Africa.

2. AESTHETIC VALUE

It is important in exhibiting particular aesthetic characteristics valued by a community or cultural group.

- Important to a community for aesthetic characteristics held in high esteem or otherwise valued by the community.
- Importance for its creative, design or artistic excellence, innovation or achievement.
- Importance for its contribution to the aesthetic values of the setting demonstrated by a landmark quality or having impact on important vistas or otherwise contributing to the identified aesthetic qualities of the cultural environs or the natural landscape within which it is located.
- In the case of an historic precinct, importance for the aesthetic character created by the individual components which collectively form a significant streetscape, townscape or cultural environment.

3. SCIENTIFIC VALUE

It has potential to yield information that will contribute to an understanding of natural or cultural heritage

- Importance for information contributing to a wider understanding of natural or cultural history by virtue of its use as a research site, teaching site, type locality, reference or benchmark site.
- Importance for information contributing to a wider understanding of the origin of the universe or of the development of the earth.
- Importance for information contributing to a wider understanding of the origin of life; the development of plant or animal species, or the biological or cultural development of hominid or human species.
- Importance for its potential to yield information contributing to a wider understanding of the history of human occupation of the nation, Province, region or locality.
- It is important in demonstrating a high degree of creative or technical achievement at a particular period
- Importance for its technical innovation or achievement.

4. SOCIAL VALUE

- It has strong or special association with a particular community or cultural group for social, cultural or spiritual reasons
- Importance as a place highly valued by a community or cultural group for reasons of social, cultural, religious, spiritual, symbolic, aesthetic or educational associations.
- Importance in contributing to a community's sense of place.

DEGREES OF SIGNIFICANCE

1. RARITY

It possesses uncommon, rare or endangered aspects of natural or cultural heritage.

- Importance for rare, endangered or uncommon structures, landscapes or phenomena.

2. REPRESENTIVITY

- It is important in demonstrating the principal characteristics of a particular class of natural or cultural places or objects.
- Importance in demonstrating the principal characteristics of a range of landscapes or environments, the attributes of which identify it as being characteristic of its class.
- Importance in demonstrating the principal characteristics of human activities (including way of life, philosophy, custom, process, land-use, function, design or technique) in the environment of the nation, province, region or locality.

The table below illustrates how a site's heritage significance is determined

Spheres of Significance	High	Medium	Low
International			
National			
Provincial			
Regional			
Local			
Specific Community			

What other similar sites may be compared to this site?

ASSESSMENT OF IMPACTS

IMPACT STATEMENT

PALAEONTOLOGICAL SITES

Palaeontological significance is evaluated in the attached specialist report.

Mitigation

As per attached palaeontological report.

BUILT ENVIRONMENT

Some structures associated with rural living were identified;

- Barb-wire fences (modern)
- Mud-brick huts (modern)
- Dirt roads (modern)
- Footpaths

Mitigation

None of the structures will be affected by the bridge upgrade activities.

CULTURAL LANDSCAPE

The following landscape types were identified during the study.

Landscape Type	Description	Occurrence still possible?	Identified on site?
1 Paleontological	Mostly fossil remains. Remains include microbial fossils such as found in Baberton Greenstones	Yes, sub-surface	No
2 Archaeological	Evidence of human occupation associated with the following phases – Early-, Middle-, Late Stone Age, Early-, Late Iron Age, Pre-Contact Sites, Post-Contact Sites	No	No
3 Historic Built Environment	<ul style="list-style-type: none"> - Historical townscapes/streetscapes - Historical structures; i.e. older than 60 years - Formal public spaces - Formally declared urban conservation areas - Places associated with social identity/displacement 	No	No
4 Historic Farmland	<p>These possess distinctive patterns of settlement and historical features such as:</p> <ul style="list-style-type: none"> - Historical farm yards - Historical farm workers villages/settlements - Irrigation furrows - Tree alignments and groupings - Historical routes and pathways - Distinctive types of planting - Distinctive architecture of cultivation e.g. planting blocks, trellising, terracing, ornamental planting. 	Yes	No
5 Historic rural town	<ul style="list-style-type: none"> - Historic mission settlements - Historic townscapes 	No	No
6 Pristine natural landscape	<ul style="list-style-type: none"> - Historical patterns of access to a natural amenity - Formally proclaimed nature reserves - Evidence of pre-colonial occupation - Scenic resources, e.g. view corridors, viewing sites, visual edges, visual linkages - Historical structures/settlements older than 60 years - Pre-colonial or historical burial sites - Geological sites of cultural significance. 	No	No
7 Relic Landscape	<ul style="list-style-type: none"> - Past farming settlements - Past industrial sites - Places of isolation related to attitudes to medical treatment - Battle sites - Sites of displacement, 	Yes	No
8 Burial grounds and grave sites	<ul style="list-style-type: none"> - Pre-colonial burials (marked or unmarked, known or unknown) 	Yes	No

	<ul style="list-style-type: none"> - Historical graves (marked or unmarked, known or unknown) - Graves of victims of conflict - Human remains (older than 100 years) - Associated burial goods (older than 100 years) - Burial architecture (older than 60 years) 		
9 Associated Landscapes	<ul style="list-style-type: none"> - Sites associated with living heritage e.g. initiation sites, harvesting of natural resources for traditional medicinal purposes - Sites associated with displacement & contestation - Sites of political conflict/struggle - Sites associated with an historic event/person - Sites associated with public memory 	No	No
10 Historical Farmyard	<ul style="list-style-type: none"> - Setting of the yard and its context - Composition of structures - Historical/architectural value of individual structures - Tree alignments - Views to and from - Axial relationships - System of enclosure, e.g. defining walls - Systems of water reticulation and irrigation, e.g. furrows - Sites associated with slavery and farm labour - Colonial period archaeology 	No	No
11 Historic institutions	<ul style="list-style-type: none"> - Historical prisons - Hospital sites - Historical school/reformatory sites - Military bases 	No	No
12 Scenic visual	<ul style="list-style-type: none"> - Scenic routes 	No	No
13 Amenity landscape	<ul style="list-style-type: none"> - View sheds - View points - Views to and from - Gateway conditions - Distinctive representative landscape conditions - Scenic corridors 	No	No

Mitigation

It is recommended that the development designs take into account the positive and negative characteristics of the existing cultural landscape type and that they endeavor to promote the positive aspects while at the same time mitigating the negative aspects.

RESOURCE MANAGEMENT RECOMMENDATIONS

Although unlikely, sub-surface remains of heritage sites could still be encountered during the construction activities associated with the project. Such sites would offer no surface indication of their presence due to the high state of alterations in some areas as well as heavy plant cover in other areas. The following indicators of unmarked sub-surface sites could be encountered:

- Ash deposits (unnaturally grey appearance of soil compared to the surrounding substrate);
- Bone concentrations, either animal or human;
- Ceramic fragments such as pottery shards either historic or pre-contact;
- Stone concentrations of any formal nature.

The following recommendations are given should any sub-surface remains of heritage sites be identified as indicated above:

- All operators of excavation equipment should be made aware of the possibility of the occurrence

of sub-surface heritage features and the following procedures should they be encountered.

- All construction in the immediate vicinity (50m radius of the site) should cease.
- The heritage practitioner should be informed as soon as possible.
- In the event of obvious human remains the South African Police Services (SAPS) should be notified.
- Mitigation measures (such as refilling etc.) should not be attempted.
- The area in a 50m radius of the find should be cordoned off with hazard tape.
- Public access should be limited.
- The area should be placed under guard.
- No media statements should be released until such time as the heritage practitioner has had sufficient time to analyze the finds.

CONCLUSION

The design of the existing low-water bridge is resulting in severe approach-erosion taking place. This is widening the riverbank and exposing more possibly important palaeontological deposits. It is anticipated that the new bridge design and associated erosion measures will in a large part restrict this process ensuring that further exposure does not result.



Figure 6. Approach erosion

Due to the fact that the only significant heritage factor within this area is possible palaeontological deposits, it is anticipated that the proposed development will have a positive effect on the heritage value of the area. It is however imperative that the recommendations of the specialist palaeontological report be adhered to.

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PROPOSED DEVELOPMENT AT BUSINGATHA, KWAZULU/NATAL

SCOPING REPORT PALAEOLOGY

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1. Introduction

The palaeontological heritage of South Africa is unsurpassed and can only be described in superlatives. The South African palaeontological record gives us insight in *i.a.* the origin of life, mammals, dinosaurs and humans. Fossils are also used to identify rock strata and determine the geological context of the sub region with other continents and to study evolutionary relationships, sedimentary processes and palaeoenvironments. The Beaufort Group of the Karoo Supergroup contains amongst others approximately 70% of all known synapsid (also known as mammal-like reptile) fossils in the world which have played a crucial role in our understanding of the origin of mammals and the Permo-Triassic terrestrial palaeoenvironment including the existence of Gondwanaland.

The Heritage Act of South Africa stipulates that fossils and fossil sites may not be altered or destroyed. The purpose of this document is to detail the probability of finding fossils in the study area which may be impacted by the proposed development. The impact of the development can be ameliorated in several ways in the areas where fossils are common.

2. Terms of reference for the report

According to the South African Heritage Resources Act (Act 25 of 1999) (Republic of South Africa, 1999), certain clauses are relevant to palaeontological aspects for a terrain suitability assessment.

- **Subsection 35(4)** No person may, without a permit issued by the responsible heritage resources authority-
 - (a) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;
 - (b) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;
 - (c) trade in, sell for private gain, export or attempt to export from the republic any category of archaeological or palaeontological material or object, or any meteorite; or
 - (d) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist with the detection or recovery of metals or archaeological material or objects, or use such equipment for the recovery of meteorites.
- **Subsection 35(5)** When the responsible heritage resources authority has reasonable cause to believe that any activity or development which will destroy, damage or alter any archaeological or palaeontological site is under way, and where no application for a permit has been submitted and no heritage resources management procedures in terms of section 38 has been followed, it may-
 - (a) serve on the owner or occupier of the site or on the person undertaking such development an order for the development to cease immediately for such period as is specified in the order;
 - (b) carry out an investigation for the purpose of obtaining information on whether or not an archaeological or palaeontological site exists and whether mitigation is necessary;
 - (c) if mitigation is deemed by the heritage resources authority to be necessary, assist the person on whom the order has been served under paragraph (a) to apply for a permit as required in subsection (4); and
 - (d) recover the costs of such investigation from the owner or occupier of the land on which it is believed an archaeological or palaeontological site is located or from the person proposing to undertake the development if no application for a permit is received within two weeks of the order being served.

South Africa's unique and non-renewable palaeontological heritage is protected in terms of the NHRA. According to this act, heritage resources may not be excavated, damaged, destroyed or otherwise impacted by any development without prior assessment and without a permit from the relevant heritage resources authority.

As areas are developed and landscapes are modified, heritage resources, including palaeontological resources, are threatened. As such, both the environmental and heritage legislation require that development activities must be preceded by an assessment of the impact undertaken by qualified professionals. Palaeontological Impact Assessments (PIAs) are specialist reports that form part of the wider heritage component of:

- Heritage Impact Assessments (HIAs) called for in terms of Section 38 of the

National Heritage Resources Act, Act No. 25, 1999 by a heritage resources authority.

- Environmental Impact Assessment process as required in terms of other legislation listed in s. 38(8) of NHRA;
- Environmental Management Plans (EMPs) required by the Department of Mineral Resources.

HIAs are intended to ensure that all heritage resources are protected, and where it is not possible to preserve them in situ, appropriate mitigation measures are applied. An HIA is a comprehensive study that comprises a palaeontological, archaeological, built environment, living heritage, etc specialist studies. Palaeontologists must acknowledge this and ensure that they collaborate with other heritage practitioners. Where palaeontologists are engaged for the entire HIA, they must refer heritage components for which they do not have expertise on to appropriate specialists. Where they are engaged specifically for the palaeontology, they must draw the attention of environmental consultants and developers to the need for assessment of other aspects of heritage. In this sense, Palaeontological Impact Assessments that are part of Heritage Impact Assessments are similar to specialist reports that form part of the EIA reports.

The standards and procedures discussed here are therefore meant to guide the conduct of PIAs and specialists undertaking such studies must adhere to them.

The process of assessment for the palaeontological (PIA) specialist components of heritage impact assessments, involves:

Scoping stage in line with regulation 28 of the National Environmental Management Act (No. 107 of 1998) Regulations on Environmental Impact Assessment. This involves an **initial assessment** where the specialist evaluates the scope of the project (based, for example, on NID/BIDs) and advises on the form and extent of the assessment process. At this stage the palaeontologist may also decide to compile a **Letter of Recommendation for Exemption from further Palaeontological Studies**. This letter will state that there is little or no likelihood that any significant fossil resources will be impacted by the development. This letter should present a reasoned case for exemption, supported by consultation of the relevant geological maps and key literature.

A **Palaeontological Desktop Study** – the palaeontologist will investigate available resources (geological maps, scientific literature, previous impact assessment reports, institutional fossil collections, satellite images or aerial photos , etc) to inform an assessment of fossil heritage and/or exposure of potentially fossiliferous rocks within the study area. A Desktop studies will conclude whether a further field assessment is warranted or not. Where further studies are required, the desktop study would normally be an integral part of a field assessment of relevant palaeontological resources.

A **Phase 1 Palaeontological Impact Assessment** is generally warranted where rock units of high palaeontological sensitivity are concerned, levels of bedrock exposure within the study area are adequate; large-scale projects with high potential heritage impact are planned; and where the distribution and nature of fossil remains in the proposed project area is unknown. In the recommendations of Phase 1, the specialist will inform whether further monitoring and mitigation are necessary. The Phase 1 should identify the rock units and significant fossil heritage resources present, or by inference likely to be present, within the study area, assess the palaeontological significance of these rock units, fossil sites or other fossil heritage, comment on the impact of the development on palaeontological heritage resources and make recommendations for their mitigation or conservation, or for any further specialist studies that are required in order to adequately assess the nature, distribution and conservation value of palaeontological resources within the study area.

A **Phase 2 Palaeontological Mitigation** involves planning the protection of significant fossil sites, rock units or other palaeontological resources and/or the recording and sampling of fossil heritage that might be lost during development, together with pertinent geological data. The mitigation may take place before and / or during the construction phase of development. The specialist will require a Phase 2 mitigation permit from the relevant Heritage Resources Authority before Phase 2 may be implemented.

A **'Phase 3' Palaeontological Site Conservation and Management Plan** may be required in cases where the site is so important that development will not be allowed, or where development is to co-exist

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with the resource. Developers may be required to enhance the value of the sites retained on their properties with appropriate interpretive material or displays as a way of promoting access of such resources to the public.

The assessment reports will be assessed by the relevant heritage resources authority, and depending on which piece of legislation triggered the study, a response will be given in the form of a Review Comment or Record of Decision (ROD). In the case of PIAs that are part of EIAs or EMPs, the heritage resources authority will issue a comment or a record of decision that may be forwarded to the consultant or developer, relevant government department or heritage practitioner and where feasible to all three.

3. Details of study area and the type of assessment:

The relevant literature and geological maps for the region in which the development is proposed to take place, have been studied for this Scoping Report.

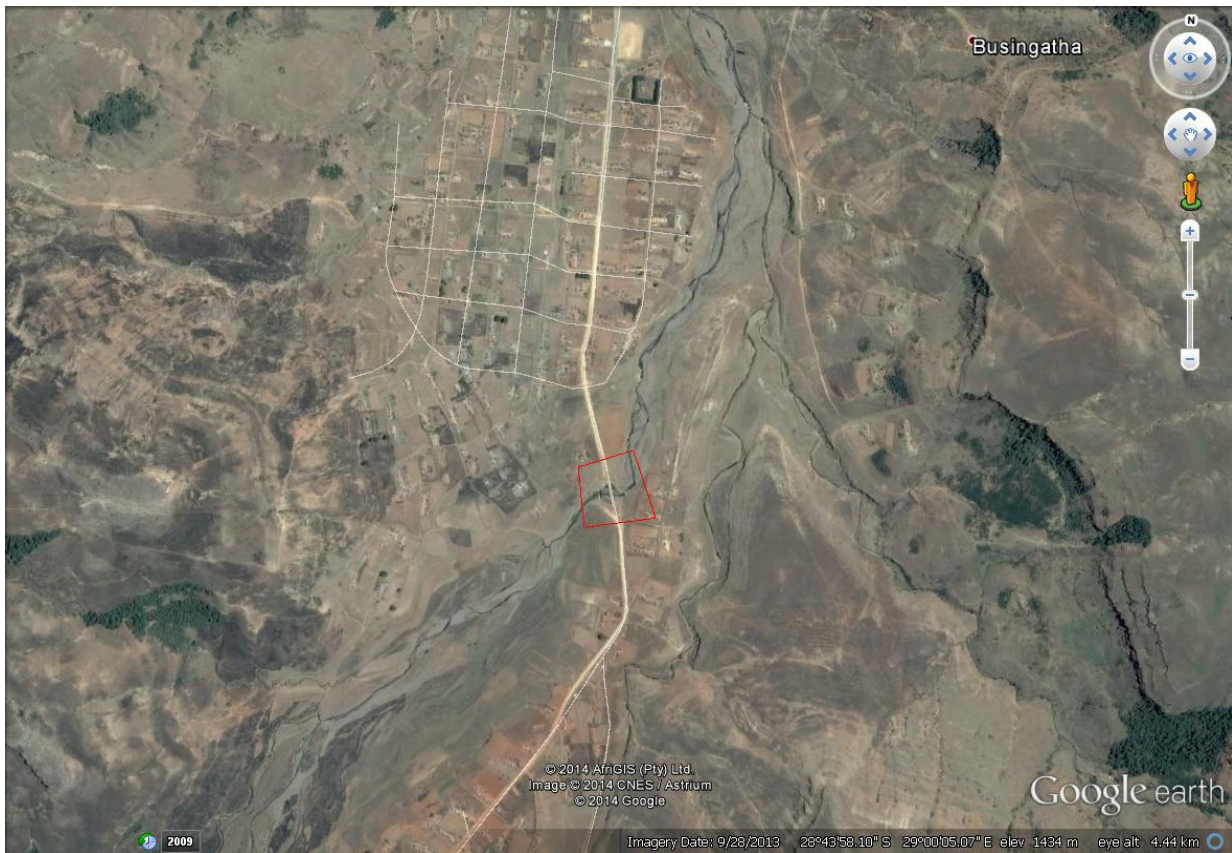


Figure 1: Google Earth photo indicating the study area (red polygon)

The study site is situated in rural KwaZuluNatal, south of a settlement approximately 34km west of Bergville on a dirt road crossing a river. The settlement is located in a deep valley surrounded by mountains. Vegetation is sparse and the bedrock is exposed due to erosion.

4. Geological setting



Figure 2: Geology of the study area (indicated with the red polygon) (adapted from the Harrismith 2828 1: 250 000 Geology Map (Council for Geoscience, 1998)

LEGEND:

Age	Group	Subgroup / Formation	
Jurassic	Dolerite intrusions		Jd
Triassic	Karoo Supergroup	Clarens	Tc
		Elliot	Te
		Molteno	Tm
		Tarkastad Subgroup/Subgroep	Tt
Permian		BEAUFORT	Adelaide Subgroup/Subgroep

The study site falls within the Tarkastad Subgroup of the Beaufort Group of the Karoo Supergroup (see Fig.2). The geology of the study area is dominated by sedimentary rocks consisting of sandstones and mudstones which were set down during the early Triassic by meandering rivers.

The Tarkastad Subgroup is subdivided into a lower Verkykerskop Formation and an upper Driekoppen Formation in the northeastern section of the Main Karoo Basin (Groenewald, 1989). The Verkykerskop

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Formation in which the study site falls, comprises of fine- to very coarse-grained sandstones (Johnson *et al.*, 2006). The mudstones of the Tarkastad Subgroup are often maroon coloured, compared to the greenish grey mudstones of the underlying Adelaide Subgroup.

The Beaufort Group is renowned for its synapsid, basal tetrapod and achosaur fossils.

5. Palaeontology of the study area

The study area falls within the *Lystrosaurus* Assemblage Zone (see Fig.3).

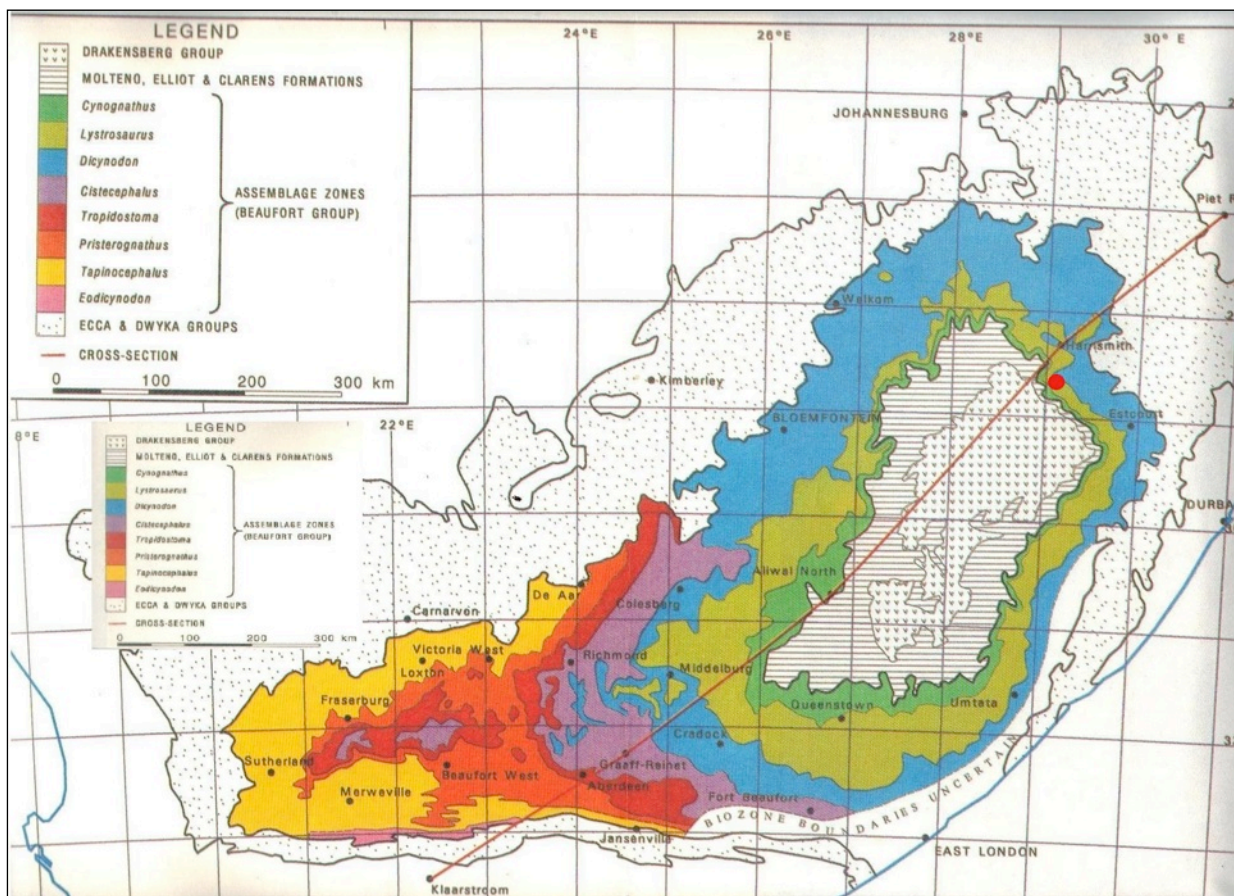


Figure 3: Biostratigraphical map indicating the Karoo Supergroup strata including the biozonation of the Karoo Supergroup (adapted from Rubidge, 1995). The red spot indicates the study area

The fossils of this assemblage zone in this region include vertebrate skeletal material and fossilised wood. The *Lystrosaurus* Assemblage Zone is well known for its *Lystrosaurus* fossils (see Fig. 4). *Lystrosaurus* is also the most common fossil of this assemblage zone and hundreds of these have been collected and are stored in fossil repositories around the country. Fossils of other synsids such as *Moschorhinus* (see Fig.5) and *Thrinaxodon* (see Fig. 6), the small anapsid *Procolophon* (see Fig.7), archosaurs such as *Proterosuchus* (see Fig. 8) and the small amphibian *Lydekkerina* are also known from this assemblage zone (Kitching, 1977; Rubidge, 1995; Durand, 2005). Fossil burrows are common in this assemblage zone and are often found in association with *Thrinaxodon*, *Procolophon* and *Lystrosaurus* remains (Groenewald, 1991; Rubidge, 1995).

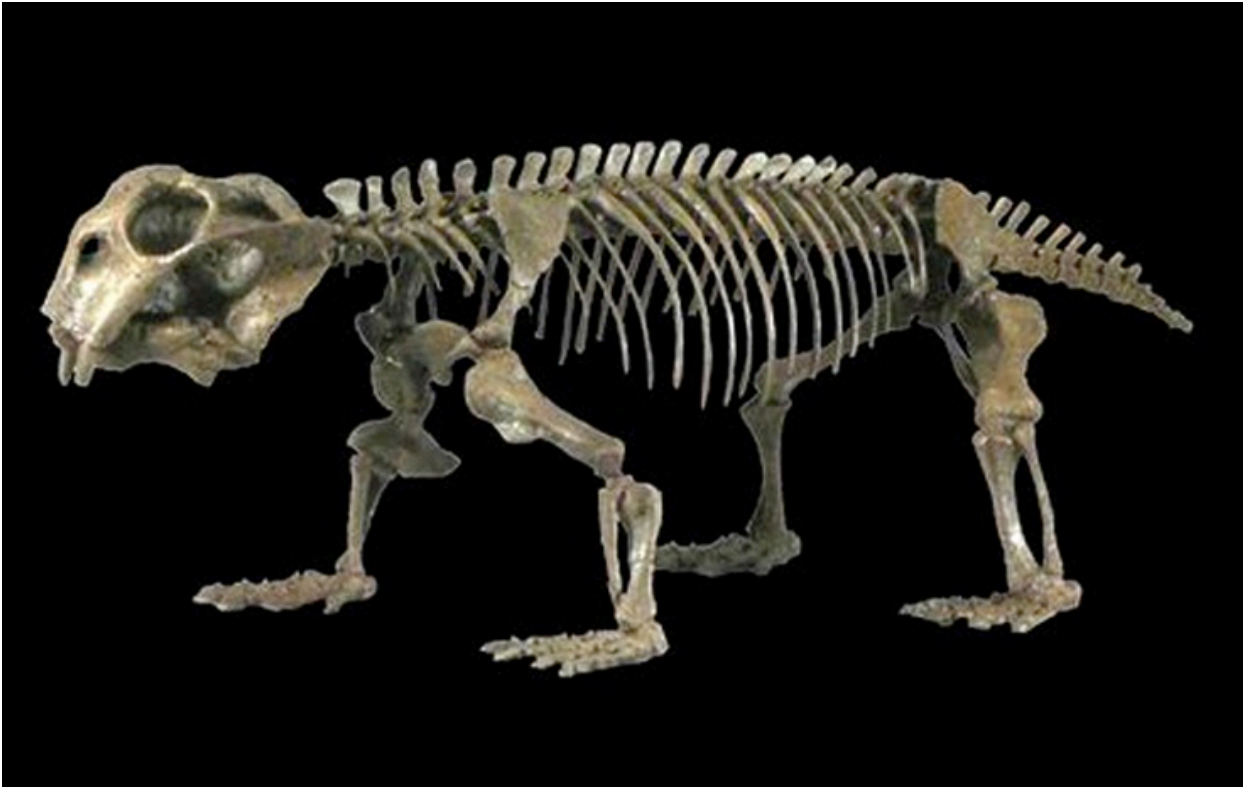


Fig. 4 *Lystrosaurus* skeleton



Fig. 5 *Moschorhinus* skull



Fig. 6 *Thrinaxodon* skeleton

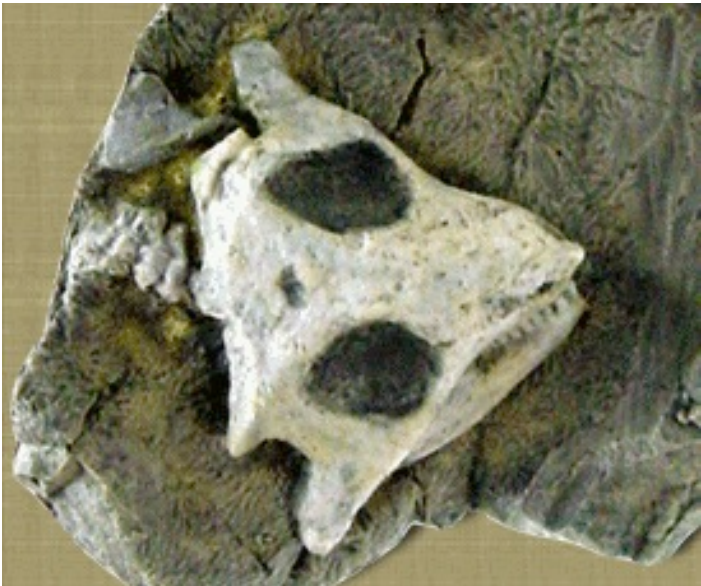


Fig. 7 *Procolophon* skull

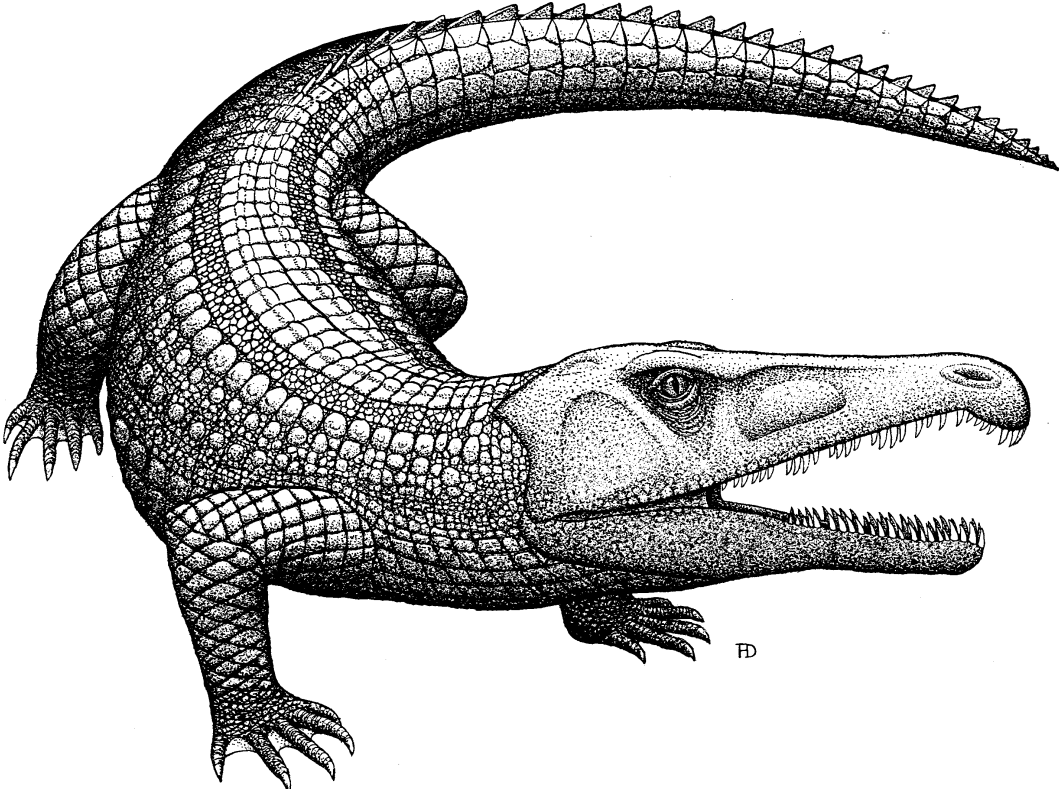


Fig. 8 *Proterosuchus* reconstruction (JF. Durand)

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Johnson, M.R.; Van Vuuren, C.J.; Visser, J.N.J.; Cole, D.I.; Wickens, H. De V.; Christie, A.D.M.; Roberts, D.L. & Brandl, G. (2006). Sedimentary rocks of the Karoo Supergroup, pp. 461-499. *In: Johnson. M.R., Anhaeusser, C.R. & Thomas, R.J. (Eds.) The geology of South Africa*. Geological Society of South Africa, Johannesburg & the Council for Geoscience, Pretoria.

Kitching, J.W., 1977. The distribution of the Karoo vertebrate fauna. Memoir 1, Bernard Price Institute Palaeontological Research, University Witwatersrand.

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6. Conclusion and Recommendations:

The *Lystosaurus* Assemblage Zone is reasonably fossil rich. There is a strong possibility that fossils will be discovered within the study area.

Mitigation

The study site needs to be investigated before construction and after excavations have taken place and fossils exposed on the surface need to be salvaged before construction. The site needs to be inspected again after excavations have taken place. The excavated rock need to be kept on site until a palaeontologist has had the opportunity to study it in order to see whether there are fossils that could be salvaged.

A working relationship should be established between the ECO and the project palaeontologist. Excavations should be halted if fossils are uncovered during the process and the ECO should contact the palaeontologist for advice before continuing excavations or construction.

Due to the fact that it would be impractical and very expensive for a qualified palaeontologist to be present at the site for the duration of construction, the responsibility of the recording of fossil localities as they are discovered will fall upon the ECO. Fossil localities should be recorded in all cases by means of photographs and GPS readings and written up in a log book with the date, locality, photograph number and short description of the site.

It is important for the ECO to familiarise him- or herself with the fossils which could be expected in this region. It is very important that the ECO accompanies the palaeontologist on his or her site visit in order to be sensitised to the occurrence and appearance of fossils in their natural state.

The excavations and collection of fossils should be performed by a qualified palaeontologist and with a permit from the South African Heritage Resources Agency. The fossils should preferably be donated to a fossil repository after collection – in this case the Pietermaritzburg Museum.



Palaeontological specialist:

Dr JF Durand (Sci. Nat.)

BSc Botany & Zoology (RAU), BSc Zoology (WITS), Museology Dipl. (UP),
Higher Education Diploma (RAU), PhD Palaeontology (WITS)

Experience:

Palaeontological assessments:

- Urban development in Cradle of Humankind World Heritage Site (Gauteng): Letamo, Honingklip, Windgat, Sundowners, Ekutheni
- Urban development at Goose Bay, Vereeniging, Gauteng
- Urban development on Portions 98, 99, 179, 236, 284 and 364 of the farm Waterkloof 306 JQ, Rustenburg, North West Province
- Upgrade of R21 between N12 and Hans Strydom Drive, Gauteng
- Vele Colliery, Limpopo Province
- De Wildt 50 MW Solar Power Station, Gauteng
- 10 MW PV Plant Potchefstroom, North West Province
- Omega 342 50MW Solar Power Station, Viljoenskroon, Free State
- Springfontein wind and solar energy facility, Free State
- Solar power plant, Bethal, Mpumalanga
- Diamond mine on Endora, Limpopo Province
- Development at Tubatse Ext.15, Limpopo Province
- Manganese mine south of Hotazel, Northern Cape
- Wind energy facility at Cookhouse, Eastern Cape
- Energy facility at Noupoot, Northern Cape
- Fluorspar mine near Wallmannsthal, Gauteng
- ESKOM power line, Dumo, KwaZulu-Natal
- ESKOM Gamma-Omega 765KV transmission line, Western Cape
- ESKOM 44KV power line at Elandspruit near Middelburg, Mpumalanga
- ESKOM Makopane Substation, Limpopo Province
- ESKOM Platreef Substation and power lines to Borutho MTS Substation, Limpopo Province
- Marang B - a 3 x 500MVA 400/132kV Main Transmission Substation east of Rustenburg, North West Province
- Upgrading of storm water infrastructure in Valencia, Addo, Sundays River Valley Municipality, Eastern Cape
- Development of a 10 MW Solar Energy facility on the Farm Liverpool 543 KQ Portion 2 at Koedoeskop, Limpopo Province
- Development of a fluorspar mine at Wallmannsthal, North of Pretoria
- Extension of limestone mine on the farms Buffelskraal 554 KQ Portion1 and Krokodilkraal 545 KQ, Limpopo Province
- Lesego Platinum Mine, Sekhukhune Area, Steelpoort, Limpopo Province
- Proposed mine at Hotazel, Northern Cape
- Pollution control dams at Transalloys in Clewer near Emalaheni (Witbank), Mpumalanga
- Erection of spill points on the Farm Kwikstaart 431 KQ Portion 2, Thabazimbi, Limpopo Province

Palaeontological research:

- Gauteng: Wonder Cave
- KwaZulu/Natal: Newcastle, Mooi River, Rosetta, Impendle, Himeville Underberg, Polela & Howick Districts, Sani Pass
- Eastern Cape: Cradock District, Algoa Basin
- Western Cape: Clanwilliam District
- Free State: Memel & Warden Districts
- Limpopo Province: Nyalaland (KNP), Vhembe Reserve, Pont Drift
- Zimbabwe: Sentinel Ranch, Nottingham