HERITAGE IMPACT ASSESSMENT:

PROPOSED PAVEMENT STABILISATION OF THE ROAD TR75/1 (TRUNK ROAD 75 / N12 HIGHWAY) NEAR OUDTSHOORN, WESTERN CAPE

Required under Section 38(8) of the National Heritage Resources Act (No. 25 of 1999)

HWC Case No.: HWC23050807SB0509

Report for:

Sharples Environmental Services
Unit 1 A2, The Avenues, Parklands, Cape Town, 7441
Email: madeleine@sescc.net

On behalf of:

Western Cape Government: Department of Infrastructure – Transport Infrastructure Branch

Dr Jayson Orton
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30 June 2023

SUMMARY

1. Site Name

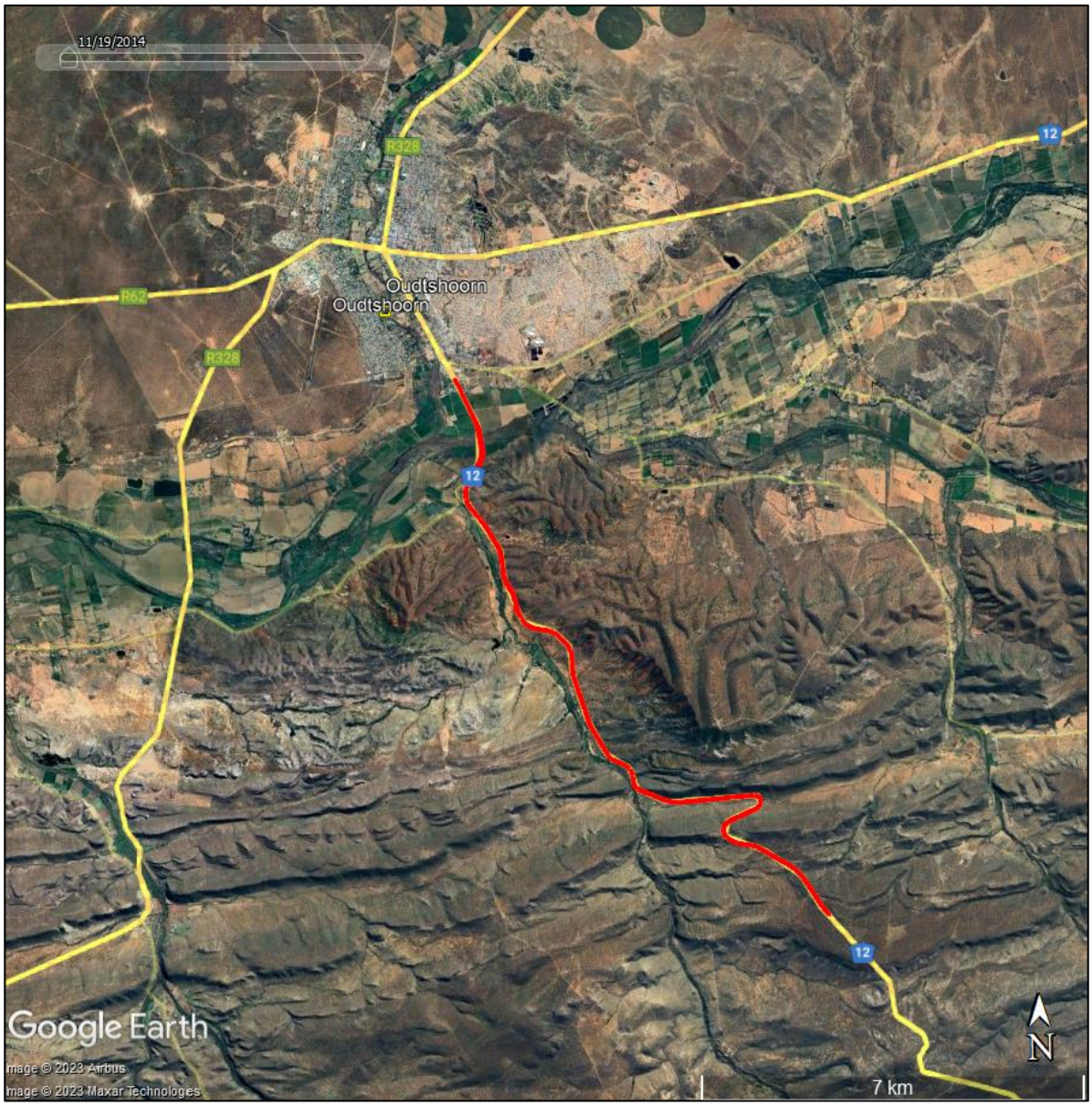
N12 highway (TR75/1)

2. Location

N12
Erven: many - see list on report

- North end points at: S33° 36’ 51.1” E22° 12’ 57.5”
- South end point at: S32° 42’ 11.2” E22° 17’ 17.2”

3. Locality Plan



Study area shown by red line.

4. Description of Proposed Development

1. **Road works**
    a. Rehabilitation of the existing road cross-section to include surfaced shoulders. The exact cross-section is still to be agreed with the Client, but will require widening of the existing road prism at selected locations. The road rehabilitation will require:
        I. Widening of existing cut and fill slopes,
        II. In-situ reconstruction of the existing pavement layers as the upper selected layer,
        III. Construction of new subbase and base layers, and
        IV. Construction of a new surfacing seal
    b. Construction of auxiliary (passing and climbing) lanes at selected locations
    c. Rehabilitation of selected accesses to main or minor farm access standards as applicable
    d. Extension of existing minor culverts
    e. Maintenance of existing minor culvert inlet and outlet structures

2. **Structures**
    a. Widening or raising head and wing walls at major culverts if required due to cross-section rehabilitation or introduction of auxiliary lanes
    b. Maintenance to major culverts including:
        I. Concrete crack repair
        II. Scour repair
    c. Maintenance to B4691 over the Olifants River including:
        I. Repair of honeycombing in concrete
        II. Replacement of bridge joints

3. **Appurtenant works**
    a. Construction of concrete lined drains
    b. Installation of road signs
    c. Painting of road marking
    d. Installation of guardrails
    e. Installation of fencing, including clearing the fenceline

5. Heritage Resources Identified

The palaeontological study identified significant fossil resources in the existing road cuttings. These included various well-preserved bivalves, trace fossils and possible trilobites. Other fossils are likely present in these rock outcrops as well.

The road itself and associated culverts may be older than 60 years but are not significant. The railway line is older than the road and carries slightly greater significance. The metal road and railway bridges over the Olifants River are more significant.

A few structures greater than 60 years of age were noted in the surrounding area with one of them likely to have been an 'ostrich palace' in the early 20th century.

The landscape is a heritage resource but in this area it is not considered to be of high significance.

6. Anticipated Impacts on Heritage Resources

Fossils will definitely be impacted when the road cuttings are enlarged and useful scientific data would be lost. The existing road culverts will be lengthened but this is not a significant impact. The cultural landscape would be very minimally affected, mostly just during the construction phase. After the work is completed the status quo would be resumed.

7. Recommendations

It is recommended that the proposed N12 road rehabilitation be authorised, but subject to the following recommendations which should be included as conditions of authorisation:

- A palaeontologist must be appointed to rescue fossils in the existing road cuttings prior to the commencement of construction. The work must be carried out under a Workplan approved by HWC;
- Palaeontological monitoring must also take place during expansion of the road cuttings. A suitable schedule for inspections must be agreed upon between the palaeontologist and contractor;
- A palaeontological chance finds procedure must be in place and should be implemented if fossils are found in the absence of the palaeontologist;
- The total area disturbed must be minimised as far as possible and all areas not required during operation of the road must be rehabilitated; and
- If any archaeological material, fossils or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist or palaeontologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.

8. Author/s and Date

Heritage Impact Assessment: Jayson Orton, ASHA Consulting (Pty) Ltd, 30 June 2023
Palaeontological specialist study: Elize Butler, Banzai Environmental, 30 June 2023

Glossary

Background scatter: Artefacts whose spatial position is conditioned more by natural forces than by human agency.

Early Stone Age: Period of the Stone Age extending approximately between 2 million and 200 000 years ago.

Holocene: The geological period spanning the last approximately 10-12 000 years.

Hominid: a group consisting of all modern and extinct great apes (i.e. gorillas, chimpanzees, orangutans and humans) and their ancestors.

Later Stone Age: Period of the Stone Age extending over the last approximately 20 000 years.

Middle Stone Age: Period of the Stone Age extending approximately between 200 000 and 20 000 years ago.

Pleistocene: The geological period beginning approximately 2.5 million years ago and preceding the Holocene.

Abbreviations

APHP: Association of Professional Heritage Practitioners

ASAPA: Association of Southern African Professional Archaeologists

BA: Basic Assessment

CRM: Cultural Resources Management

DEA&DP: Department of Environmental Affairs and Development Planning

EA: Environmental Authorisation

ECO: Environmental Control Officer

EMPr: Environmental Management Program

ESA: Early Stone Age

GPS: global positioning system

HIA: Heritage Impact Assessment

HWC: Heritage Western Cape

LSA: Later Stone Age

MSA: Middle Stone Age

NCW: Not Conservation Worthy

NEMA: National Environmental Management Act (No. 107 of 1998)

NHRA: National Heritage Resources Act (No. 25) of 1999

NID: Notification of Intent to Develop

PPP: Public Participation Process

SAHRA: South African Heritage Resources Agency

SAHRIS: South African Heritage Resources Information System

Contents

1. INTRODUCTION

ASHA Consulting (Pty) Ltd was appointed by Sharples Environmental Services to conduct an assessment of the potential impacts to heritage resources that might occur through the proposed rehabilitation of a section of the N12 highway (TR75/1) located to the south of Oudtshoorn (Figures 1 & 2). The rehabilitation work will occur on many different properties as listed in Table 1 and will be over a length of approximately 15 km of road. End points for the study area are at:

- North: S33° 36' 51.1" E22° 12' 57.5"; and
- South: S32° 42' 11.2" E22° 17' 17.2".

Table 1: *Properties affected by the proposed rehabilitation of the N12.*

Property details	Zoning
Portion 5 of the Farm Wagenaars 166	Agricultural Zone I
Remainder of the farm Wagenaars 166	Agricultural Zone I
Remainder of portion 31 of the farm Klein Fontein 22	Agicultural Zone I
Farm Wagenaars Kraal 251	Agricultural Zone I
Remainder of the Wagenaars Kraal Railway Reserve 167	Transport Zone I
Portion 36 of the Farm Frischgewaagd 163	Transport Zone I
Portion 69 of the Farm Frischgewaagd 163	Agricultural Zone I
Portion 70 of the Farm Frischgewaagd 163	Agricultural Zone I
Portion 15 of the Farm Frischgewaagd 163	Agricultural Zone I
Portion 17 of the Farm Frischgewaagd 163	Agricultural Zone I
Portion 18 of the Farm Frischgewaagd 163	Agricultural Zone I
Portion 20 of the Farm Frischgewaagd 163	Agricultural Zone I
Portion 22 of the Farm Frischgewaagd 163	Agricultural Zone I
Portion 24 of the Farm Frischgewaagd 163	Agricultural Zone I
Portion 68 of the Farm Frischgewaagd 163	Agricultural Zone I
Portion 66 of the Farm Frischgewaagd 163	Agricultural Zone I
Portion 48 of the Farm Frischgewaagd 163	Transport Zone I
Remainder of the farm Bakenskraal 239	Agricultural Zone I
Portion 4 of the farm Bakenskraal 239	Agricultural Zone I
Portion 8 of the farm Bakens Kraal 164	Transport Zone I
Portion 9 of the farm Bakens Kraal 164	Transport Zone I
Remainder of the farm Onverwag B 241	Agricultural Zone I
Portion 90 of the farm Onverwag 143	Transport Zone I
Portion 62 of the farm Onverwag 143	Transport Zone I
Portion 10 of the farm Onverwag 143	Agricultural Zone I
Portion 53 of the farm Onverwag 143	Agricultural Zone I
Portion 106 of the farm Onverwag 143	Agricultural Zone I
Portion 29 of the farm Onverwag 143	Transport Zone I
Portion 127 of the farm Onverwag 143	Transport Zone I
Portion 207 of the farm Onverwag 143	Transport Zone I
Portion 92 of the farm Onverwag 143	Transport Zone I
Portion 94 of the farm Onverwag 143	Transport Zone I
Portion 47 of the Farm Frischgewaagd 163	Transport Zone I

Property details	Zoning
Portion 39 of the Farm Frischgewaagd 163	Transport Zone I

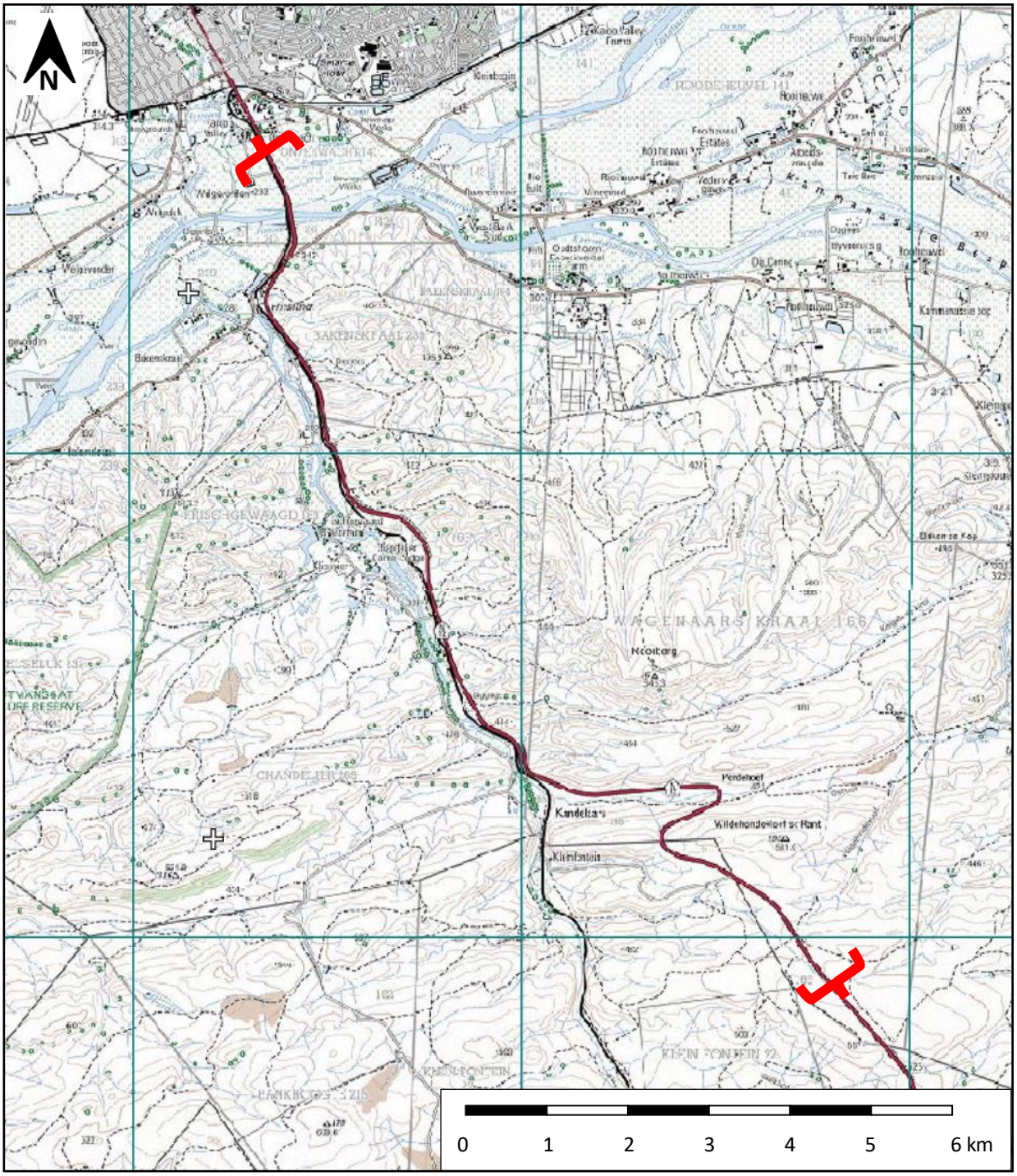


Figure 1: *Extract from 1:50 000 topographic map 3322CA and 3322CB showing the location of the site (between red braces). Source of basemap: Chief Directorate: National Geo-Spatial Information. Website: www.ngi.gov.za.*

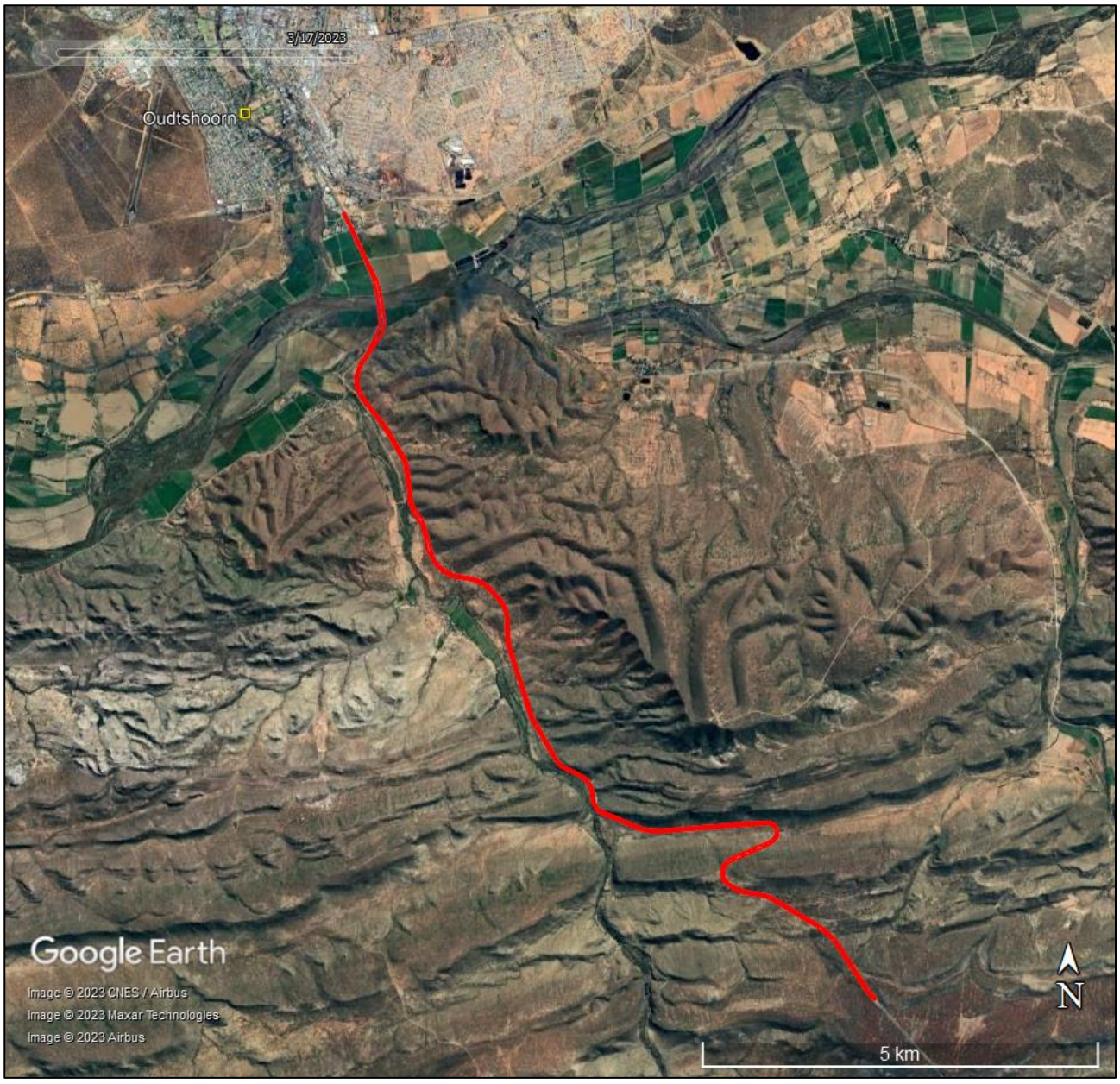


Figure 2: *Aerial view of the study area (red line) showing the wider landscape context and location relative to Oudtshoorn.*

1.1. The proposed project

1.1.1. Project description

4. Road works

f. Rehabilitation of the existing road cross-section to include surfaced shoulders. The exact cross-section is still to be agreed with the Client, but will require widening of the existing road prism at selected locations. The road rehabilitation will require:

V. Widening of existing cut and fill slopes,

VI. In-situ reconstruction of the existing pavement layers as the upper selected layer,

VII. Construction of new subbase and base layers, and

VIII. Construction of a new surfacing seal

g. Construction of auxiliary (passing and climbing) lanes at selected locations
h. Rehabilitation of selected accesses to main or minor farm access standards as applicable
i. Extension of existing minor culverts
j. Maintenance of existing minor culvert inlet and outlet structures

5. Structures

d. Widening or raising head and wing walls at major culverts if required due to cross-section rehabilitation or introduction of auxiliary lanes
e. Maintenance to major culverts including:
III. Concrete crack repair
IV. Scour repair
f. Maintenance to B4691 over the Olifants River including:
III. Repair of honeycombing in concrete
IV. Replacement of bridge joints

6. Appurtenant works

f. Construction of concrete lined drains
g. Installation of road signs
h. Painting of road marking
i. Installation of guardrails
j. Installation of fencing, including clearing the fenceline

1.1.2. Identification of alternatives

There are no alternatives for this project, since the work has to occur where the road is situated and must be done according to established standards. As such, the only alternative considered is the No-Go option.

1.1.3. Aspects of the project relevant to the heritage study

All aspects of the proposed development are relevant, since excavations for foundations and/or services may impact on archaeological and/or palaeontological remains, while all above-ground aspects create potential visual (contextual) impacts to the cultural landscape and any significant heritage sites that might be visually sensitive.

1.2. Terms of reference

ASHA Consulting was asked to:

1. Submit a NID.
2. Compile an HIA including the following:
   - Describe regional and local features of the receiving environment;
   - Conduct desktop research;
   - Conduct a field survey to search for and identify sensitive areas and sites of cultural significance, including the cultural landscape;
   - Map sensitive features and development constraints;
   - Determine significance and grading of identified resources;

- Assess the degree of and nature of significance;
- Assess the potential impacts on identified heritage resources within a report that complies with the requirements of both the NHRA and Appendix 6 of the NEMA EIA regulations;
- Subcontract a palaeontologist to deal with the palaeontological aspect;
- Identify relevant legislation and legal requirements;
- Provide recommendations on possible mitigation measures and management guidelines; and
- Provide a substantiated statement, based on the findings of the specialist assessment, regarding the acceptability, or not, of the proposed development, including whether it should receive authorisation.

A Notification of Intent to Develop (NID) was submitted to Heritage Western Cape (HWC). They responded with a request for an HIA as follows:

RESPONSE TO NOTIFICATION OF INTENT TO DEVELOP: HIA REQUIRED
In terms of Section 38(8) of the National Heritage Resources Act (Act 25 of 1999) and the Western Cape Provincial Gazette 6061, Notice 298 of 2003

NOTIFICATION OF INTENT TO DEVELOP: PROPOSED UPGRADE OF THE N12 RESERVE OVER MANY PROPERTIES, OUDTSHOORN, SUBMITTED IN TERMS OF SECTION 38(1) OF THE NATIONAL HERITAGE RESOURCES ACT (ACT 25 OF 1999)

The matter above has reference.

Heritage Western Cape is in receipt of your application for the above matter received. This matter was discussed at the Heritage Officers Meeting held on 22 May 2023.

You are hereby notified that, since there is reason to believe that the proposed upgrade of the N12 reserve over many properties, Oudtshoorn will impact on heritage resources, HWC requires that a Heritage Impact Assessment (HIA) that satisfies the provisions of Section 38(3) of the NHRA be submitted. Section 38(3) of the NHRA provides

(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.

(Our emphasis)
This HIA must in addition have specific reference to the following:

- Palaeontological impact assessment

The HIA must have an overall assessment of the impacts to heritage resources which are not limited to the specific studies referenced above.

The required HIA must have an integrated set of recommendations.

The comments of relevant registered conservation bodies; all Interested and Affected parties; and the relevant Municipality must be requested and included in the HIA where provided. Proof of these requests must be supplied.

1.3. Scope and purpose of the report

A HIA is a means of identifying any significant heritage resources before development begins so that these can be managed in such a way as to allow the development to proceed (if appropriate) without undue negative impacts to the fragile heritage of South Africa. This HIA report aims to fulfil the requirements of the heritage authorities such that a comment can be issued by them for consideration by the Western Cape Department of Environmental Affairs and Development Planning (DEA&DP) who will review the Basic Assessment (BA) and grant or refuse authorisation. The HIA report will outline any management and/or mitigation requirements that will need to be complied with from a heritage point of view and that should be included in the conditions of authorisation should this be granted.

1.4. The author

Dr Jayson Orton has an MA (UCT, 2004) and a D.Phil (Oxford, UK, 2013), both in archaeology, and has been conducting Heritage Impact Assessments and archaeological specialist studies in South Africa (primarily in the Western Cape and Northern Cape provinces) since 2004 (please see curriculum vitae included as Appendix 1). He has also conducted research on aspects of the Later Stone Age in these provinces and published widely on the topic. He is an accredited heritage practitioner with the Association of Professional Heritage Practitioners (APHP; Member #43) and also holds archaeological accreditation with the Association of Southern African Professional Archaeologists (ASAPA) CRM section (Member #233) as follows:

- Principal Investigator: Stone Age, Shell Middens & Grave Relocation; and
- Field Director: Colonial Period & Rock Art.

1.5. Declaration of independence

ASHA Consulting (Pty) Ltd and its consultants have no financial or other interest in the proposed development and will derive no benefits other than fair remuneration for consulting services provided.

2. LEGISLATIVE CONTEXT

2.1. National Heritage Resources Act (NHRA) No. 25 of 1999

The NHRA protects a variety of heritage resources as follows:

- Section 34: structures older than 60 years;
- Section 35: prehistoric and historical material (including ruins) more than 100 years old as well as military remains more than 75 years old, palaeontological material and meteorites;
- Section 36: graves and human remains older than 60 years and located outside of a formal cemetery administered by a local authority; and
- Section 37: public monuments and memorials.

Following Section 2, the definitions applicable to the above protections are as follows:

- Structures: “any building, works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith”;

- Palaeontological material: “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”;
- Archaeological material: a) “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”; b) “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”; c) “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 respectively in sections 3, 4 and 6 of the Maritime Zones Act, 1994 (Act No. 15 of 1994), 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”; and d) “features, structures and artefacts associated with military history which are older than 75 years and the sites on which they are found”;
- Grave: “means a place of interment and includes the contents, headstone or other marker of such a place and any other structure on or associated with such place”; and
- Public monuments and memorials: “all monuments and memorials a) “erected on land belonging to any branch of central, provincial or local government, or on land belonging to any organisation funded by or established in terms of the legislation of such a branch of government”; or b) “which were paid for by public subscription, government funds, or a public-spirited or military organisation, and are on land belonging to any private individual.”

Section 3(3) describes the types of cultural significance that a place or object might have in order to be considered part of the national estate. These are as follows:

a) its importance in the community, or pattern of South Africa’s history;
b) its possession of uncommon, rare or endangered aspects of South Africa’s natural or cultural heritage;
c) its potential to yield information that will contribute to an understanding of South Africa’s natural or cultural heritage;
d) its importance in demonstrating the principal characteristics of a particular class of South Africa’s natural or cultural places or objects;
e) its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;
f) its importance in demonstrating a high degree of creative or technical achievement at a particular period;
g) its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;
h) its strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa; and
i) sites of significance relating to the history of slavery in South Africa.

While landscapes with cultural significance do not have a dedicated Section in the NHRA, they are protected under the definition of the National Estate (Section 3). Section 3(2)(c) and (d) list “historical settlements and townscapes” and “landscapes and natural features of cultural

significance" as part of the National Estate. Furthermore, some of the points in Section 3(3) speak directly to cultural landscapes.

2.2. Approvals and permits

2.2.1. Assessment Phase

Section 38(8) of the NHRA states that if an impact assessment is required under any legislation other than the NHRA then it must include a heritage component that satisfies the requirements of S.38(3). Furthermore, the comments of the relevant heritage authority must be sought and considered by the consenting authority prior to the issuing of a decision. Under the National Environmental Management Act (No. 107 of 1998; NEMA), as amended, the project is subject to a BA. The present report provides the heritage component. HWC is required to provide comment on the proposed project in order to facilitate final decision making by the DEA&DP.

2.2.2. Construction Phase

If archaeological or palaeontological mitigation is required prior to construction, then the appointed archaeologist or palaeontologist would need to obtain a Workplan approval from HWC. This would be issued in their name. This is so that the heritage authority can ensure that the appointed practitioner has proposed an appropriate methodology that will result in the mitigation being undertaken properly.

2.3. Guidelines

HWC have issued minimum standards documents for HIAs and specialist studies. There is also a Western Cape Provincial guideline for heritage specialists working in an EIA context and which is generally useful. The reporting has been prepared in accordance with these guidelines. The relevant documents are as follows:

- Heritage Western Cape. 2016. Grading: purpose and management implications.
- Heritage Western Cape. 2019. Public consultation guidelines.
- Heritage Western Cape. 2021. Guide for Minimum Standards for Archaeology and Palaeontology reports submitted to Heritage Western Cape.
- Heritage Western Cape. 2021. Notification of Intent to Develop, Heritage Impact Assessment, (Pre-Application) Basic Assessment Reports, Scoping Reports and Environmental Impact Assessments, Guidelines for submission to Heritage Western Cape.
- Winter, S. & Baumann, N. 2005. Guideline for involving heritage specialists in EIA processes: Edition 1. CSIR Report No ENV-S-C 2005 053 E. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town.

2.4. Application timeline

The application to DEA&DP under NEMA is currently in the pre-application phase with submission of the final BAR planned for the beginning of October.

3. METHODS

3.1. Literature survey and information sources

A survey of available literature was carried out to assess the general heritage context into which the development would be set. The information sources used in this report are presented in Table 1 with relevant dates of each source referenced in the text as needed. Data were also collected via a field survey. The data quality is suitable for the purpose of informing this report.

Table 1: *Information sources used in this assessment.*

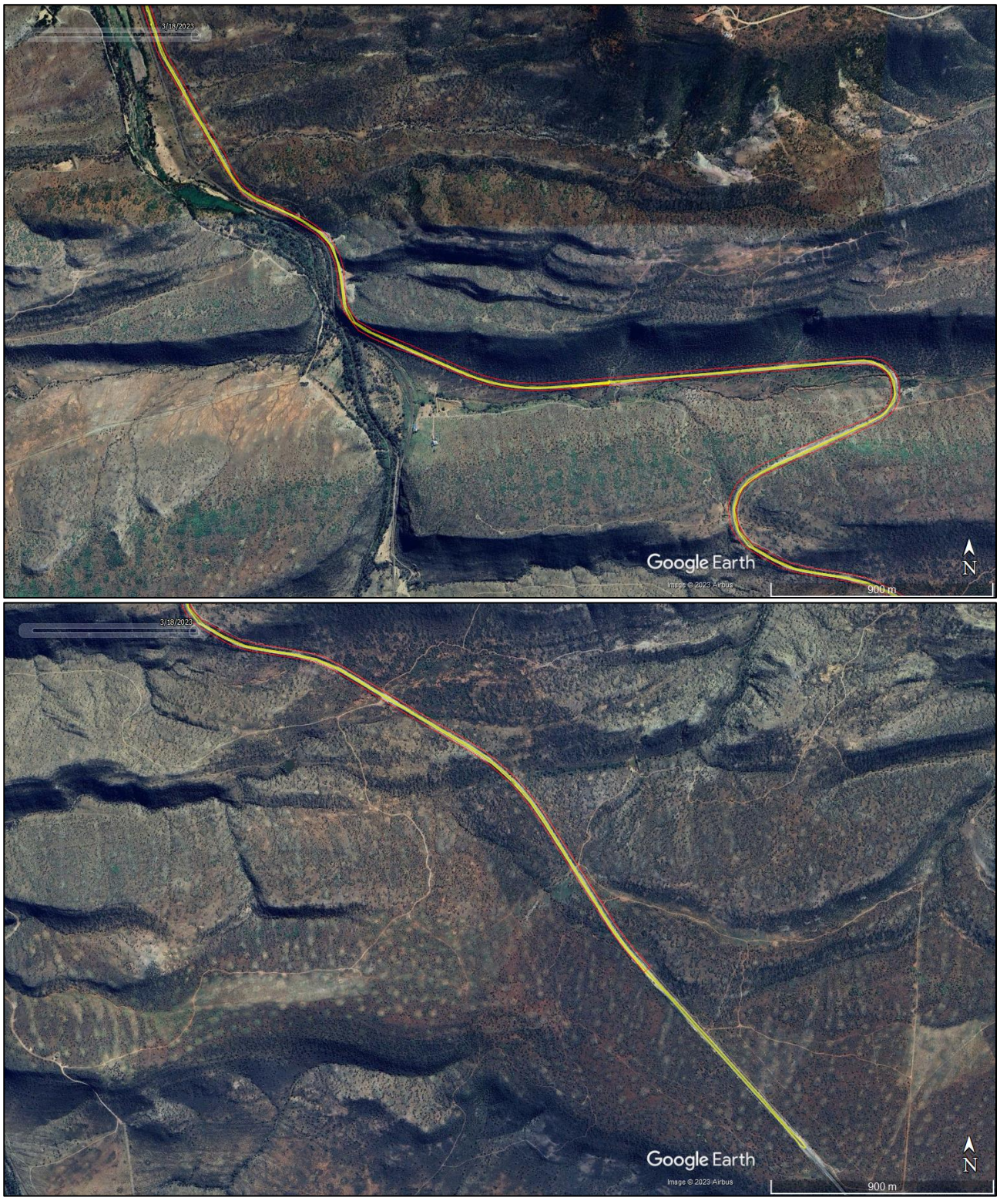
Data / Information	Source	Date	Type	Description
Maps	Chief Directorate: National Geo-Spatial Information	Various	Spatial	Historical and current 1:50 000 topographic maps of the study area and immediate surrounds
Aerial photographs	Chief Directorate: National Geo-Spatial Information	Various	Spatial	Historical aerial photography of the study area and immediate surrounds
Aerial photographs	Google Earth	Various	Spatial	Recent and historical aerial photography of the study area and immediate surrounds
Cadastral data	CapeFarmMapper (http://gis.elsenburg.com/apps/cfm/#)	Current	Spatial	Cadastral boundaries, extents and aerial photography
Cadastral data	Chief Directorate: National Geo-Spatial Information	Various	Survey diagrams	Historical and current survey diagrams, property survey and registration dates
Background data	South African Heritage Resources Information System (SAHRIS)	Various	Reports	Previous impact assessments for any developments in the vicinity of the study area
Palaeontological sensitivity	South African Heritage Resources Information System (SAHRIS)	Current	Spatial	Map showing palaeontological sensitivity and required actions based on the sensitivity.
Background data	Books, journals, websites	Various	Books, journals, websites	Historical and current literature describing the study area and any relevant aspects of cultural heritage.
Screening Tool maps	DFFE	Current	Spatial	Potential sensitivity of the study area

3.2. Field survey

The site was examined on 18th March 2023. Most of the inspection of the road and adjacent area was from the vehicle, but selected spots were examined on foot to record aspects of the project area. This was during early Autumn but, in this area, the season makes no meaningful difference to vegetation covering and hence the visibility of heritage resources. During the survey the positions of finds and survey tracks were recorded on a hand-held Garmin Global Positioning System (GPS) receiver set to the WGS84 datum (Figures 3 to 7). Photographs were taken at times in order to capture representative samples of both the affected heritage and the landscape setting of the proposed development.

It should be noted that the amount of time between the dates of the field inspection and final report do not materially affect the outcome of the report.

Figures 3 to 5: *Aerial view of the study area (red polygon) showing the survey tracks (yellow lines).*



Figures 6 & 7: *Aerial view of the study area (red polygon) showing the survey tracks (yellow lines).*

3.3. Specialist studies

A specialist palaeontological study was required by HWC. This has been compiled by Elize Butler and is submitted as an appendix to the HIA.

3.4. Impact assessment

For consistency among specialist studies, the impact assessment was conducted through application of a methodology supplied by Sharples Environmental Services.

3.5. Grading

S.7(1) of the NHRA provides for the grading of heritage resources into those of National (Grade I), Provincial (Grade II) and Local (Grade III) significance. Grading is intended to allow for the identification of the appropriate level of management for any given heritage resource. Grade I and II resources are intended to be managed by the national and provincial heritage resources authorities respectively, while Grade III resources would be managed by the relevant local planning authority. These bodies are responsible for grading, but anyone may make recommendations for grading.

It is intended under S.7(2) that the various provincial authorities formulate a system for the further detailed grading of heritage resources of local significance but this is generally yet to happen. Heritage Western Cape (2016), however, uses a system in which resources of local significance are divided into Grade IIIA, IIIB and IIIC. These approximately equate to high, medium and low local significance, while sites of very low or no significance (and generally not requiring mitigation or other interventions) are referred to as Not Conservation Worthy (NCW).

3.6. Consultation

The draft HIA was submitted to relevant interested and affected parties as required by HWC in their response to the NID application (Section 1.2). The was done via the main public participation process (PPP) required under NEMA as part of the BA.

3.7. Assumptions and limitations

The field study was carried out at the surface only and hence any completely buried archaeological sites would not be readily located. The road reserve was found to be generally quite disturbed due to the earlier construction of the road prism. It was thus assumed that archaeological materials would not be found and no detailed survey of the entire project footprint was undertaken.

Cumulative impacts are difficult to assess due to the variable site conditions that would have been experienced in different areas and in different seasons. Survey quality is thus likely to be variable. As such, some assumptions need to be made in terms of what and how much heritage might be impacted by other developments in the broader area.

4. PHYSICAL ENVIRONMENTAL CONTEXT

4.1. Site context

The study area is an existing road reserve with a surfaced road in it. It starts at the southern outskirts of Oudtshoorn and extends to some 12 km southeast of the edge of Oudtshoorn. The adjacent land is variably farmland and undeveloped mountainside with the latter dominating. A railway line runs adjacent to the road for part of the distance.

4.2. Site description

As noted above, the study area is an existing road reserve with a surfaced road. It includes bridges and culverts, steep road cuttings, gentler mountain slopes and flat areas. A gravel shoulder flanks the road in most areas. Vegetation is sparse in some parts of the road reserve and light to moderate density in others, tending to be denser further away from the road. Figures 8 to 22 illustrate the study area with the photographs progressing from north to south.

Figure 8: *Looking north near the southern edge of Oudtshoorn.*

Figure 9: *Looking north towards the N12 bridge over the Olifants River (arrowed). The bridge visible to the left carries the railway line.*

Figure 10: *Looking north towards Oudtshoorn with the old railway bridge and new road bridges visible. The older road bridge lies between the above two bridges and is not visible in this view.*

Figure 11: *View looking southbound.*

Figure 12: *View looking northbound.*

Figure 13: *View looking southbound showing a slightly unstable road cutting.*

Figure 14: *View looking northbound.*

Figure 15: *View northbound.*

Figure 16: *View southbound showing a tall road cutting stabilised with metal mesh.*

Figure 17: *View northbound.*

Figure 18: *View southbound.*

Figure 19: *Looking south across the large hairpin bend with the N12 visible on the opposite side of the valley.*

Figure 20: *View southbound.*

Figure 21: *View southbound at the southern end of the study area.*

Figure 22: *View northbound at the southern end of the study area.*

5. FINDINGS OF THE HERITAGE STUDY

This section describes the heritage resources recorded in the study area during the course of the project.

5.1. Palaeontology

The SAHRIS Palaeosensitivity Map shows that much of the site is of very high palaeontological sensitivity with the northern section being of moderate sensitivity (Figure 23). As such, a specialist palaeontological study was commissioned. Butler (2023) found significant fossils in several places within the existing road cuttings, many of which would need to be widened for this project. These fossils include various well-preserved bivalves, trace fossils and possible trilobites (Butler 2023).

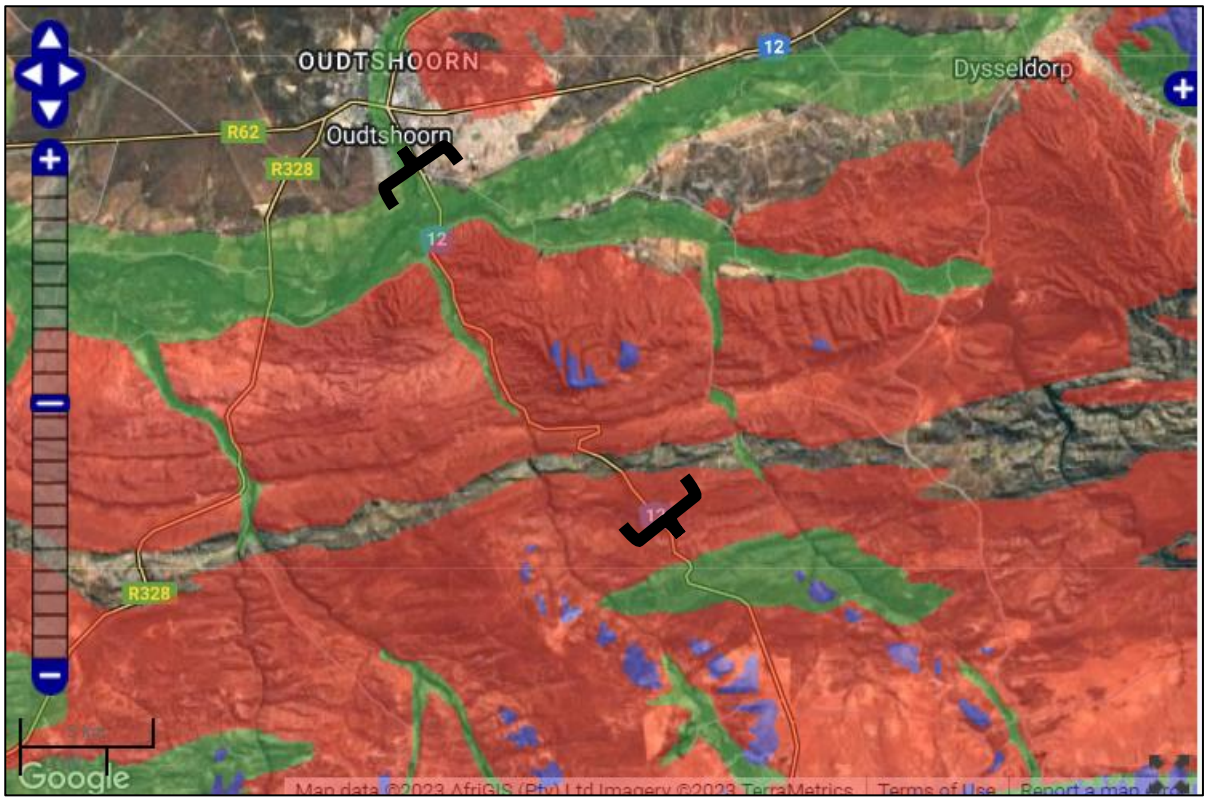


Figure 23: *Extract from the SAHRIS Palaeosensitivity Map showing the site (between black braces) to be of moderate (green shading) very high (red shading) sensitivity.*

5.2. Archaeology

5.2.1. Desktop study

The most significant archaeological work to have been carried out in the Oudtshoorn area is the excavations at Boomplaas Cave to the north of the town by Hilary Deacon and colleagues (H. Deacon 1979; H. Deacon *et al.* 1978; Klein 1978; Von den Driesch & Deacon 1985). There the researchers found convincing evidence for early pastoralism at the top of a deep sequence of archaeological deposits. The cave is in limestone and the cliffs there and at other nearby locations (personal observation) preserve rock art. Working further south along the Outeniqua Pass to the south of the current study area, Kaplan (1991) recorded several rock art sites (both geometric and fine-line traditions were present) and some sites had Later Stone Age (LSA) artefacts associated with them. He also located a small stone-walled structure and some scatters of artefacts, the latter generally in ploughed lands. Many other rock art sites have been recorded in the Klein Karoo region (Rust 2011).

Many cultural resource management reports in the general region of the Little Karoo have revealed the presence of Early (ESA) and Middle Stone Age (MSA) archaeological material that can be referred to as background scatter (Orton 2016). These include studies by Kaplan (2003, 2005, 2007) and Wiltshire and Hart (2011). Such material is usually of very limited archaeological research value due to its secondary context, but, a few kilometres west of the northern end of the study area, Kaplan (2007) recorded some areas with higher densities of artefacts (mostly MSA), some of which were deemed to be *in situ*, making them more significant.

Kaplan (2005) also located two clusters of historical graves in the veld not far from the edge of Oudtshoorn, while to the east Wiltshire and Hart (2011) recorded farm ruins of mud brick.

5.2.2. Site visit

No archaeological resources were seen along the road margins. It is expected that nothing more than very rare, isolated background scatter artefacts might occur along the road. Artefacts are more commonly found in valleys and flat areas than along mountain slopes. No rock shelters were seen close to the road in the vicinity of the study area.

5.3. Graves

No graves were seen and none are expected to occur anywhere close to the road.

5.4. Historical aspects and the Built environment

5.4.1. Desktop study

The historical period is richly represented in the Oudtshoorn area with many declared Provincial Heritage Sites. Fransen (2004, 2006) documents the early history of the town which can be summarised as follows:

- A small, informal settlement grew in the area alongside the Grobbelaar's River and was known until 1843 as Grobbelaarsrivier.
- In 1843 it was renamed Oudtshoorn by the magistrate of George after his wife who was a granddaughter of Governor van Oudtshoorn.
- Mossel Bay was established in 1845 and the Grobbelaar's River became the parish boundary between George and Mossel Bay. From then on, residents living west of the river were not allowed to attend the Buitekerk that had been established on the east side because they were now in different parishes.
- The town grid was formally laid out by surveyor J. Ford in 1847 following the course of the Grobbelaar's River and allowing for agricultural 'water erven' along the river.
- The town developed fairly slowly in the beginning but was given great impetus by the ostrich feather boom that commenced in the 1860s. This boom lasted until 1914 and this period resulted in many of Oudtshoorn's finest buildings being erected. They include many of the so-called 'ostrich feather palaces', most of which are Victorian in age and character.

Historical architecture abounds in the town, but most of the early thatched and plastered houses have not survived, with stone buildings from the late 19th and early 20th centuries now dominating.

The road section under consideration is not very old. The 1939 aerial photography shows that while the railway line was in existence, the road under study was not (Figure 24). An earlier road did run southwards from Oudtshoorn but, after some distance, it crossed to the west side of the valley and, later, turned westwards and southwards through the hills. A 1964 photograph shows the N12 road in place. The 1968 aerial photography also shows the N12 but the current bridge (which bears no date) over the Olifants River was not yet constructed. An older bridge (which is still present between the current N12 bridge and the railway bridge) was in use at that time. By 1979 the current bridge was in place, but it is evident that the guardrails have been raised since then. The N12 in the study area is thus between 59 and 84 years old.

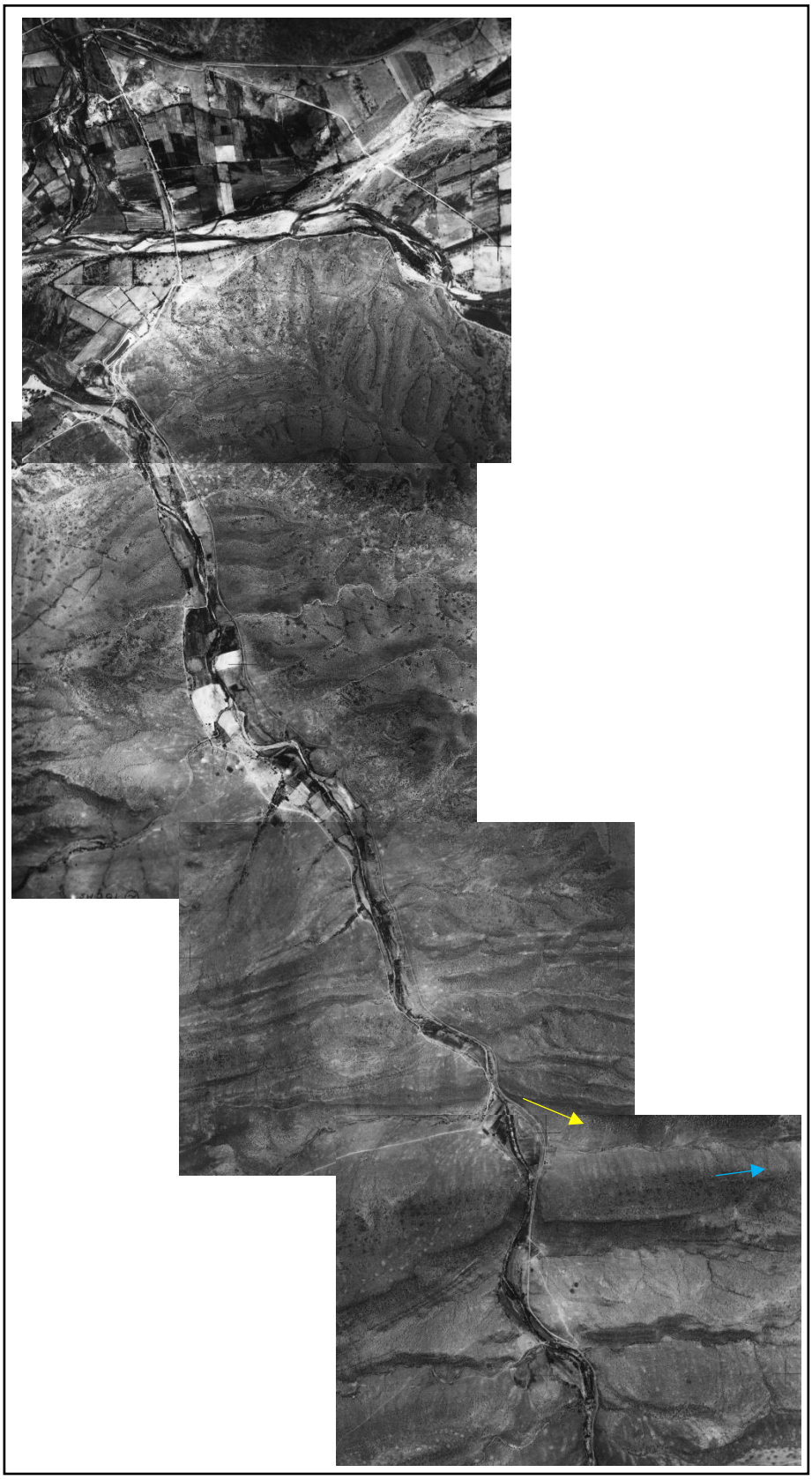


Figure 24: *Composite 1939 aerial photography showing the location of the study area. The yellow arrow indicates the area where the N12 leaves the river valley and the blue arrow the location of the hairpin bend. The N12 then proceeds southeast out of picture.*

5.4.2. Site visit

A number of features were recorded along the road. Many of them were purely for interest rather than heritage reasons, but they do assist with understanding the history of the study area. Figure 25 shows their locations and they are described below. They relate to the road, the railway line and to adjacent structures.

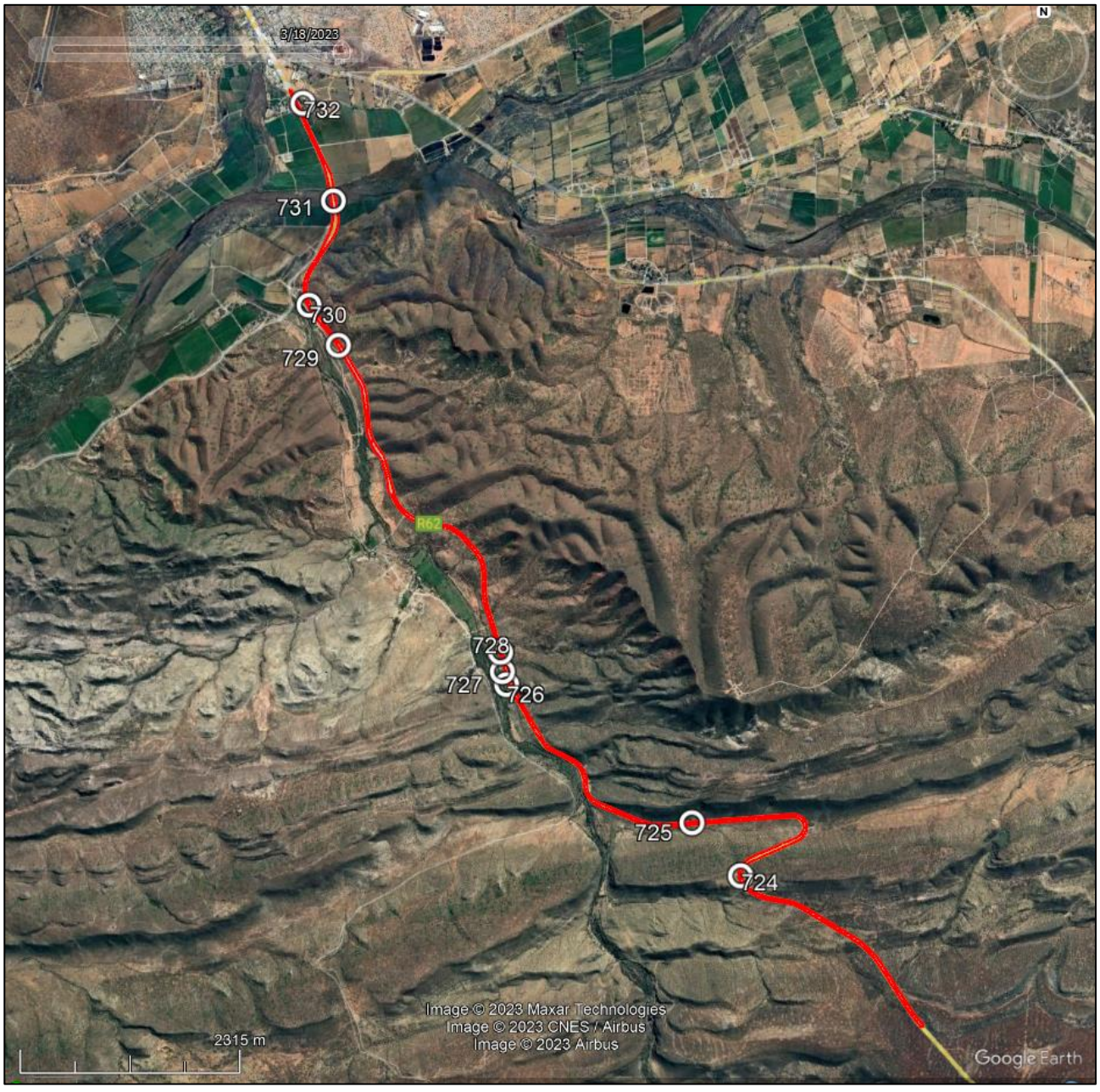


Figure 25: *Aerial view of the study area (red line) showing the locations of the features described below.*

Waypoint 724 (Figure 26): Modern road accident marker. S33° 41’ 21.9” E22° 16’ 04.4” This is not a heritage resource as it does not meet the definition of public monuments and memorials as provided in the NHRA (see Section 2.1 above).

Figure 26: *Road accident marker at waypoint 724.*

Waypoint 725 (Figures 27 & 28): Road culvert. S33° 41’ 04.2” E22° 15’ 44.5” It is made from modern shuttered concrete walls with slabs overlaid.

Figures 27 & 28: *Two views of the culvert at waypoint 725.*

Waypoint 726 (Figure 29): Ruined cottage. S33° 40’ 17.4” E22° 14’ 27.5” Its age is uncertain but it does not appear to be present on the 1939 aerial photography. As a ruin, this means it is not heritage. It is 60 m away from N12.

Figure 29: *Ruined cottage at waypoint 726.*

Waypoint 727 (Figure 30): House. S33° 40’ 12.1” E22° 14’ 26.0” Historical aerial photography shows that the house is older than 60 years. It lies 44 m from N12. Only its roof was visible from the road.

Figure 30: *1939 and modern aerial views of the cottage at waypoint 727.*

Waypoint 728 (Figures 31 & 32): Road culvert. S33° 40’ 06.4” E22° 14’ 25.6” Constructed from modern shuttered concrete walls with slabs overlaid.

Figures 31 & 32: *Two views of the culvert at waypoint 728.*

Waypoint 729 (Figures 33 & 34): Road culvert. S33° 38’ 19.9” E22° 13’ 18.0” Constructed from modern shuttered concrete walls with slabs overlaid.

Figures 33 & 34: *Two views of the culvert at waypoint 729.*

Waypoint 730 (Figure 35): Railway culvert. S33° 13’ 05.8” E22° 13’ 04.3” The railway line has been shown above to be older than the road. It predates 1939. This railway culvert shows modern concrete added to the tops of the walls with new ballast also visible. This indicates a relay of the railway line.

Figure 35: *Railway culvert at waypoint 730.*

Near Waypoint 730 (Figure 36): N12 road surface. The N12 road structure was recorded at this location. Multiple layers of tarmac are evident with the oldest making use of local Enon cobbles and rock fragments.

Figure 36: *Railway culvert at waypoint 730.*

Waypoint 731 (Figures 37 to 42): Road and railway bridges. S33° 27’ 28.4” E22° 13’ 14.3” There are four bridges here. The newest one is the concrete bridge supporting the current N12. It has had its guard rails extended in recent years. The older road alignment and bridge are visible just west of the N12 bridge. Both are iron bridges on concrete supports. The railway line crosses two bridges with the southern one being over a road.

Figure 37: *View along the modern N12 bridge.*

Figure 38: *The current N12 road bridge.*

Figure 39: *View between the old railway bridge (left) and modern N12 bridge (right) showing the older road (red arrow).*

Figure 40: *View from the N12 towards the old road bridge (now carrying a pipeline) and the railway bridge in the background.*

Figure 41: *1968 and modern aerial views showing that the current road bridge had not yet been constructed in1968. The side road coming from the east crosses the other road and passes beneath the railway line before turning south. This side road has been cut off by the modern N12.*

Figure 42: *1979 aerial view showing the modern bridge in place immediately east of the old one.*

Waypoints 732 and 733 (Figures 43 to 45): Houses. S33° 36’ 55.8” E22° 13’ 03.8” (732) and S33° 36’ 55.8” E22° 12’ 55.8” (733) Two houses older than 60 years were identified 65 m and 90 m from the N12 a short way from the southern edge of Oudtshoorn. From the little that was visible from the road, the former did not look highly significant, but the latter was set within a mature treescape and may well have once been an ostrich palace.

Figure 43: *1939 and modern aerial views showing the locations of two historical houses located 90 m (red circle) and 65 m (blue circle) from the N12.*

Figure 44: *The house located 65 m east of the N12.*

Figure 45: *The house located 90 m west of the N12.*

5.5. Cultural landscapes and scenic routes

Cultural landscapes are the product of the interactions between humans and nature in a particular area. Sauer (1925) defined them thus: “The cultural landscape is fashioned from a natural landscape by a cultural group. Culture is the agent, the natural area is the medium, the cultural landscape the result”.

The study area is an existing road set within a rural landscape. The landscape is a combination of agricultural lands and undeveloped mountainside. It is generally scenic but does not obviously possess any particularly special qualities. The N12 in this area is not listed by Winter and Oberholzer (2013) as an important scenic resource. Given that the nature of the study area will not change should the project proceed, the cultural landscape and scenic aspects also would not change.

5.6. Statement of significance and provisional grading

Section 38(3)(b) of the NHRA requires an assessment of the significance of all heritage resources. In terms of Section 2(vi), ‘‘cultural significance’’ means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance. The reasons that a place may have cultural significance are outlined in Section 3(3) of the NHRA (see Section 2 above).

No archaeological resources were identified.

The palaeontological resources are deemed to have medium cultural significance at the loval level for their scientific value and can be graded IIIB.

The built heritage resources (houses and the railway culverts) are deemed to have low to medium cultural significance at the local level for their architectural value. Most are either NCW or possibly IIIC, but the older railway and road bridges are considered at least IIIB and the likely ostrich palace at waypoint 732 could be graded IIIA.

The cultural landscape is largely a natural landscape with aesthetic value and is rated as having low cultural significance at the local level. It can be graded IIIC.

Figure 46 shows the locations of all the recorded features by grade (excluding palaeontology).

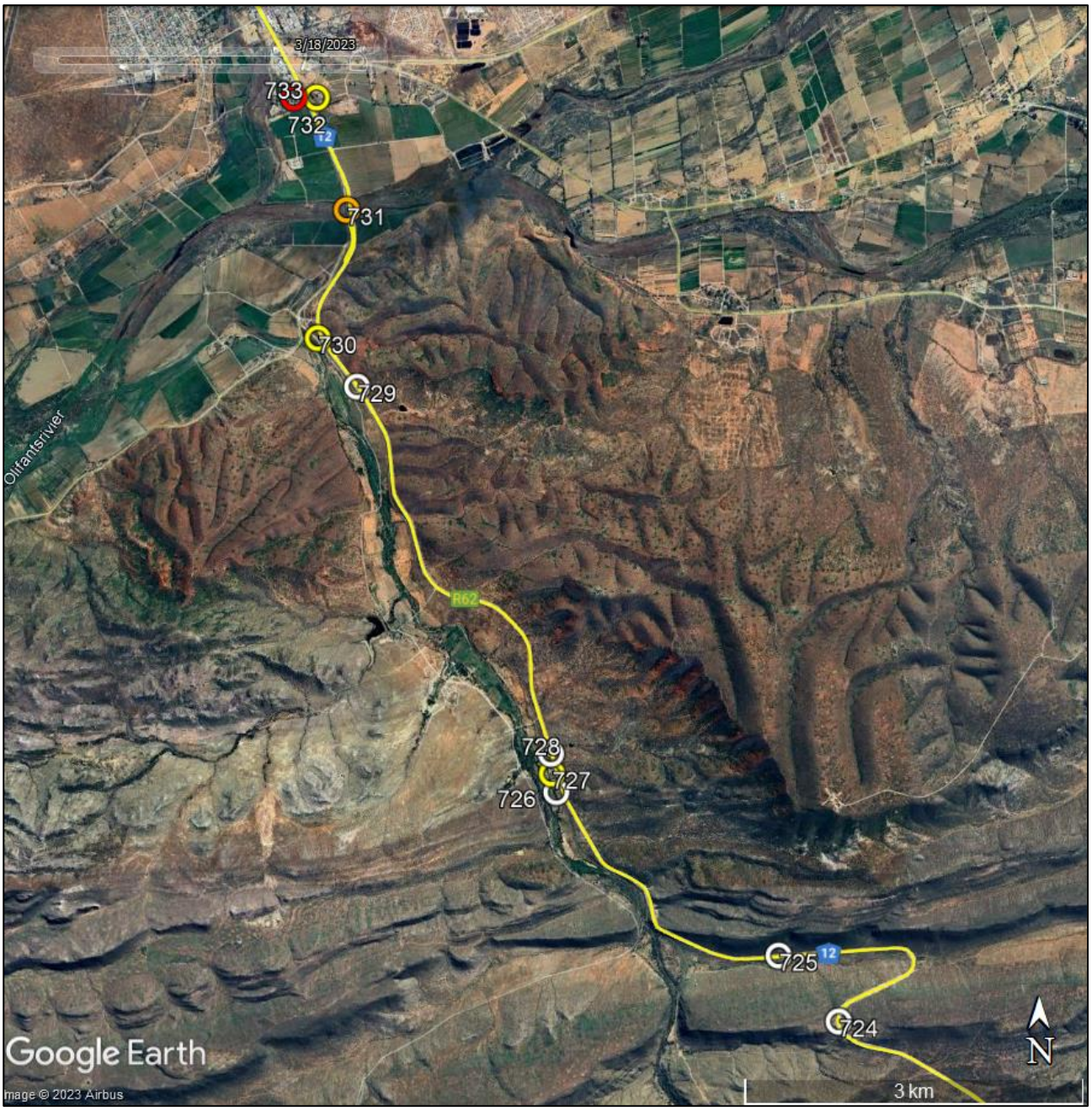


Figure 46: *Grade map of heritage resources (excluding palaeontology).*

6. ASSESSMENT OF IMPACTS

The impacts identified for this project are:

- *Construction phase:*
  - Impacts to palaeontology
  - Impacts to the cultural landscape

Operation phase impacts will not occur because the road would effectively revert to the status quo. Decommissioning will not happen. While palaeontological heritage is assessed in the separate specialist study, the cultural landscape impacts are considered here.

6.1. Construction Phase

6.1.1. Impacts to the cultural landscape

Direct impacts to the cultural landscape would occur during the construction phase when construction equipment arrives on site and work gets underway. The impact relates mainly to the scarring of the landscape that may arise as a result of the project. Although there will definitely be an impact if the project proceeds, the significance is likely to be **low negative** because of the localised nature of the impact and its temporary duration (Table 2). Mitigation measures all relate to minimising landscape scarring both during and after the construction period. These will reduce the impact significance but the rating remains **low negative**.

There are no fatal flaws in terms of construction phase impacts to the cultural landscape.

Table 2: *Assessment of construction phase cultural landscape impacts.*

Potential impact and risk:	**Cultural landscape impact:** The rural landscape may be negatively affected by the construction work.	
Nature of impact:	Negative	No-Go alternative: No impact expected (neutral).
Extent and duration of impact:	Local / temporary	
Consequence of impact or risk:	Alteration of the cultural landscape.	
Probability of occurrence:	Definite	
Degree to which the impact may cause irreplaceable loss of resources:	Marginal loss of resource	
Degree to which the impact can be reversed:	Mostly Reversible	
Indirect impacts:	None identified	
Cumulative impact prior to mitigation:	Low	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low	
Degree to which the impact can be avoided:	Medium	
Degree to which the impact can be managed:	Medium (Can be partially managed)	
Degree to which the impact can be mitigated:	Medium (Can be mitigated)	
Proposed mitigation:	• Clearance of natural vegetation must be minimised. • Cuts and fills and landscape scarring in general must be minimised. • All disturbed areas not needed during operation of the road must be rehabilitated.	
Residual impacts:	None	
Cumulative impact post mitigation:	Low	

Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	No-Go alternative: No impact expected (neutral).

6.2. Cumulative impacts

Cumulative impacts are not expected to be of any concern since no similar impacts would be visible from the vicinity of the study area.

6.3. Evaluation of impacts relative to sustainable social and economic benefits

Section 38(3)(d) of the NHRA requires an evaluation of the impacts on heritage resources relative to the sustainable social and economic benefits to be derived from the development.

The road is in need of rehabilitation to safely accommodate expected traffic volumes. The rehabilitated road will be appreciated by road users. The work would also provide some employment opportunities. Given the very minimal impacts to the landscape and easily mitigatable palaeontological impacts, the economic and social benefits outweigh the impacts.

6.4. Existing impacts to heritage resources

There are currently no obvious threats to heritage resources on the site.

6.5. The No-Go alternative

If the project were not implemented then the site would stay as it currently is (impact significance of **neutral**). Although the heritage impacts with implementation would be greater than the existing impacts, the loss of socio-economic benefits is more significant and suggests that the No-Go option is less desirable in heritage terms.

6.6. Levels of acceptable change

Any impact to an archaeological or palaeontological resource or a grave is deemed unacceptable until such time as the resource has been inspected and studied further if necessary. Impacts to the landscape are difficult to quantify but in general a development that visually dominates the landscape from many publicly accessible vantage points is undesirable. Because of the nature of the proposed development, such an impact to the landscape is not envisaged.

7. INPUT TO THE ENVIRONMENTAL MANAGEMENT PROGRAMME

The actions recorded in Table 3 should be included in the environmental management programme (EMPr) for the project.

Table 3: *Heritage considerations for inclusion in the EMPr.*

Impact	Mitigation / management objectives & outcomes	Mitigation / management actions	Monitoring		
			Methodology	**Frequency**	**Responsibility**
Impacts to palaeontology					
Destruction of fossils	Minimise loss of fossils	Planning Phase: Appoint a palaeontologist to carry out the necessary mitigation at least 6 months ahead of construction.	Appoint palaeontologist	Once off	Developer
			Ensure HWC approval in place	Once off	ECO
Destruction of fossils	Minimise loss of fossils	Construction Phase: Appoint a palaeontologist to carry out the necessary monitoring. Schedule to be decided with construction manager.	Appoint palaeontologist	Once off	Developer
Destruction of fossils	Minimise loss of fossils	Construction Phase: Report any fossils discovered during excavations. Implement Chance Finds Procedure (see palaeontological report appendix)	Monitoring of excavations	Ongoing basis	Construction Manager or Contractor and/or ECO
Impacts to the cultural landscape					
Visible landscape scarring	Minimise landscape scarring	Construction Phase: Ensure disturbance is kept to a minimum and does not exceed project requirements. Rehabilitate areas not needed during operation.	Monitoring of surface clearance relative to approved layout	Ongoing basis	Construction Manager or Contractor
				As required	ECO

8. CONSULTATION WITH HERITAGE CONSERVATION BODIES

As requested by HWC, this report was sent to the municipality and relevant heritage conservation bodies for a 30 day comment period.

9. CONCLUSIONS

The only significant concern for this project is palaeontology. Significant fossils were seen in a number of the existing road cuttings and these would be destroyed when these cuttings are enlarged. Avoidance of these areas is not feasible and mitigation will be required.

9.1. Reasoned opinion of the specialist

Given that (1) impacts to the cultural landscape will be minimal and can be easily managed and (2) impacts to fossils can be mitigated, it is the opinion of the heritage specialist that the project should be authorised in full.

10. RECOMMENDATIONS

It is recommended that the proposed N12 road rehabilitation be authorised, but subject to the following recommendations which should be included as conditions of authorisation:

- A palaeontologist must be appointed to rescue fossils in the existing road cuttings prior to the commencement of construction. The work must be carried out under a Workplan approved by HWC;
- Palaeontological monitoring must also take place during expansion of the road cuttings. A suitable schedule for inspections must be agreed upon between the palaeontologist and contractor;
- A palaeontological chance finds procedure must be in place and should be implemented if fossils are found in the absence of the palaeontologist;
- The total area disturbed must be minimised as far as possible and all areas not required during operation of the road must be rehabilitated; and
- If any archaeological material, fossils or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist or palaeontologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.

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APPENDIX 1 – Curriculum Vitae

Curriculum Vitae

Jayson David John Orton

ARCHAEOLOGIST AND HERITAGE CONSULTANT

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Cell Phone: 083 272 3225
Email: jayson@asha-consulting.co.za

Birth date and place: 22 June 1976, Cape Town, South Africa
Citizenship: South African
ID no: 760622 522 4085
Driver's License: Code 08
Marital Status: Married to Carol Orton
Languages spoken: English and Afrikaans

Education:

SA College High School	Matric	1994
University of Cape Town	B.A. (Archaeology, Environmental & Geographical Science)	1997
University of Cape Town	B.A. (Honours) (Archaeology)*	1998
University of Cape Town	M.A. (Archaeology)	2004
University of Oxford	D.Phil. (Archaeology)	2013

*Frank Schweitzer memorial book prize for an outstanding student and the degree in the First Class.

Employment History:

Spatial Archaeology Research Unit, UCT	Research assistant	Jan 1996 – Dec 1998
Department of Archaeology, UCT	Field archaeologist	Jan 1998 – Dec 1998
UCT Archaeology Contracts Office	Field archaeologist	Jan 1999 – May 2004
UCT Archaeology Contracts Office	Heritage & archaeological consultant	Jun 2004 – May 2012
School of Archaeology, University of Oxford	Undergraduate Tutor	Oct 2008 – Dec 2008
ACO Associates cc	Associate, Heritage & archaeological consultant	Jan 2011 – Dec 2013
ASHA Consulting (Pty) Ltd	Director, Heritage & archaeological consultant	Jan 2014 –

Professional Accreditation:

Association of Southern African Professional Archaeologists (ASAPA) membership number: 233
CRM Section member with the following accreditation:

- Principal Investigator: Coastal shell middens (awarded 2007)
  Stone Age archaeology (awarded 2007)
  Grave relocation (awarded 2014)
- Field Director: Rock art (awarded 2007)
  Colonial period archaeology (awarded 2007)

Association of Professional Heritage Practitioners (APHP) membership number: 43

- Accredited Professional Heritage Practitioner

➢ *Memberships and affiliations:*

South African Archaeological Society Council member	2004 – 2016
Assoc. Southern African Professional Archaeologists (ASAPA) member	2006 –
UCT Department of Archaeology Research Associate	2013 – 2017
Heritage Western Cape APM Committee member	2013 –
UNISA Department of Archaeology and Anthropology Research Fellow	2014 –
Fish Hoek Valley Historical Association	2014 –
Kalk Bay Historical Association	2016 –
Association of Professional Heritage Practitioners member	2016 –

Fieldwork and project experience:

Extensive fieldwork and experience as both Field Director and Principle Investigator throughout the Western and Northern Cape, and also in the western parts of the Free State and Eastern Cape as follows:

Feasibility studies:

- Heritage feasibility studies examining all aspects of heritage from the desktop

Phase 1 surveys and impact assessments:

- Project types
  - Notification of Intent to Develop applications (for Heritage Western Cape)
  - Desktop-based Letter of Exemption (for the South African Heritage Resources Agency)
  - Heritage Impact Assessments (largely in the Environmental Impact Assessment or Basic Assessment context under NEMA and Section 38(8) of the NHRA, but also self-standing assessments under Section 38(1) of the NHRA)
  - Archaeological specialist studies
  - Phase 1 archaeological test excavations in historical and prehistoric sites
  - Archaeological research projects
- Development types
  - Mining and borrow pits
  - Roads (new and upgrades)
  - Residential, commercial and industrial development
  - Dams and pipe lines
  - Power lines and substations
  - Renewable energy facilities (wind energy, solar energy and hydro-electric facilities)

Phase 2 mitigation and research excavations:

- ESA open sites
  - Duinefontein, Gouda, Namaqualand
- MSA rock shelters
  - Fish Hoek, Yzerfontein, Cederberg, Namaqualand
- MSA open sites
  - Swartland, Bushmanland, Namaqualand
- LSA rock shelters
  - Cederberg, Namaqualand, Bushmanland
- LSA open sites (inland)
  - Swartland, Franschhoek, Namaqualand, Bushmanland
- LSA coastal shell middens
  - Melkbosstrand, Yzerfontein, Saldanha Bay, Paternoster, Dwarskersbos, Infanta, Knysna, Namaqualand
- LSA burials
  - Melkbosstrand, Saldanha Bay, Namaqualand, Knysna
- Historical sites
  - Franschhoek (farmstead and well), Waterfront (fort, dump and well), Noordhoek (cottage), variety of small excavations in central Cape Town and surrounding suburbs
- Historic burial grounds
  - Green Point (Prestwich Street), V&A Waterfront (Marina Residential), Paarl

Awards:

Western Cape Government Cultural Affairs Awards 2015/2016: Best Heritage Project.

APPENDIX 2 – Palaeontological specialist study

BANZAI ENVIRONMENTAL

PALAEONTOLOGICAL IMPACT ASSESSMENT

PROPOSED UPGRADE OF THE N12 RESERVE NEAR OUDTSHOORN, IN THE WESTERN CAPE PROVINCE

Case number: HWC23050807SB0509

June 2023

COMPILED for ASHA Consulting

Declaration of Independence

I, Elize Butler, declare that –

General declaration:

- I act as the independent palaeontological specialist in this application
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favorable to the applicant
- I declare that there are no circumstances that may compromise my objectivity in performing such work.
- I have expertise in conducting palaeontological impact assessments, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity.
- I will comply with the Act, Regulations, and all other applicable legislation.
- I will take into account, to the extent possible, the matters listed in section 38 of the NHRA when preparing the application and any report relating to the application.
- I have no, and will not engage in, conflicting interests in the undertaking of the activity.
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority.
- I will ensure that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties and the public and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application.
- I will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favorable to the applicant or not
- All the particulars furnished by me in this form are true and correct.
- I will perform all other obligations as expected a palaeontological specialist in terms of the Act and the constitutions of my affiliated professional bodies; and
- I realize that a false declaration is an offense in terms of regulation 71 of the Regulations and is punishable in terms of section 24F of the NEMA.

Disclosure of Vested Interest

I do not have and will not have any vested interest (either business, financial, personal, or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Regulations.

PALAEONTOLOGICAL CONSULTANT: Banzai Environmental (Pty) Ltd

CONTACT PERSON: Elize Butler

Tel: +27 844478759

Email: info@banzai-group.com

SIGNATURE: 

This Palaeontological Impact Assessment report has been compiled considering the National Environmental Management Act 1998 (NEMA) and Environmental Impact Regulations 2014 as amended, requirements for specialist reports, Appendix 6, as indicated in the table below.

Table 1: Checklist for Specialist studies conformance with Appendix 6 of the EIA Regulations of 2014 (as amended)		
Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	**Relevant section in report**	**Comment where not applicable.**
1.(1) (a) (i) Details of the specialist who prepared the report	Page ii and Section 2 of Report – Contact details and company and Appendix A	-
(ii) The expertise of that person to compile a specialist report including a curriculum vita	Section 2 – refer to **Appendix A**	-
(b) A declaration that the person is independent in a form as may be specified by the competent authority	Page ii of the report	-
(c) An indication of the scope of, and the purpose for which, the report was prepared	Section 4 – Methods and TOR	-
(cA) An indication of the quality and age of base data used for the specialist report	Section 5 – Geological and Palaeontological history	-
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 9	-
(d) The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment	Section 1 and 10	
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used	Section 4 Approach and Methodology	-
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and	Section 1 and 10	

Table 1: Checklist for Specialist studies conformance with Appendix 6 of the EIA Regulations of 2014 (as amended)		
Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	**Relevant section in report**	**Comment where not applicable.**
infrastructure, inclusive of a site plan identifying site alternatives;		
(g) An identification of any areas to be avoided, including buffers	Section 5	No buffers or areas of sensitivity identified
(h) A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 5 – Geological and Palaeontological history	
(i) A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 4.1 – Assumptions and Limitation	-
(j) A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment	Section 1 and 10	
(k) Any mitigation measures for inclusion in the EMPr	Section 1 and 10	
(l) Any conditions for inclusion in the environmental authorisation	Section 1 and 10	
(m) Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 1 and 10	
(n)(i) A reasoned opinion as to whether the proposed activity, activities or portions thereof should be authorised and	Section 1 and 10	
(n)(iA) A reasoned opinion regarding the acceptability of the proposed activity or activities; and		
(n)(ii) If the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	Section 1 and 10	-

Table 1: Checklist for Specialist studies conformance with Appendix 6 of the EIA Regulations of 2014 (as amended)		
Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	**Relevant section in report**	**Comment where not applicable.**
(o) A description of any consultation process that was undertaken during the course of carrying out the study	N/A	Not applicable. A public consultation process will be conducted as part of the EIA and EMPr process.
(p) A summary and copies if any comments that were received during any consultation process	N/A	
(q) Any other information requested by the competent authority.	N/A	Not applicable.
(2) Where a government notice by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	Section 3 compliance with SAHRA guidelines	

EXECUTIVE SUMMARY

Banzai Environmental was appointed by ASHA CONSULTING to conduct the Palaeontological Impact Assessment (PIA) to assess the proposed Upgrade of the N12 Reserve over many properties, near Oudtshoorn in the Western Cape Province. Under the National Environmental Management Act 107 of 1998 (NEMA) and to comply with the National Heritage Resources Act (No 25 of 1999, section 38) (NHRA), this PIA is necessary to confirm if fossil material could potentially be present in the approved development area and to evaluate the potential impact of the proposed changes to the development on the Palaeontological Heritage.

The N12 road upgrade is underlain by Tertiary to Quaternary alluvium, Tertiary to Cretaceous Enon Formation; as well as the Bokkeveld Group (Cape Supergroup). The Bokkeveld Group is represented by the Traka and Ceres Subgroups. The Ceres Subgroup is represented by the Boplaas, Tra-Tra, Hex River, Swartkrans and Gamka Formations. The PalaeoMap of the South African Heritage Resources Information System (SAHRIS) indicates that the Palaeontological Sensitivity of the alluvium and Enon Formation is Moderate, the Traka Subgroup has a Very High Palaeontological Sensitivity while that of the Ceres Subgroup is also Very high with the exception of the Swartkrans that has an unknown Palaeontological Sensitivity in this area (Almond and Pether, 2009; Almond *et al*., 2013, Groenewald et al 2014). Updated Geology (Council of Geosciences, Pretoria) indicates that the proposed development is underlain by alluvium, colluvium, eluvium and gravel, and the Enon Formation as well as the Traka and Ceres Subgroups (Bokkeveld Group). The DFFE Screening Tool also indicates that the development is underlain by sediments with a Very High and Moderate Palaeontological Sensitivity.
A site-specific field survey of the development footprint was conducted on foot on the weekend of 1 April 2023. Various well-preserved bivalve, trace fossils as well as possible trilobites have been identified. A High Palaeontological Significance has thus been allocated to the proposed development.

Mitigation, in the form of fossils excavation as well as a realistic monitoring programme for the Palaeontological Sensitive areas of the road upgrade, by a professional Palaeontologist is thus recommended. This palaeontologist will need an HWC-approved Workplan for collection of fossils and must conform to international best practice for palaeontological fieldwork and the study (*e.g.,* data collecting, collecting of fossil as well as report writing) should meet the minimum standards for Phase 2 palaeontological studies suggested by HWC (2021). Fossil material should be housed in an accredited collection (museum or university). A Chance Finds Procedure must be included in the project EMPr so that any fossils found in the absence of the palaeontologist may be correctly recorded and rescued. These recommendations must be incorporated into the Environmental Management Plan for the N12 road upgrade.

The N12 road upgrade may be permitted after mitigation measures have been implemented.

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1 INTRODUCTION

Asha Consulting was Commissioned by Sharples Environmental Services cc (SEScc) to conduct the Heritage Impact Assessment (HIA) for the proposed upgrade of the N12 Road Reserve over many properties, near Oudtshoorn, in the Western Cape Province. Banzai Environmental was in turn appointed to conduct the Palaeontological Impact Assessment (PIA) for the report.

The following information was provided by Asha Consulting.

Project description

- The establishment on site of the Contractor's campsite and offices for the Engineer and his site staff
- The supply of plant, labour, tools, equipment and materials necessary to complete the work
- Setting out the works
- Accommodation of traffic

Road works

- Rehabilitation of the existing road cross-section to include surfaced shoulders. The exact cross-section is still to be agreed with the Client, but will require widening of the existing road prism at selected locations. The road rehabilitation will require:
    - Widening of existing cut and fill slopes,
    - In-situ reconstruction of the existing pavement layers as the upper elected layer,
    - Construction of new subbase and base layers, and
    - Construction of a new surfacing seal
- Construction of auxiliary (passing and climbing) lanes at selected locations
- Rehabilitation of selected accesses to main or minor farm access standards as applicable
- Extension of existing minor culverts
- Maintenance of existing minor culvert inlet and outlet structures

Structures

- Widening or raising head and wing walls at major culverts if required due to cross-section rehabilitation or introduction of auxiliary lanes
- Maintenance to major culverts including:
    - Concrete crack repair
    - Scour repair
- Maintenance to B4691 over the Olifants River including:
    - Repair of honeycombing in concrete
    - Replacement of bridge joints

Appurtenant works

- Construction of concrete lined drains
- Installation of road signs
- Painting of road marking
- Installation of guardrails
- Installation of fencing, including clearing the fence line

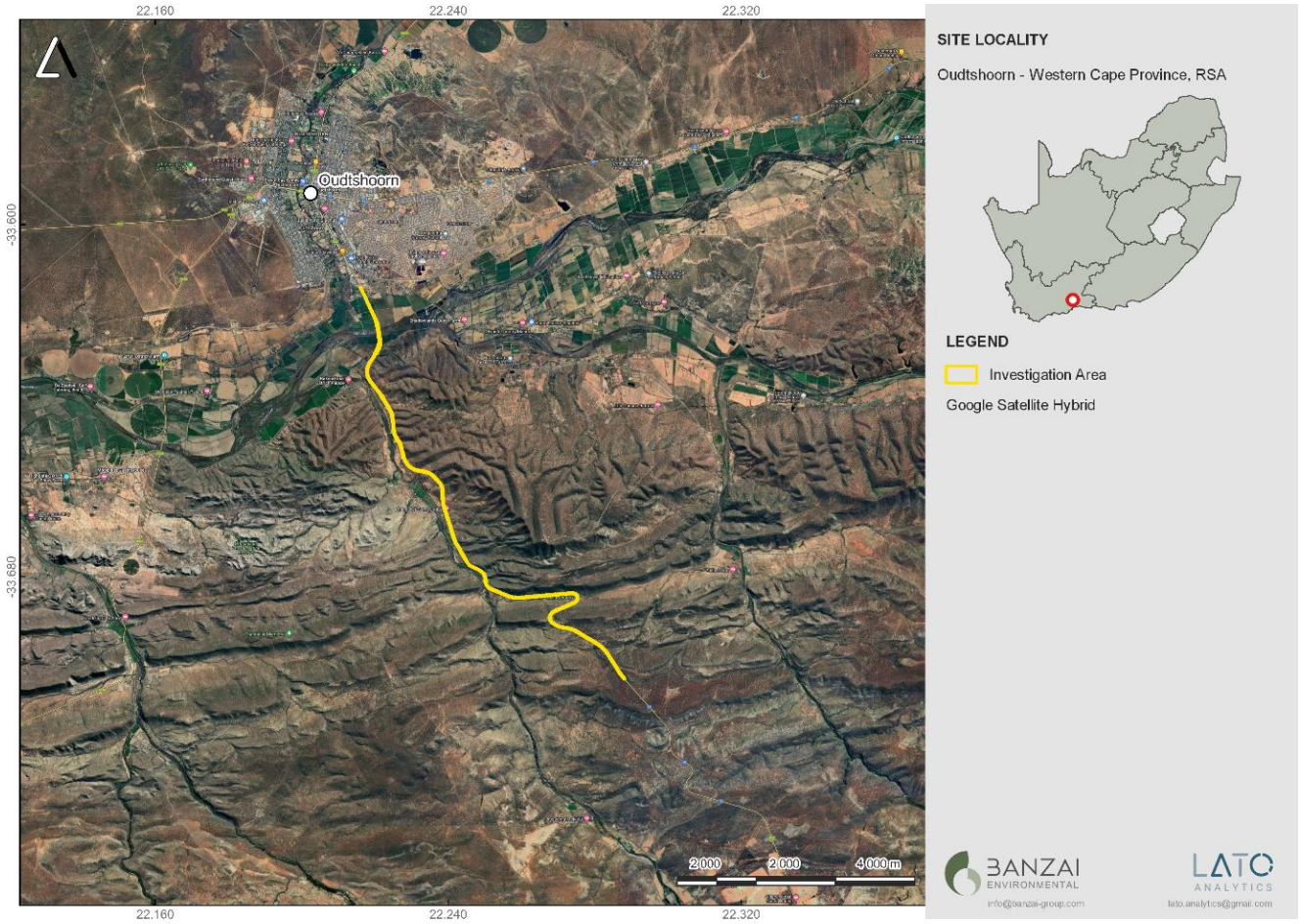


***Figure 1**: Location of the proposed N12 road reserve upgrade near Oudtshoorn, Western Cape Province.*

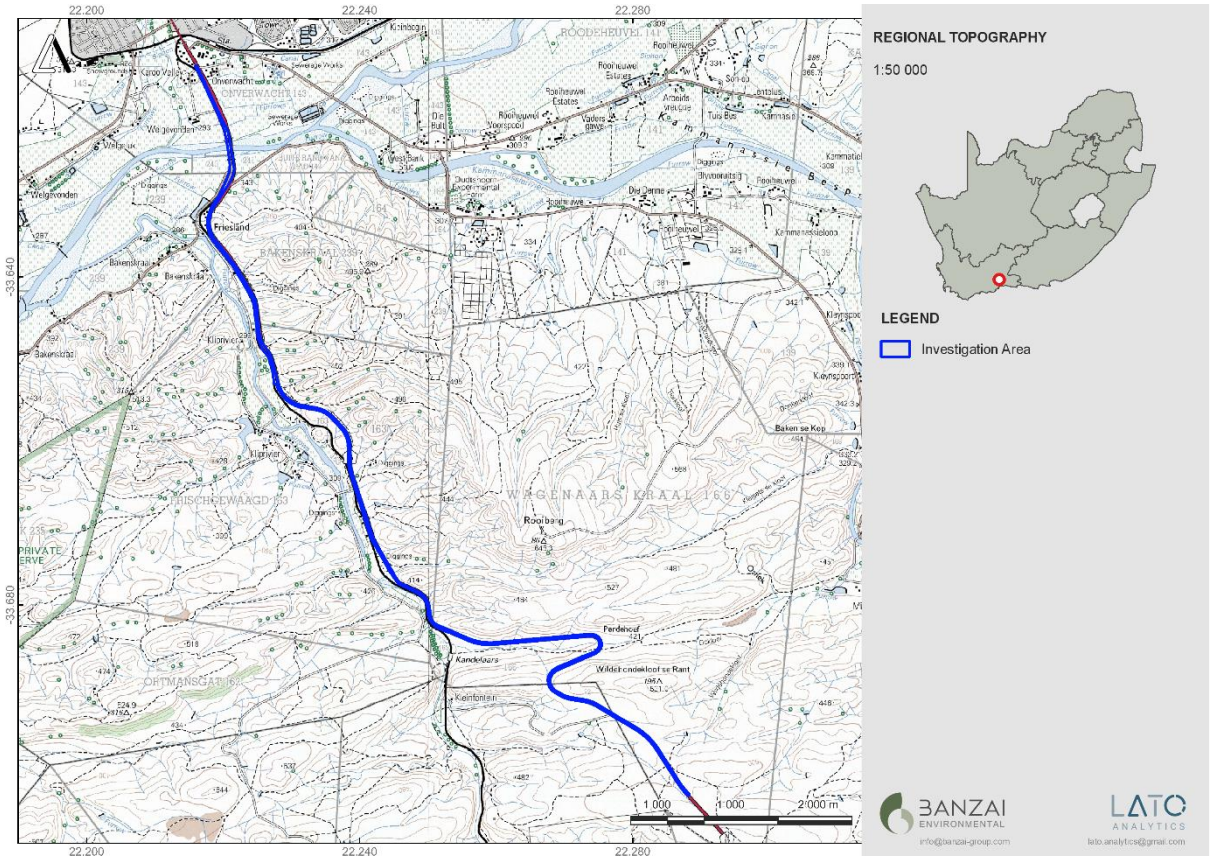


Figure 2: *Regional topography of proposed N12 road reserve upgrade near Oudtshoorn, Western Cape Province.*

2 QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

This present study has been conducted by Mrs Elize Butler. She has conducted approximately 500 palaeontological impact assessments for developments in the Free State, KwaZulu-Natal, Eastern, Central, and Northern Cape, Northwest, Gauteng, Limpopo, and Mpumalanga. She has an MSc (*cum laude*) in Zoology (specializing in Palaeontology) from the University of the Free State, South Africa and has been working in Palaeontology for more than twenty-five years. She has experience in locating, collecting, and curating fossils. She has been a member of the Palaeontological Society of South Africa (PSSA) since 2006 and has been conducting PIAs since 2014.

3 LEGISLATION

3.1 National Heritage Resources Act (25 of 1999)

Cultural Heritage in South Africa, includes all heritage resources, is protected by the National Heritage Resources Act (Act 25 of 1999) (NHRA). Heritage resources as defined in Section 3 of the Act include "all

objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens".

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

- National Environmental Management Act (NEMA) Act 107 of 1998
- National Heritage Resources Act (NHRA) Act 25 of 1999
- Minerals and Petroleum Resources Development Act (MPRDA) Act 28 of 2002
- Notice 648 of the Government Gazette 45421- general requirements for undertaking an initial site sensitivity verification where no specific assessment protocol has been identified.

The next section in each Act is directly applicable to the identification, assessment, and evaluation of cultural heritage resources.

GNR 982 (Government Gazette 38282, 14 December 2014) promulgated under the National Environmental Management Act (NEMA) Act 107 of 1998

- Basic Assessment Report (BAR) – Regulations 19 and 23
- Environmental Impacts Assessment (EIA) – Regulation 23
- Environmental Scoping Report (ESR) – Regulation 21
- Environmental Management Programme (EMPr) – Regulations 19 and 23

National Heritage Resources Act (NHRA) Act 25 of 1999

- Protection of Heritage Resources – Sections 34 to 36
- Heritage Resources Management – Section 38

MPRDA Regulations of 2014

Environmental reports to be compiled for application of mining right – Regulation 48

- Contents of scoping report – Regulation 49
- Contents of environmental impact assessment report – Regulation 50
- Environmental management programme – Regulation 51
- Environmental management plan – Regulation 52

The NEMA (No 107 of 1998) states that an integrated EMP should (23:2 (b)) "*…identify, predict, and evaluate the actual and potential impact on the environment, socio-economic conditions, and cultural heritage*".

In agreement with legislative requirements, EIA rating standards as well as SAHRA policies the following comprehensive and legally compatible PIA report have been compiled.

Palaeontological heritage is exceptional and non-renewable and is protected by the NHRA. Palaeontological resources and may not be unearthed, broken moved, or destroyed by any development without prior assessment and without a permit from the relevant heritage resources authority as per section 35 of the NHRA.

This Palaeontological Impact assessment forms part of the Heritage Impact Assessment (HIA) and adhere to the conditions of the Act. According to Section 38 (1), an HIA is required to assess any potential impacts to palaeontological heritage within the development footprint where:

- the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length.
- the construction of a bridge or similar structure exceeding 50 m in length.
- any development or other activity which will change the character of a site—
- (Exceeding 5 000 m^2 in extent; or
- involving three or more existing erven or subdivisions thereof; or
- involving three or more erven or divisions thereof which have been consolidated within the past five years; or
- the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority
- the re-zoning of a site exceeding 10 000 m² in extent.
- or any other category of development provided for in regulations by SAHRA or a Provincial heritage resources authority.

4 METHODS AND TERMS OF REFERENCE

This study forms part of the Heritage Impact Assessment Report. According to the "SAHRA APM Guidelines: Minimum Standards for the Archaeological and Palaeontological Components of Impact Assessment Reports" the purpose of the PIA is: 1) to identify the palaeontological importance of the rock formations in the footprint; 2) to evaluate the palaeontological magnitude of the formations; 3) to clarify the impact on fossil heritage; and 4) to suggest how the developer might protect and lessen possible damage to fossil heritage.

The palaeontological status of each rock section is calculated as well as the possible impact of the development on fossil heritage by a) the palaeontological importance of the rocks, b) the type of development and c) the quantity of bedrock removed.

All possible information is consulted to compile a scoping report, and this includes the following: Provisional DFFE Screening Tool, SAHRIS Palaeosensitivity map, all Palaeontological Impact Assessment reports in the same area; aerial photos and Google Earth images, topographical and

geological maps as well as scientific articles of specimens from the development area and Assemblage Zones.

When the development footprint has a moderate to high palaeontological sensitivity a field-based assessment is necessary. The desktop and the field survey of the exposed rock determine the impact significance of the planned development and recommendations for further studies or mitigation are made. Destructive impacts on palaeontological heritage usually only occur during the construction phase while the excavations will change the current topography and destruct or permanently seal-in fossils at or below the ground surface. Fossil Heritage will then no longer be accessible for scientific research.

During a site investigation the palaeontologist does not only survey the development but also tries to determine the density and diversity of fossils in the development area. This is confirmed by examining representative exposures of fossiliferous rocks (sedimentary rocks contain fossil heritage whereas igneous and metamorphic rocks are mostly unfossiliferous). Rock exposures that are investigated usually contains a large portion of the stratigraphic unit, can be accessed easily and comprise of unweathered (fresh) exposed rock. These exposures may be natural (rocky outcrops in stream or river banks, cliffs, dongas) but could also be artificial (quarries, open building excavations and even railway and road cuttings). It is common practice for palaeontologist to log well-preserved fossils (GPS, and stratigraphic data) during field assessment studies.

Mitigation usually precedes construction or may occur during construction when potentially fossiliferous bedrock is exposed. Mitigation comprises the collection and recording of fossils. Preceding excavation of any fossils, a permit from SAHRA must be obtained and the material will have to be housed in a permitted institution. When mitigation is applied correctly, a positive impact is possible as knowledge of local palaeontological heritage may be increased.

The fossil potential of the N12 road upgrade was determined by criss-crossing the development footprint and by physically investigating the bedrock outcrops to determine the lithology and fossil content of the outcrops. Selected potentially fossiliferous sites (e.g., along drainage lines, hillslopes and erosion gullies) were specifically investigated as this region of the Great Karoo has a limited bedrock exposure. Representative investigations of crevasse splay and channel sandstones as well as Cenozoic alluvial deposits were also conducted. Fossils occurring at the surface is very unpredictable and as the area is very large and a representative sample size of the area has been investigated. The outcome of a site investigation is limited due to the time and cost of a detailed investigation. Fossil sites are usually discovered by chance and a representative subsample is all that can be hoped for. However, it is important to note that the absence of fossils in a development footprint does not necessarily mean that palaeontological significant material is not present on site (on or beneath ground surface).

4.1 Assumptions and Limitations

The focal point of geological maps is the geology of the area and the sheet explanations of the Geological Maps were not meant to focus on palaeontological heritage. Many inaccessible regions of South Africa have never been reviewed by palaeontologists and data is generally based on aerial photographs alone. Locality and geological information of museums and universities databases have not been kept up to date or data collected in the past have not always been accurately documented.

Areas with similar Assemblage Zones in other areas is also used to provide information on the existence of fossils in an area which has not documented in the past. When using similar Assemblage Zones and geological formations for Desktop studies it is generally assumed that exposed fossil heritage is present within the footprint. A field-assessment was conducted to improve the accuracy of the desktop assessment.

Access to the relevant farms was freely available and it was possible to investigate all areas deemed necessary for the satisfactory completion of the study.

General Requirements of a PIA:

- Adherence to the content requirements for specialist reports in accordance with Appendix 6 of the EIA Regulations 2014, as amended.
- Adherence to all applicable best practice recommendations, appropriate legislation, and authority requirements.
- Submit a comprehensive overview of all appropriate legislation, guidelines.
- Description of the proposed project and provide information regarding the developer and consultant who commissioned the study.
- Description and location of the proposed development and provide geological and topographical maps.
- Provide Palaeontological and geological history of the affected area.
- Identification sensitive areas to be avoided (providing shapefiles/kml's) in the proposed development.
- Evaluation of the significance of the planned development during the Pre-construction, Construction, Operation, Decommissioning Phases and Cumulative impacts. Potential impacts should be rated in terms of the direct, indirect, and cumulative:
    a. Direct impacts are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity.
    b. Indirect impacts of an activity are indirect or induced changes that may occur as a result of the activity.

c. Cumulative impacts result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present, or reasonably foreseeable future activities.

- Fair assessment of alternatives (infrastructure alternatives have been provided):
- Recommend mitigation measures to minimise the impact of the proposed development; and
- Implications of specialist findings for the proposed development (such as permits, licenses etc).

5 GEOLOGICAL AND PALAEONTOLOGICAL HISTORY

The geology of the N12 Road upgrade is depicted on the 1:250 000 Oudtshoorn 3322 (1979) Geological map (Council of Geoscience, Pretoria) and is underlain by Tertiary to Quaternary alluvium (yellow single bird figure), Tertiary to Cretaceous Enon Formation (Ke, re; Uitenhage Group) as well as the Bokkeveld Group (Cape Supergroup). The Bokkeveld Group is represented by the Traka and Ceres Subgroups. The Ceres Subgroup is represented by the Boplaas (Db), Tra-Tra (Dt), Hex River (Dh), Swartkrans (Ds) and Gamka (Dgs) Formations (Figure 3, Table 2). Updated (Council of Geosciences, Pretoria) indicates that the proposed development is underlain by alluvium, colluvium, eluvium and gravel, and the Enon Formation as well as the Traka and Ceres Subgroups (Bokkeveld Group) (Figure 4).The PalaeoMap of the South African Heritage Resources Information System (SAHRIS) indicates that the Palaeontological Sensitivity of the alluvium and Enon Formation is Moderate (green), the Traka Subgroup has a Very High (red) Palaeontological Sensitivity while that of the Ceres Subgroup is also Very high with the exception of the Swartkrans (Ds) that has an unknown (white) Palaeontological Sensitivity in this area (Figure 5) (Almond and Pether, 2009; Almond *et al*., 2013, Groenewald et al 2014). The DFFE Screening Tool also indicates that the development is underlain by sediments with a Very High and Moderate Palaeontological Sensitivity (Figure 6).

The Uitenhage group comprises of three formations of which the Enon Formation is the lowermost. At the Enon type locality (east of Kirkwood) the Enon Formation is 400m thick but thins to 150m in the Gamtoos Basin. Dingle et al (1983) describes a thickness of up to 2000m in boreholes. This formation is absent over large areas of the basin floor. A few disarticulated bone fragments as well as charred fossil wood fragments has thus far been identified form this formation.

The Cape Supergroup represents about 170 million years of earth history (Early Ordovician (~500 Ma) to the Early Carboniferous (~330 Ma) (Thamm and Johnson, 2006). Deposition of the Cape Supergroup began when the Gondwana supercontinent assembled through continental drift. The "pre-Cape' granites and shales eroded and weathered to form a gently rolling landscape. In time, a rift margin developed and subsided to form the depositional basin where the sediments of the Cape Supergroup accumulated (southern tip of South Africa). The sediments of the Cape Supergroup were deposited along the northern edge of the semi-enclosed Agulhas Sea. The latter opened due to early rifting between Africa, South America, and Antarctica. About 250 Ma the Agulhas Sea was compressed from the south and was

crushed upwards to form the Cape Fold Belt, while the Karoo Basin was formed in the north with the subsequent sagging of the earth crust. The Cape Supergroup forms the southern mountain ranges of the Western and Eastern Provinces.

The Early to Middle Palaeozoic sedimentary rocks of the Cape Supergroup is divided into three Groups namely (from the youngest at the top to the oldest at the bottom) Witteberg, Bokkeveld, and the Table Mountain Group. The Bokkeveld Group is a mudrock-dominated fossiliferous succession of 1.5 to 3.5km thick, deposited in coastal to shallow marine settings during the Early to Middle Devonian Period (400 to 375 million years ago). Sediments were deposited on the continental shelf that at that time lay towards the southern margin of the Gondwana supercontinent. Tectonic deformation is high in this area due to the NNE-directed crustal compression.

The Bokkeveld Group overlies the Table Mountain Group and comprise of fossiliferous sandstone and shale units. This Group consists of coarsening-upward cycles assigned to repeated progradation of wave-dominated deltas (mostly southward or westward) (Theron, 1972). The Bokkeveld group has a maximum thickness of 2200m to 3500m in the western and eastern portions of the basin while it thins northwards. The thickness of the Bokkeveld Group varies between 1.5 to 3.5km and is a fossiliferous sedimentary rocks succession that was deposited in a coastal to shallow marine setting. Sediments were deposited about 400 to 375 million years ago (during the Early to Middle Devonian). Sediments accumulated on the continental shelf of the Cape Basin on the southern edge of the Gondwana supercontinent at moderately high palaeolatitudes (c. 70°S).

The Ceres Subgroup has a High Palaeontological Sensitivity (especially in the less deformed Western Cape) and has a rich fossil assemblage of shallow marine invertebrates of the Malvinokaffric Realm (Cooper 1982, Oosthuizen 1984, Hiller & Theron 1988, Theron & Johnson 1991, MacRae 1999, Almond in De Beer et. al. 2002, Thamm & Johnson 2006, Almond 2008).

Fossil groups include brachiopods, trilobites, various molluscs subgroups (bivalves, gastropods, nautiloids), and echinoderms (like brittle stars, crinoids, carpoids and starfish). Examples of minor taxa include corals, conulariids, tentaculitids and fish. Fine-grained, mudrock-dominated deposits of the Gydo (Dg) and Voorstehoek Formations contain shelly fossil assemblages that is mostly preserved as moulds. Well-preserved and diverse assemblages of marine trace fossils (tracks and burrows) occur in mud and sandstone facies of the more proximal northern, outcrop area of the Bokkeveld Group (Swart 1950, Theron 1972, Oosthuizen 1984, Almond 1998a, 1998b, De Beer et al. 2002, Almond 2008).

Fresh outcrops in the Ceres Subgroup are scarce due to vegetation cover, post Gondwana weathering as well as a mantle of scree and soil. This series is characterized by sandstones that has a maximum thickness of about 50-100m and is sometimes mapped as separate formations. This Subgroup is subdivided in six laterally continuing formations that is in turn dominated by sandstones and mudrocks.

Bokkeveld Group comprise of rich fossil assemblages of marine invertebrates. The foremost invertebrate taxa in the Bokkeveld Group include brachiopods, echinoderms, molluscs, and trilobites while minor groups include corals, conulariids, hyolithids, etc. These diverse and abundant invertebrates is present in the mudrock dominated formations while fossils assemblages in the sandstones is low in diversity. Shells are preserved as internal and external moulds and casts. Marine trace fossils (especially near shore facies) are abundant and described by numerous authors e.g., Thamm & Johnson 2006, Almond 1998a, 1998b and 2008.

The Ceres Subgroup of the lower Bokkeveld Group is known for shelly marine invertebrates with trace fossils as well as rare fish remains. Plants include primitive vascular plants containing borings and burrows. Microfossils include palynomorphs, ostracods and foraminiferans. Vascular plants from the Ceres Subgroup are rare and generally poorly preserved as they are washed offshore from the land and has mainly been recorded of the eastern Bokkeveld outcrops (Anderson and Anderson 1985). Fossil fish remains are very rare and fragmentary. But this material will be of high palaeontological significance as little is known about Early Devonian ichthyofaunas of the ancient Gondwana supercontinent. Potentially fossiliferous mudrocks in the Eastern Cape are normally cleaved, highly deformed, and often deeply weathered and even covered by dense vegetation. These fossil records are extremely rare and understudied.

The Bokkeveld Group is one of the most important Devonian units in the southern hemisphere.

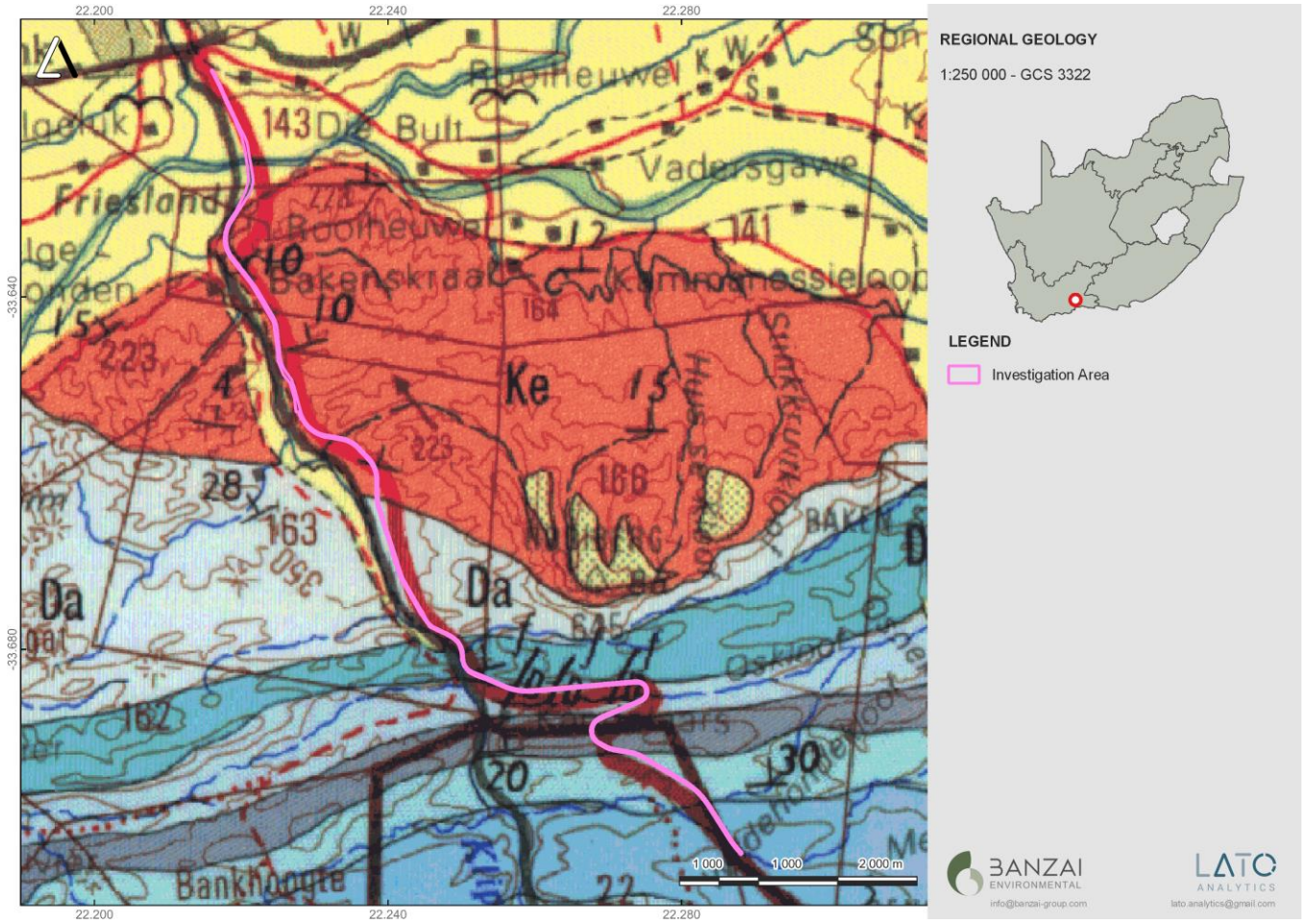
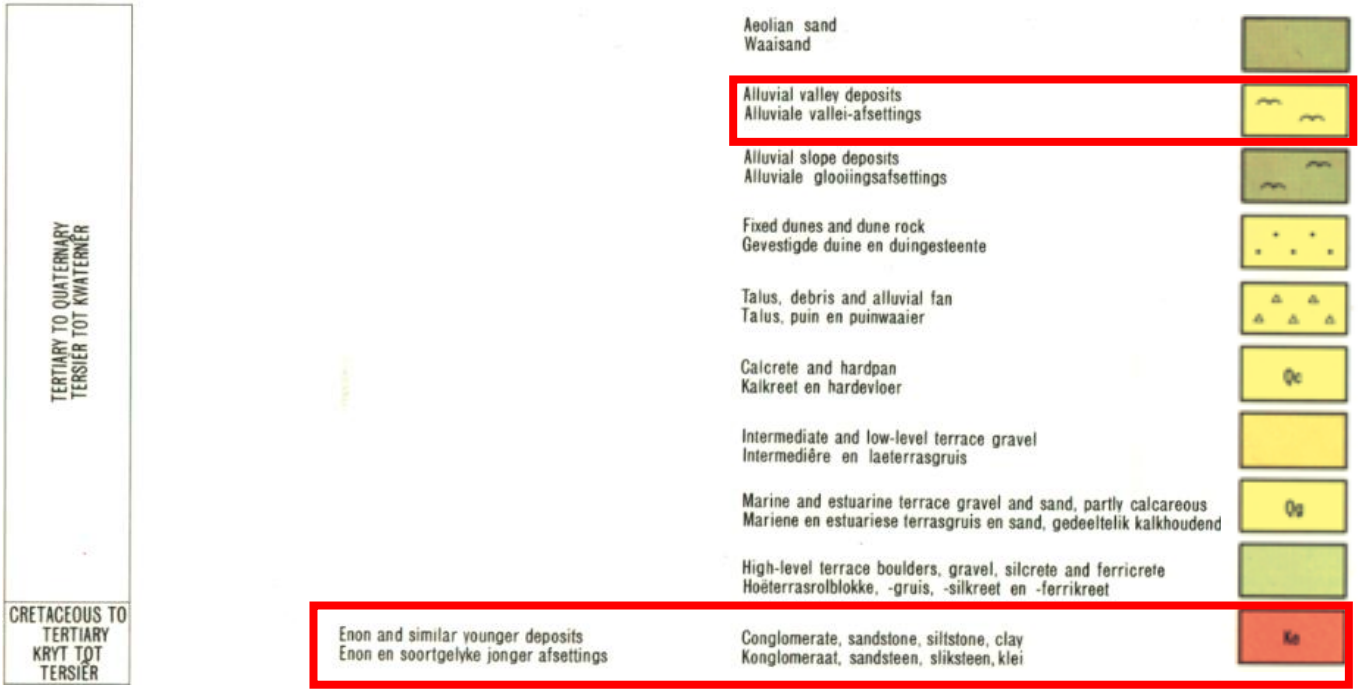
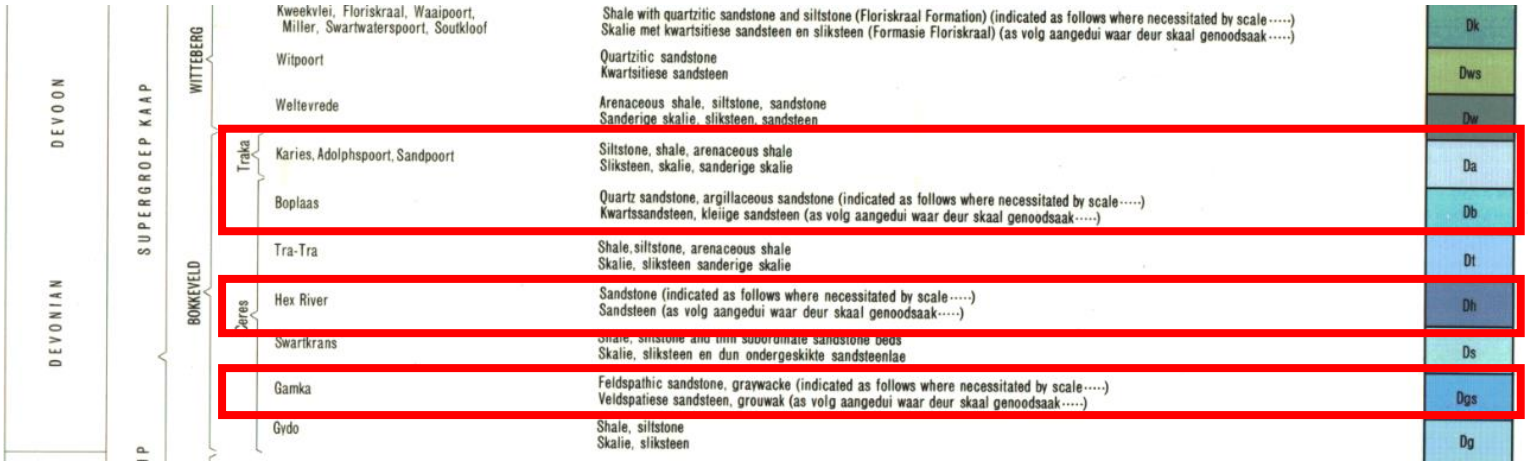


Figure 3: *Extract of the 1:250 000 Oudtshoorn 3322 (1979) Geological map (Council of Geoscience, Pretoria indicates that the proposed road upgrade is underlain by Tertiary to Quaternary alluvium (yellow single bird figure), Tertiary to Cretaceous Enon Formation (Ke, red); as well as undifferentiated Traka Subgroup and the Boplaas (Db) and Hex River (Dh) and Gamka (Dgs) Formation of the Ceres Group (Bokkeveld Group).*

***Table 2**: Legend of the 1:250 000 Oudtshoorn 3322 (1979) Geological Map (Council of Geoscience, Pretoria)*





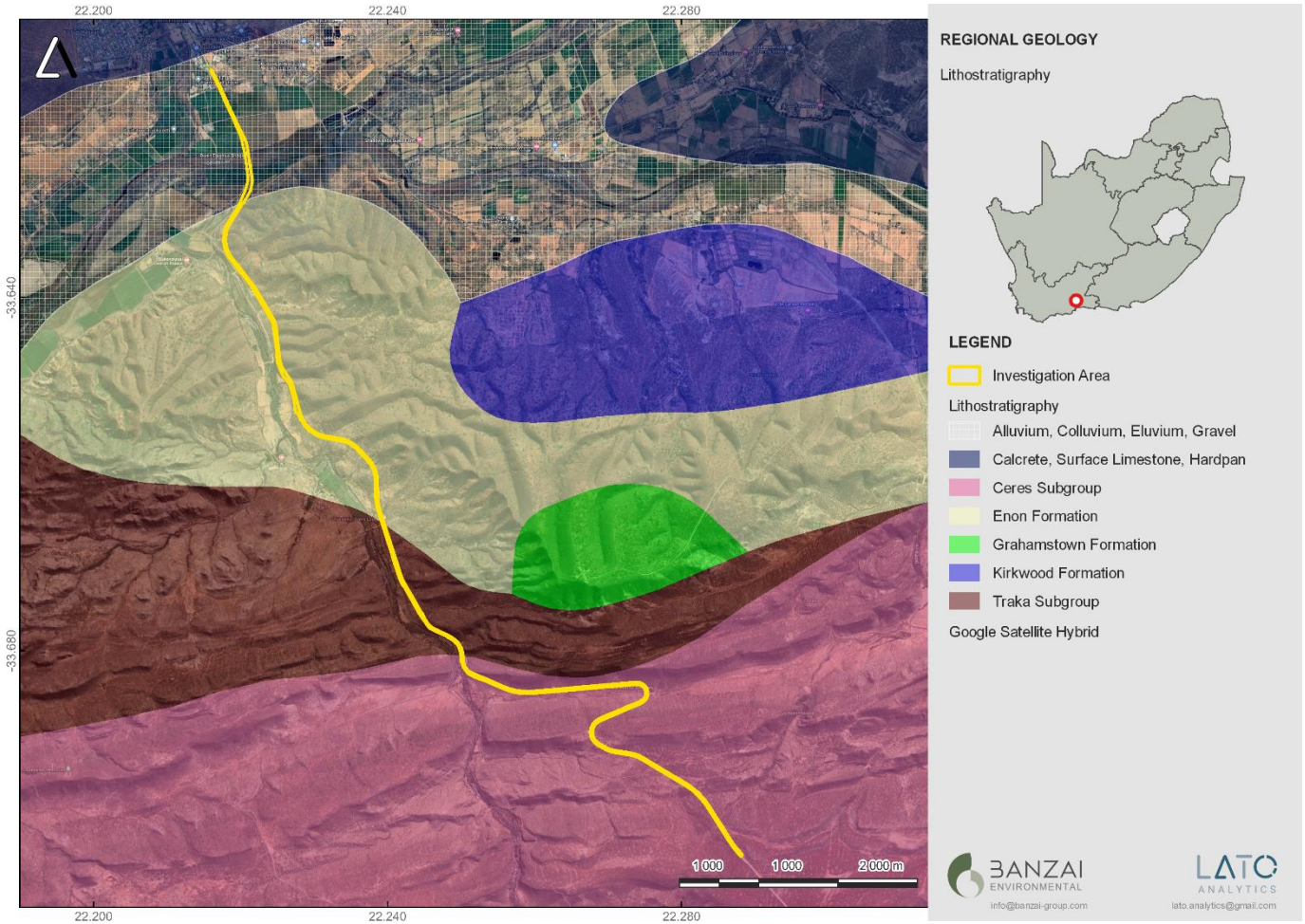


***Figure 4**: Updated (Council of Geosciences, Pretoria) indicates that the proposed development is underlain by alluvium, colluvium, eluvium and gravel, and the Enon Formation as well as the Traka and Ceres Subgroups (Bokkeveld Group).*

Table 3: *Stratigraphy, lithology and palaeoenvironments of the Bokkeveld Group. Figures in brackets are the approximate maximum thicknesses in meters. "Shallow marine" denotes high-energy coastal environments (beach, shoreface, barrier, etc.) (Tablet taken Thamm and Johnson, 2006).*

AGE	WEST OF ~21°E		EAST OF ~21°E		LITHOLOGY		PALAEOENVIRONMENTS	
		FORMATION		FORMATION				
DEVONIAN	BIDOUW SUBGROUP	Karoopoort (150)	TRAKA SUBGROUP	Sandpoort (400)	Mudrock, siltstone, sandstone		Tidal flat, delta front, prodelta slope, shelf	
		Osberg (55)		Adolphspoort (600)	Sandstone (siltstone in east)		Distributary channel, shallow marine (prodelta slope in east)	
		Klipbokkop (300)		Karies (1300)	Mudrock, siltstone, sandstone	Karies Formation: Mudrock, rhythmite	Tidal flat, delta front, prodelta slope, shelf	Karies Formation: Deep marine
		Wuppertal (70)			Sandstone, siltstone		Tidal flat, delta front, shallow marine	
		Waboomberg (200)			Mudrock, siltstone, sandstone		Offshore shelf, prodelta slope	
	CERES SUBGROUP	Boplaas (70)	CERES SUBGROUP	Boplaas (100)	Sandstone		Delta front, shallow marine	
		Tra-Tra (85)		Tra-Tra (350)	Mudrock, siltstone		Offshore shelf, prodelta slope	
		Hex River (60)		Hex River (60)	Sandstone		Delta front, shallow marine	
		Voorstehoek (200)		Voorstehoek (300)	Mudrock, siltstone		Offshore shelf, prodelta slope	
		Gamka (70)		Gamka (200)	Sandstone		Delta front, shallow marine	
		Gydo (150)		Gydo (600)	Mudrock, siltstone		Offshore shelf, prodelta slope	

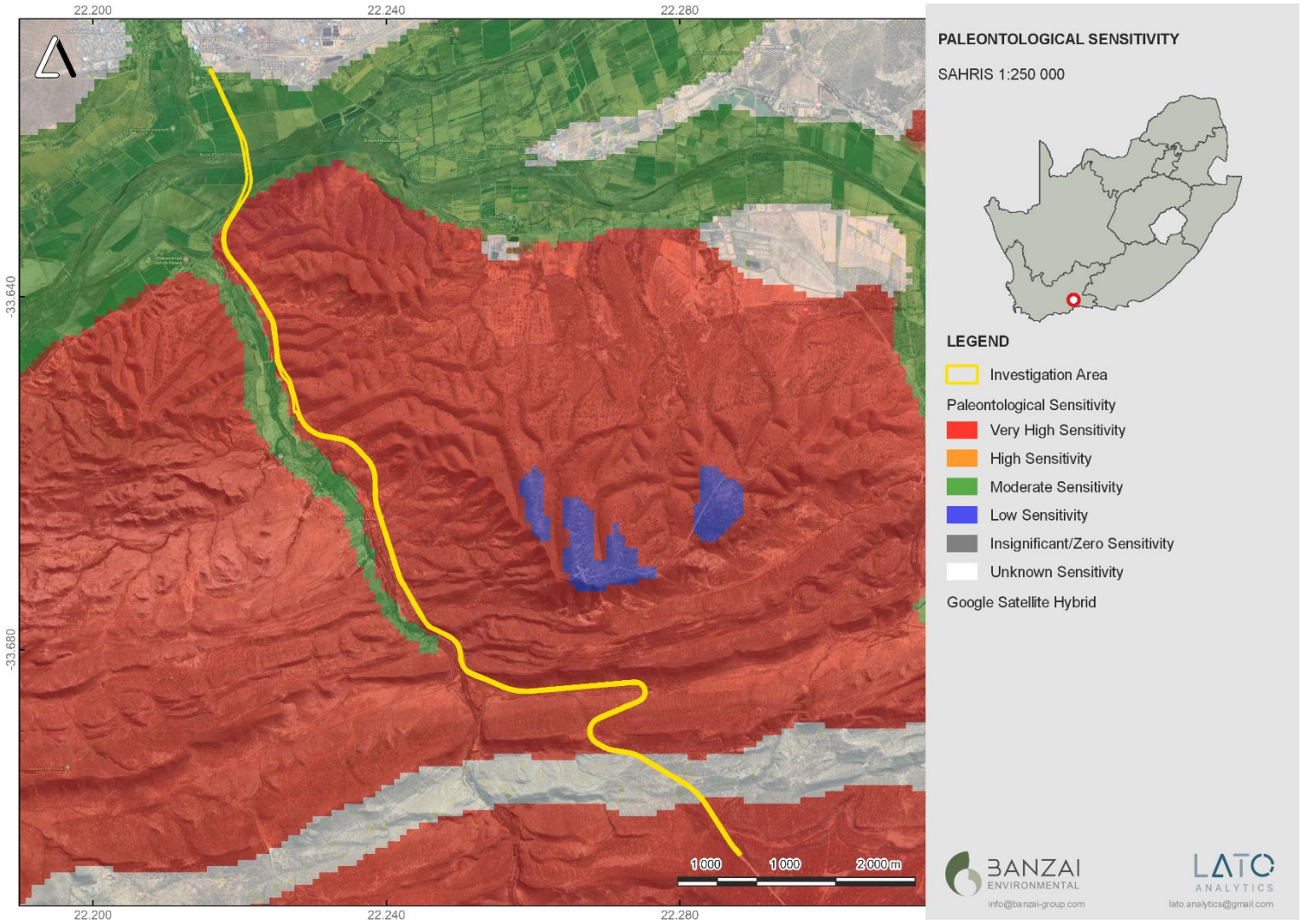


Figure 5: *Extract of the 1:250 000 SAHRIS PalaeoMap (Council of Geosciences, Pretoria) indicating the proposed development.* The proposed development is underlain by sediments of Very High (red), Moderate (green) and unknown (white) Palaeontological Sensitivity.

Table 4: *Palaeontological Significance*		
Colour	**Sensitivity**	**Required Action**
RED	**VERY HIGH**	**Field assessment and protocol for finds is required**
ORANGE/YELLOW	HIGH	Desktop study is required and based on the outcome of the desktop study; a field assessment is likely
GREEN	**MODERATE**	**Desktop study is required**
BLUE	LOW	No palaeontological studies are required however a protocol for finds is required
GREY	INSIGNIFICANT/ZERO	no palaeontological studies are required
WHITE/CLEAR	UNKNOWN	these areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map.

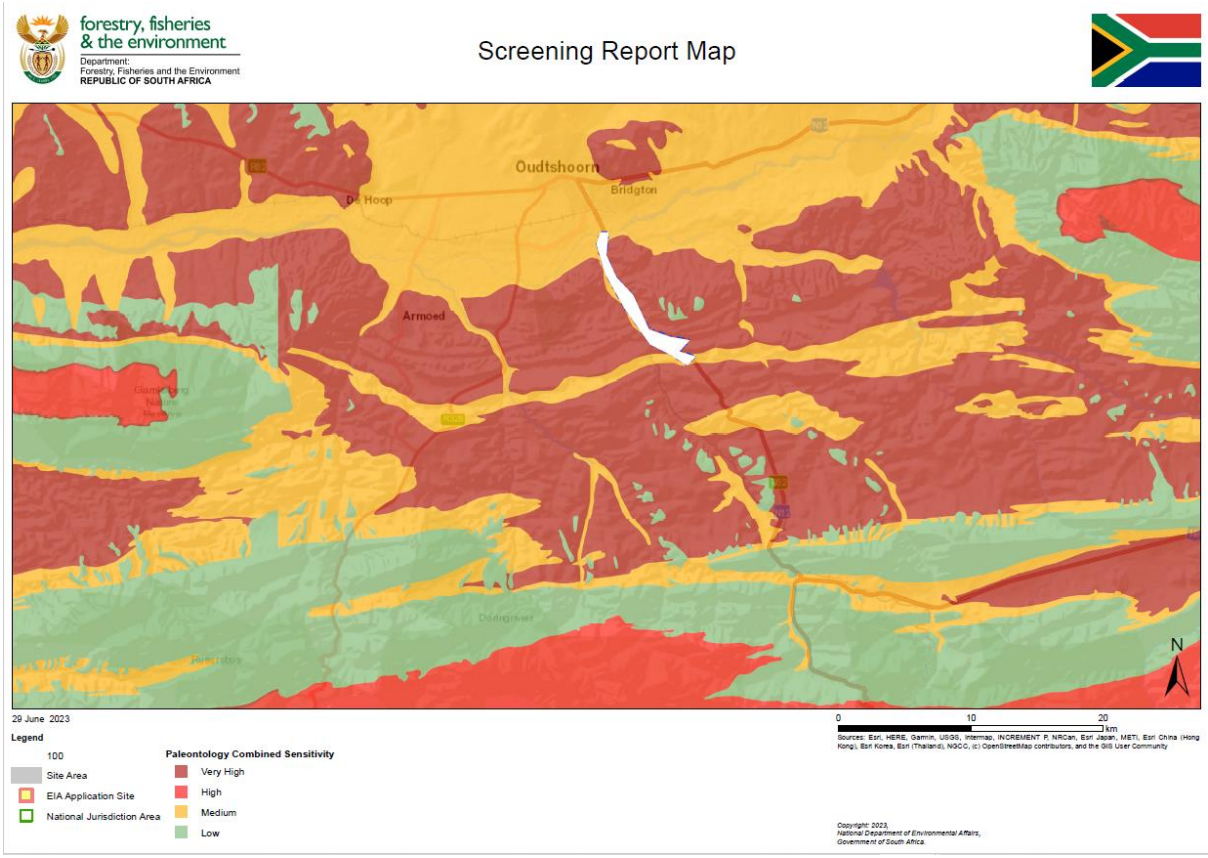


Figure 6*: Palaeontological Sensitivity if the Beau Valley SEF and associated infrastructure generated by the National Environmental Web-based Screening Tool.*

6 GEOGRAPHICAL LOCATION OF THE SITE

The proposed N12 road upgrade is located south of the town of Oudtshoorn in the Western Cape Province.

***Table 5**: GPS coordinates*		
Starting point in town	33°36'51.29"S	22°12'57.49"E
End Point	33°42'11.63"S	22°17'17.99"E

7 ADDITIONAL INFORMATION CONSULTED

In compiling this report the following sources were consulted:

- Geological map 1:100 000, Geology of the Republic of South Africa (Visser 1984).
- A Google Earth map with polygons of the proposed development was obtained from ASHA Consulting
- 1:250 000 Oudtshoorn 3322 (1979) Geological Map (Council of Geoscience, Pretoria)
- Relevant PIAs of the area (see references)

8 SITE VISIT

A site-specific field survey of the development footprint was conducted on foot on the weekend of 1 April 2023. Well-preserved bivalve, trace fossils with possible trilobites have been identified.

Figure 7: *Trace fossils - round shapes on surface may be of the Skilithos ichnofossil, with casts of bivalves (red oval shaped features) (Point 12)*
(-33.672004; 22.242022)

***Figure 8**:Trace fossils – a) bivalves and b-c) possible Teichichnus (-33.691819; 22.273814)*

***Figure 9**: Invertebrate fossils - internal brachial valve of brachiopod.*

(--33.691704; 22.273171)

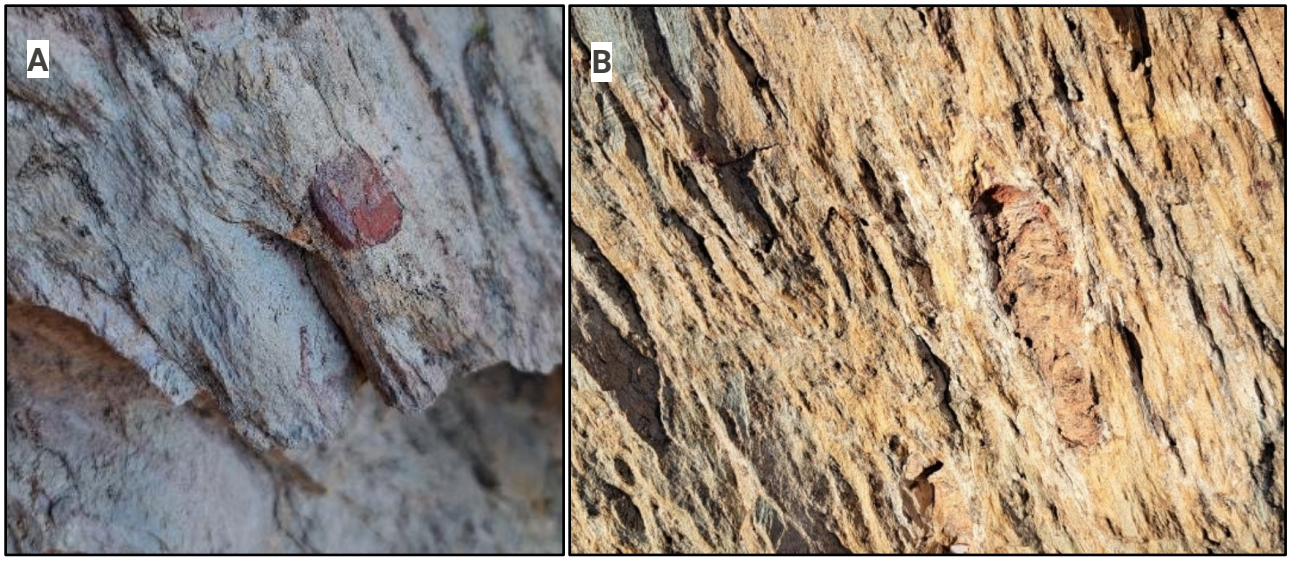


***Figure 10**: Sandstone unit containing A) bivalves and B) tube like fossils in the finer beds.*

(-33.689770; 22.267929)

***Figure 11**: Trace fossils and possible bivalves (bivalves red). Bivalves occurring as cast within the lithology.*
(-33.678214; 22.247971)

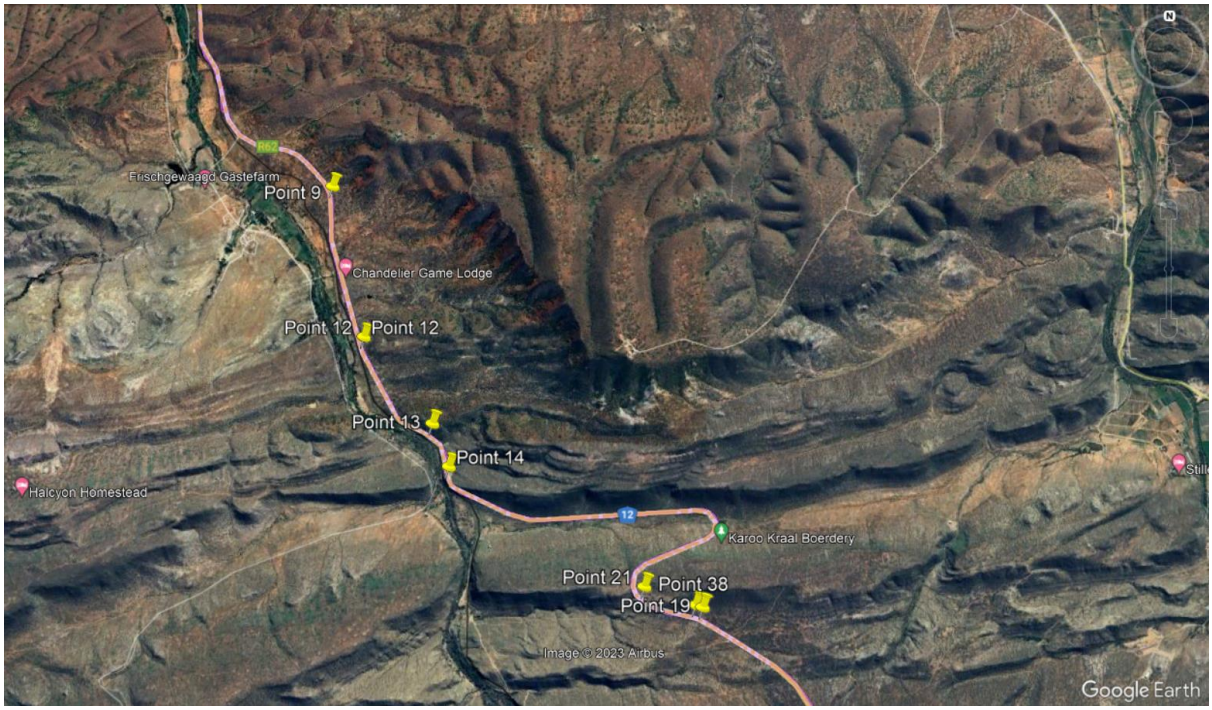


***Figure 12**: Fossil location on the N12 road upgrade.*

***Table 6**: Fossil location as indicated in location map*	
Point 9	Figure 7
Point 19	Figure 8
Point 38	Figure 9
Point 21	Figure 10
Point 13	Figure 11

9 IMPACT ASSESSMENT METHODOLOGY

IMPACT ASSESSMENT METHODOLOGY

The assessment criteria utilised in this environmental impact assessment is based on, and adapted from, the Guideline on Impact Significance, Integrated Environmental Management Information Series 5 (Department of Environmental Affairs and Tourism (DEAT), 2002) and the Guideline 5: Assessment of Alternatives and Impacts in Support of the Environmental Impact Assessment Regulations (DEAT, 2006).

The impacts have henceforth been determined through the following parameters:

- The **extent** of the anticipated impact.

- The **duration** for which the impact will be exercised.
- The **probability** of occurrence of the anticipated impact.
- The **significance** of the anticipated impact.
- How **reversible** the anticipated impact would be.
- How **mitigable** the anticipated impact would be.
- The **degree of loss** of the resources.
- The **cumulative impact** of the anticipated aspect.
- The significance of the **consequence** of the aspect.

Determination of the Extent (Scale)	
Site specific	On site or within 100m of the site boundary, but not beyond the property boundary
Local	The impacted area includes the whole or a measurable portion of the site and property, but could affect the area surrounding the development, including the neighbouring properties and wider municipal area.
Regional	The impact would affect the broader region (e.g. neighbouring towns) beyond the boundaries of the adjacent properties.
National	The impact would affect the whole country (if applicable)

Determination of Duration	
Temporary	The impact will be limited to the construction phase
Short term	The impact will either disappear with mitigation or will be mitigated through a natural process in a period shorter than 8 months after the completion of the construction phase.
Medium term	The impact will last up to the end of the construction phase, where after it will be entirely negated in a period shorter than 3 years after the completion of construction activities.
Long term	The impact will continue for the entire operational lifetime of the development, but will be mitigated by direct human action or by natural processes thereafter.
Permanent	This is the only class of impact that will be non-transitory. Such impacts are regarded to be irreversible, irrespective of what mitigation is applied.

Determination of Probability	
Improbable	The possibility of the impact occurring is very low, due either to the circumstances, design or experience.
Probable	There is a possibility that the impact will occur to the extent that provisions must therefore be made.
Highly probable	It is most likely that the impact will occur at some stage of the development. Plans must be drawn up to mitigate the activity before the activity commences.
Definite	The impact will take place regardless of any prevention plans

Determination of Significance (without mitigation)	
No significance	The impact is not substantial and does not require any mitigation action.
Low	The impact is of little importance but may require limited mitigation.

Medium	The impact is of sufficient importance and is therefore considered to have a negative impact. Mitigation is required to reduce the negative impact to acceptable levels.
Medium-High	The impact is of high importance and is therefore considered to have a negative impact. Mitigation is required to manage the negative impacts to acceptable levels.
High	The impact is of great importance. Failure to mitigate with the objective of reducing the impact to acceptable levels could render the entire development option or entire project proposal unacceptable. Mitigation is therefore essential.
Very High	The impact is critical. Mitigation measures cannot reduce the impact to acceptable levels. As such the impact renders the proposal unacceptable.

Determination of Significance (with mitigation)	
No significance	The impact will be mitigated to the point where it is regarded to be insubstantial
Low	The impact will be mitigated to the point where it is of limited importance.
Medium	Notwithstanding the successful implementation of the mitigation measures, the impact will remain of significance. However, taken within the overall context of the project, such a persistent impact does not constitute a fatal flaw.
High	Mitigation of the impact is not possible on a cost-effective basis. The impact continues to be of great importance and taken with the overall context of the project, is considered to be a fatal flow in the project proposal.

Determi9nation of Reversibility	
Completely Reversible	The impact is reversible with implementation of minor mitigation measures
Partly Reversible	The impact is partly reversible but more intensive mitigation measures
Barely Reversible	The impact is unlikely to be reversed even with intense mitigation measures
Irreversible	The impact is irreversible, and no mitigation measures exist.

Determination of Degree to which an impact can be Mitigated	
Can be mitigated	The impact is reversible with implementation of minor mitigation measures
Can be partly mitigated	The impact is partly reversible but more intense mitigation measures
Can be barely mitigated	The impact is unlikely to be reversed even with intense mitigation measures
Not able to mitigate	The impact is irreversible, and no mitigation measures exist.

Determination of Loss of Resources	
No loss of resource	The impact will not result in the loss of any resources.
Marginal loss of resource	The impact will result in marginal loss of resources.

Significant loss of resources	The impact will result in significant loss of resources.
Complete loss of resources	The impact will result in a complete loss of all resources.

Determination of Cumulative Impact	
Negligible	The impact would result in negligible to no cumulative effects.
Low	The impact would result in insignificant cumulative effects.
Medium	The impact would result in minor cumulative effects.
High	The impact would result in significant cumulative effects.

Determination of Consequence significance	
Negligible	The impact would result in negligible to no consequences.
Low	The impact would result in insignificant consequences.
Medium	The impact would result in minor consequences.
High	The impact would result in significant consequences.

Potential impact and risk:	**Archaeological, Cultural and Palaeontological impact:** Although no impacts are expected on the cultural and heritage resources in the area, there were a number of paleontologically sensitive receptors identified within the road reserve.	
Nature of impact:	Negative	No impact
Extent and duration of impact:	Site Specific / permanent	
Consequence of impact or risk:	Loss of palaeontological resources of significance.	
Probability of occurrence:	Probable	
Degree to which the impact may cause irreplaceable loss of resources:	Marginal loss of resource	
Degree to which the impact can be reversed:	Reversible	
Indirect impacts:	None identified. To be updated upon receipt of the HIA.	
Cumulative impact prior to mitigation:	Medium	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	High	
Degree to which the impact can be avoided:	High (Avoidable)	
Degree to which the impact can be managed:	Medium (Can be partially managed)	
Degree to which the impact can be mitigated:	High (Can be mitigated)	
Proposed mitigation:	Specialist recommendation: • Fossil excavation • Monitoring. • Feedback from Heritage Western Cape must be received regarding this aspect.	

	General • A Chance of Find protocol must be implemented on site throughout the construction phase of the proposed project. • A search and rescue of fossils is required prior to site establishment. • A suitably qualified palaeontological specialist must be appointed to oversee the search and rescue activities.	
Residual impacts:	None	
Cumulative impact post mitigation:	Medium	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium (-)	No impact

10 FINDINGS AND RECOMMENDATIONS

The N12 road upgrade area is underlain by Tertiary to Quaternary alluvium, Tertiary to Cretaceous Enon Formation; as well as the Bokkeveld Group (Cape Supergroup). The Bokkeveld Group is represented by the Traka and Ceres Subgroups. The Ceres Subgroup is represented by the Boplaas, Tra-Tra, Hex River, Swartkrans and Gamka Formations. The PalaeoMap of the South African Heritage Resources Information System (SAHRIS) indicates that the Palaeontological Sensitivity of the alluvium and Enon Formation is Moderate, the Traka Subgroup has a Very High Palaeontological Sensitivity while that of the Ceres Subgroup is also Very high with the exception of the Swartkrans (Ds) that has an unknown Palaeontological Sensitivity in this area (Almond and Pether, 2009; Almond *et al*., 2013, Groenewald et al 2014). Updated Geological mapping (Council of Geosciences, Pretoria) indicates that the proposed development is underlain by alluvium, colluvium, eluvium and gravel, and the Enon Formation as well as the Traka and Ceres Subgroups (Bokkeveld Group). The DFFE Screening Tool also indicates that the development is underlain by sediments with a Very High and Moderate Palaeontological Sensitivity.

A site-specific field survey of the development footprint was conducted on foot on the weekend of 1 April 2023. Various well-preserved bivalve, trace fossils as well as possible trilobites have been identified. A High Palaeontological Significance has thus been allocated to the proposed development.

Mitigation, in the form of excavation of fossils as well as a realistic monitoring programme for the palaeontologically sensitive areas of the road upgrade, by a professional palaeontologist is thus recommended. This palaeontologist will need an HWC-approved Workplan for the collection of palaeontological materials and must conform to international best practice for palaeontological fieldwork and the study (*e.g.,* data collecting, collecting of fossil as well as report writing) should meet the minimum standards for Phase 2 palaeontological studies suggested by HWC

(2021). Fossil material should be housed in an accredited collection (museum or university). A Chance Finds Procedure must be included in the project EMPr so that any fossils found in the absence of the palaeontologist may be correctly recorded and rescued. To this end, the HWC Chance Finds Procedure is appended to this report These recommendations must be incorporated into the Environmental Management Plan for the N12 road upgrade.

The N12 road upgrade may be permitted after mitigation measures have been implemented.

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APPENDIX A **CURRICULUM VITAE**

PROFESSION:	Palaeontologist
YEARS' EXPERIENCE:	30 years in Palaeontology
EDUCATION:	B.Sc Botany and Zoology, 1988
	University of the Orange Free State
	B. Sc (Hons) Zoology, 1991
	University of the Orange Free State
	Management Course, 1991
	University of the Orange Free State
	M. Sc. *Cum laude* (Zoology), 2009
	University of the Free State

Dissertation title: The postcranial skeleton of the Early Triassic non-mammalian Cynodont *Galesaurus planiceps*: implications for biology and lifestyle

MEMBERSHIP

Palaeontological Society of South Africa (PSSA) 2006-currently

EMPLOYMENT HISTORY

Part time Laboratory assistant	Department of Zoology & Entomology University of the Free State Zoology 1989-1992
Part time laboratory assistant	Department of Virology University of the Free State Zoology 1992

Research Assistant	National Museum, Bloemfontein 1993 – 1997
Principal Research Assistant and Collection Manager	National Museum, Bloemfontein 1998–2022

TECHNICAL REPORTS

Butler, E. 2014. Palaeontological Impact Assessment of the proposed development of private dwellings on portion 5 of farm 304 Matjesfontein Keurboomstrand, Knysna District, Western Cape Province. Bloemfontein.

Butler, E. 2014. Palaeontological Impact Assessment for the proposed upgrade of existing water supply infrastructure at Noupoort, Northern Cape Province. 2014. Bloemfontein.

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Butler, E. 2015. Palaeontological exemption report of the proposed truck stop development at Palmiet 585, Vrede, Free State. Bloemfontein.

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Butler, E. 2015. Palaeontological Impact Assessment of the proposed township establishment on the remainder of portion 6 and 7 of the farm Sunnyside 2620, Bloemfontein, Mangaung metropolitan municipality, Free State, Bloemfontein.

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Butler, E. 2015.Palaeontological Impact Assessment of the proposed Orkney solar energy farm and associated infrastructure on the remaining extent of Portions 7 and 21 of the farm Wolvehuis 114, near Orkney, North West Province. Bloemfontein.

Butler, E. 2015. Palaeontological Impact Assessment of the proposed Spectra foods broiler houses and abattoir on the farm Maiden Manor 170 and Ashby Manor 171, Lukhanji Municipality, Queenstown, Eastern Cape Province. Bloemfontein.

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Butler, E. 2016. Palaeontological Impact Assessment of the proposed Senqu Pedestrian Bridges in Ward 5 of Senqu Local Municipality, Eastern Cape Province. Bloemfontein.

Butler, E. 2016. Recommendation from further Palaeontological Studies: Proposed Construction of the Modderfontein Filling Station on Erf 28 Portion 30, Founders Hill, City of Johannesburg, Gauteng Province. Bloemfontein.
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Butler, E. 2017. Palaeontological Desktop Assessment for the proposed prospecting right project without bulk sampling, in the Koa Valley, Northern Cape Province. Bloemfontein.
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Butler, E. 2017. Palaeontological Desktop Assessment of the proposed construction of the Mangaung Gariep Water Augmentation Project. Bloemfontein.

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Butler, E. 2017. Palaeontological Desktop Assessment of the proposed of the Lephalale Coal and Power Project, Lephalale, Limpopo Province, Republic of South Africa. Bloemfontein.
Butler, E. 2017. Palaeontological Desktop Assessment of the proposed Overvaal Trust PV Facility, Buffelspoort, North West Province. Bloemfontein.
Butler, E. 2017. Palaeontological Impact Assessment of the proposed development of the H_2 Energy Power Station and associated infrastructure on Portions 21; 22 And 23 of the farm Hartebeestspruit in the Thembisile Hani Local Municipality, Nkangala District near Kwamhlanga, Mpumalanga Province. Bloemfontein.
Butler, E. 2017. Palaeontological Impact Assessment of the proposed upgrade of the Sandriver Canal and Klippan Pump station in Welkom, Free State Province. Bloemfontein.
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Butler, E. 2017. Palaeontological Impact Assessment of the proposed diamonds alluvial & diamonds general prospecting right application near Christiana on the remaining extent of portion 1 of the farm Kaffraria 314, registration division HO, North West Province. Bloemfontein.
Butler, E. 2017. Palaeontological Desktop Assessment for the proposed development of Wastewater Treatment Works on Hartebeesfontein, near Panbult, Mpumalanga. Bloemfontein.
Butler, E. 2017. Palaeontological Desktop Assessment for the proposed development of Wastewater Treatment Works on Rustplaas near Piet Retief, Mpumalanga. Bloemfontein.
Butler, E. 2018. Palaeontological Impact Assessment for the Proposed Landfill Site in Luckhoff, Letsemeng Local Municipality, Xhariep District, Free State. Bloemfontein.
Butler, E. 2018. Palaeontological Impact Assessment of the proposed development of the new Mutsho coal-fired power plant and associated infrastructure near Makhado, Limpopo Province. Bloemfontein.
Butler, E. 2018. Palaeontological Impact Assessment of the authorisation and amendment processes for Manangu mine near Delmas, Victor Khanye local municipality, Mpumalanga. Bloemfontein.
Butler, E. 2018. Palaeontological Desktop Assessment for the proposed Mashishing township establishment in Mashishing (Lydenburg), Mpumalanga Province. Bloemfontein.
Butler, E. 2018. Palaeontological Desktop Assessment for the Proposed Mlonzi Estate Development near Lusikisiki, Ngquza Hill Local Municipality, Eastern Cape. Bloemfontein.
Butler, E. 2018. Palaeontological Phase 1 Assessment of the proposed Swaziland-Mozambique border patrol road and Mozambique barrier structure. Bloemfontein.
Butler, E. 2018. Palaeontological Desktop Assessment for the proposed electricity expansion project and Sekgame Switching Station at the Sishen Mine, Northern Cape Province. Bloemfontein.
Butler, E. 2018. Palaeontological field assessment of the proposed construction of the Zonnebloem Switching Station (132/22kV) and two loop-in loop-out power lines (132kV) in the Mpumalanga Province. Bloemfontein.
Butler, E. 2018. Palaeontological Field Assessment for the proposed re-alignment and de-commissioning of the Firham-Platrand 88kv Powerline, near Standerton, Lekwa Local Municipality, Mpumalanga province. Bloemfontein.
Butler, E. 2018. Palaeontological Desktop Assessment of the proposed Villa Rosa development In the Buffalo City Metropolitan Municipality, East London. Bloemfontein.

Butler, E. 2018. Palaeontological field Assessment of the proposed Villa Rosa development In the Buffalo City Metropolitan Municipality, East London. Bloemfontein.
Butler, E. 2018. Palaeontological desktop assessment of the proposed Mookodi – Mahikeng 400kV line, North West Province. Bloemfontein.
Butler, E. 2018. Palaeontological Desktop Assessment for the proposed Thornhill Housing Project, Ndlambe Municipality, Port Alfred, Eastern Cape Province. Bloemfontein.
Butler, E. 2018. Palaeontological desktop assessment of the proposed housing development on portion 237 of farm Hartebeestpoort 328. Bloemfontein.
Butler, E. 2018. Palaeontological desktop assessment of the proposed New Age Chicken layer facility located on holding 75 Endicott near Springs in Gauteng. Bloemfontein.
Butler, E. 2018 Palaeontological Desktop Assessment for the development of the proposed Leslie 1 Mining Project near Leandra, Mpumalanga Province. Bloemfontein.
Butler, E. 2018. Palaeontological field assessment of the proposed development of the Wildealskloof mixed use development near Bloemfontein, Free State Province. Bloemfontein.
Butler, E. 2018. Palaeontological Field Assessment of the proposed Megamor Extension, East London. Bloemfontein
Butler, E. 2018. Palaeontological Impact Assessment of the proposed diamonds Alluvial & Diamonds General Prospecting Right Application near Christiana on the Remaining Extent of Portion 1 of the Farm Kaffraria 314, Registration Division HO, North West Province. Bloemfontein.
Butler, E. 2018. Palaeontological Impact Assessment of the proposed construction of a new 11kV (1.3km) Power Line to supply electricity to a cell tower on farm 215 near Delportshoop in the Northern Cape. Bloemfontein.
Butler, E. 2018. Palaeontological Field Assessment of the proposed construction of a new 22 kV single wood pole structure power line to the proposed MTN tower, near Britstown, Northern Cape Province. Bloemfontein.
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Butler, E. 2018. Proposed Kalabasfontein Mine Extension project, near Bethal, Govan Mbeki District Municipality, Mpumalanga. Bloemfontein.
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Butler, E. 2018. Environmental Impact Assessment (EIA) for the Proposed 325mw Rondekop Wind Energy Facility between Matjiesfontein and Sutherland in the Northern Cape Province.
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Butler, E., 2019. Recommended Exemption from further Palaeontological studies for the Proposed Agricultural Development on Farms 1763, 2372 And 2363, Kakamas South Settlement, Kai! Garib Municipality, Mgcawu District Municipality, Northern Cape Province.
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Butler, E., 2019. Palaeontological Desktop Assessment of the proposed Integrated Environmental Authorisation process for the proposed Der Brochen Amendment project, near Groblershoop, Limpopo
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Butler, E., 2019. Palaeontological Desktop Assessment for the proposed construction of an iron/steel smelter at the Botshabelo Industrial area within the Mangaung Metropolitan Municipality, Free State Province.
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Butler, E., 2019. Palaeontological Impact Assessment of the proposed new Township Development, Lethabo Park, on Remainder of Farm Roodepan No 70, Erf 17725 And Erf 15089, Roodepan Kimberley, Sol Plaatjies Local Municipality, Frances Baard District Municipality, Northern Cape
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APPENDIX B PALAEONTOLOGICAL CHANCE FINDS PROCEDURE

HWC PROCEDURE: CHANCE FINDS OF PALAEONTOLOGICAL MATERIAL

Introduction

This document is aimed to inform workmen and foremen working on a construction and/or mining site. It describes the procedure to follow in instances of accidental discovery of palaeontological material (please see attached poster with descriptions of palaeontological material) during construction/mining activities. This protocol does not apply to resources already identified under an assessment undertaken under s. 38 of the National Heritage Resources Act (no 25 of 1999).

Fossils are rare and irreplaceable. Fossils tell us about the environmental conditions that

existed in a specific geographical area millions of years ago. As heritage resources that inform us of the history of a place, fossils are public property that the State is required to manage and conserve on behalf of all the citizens of South Africa. Fossils are therefore protected by the National Heritage Resources Act and are the property of the State. Ideally, a qualified person should be responsible for the recovery of fossils noticed during construction/mining to ensure that all relevant contextual information is recorded.

Heritage Authorities often rely on workmen and foremen to report finds, and thereby contribute to our knowledge of South Africa's past and contribute to its conservation for future generations.

Training

Workmen and foremen need to be trained in the procedure to follow in instances of accidental discovery of fossil material, in a similar way to the Health and Safety protocol. A brief introduction to the process to follow in the event of possible accidental discovery of fossils should be conducted by the designated Environmental Control Officer (ECO) for the project, or the foreman or site agent in the absence of the ECO. It is recommended that copies of the attached poster and procedure are printed out and displayed at the site office so that workmen may familiarise themselves with them and are thereby prepared in the event that accidental discovery of fossil material takes place.

Actions to be taken

One person in the staff must be identified and appointed as responsible for the implementation of the attached protocol in instances of accidental fossil discovery and must report to the ECO or site agent. If the ECO or site agent is not present on site, then the responsible person on site should follow the protocol correctly in order to not jeopardize the conservation and well-being of the fossil material.

Once a workman notices possible fossil material, he/she should report this to the ECO or site

agent.

Procedure to follow if it is likely that the material identified is a fossil:

i The ECO or site agent must ensure that all **work ceases** immediately in the vicinity of the area where the fossil or fossils have been found;

ii The ECO or site agent must **inform HWC of the find immediately.** This information must include photographs of the findings and GPS co-ordinates;

iii The ECO or site agent must compile a **Preliminary Report and fill in the Fossil Discoveries: HWC Preliminary Record Form** within 24 hours without removing the fossil from its original position. The **Preliminary Report** records basic information about the find including:

- The date
- A description of the discovery
- A description of the fossil and its context (e.g. position and depth of find) Where and how the find has been stored
- Photographs to accompany the preliminary report (the more the better):
  - A scale must be used
  - Photos of location from several angles Photos of vertical section should be provided
  - Digital images of hole showing vertical section (side);
  - Digital images of fossil or fossils.

iv Upon receipt of this **Preliminary Report**, HWC will inform the ECO or site agent whether or not a rescue excavation or rescue collection by a palaeontologist is necessary.

v **Exposed finds must be stabilized where they are unstable and the site capped, e.g. with a plastic sheet or sand bags.** This protection should allow for the later excavation of the finds with due scientific care and diligence. HWC can advise on the most appropriate method for stabilization.

vi If the find cannot be stabilized, **the fossil may be collect with extreme care** by the ECO or the site agent and put aside and protected until HWC advises on further action. Finds collected in this way must be safely and securely stored in tissue paper and an appropriate box. Care must be taken to remove the all fossil material and any breakage of fossil material must be avoided at all costs.

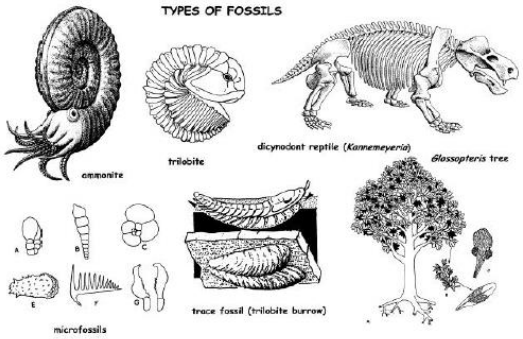
No work may continue in the vicinity of the find until HWC has indicated, in writing, that it is appropriate to proceed.

FOSSIL DISCOVERIES: HWC PRELIMINARY RECORDING FORM		
Name of project		
Name of fossil location		
Date of discovery		
Description of situation in which the fossil was found:		
Description of context in which the fossil was found:		
Description and condition of fossil identified:		
GPS coordinates:	Lat:	Long:
If no co-ordinates available then please describe the location:		
Time of discovery:		
Depth of find in hole:		
Photographs (tick as appropriate and indicate number of the photograph)	Digital image of vertical section (side)	
	Fossil from different angles	
	Wider context of the find	
Temporary storage (where it is located and how it is conserved)		
Person identifying the fossil	Name: Contact:	
Recorder:	Name: Contact:	
Photographer	Name: Contact:	

Palaeontology: what is a fossil?

Fossils are the traces of ancient life (animal, plant or microbial) preserved within rocks and come in two forms:

- Body fossils preserve parts, casts or impressions of the original tissues of an organism (e.g. bones, teeth, wood, pollen grains); and
- Trace fossils such as trackways and burrows record ancient animal behaviour.



How to report chance fossil finds: What should I do if I find a fossil during construction/mining?

If you think you have identified a fossil:

Immediately inform the ECO or Site Agent. He/she will then contact HWC and write a report and if necessary operations will stop in that specific area until the fossil is recovered

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Types of palaeontological finding - What does a fossil look like?

Fossils vary in size, from fossilised tree trunks and dinosaur bones down to very small animals or plants. Finds can be **individual fossils** (one isolated wood log or bone) or **clusters and beds** (several bones, teeth, animal or plant remains, trace fossils in close proximity or bones resembling part of a skeleton). A bed of fossils is a layer with many fossil remains.

Below there is a list of few examples of fossils which may be identified during excavations in the Western Cape.

Image	Description	Image	Description
	Leaves		Snail shells and other shells
	Fossil wood		Bones of larger animals
	The remains of fish and marine life (e.g. teeth, scales, starfish)		Large burrows made by moles and other animals
	Stromatolites		Traces made by burrowing insects (ants, wasps, dung-beetles etc.).
	Animal footprints		

Images provided by Dr John Almond

Text by HWC's Archaeology, Palaeontology & Meteorites Committee June 2016