

## **PALAEONTOLOGICAL HERITAGE: LETTER OF EXEMPTION FROM FURTHER STUDIES & MITIGATION**

### **Proposed new playing field and track at Refele Village near Mount Fletcher, Elundini Local Municipality, Eastern Cape**

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#### **EXECUTIVE SUMMARY**

Elundini Local Municipality is proposing to construct a sports field and track on Farm 621 at Refele Village, c. 14.6 km WNW of Mount Fletcher in the Elundini Local Municipality (Joe Gqabi District Municipality), Eastern Cape Province. The small, partially disturbed project area overlies Late Triassic sandstones of the Molteno Formation (Stormberg Group, Karoo Supergroup) with a probable thin veneer of Pleistocene or younger slope deposits (Masotcheni Formation) and soils.

The palaeontological heritage impact significance of the proposed Refele sports field and track development is assessed as VERY LOW because:

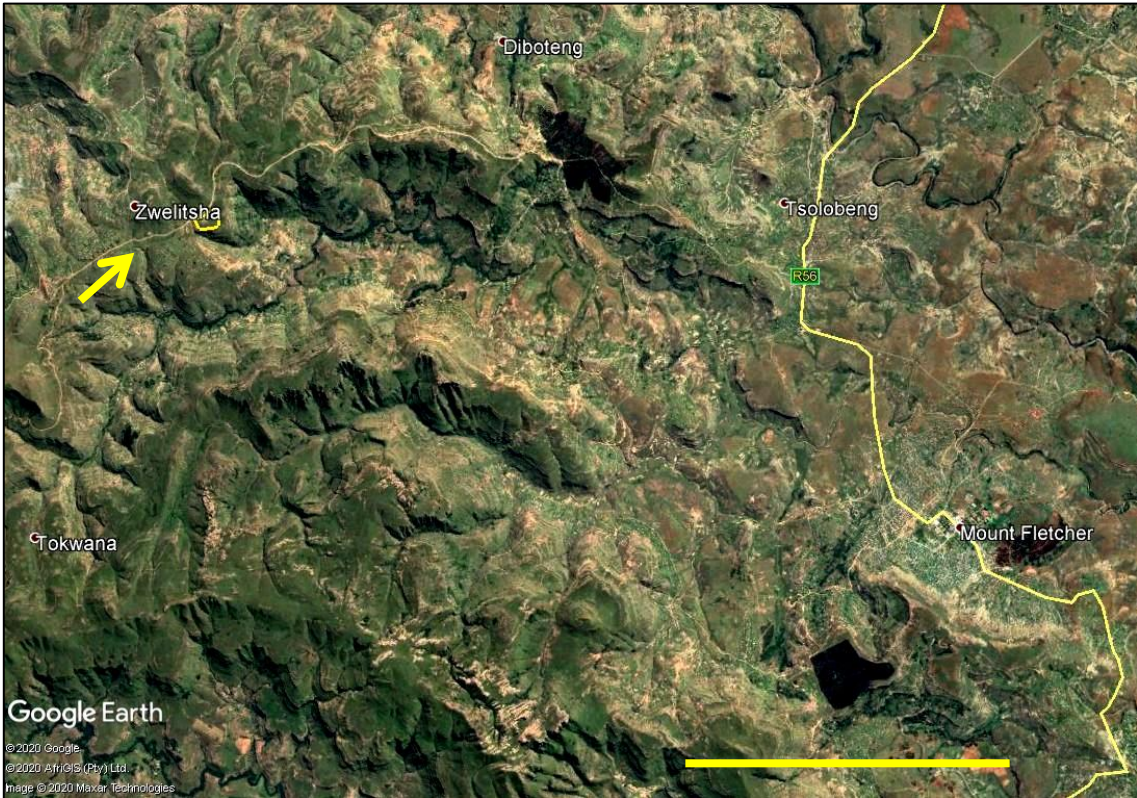
- The project footprint is small and disturbed, while substantial bedrock excavations are not envisaged here;
- Fossil plant-rich beds of the underlying Late Triassic Molteno Formation are unlikely to be exposed at or near-surface here;
- The overlying Pleistocene or younger colluvial deposits of the Masotcheni Formation and soils are generally of low palaeontological sensitivity.

Given the very low impact significance of this development in terms of palaeontological heritage resources, no recommendations for specialist palaeontological monitoring or mitigation are made, pending the potential discovery of significant new fossils (*e.g.* plant-rich beds, mammalian remains) during development. A protocol for Chance Fossil Finds is appended to this report.

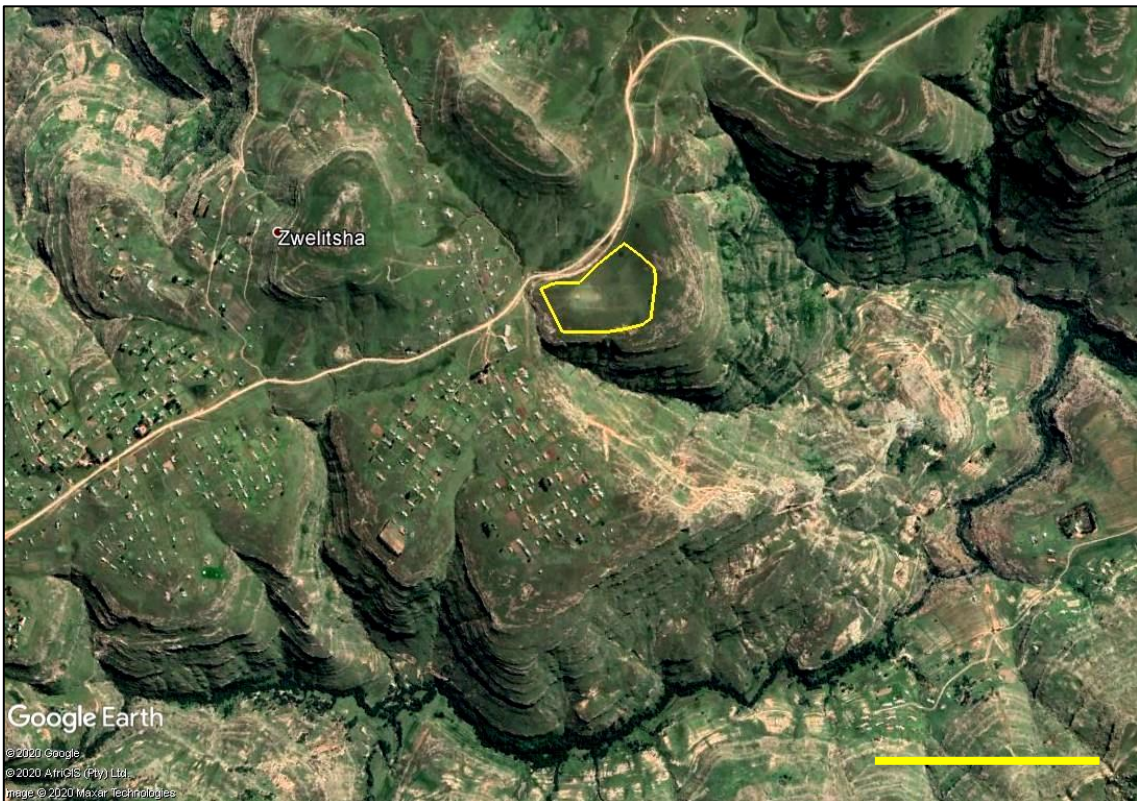
#### **1. Project outline and brief**

Nako Iliso, on behalf of the Elundini Local Municipality, is proposing to construct a sports field and track on Farm 621 at Refele Village, c. 14.6 km WNW of Mount Fletcher in the Elundini Local Municipality (Joe Gqabi District Municipality), Eastern Cape Province.

The present palaeontological heritage comment has been commissioned as part of a broader heritage impact assessment of the proposed development by CES, East London (Contact details: Ms Robyn Thompson. CES - Environmental and social advisory services. 6 Stewart Drive, Baysville 5241 East London. Tel: 087 830 9806. Fax: 086 410 7822. E-mail: r.thomson@cesnet.co.za).



**Figure 1: Google Earth© satellite image showing the location of the proposed new sports field on Farm 621 at Refele Village, c. 14.6 km WNW of Mount Fletcher in the Elundini Local Municipality (Joe Gqabi District Municipality), Eastern Cape Province (yellow polygon, arrowed). Scale bar = 6 km. N towards the top of the image.**



**Figure 2: Figure 1: Google Earth© satellite image showing a close-up of the Refele Village sports field project area (yellow polygon). Scale bar = 1 km. N towards the top of the image.**



## 2. Geological setting

The Refele Village sports field and track project area near Mount Fletcher is situated on flat to gently-sloping terrain at an elevation of between 1820-1850 m amsl in the highly-dissected foothills of the southeast-facing Drakensberg Escarpment of the Eastern Cape (Fig. 1). The project area lies on the lip of a steep, stepped escarpment which borders the deeply-incised Tokwana River Valley (Fig. 2). The terrain here is grassy and in part already disturbed by footpaths *etc.*

The geology of the project area is shown on 1: 250 000 geological sheet 3028 Kokstad (Council for Geoscience, Pretoria) with a short sheet explanation by De Decker (1981) (Fig. 3). The area is underlain by Late Triassic fluvial sediments of the Stormberg Group (Karoo Supergroup), close to the contact between the **Molteno Formation** (TRm, pale orange in Fig. 3) and the **Elliot Formation** (TRe, dark orange in Fig. 3). The Stormberg beds are intruded regionally by a few thin, NW-SE trending dolerite dykes (red lines in Fig. 3). Gullied hillslopes just to the north and outside of the project area are probably mantled by semi-consolidated colluvial (slope) deposits of the **Masotcheni Formation** of Quaternary or younger age which are not separately mapped here. The Lower Elliot mudrocks and subordinate sandstones underlie gentle hillslopes to the north of the project area whereas the latter more or less directly overlies the top of the sandstone packages of the Molteno Formation (clearly seen in the stepped face of the escarpment below), probably with a thin veneer of downwasted sandy soils and gravels broadly equivalent to Masotcheni Formation.

The Molteno Formation is a stratigraphically complex wedge of perennial braided alluvial sediments of estimated Late Triassic age that crops out around the margins of the Stormberg Group outcrop area centred on the Drakensberg highlands (Johnson *et al.* 2006, Almond 2018 and refs. therein). At its thickest, in the south, the formation reaches 600-650 m and has been subdivided into a series of five members but it tapers rapidly towards the north (Note that thicknesses of 450 to 200 m are reported from SW to NE in the Kokstad sheet area by De Decker 1981). The sandstone-rich Molteno succession is more resistant-weathering than the underlying and overlying rocks (Burgersdorp and Elliot Formations respectively) and therefore tends to form a pronounced, stepped topographic escarpment. Useful short geological accounts of the Molteno Formation are given by Dingle *et al.* (1983), Visser (1984), Smith *et al.* (1998), Hancox (2000) and Johnson *et al.* (2006), while a brief description of these rocks in the Kokstad 1: 250 000 geology sheet area is provided by De Decker (1981). Key technical papers include those by Turner (1975, 1983), Eriksson (1984), Christie (1981), Dingle *et al.* (1983), Cairncross *et al.* (1995), Anderson *et al.* (1998) and Hancox (1998). Fuller geological references are provided by Hancox (2000).

Thick (up to 10 m or more), extensively-gullied wedges or prisms of sandy to gravelly colluvial deposits encountered below the base of the Molteno escarpment as well as overlying major sandstone benches along the escarpment are assigned to the Masotcheni Formation (Almond 2018). This stratigraphic unit of probable Pleistocene to Holocene age usually contains well-developed, calcretised palaeosols, occurs widely within the northern KZN – Free State – Eastern Cape region and is often well-exposed within deep erosion gullies or *dongas* overlying Karoo sedimentary bedrocks (*cf* Botha *et al.* 1990, Botha 1992, Johnson & Verster 1994, Lindström 1981, Partridge *et al.* 2006, Evans 2015).

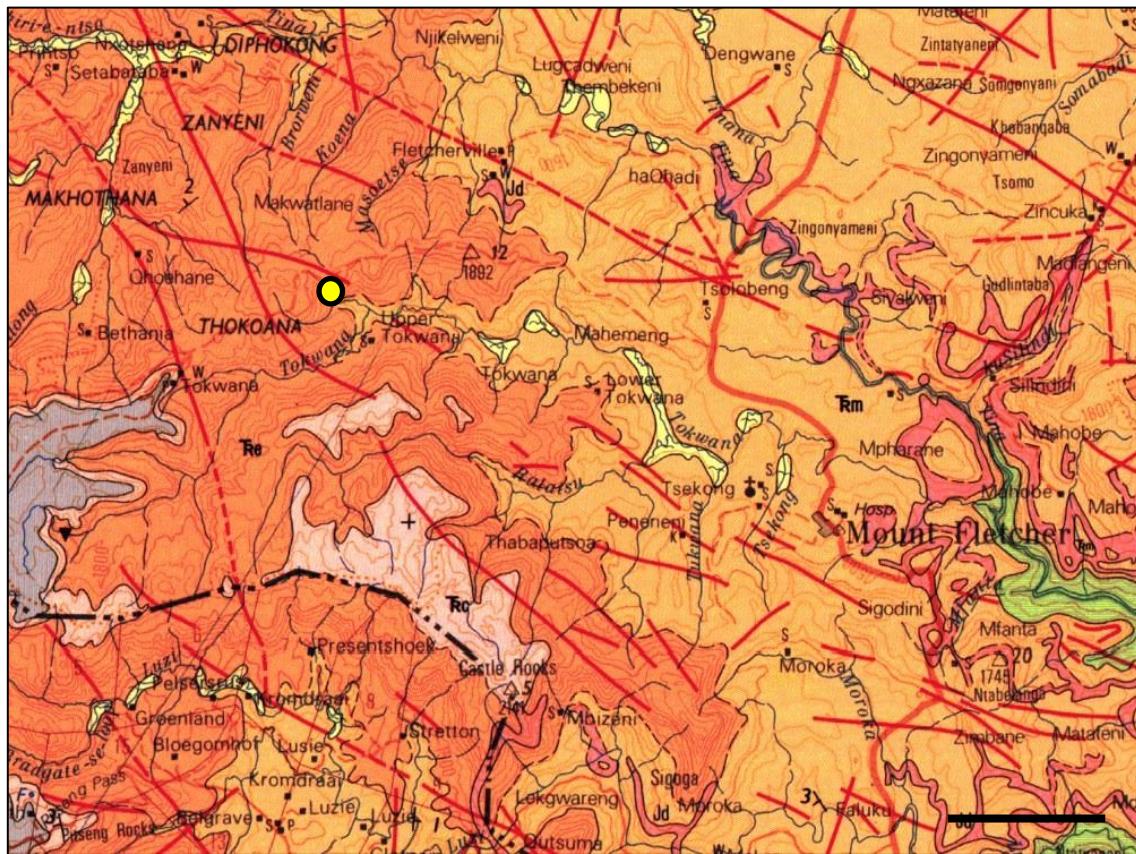


Figure 3: Extract from 1: 250 000 geological sheet 3028 Kokstad (Council for Geoscience, Pretoria) showing the geology of the region to the NW of Mount Fletcher, Eastern Cape (Scale bar = 4 km, N towards the top of the image). The Refele Village project area is approximately indicated by the yellow circle. The project footprint is underlain by Late Triassic fluvial sediments of the Stormberg Group (Karoo Supergroup), close to the contact between the Molteno Formation (TRm, pale orange) and the Elliot Formation (TRe, dark orange). The Stormberg beds are intruded regionally by a few thin, NW-SE trending dolerite dykes (red lines). Gullied hillslopes just to the north and outside of the project area are probably mantled by semi-consolidated colluvial deposits of the Masotcheni Formation of Quaternary or younger age which are not separately mapped here.

### 3. Palaeontological heritage

In terms of plant and insect fossils - but not vertebrates or traces - the Late Triassic **Molteno Formation** is one of the most productive rock units within the Main Karoo Basin. Indeed, it has produced the richest known floras of Triassic age anywhere in the world and its palaeontological sensitivity towards development is correspondingly high (Almond & Pether 2008, Almond 2018). Excellent reviews of the Molteno fossil biota have been provided by Cairncross *et al.* (1995), Anderson *et al.* (1998), Anderson and Anderson *in* MacRae (1999), Hancox (2000) and Anderson (2001). Several key systematic and synthetic papers on the Molteno palaeoflora published by John and Heidi Anderson are listed in the references to this report. The Molteno plant fossil assemblages are associated with readily-weathered carbonaceous interbeds that are unlikely to be exposed or preserved directly beneath the present project area, however.

The Pleistocene to Holocene **Masotcheni Formation** may contain concentrations of petrified fossil wood reworked from the Karoo Supergroup bedrocks as well as calcretised trace fossils (e.g. root

casts / rhizoliths, termitaria), charcoal fragments, rare mammalian bones and teeth as well as Early to Middle Stone Age stone artefacts. However, its palaeontological sensitivity is generally low.

#### 4. Conclusions and recommendations

The palaeontological heritage impact significance of the proposed Refele sportsfield and track development is assessed as VERY LOW because:

- The project footprint is small and disturbed, while substantial bedrock excavations are not envisaged here;
- Fossil plant-rich beds of the underlying Late Triassic Molteno Formation are unlikely to be exposed at or near-surface here;
- The overlying Pleistocene or younger colluvial deposits of the Masotcheni Formation and soils are generally of low palaeontological sensitivity.

Given the very low impact significance of this development in terms of palaeontological heritage resources, no recommendations for specialist palaeontological monitoring or mitigation are made, pending the potential discovery of significant new fossils (e.g. plant-rich beds, mammalian remains) during development. A protocol for Chance Fossil Finds is appended to this report.

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<b>APPENDIX - CHANCE FOSSIL FINDS PROCEDURE: Playing field and track at Refele Village near Mount Fletcher,</b>	
<b>Province &amp; region:</b>	EASTERN CAPE: Elundini Local Municipality (Joe Gqabi District Municipality)
<b>Responsible Heritage Resources Authority</b>	ECPHRA (Contact details: Mr Sello Mokhanya, 74 Alexander Road, King Williams Town 5600; smokhanya@ecphra.org.za)
<b>Rock unit(s)</b>	Molteno Formation (Late Triassic), Masotcheni Formation (Pleistocene – Holocene)
<b>Potential fossils</b>	Plant-rich horizons (e.g. carbonaceous mudrocks) with associated insects in Molteno Formation. Fossil teeth, bones and horn cores of mammals, calcretised trace fossils in Pleistocene and younger colluvial and alluvial deposits.
<b>ECO protocol</b>	1. Once alerted to fossil occurrence(s): alert site foreman, stop work in area immediately ( <i>N.B.</i> safety first!), safeguard site with security tape / fence / sand bags if necessary.
	2. Record key data while fossil remains are still <i>in situ</i> : <ul style="list-style-type: none"> <li>• Accurate geographic location – describe and mark on site map / 1: 50 000 map / satellite image / aerial photo</li> <li>• Context – describe position of fossils within stratigraphy (rock layering), depth below surface</li> <li>• Photograph fossil(s) <i>in situ</i> with scale, from different angles, including images showing context (e.g. rock layering)</li> </ul>
	3. If feasible to leave fossils <i>in situ</i> : <ul style="list-style-type: none"> <li>• Alert Heritage Resources Authority and project palaeontologist (if any) who will advise on any necessary mitigation</li> <li>• Ensure fossil site remains safeguarded until clearance is given by the Heritage Resources Authority for work to resume</li> </ul>
	3. If <i>not</i> feasible to leave fossils <i>in situ</i> (emergency procedure only): <ul style="list-style-type: none"> <li>• <i>Carefully</i> remove fossils, as far as possible still enclosed within the original sedimentary matrix (e.g. entire block of fossiliferous rock)</li> <li>• Photograph fossils against a plain, level background, with scale</li> <li>• Carefully wrap fossils in several layers of newspaper / tissue paper / plastic bags</li> <li>• Safeguard fossils together with locality and collection data (including collector and date) in a box in a safe place for examination by a palaeontologist</li> <li>• Alert Heritage Resources Authority and project palaeontologist (if any) who will advise on any necessary mitigation</li> </ul>
	4. If required by Heritage Resources Authority, ensure that a suitably-qualified specialist palaeontologist is appointed as soon as possible by the developer.
5. Implement any further mitigation measures proposed by the palaeontologist and Heritage Resources Authority	
<b>Specialist palaeontologist</b>	Record, describe and judiciously sample fossil remains together with relevant contextual data (stratigraphy / sedimentology / taphonomy). Ensure that fossils are curated in an approved repository (e.g. museum / university / Council for Geoscience collection) together with full collection data. Submit Palaeontological Mitigation report to Heritage Resources Authority. Adhere to best international practice for palaeontological fieldwork and Heritage Resources Authority minimum standards.