

## RECOMMENDED EXEMPTION FROM FURTHER PALAEOLOGICAL STUDIES:

# PROPOSED SAND MINE ALONG THE UMZIMKHULU RIVER, PORT SHEPSTONE, PORT SHEPSTONE MAGISTERIAL DISTRICT, KWAZULU-NATAL

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## EXECUTIVE SUMMARY

It is proposed to develop a small-scale sand mine along the Umzimkhulu River at Port Shepstone, KwaZulu-Natal. The shaley Ecca Group bedrocks in the Port Shepstone area (Early Permian Pietermaritzburg Formation) contain, at most, organic-walled microfossils and abundant but low-diversity trace fossils. These bedrocks as well as older (Tertiary to Quaternary) consolidated alluvial deposits along the river will not be directly impacted by the proposed mining development. The bedrocks are extensively baked by closely-spaced Karoo dolerite intrusions. The Holocene to Recent sandy alluvial deposits in and along the banks of the Umzimkhulu River that will be directly affected by the proposed sand mine are of low palaeontological sensitivity, containing – at most – subfossil remains of groups such as mammals, molluscs, crustaceans and transported plant material (e.g. wood) that are not of high palaeontological significance or conservation value.

**It is therefore recommended that, pending the discovery of significant new fossils remains (e.g. permineralised mammalian bone, teeth) during construction and operation of the proposed sand mine, exemption from further specialist palaeontological studies and mitigation be granted for this project.**

## 1. OUTLINE OF THE PROPOSED DEVELOPMENT

It is proposed to develop a small-scale (5 ha) sand mine along the bed and adjoining banks of the Umzimkhulu River on Farm Seafield 17474 / Remainder and Ambleside 2624 / Remainder on the outskirts of Port Shepstone, Port Shepstone Magisterial District, Kwa-Zulu-Natal (Figs. 1 & 2). The following project description is provided in the Heritage Impact Assessment for the project by Orton and Van der Walt (2017):

- A Mining Permit is required for the proposed establishment of a small scale 5 hectare sand mining operation.
- The existing access road from Batstones Drift will be used to access the site. An existing farm road leads to the mining area. No new roads will be required.
- Approximately 100 m<sup>3</sup> of river sand will be mined *per* day from the riverbed using a mechanical pump.

- The sand will then be left to dry in a pit about 20 metres from the riverbank while the water drains off and flows back into the river. Disturbance of the riparian zone will be avoided to ensure that the river bank is not disturbed and the river is not diverted.
- Site infrastructure will include a chemical toilet and waste bin. No buildings will be erected on site.
- Equipment and/or plant will include a front end loader and truck for the transportation of sand away from the site, and a vehicle for staff transport. No permanent infrastructure will be erected on the mining site.
- The areas used for facilities or equipment will be rehabilitated by maintaining the general topography of the area and removing all equipment and facilities from the site. At the end of the project life cycle, a thick soil layer of approximately 333 mm will be spread across the disturbed areas then ripped, fertilised and re-vegetated. Post-closure monitoring will assist in determining the success of the rehabilitation and also identify whether any additional measures need to be taken to ensure the area is restored to a reasonable and acceptable condition. The area within the river where sand was mined will be rehabilitated naturally during the rainy season where flood waters will deposit more sand across the mined area.

A palaeontological assessment as part of a HIA for this mining project has been requested by AMAFA Heritage KwaZulu-Natal (Case Ref: SAH16/10367; Interim Comment of 21 November 2016). The present palaeontological heritage assessment comment has accordingly been commissioned by ASHA Consulting (Pty) Ltd (Contact details: Dr Jayson Orton, ASHA Consulting (Pty) Ltd, 40 Brassie Street, Lakeside, 7945. E-mail: jayson@asha-consulting.co.za. Tel: 021 788 8425. Cell: 083 272 3225).

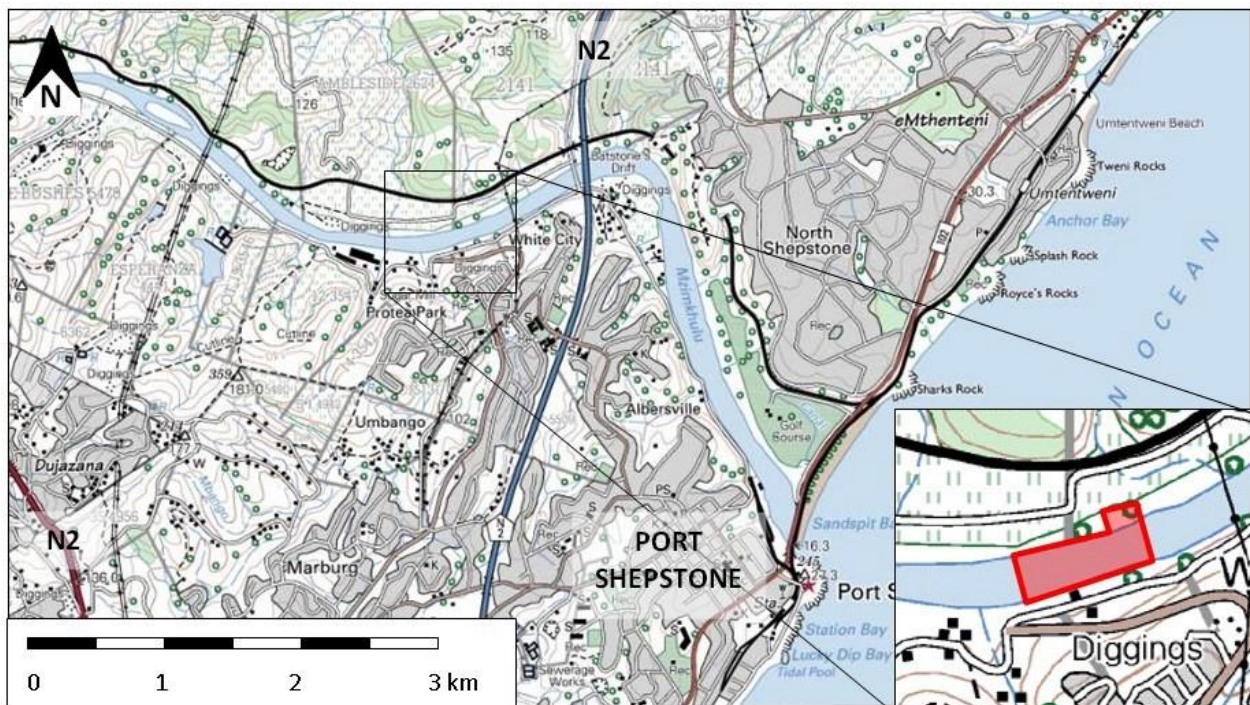


Figure 1. 1: 50 000 scale topographical map of Port Shepstone showing the location of the proposed sand mine (red polygon) along the Umzimkhulu River (Image abstracted from the Heritage Impact Assessment for the mining project by Orton and Van der Walt, 2017).



**Figure 2. Google earth© satellite image of the sand mine study area (yellow polygon) along the Umzimkhulu River on the outskirts of Port Shepstone, KZN. The access road is shown in black (Image abstracted from the Heritage Impact Assessment for the mining project by Orton and Van der Walt, 2017).**

## **2. GEOLOGICAL BACKGROUND**

The geology of the sand mine study area is shown on 1: 250 000 geology sheet 3030 Port Shepstone (Figure 3) for which a short explanation has been published by Thomas (1988). The area is underlain at depth by Early Permian basinal mudrocks of the **Pietermaritzburg Formation** (Ecca Group, Karoo Supergroup) (Pp, dark brown in Fig. 3) which overlie glacial sediments of the Dwyka Group to the south. This unit reaches a thickness of some 400 m in the 1: 250 000 sheet 3030 study area (Thomas 1988). The formation comprises a monotonous succession of dark, blue-black, finely-laminated fissile shales with occasional thicker interbeds of massive claystones and micaceous siltstones. Highly carbonaceous mudrocks and locally abundant diagenetic carbonate concretions and lenses are also known from this unit (Thomas 1988, Johnson *et al.* 2006). Interbeds of siltstone and fine-grained sandstone towards the top of the upward-shallowing succession show soft-sediment deformation features. The Ecca bedrocks in this region are intensely intruded by Early Jurassic dolerites of the **Karoo Dolerite Suite** (Thomas 1988, Duncan & March 2006) (Jd, red in Fig. 3).

The Ecca Group bedrocks in the Port Shepstone area are overlain by very thick Late Caenozoic **alluvial deposits** along the major river systems as they near the coast (pale yellow in Fig. 3); a

thickness of over 38 m of alluvium has been measured in boreholes along the Umzimkhulu River near Port Shepstone (Du Toit 1946, Thomas 1988). The older, deeper-lying deposits are likely to be of Tertiary to Quaternary age while the unconsolidated sandy alluvium in the bed of the river that will be exploited by the proposed mine is of Holocene to Recent age.

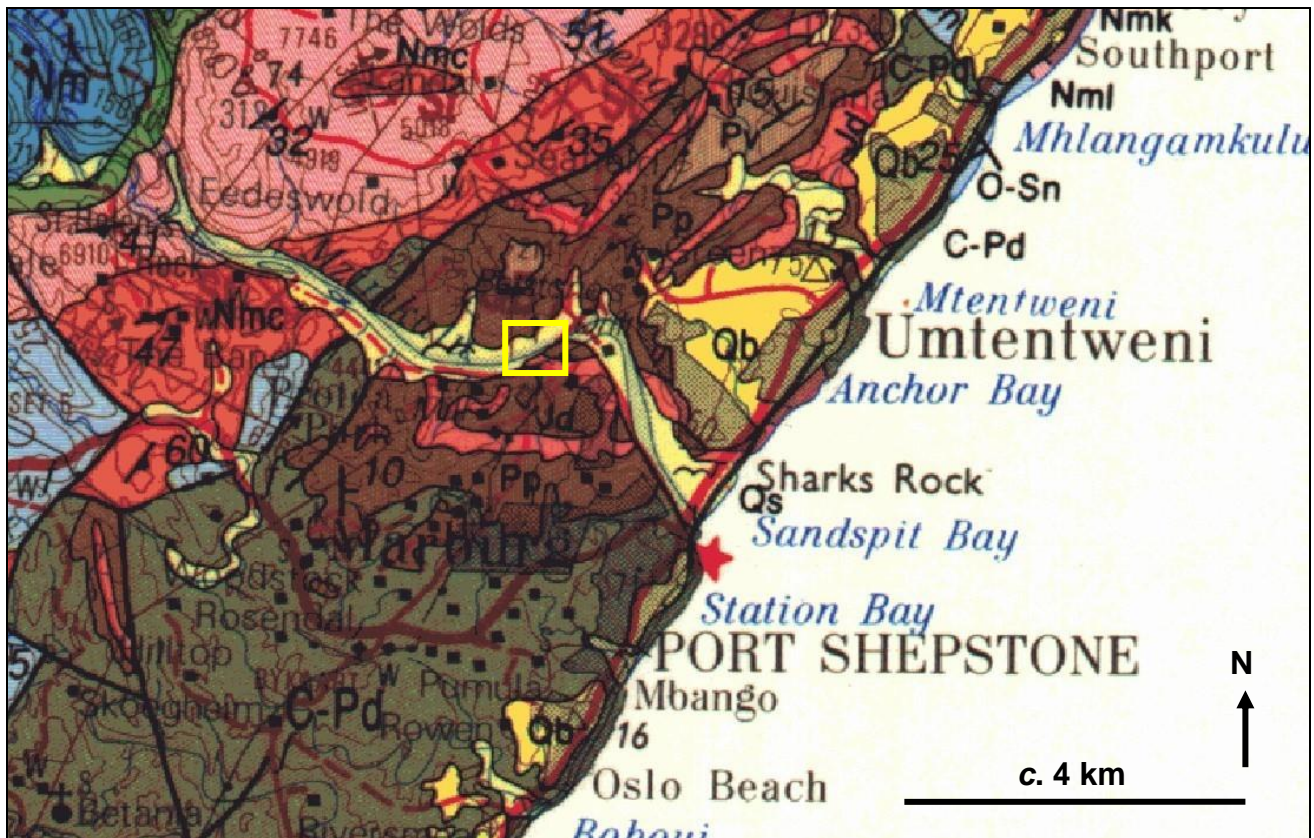


Figure 3. Extract from the 1: 250 000 geology sheet 3030 Port Shepstone (Council for Geoscience, Pretoria) showing the approximate location of the proposed sand mine along the Umzimkhulu River near Port Shepstone (yellow rectangle). The bedrocks underlying the region comprise Early Permian basinal mudrocks of the Pietermaritzburg Formation (Ecca Group, Karoo Supergroup) (Pp, dark brown) that are intruded in this area by Early Jurassic dolerites of the Karoo Dolerite Suite (Jd, red). The banks and bed of the Umzimkhulu River are mantled by Late Caenozyotic alluvium (pale yellow with flying bird symbol).

### 3. PALAEOLOGICAL HERITAGE

The palaeontology of the **Pietermaritzburg Formation** is poorly understood (*cf* Groenewald 2012). This is partially, but not entirely, attributable to poor levels of Ecca bedrock exposure and extensive surface weathering in the region as a whole. Intervals of carbonaceous mudrocks are likely to contain assemblages of organic-walled microfossils such as acritarchs, pollens and spores, where these have not been destroyed by dolerite intrusion. Prolific assemblages of invertebrate burrows occur on some bedding planes, including carbonate-cemented mudrocks, and some horizons show high levels of bioturbation (*i.e.* sediment-mixing by infaunal organisms) (Johnson *et al.* 2006). The Ecca Group bedrocks will not be directly impacted by the proposed development.

The older (probably Late Tertiary / Neogene to Quaternary) **alluvial sediments** along the Umzimkhulu River might contain palaeontologically important fossil material such as mammalian bones and teeth, fish, freshwater molluscs and crustaceans and transported terrestrial plant material (e.g. wood, leaves). To the author's knowledge such fossils have not yet been recorded here and these older alluvial deposits are unlikely to be incised by the proposed superficial sand mining. The younger sandy alluvial deposits on the Umzimkhulu River bed and banks are expected to contain, at most, subfossil material of little or no palaeontological interest.

#### **4. CONCLUSIONS & RECOMMENDATIONS**

The shaley Ecca Group bedrocks in the Port Shepstone area (Early Permian Pietermaritzburg Formation) contain, at most, organic-walled microfossils and abundant but low-diversity trace fossils. These bedrocks and older (Tertiary to Quaternary) consolidated alluvium will not be directly impacted by the proposed mining development. The Holocene to Recent sandy alluvial deposits in and along the banks of the Umzimkhulu River that will be directly impacted by the proposed sand mine are of low palaeontological sensitivity, containing – at most – subfossil remains of groups such as mammals, molluscs, crustaceans and transported plant material (e.g. wood) that are not of high palaeontological significance or conservation value.

**It is therefore recommended that, pending the discovery of significant new fossils remains (e.g. permineralised mammalian bone, teeth) during construction and operation of the proposed sand mine, exemption from further specialist palaeontological studies and mitigation be granted for this project.**

Should any substantial fossil remains (e.g. permineralised mammalian bones, teeth) be encountered during excavation, however, these should be safeguarded, preferably *in situ*, and reported by the ECO to AMAFA Heritage Kwazulu-Natal (Contact details: Amafa Ulundi Office. P.O. Box 523, Ulundi, 3838. Tel: 035 8702050. Fax: 086 5108074. E-mail: info@heritagekzn.co.za). This is so that appropriate action can be taken by a professional palaeontologist, at the developer's expense. Mitigation would normally involve the scientific recording and judicious sampling or collection of fossil material as well as associated geological data (e.g. stratigraphy, sedimentology, taphonomy) by a professional palaeontologist. These recommendations should be included in the Environmental Management Programme (EMPr) for the proposed development.

#### **5. KEY REFERENCES**

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## **6. QUALIFICATIONS & EXPERIENCE OF THE AUTHOR**

Dr John Almond has an Honours Degree in Natural Sciences (Zoology) as well as a PhD in Palaeontology from the University of Cambridge, UK. He has been awarded post-doctoral research fellowships at Cambridge University and in Germany, and has carried out palaeontological research in Europe, North America, the Middle East as well as North and South Africa. For eight years he was a scientific officer (palaeontologist) for the Geological Survey / Council for Geoscience in the RSA. His current palaeontological research focuses on fossil record of the Precambrian - Cambrian boundary and the Cape Supergroup of South Africa. He has recently written palaeontological reviews for several 1: 250 000 geological maps published by the Council for Geoscience and has contributed educational material on fossils and evolution for new school textbooks in the RSA.

Since 2002 Dr Almond has also carried out palaeontological impact assessments for developments and conservation areas in the Western, Eastern and Northern Cape, Limpopo, Northwest and the Free State under the aegis of his Cape Town-based company *Natura Viva* cc. He has served as a long-standing member of the Archaeology, Palaeontology and Meteorites Committee for Heritage Western Cape (HWC) and an advisor on palaeontological conservation and management issues for the Palaeontological Society of South Africa (PSSA), HWC and SAHRA. He is currently compiling technical reports on the provincial palaeontological heritage of Western, Northern and Eastern Cape for SAHRA and HWC. Dr Almond is an accredited member of PSSA and AHP (Association of Professional Heritage Practitioners – Western Cape).

## **Declaration of Independence**

I, John E. Almond, declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed development project, application or appeal in respect of which I was appointed other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of my performing such work.



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