PALAEONTOLOGICAL SPECIALIST STUDY: FIELD ASSESSMENT

EXISTING BORROW PIT ALONG THE OP5958 ROAD IN THE KOO REGION, MONTAGU DISTRICT, WESTERN CAPE

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1. EXECUTIVE SUMMARY

The small, recently established OP5958/0.74/R/100 pit, situated in the Koo Region of the Western Cape some 30 km northwest of Montagu, is excavated into non-marine sandstones and mudrocks of the Middle Devonian Klipbokkop Formation (Upper Bokkeveld Group). Elsewhere this formation is well-known for its Middle Devonian fish fauna and vascular plants. However, the Klipbokkop sediments in the study area are highly cleaved and show no evidence of potentially fossiliferous ferruginous nodules. The palaeontological sensitivity of the site is correspondingly LOW and, pending the discovery of substantial new fossil material such as shelly fossil, fish or plant remains, no further mitigation of fossil heritage for this borrow pit is recommended.

2. INTRODUCTION

The Department of Transport, Western Cape, is applying to the Department of Mineral Resources for approval to exploit road material from a small existing, recently established borrow pit along the unsealed road OP5958 in the Koo region (Montagu District). Pit OP5958/0.74/R/100 (33º 39' 32.1" S, 19º 50' 28.1" E) on Portion 2 of farm Leeuhoek No. 54, is situated about 30 km northwest of the town of Montagu, Western Cape (Figs. 1 & 2).

A previous desktop basic assessment of the pit by the author assessed its palaeontological heritage sensitivity as high due to the presence here of potentially fossiliferous sediments of the Klipbokkop Formation (Upper Bokkeveld Group, Bidouw Subgroup). A palaeontological field assessment of the pit as part of an HIA was requested by Heritage Western Cape (HWC Case Ref. 120130JL28, Interim Comment 15 February 2012) in accordance with the requirements of the National Heritage Resources Act, 1999 (Section 38). The present palaeontological heritage field assessment and short report were accordingly commissioned by Vidamemoria Heritage Consultants, Cape Town (Address: 3rd Floor, Guarantee House, 37 Burg Street, Greenmarket Square, Cape Town; tel: 021-424 8432; e-mail: Quahnita@vidamemoria.co.za). Fieldwork for this project was carried out on 19 August 2012.

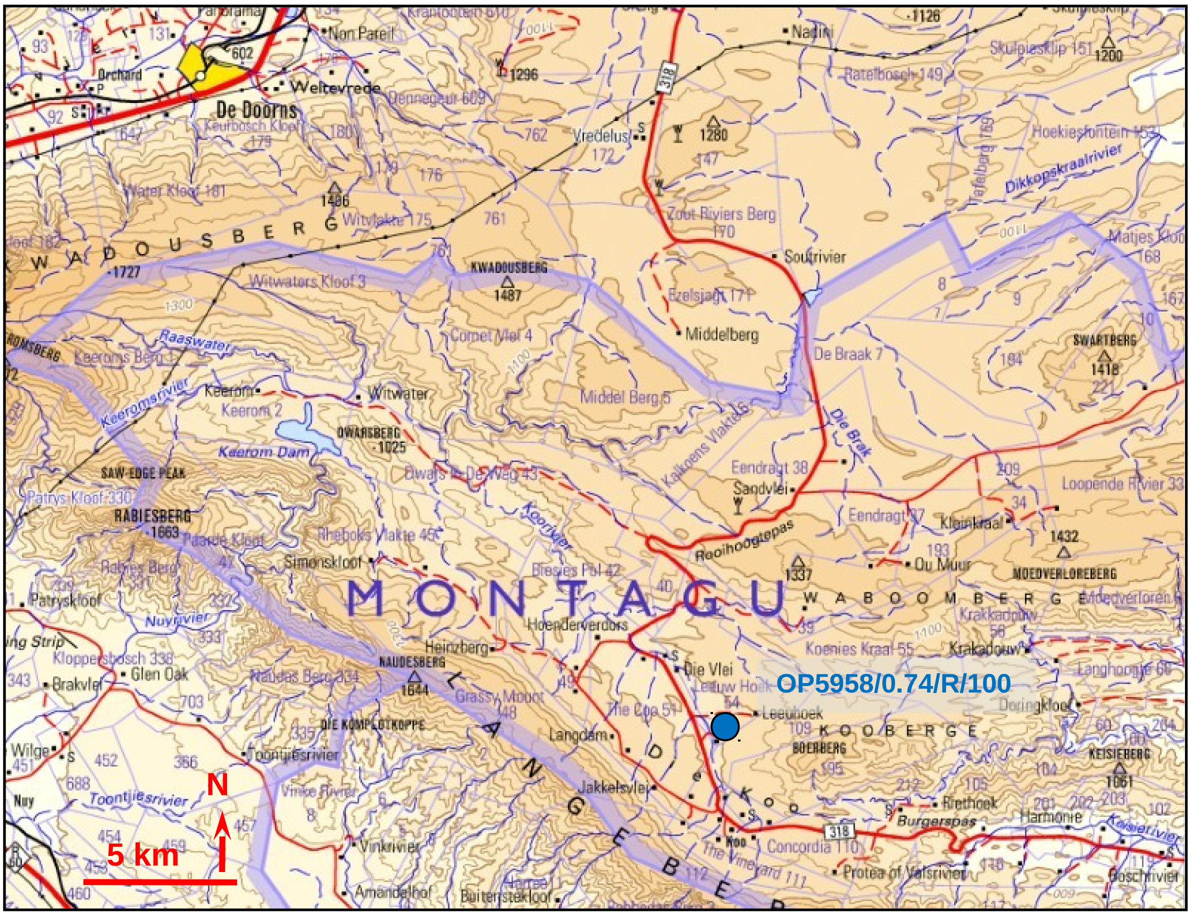

Fig.1. Extract from topographical sheets 3119 Worcester (Courtesy of the Chief Directorate: National Geo-spatial Information, Mowbray) showing the approximate location of the existing pit OP5958/0.74/R/100 located in the Koo region *c*. 30 km NW of Montagu, Western Cape (blue dot).

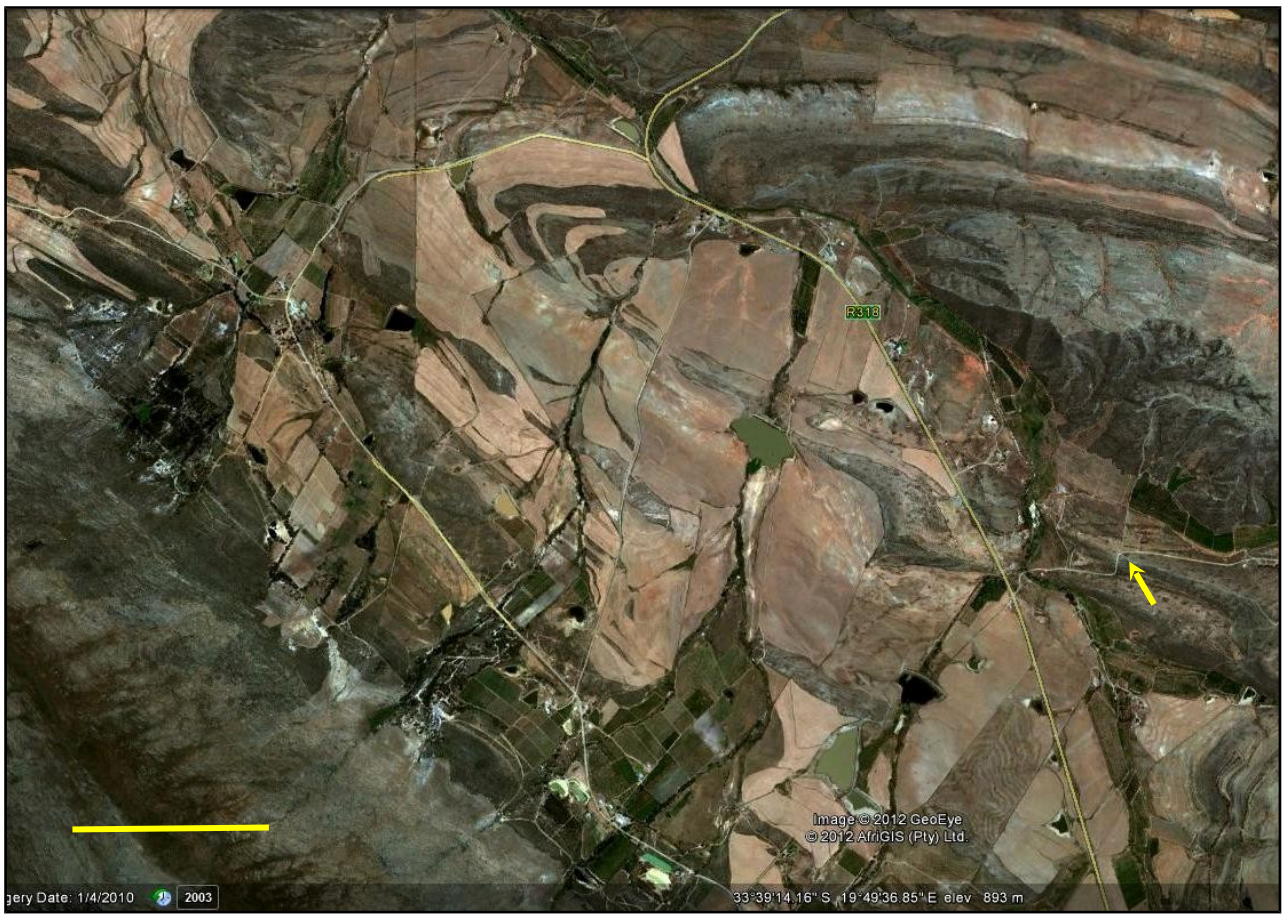

Fig. 2. 2010 Google earth© satellite image of the study area showing the location of the new OP5958/0.74/R/100 pit on the south side of the OP5958 (yellow arrow) on Portion 2 of the farm Leeeuhoek 54. The pit has only recently been established. The yellow scale bar = *c.* 1 km.

3. GEOLOGICAL HERITAGE

The geology of the Koo study area near Montagu is shown on 1: 250 000 geology sheet 3319 Worcester (Council for Geoscience, Pretoria) and is shown here in Fig. 3. A short sheet explanation has been published by Gresse & Theron (1992; see also the older 1: 125 000 Worcester- Hermanus map and sheet explanation by De Villiers *et al.* 1964).

The newly established, small OP5958/0.74/R/100 pit is situated at *c*. 890 m amsl on the crest and southwest facing slopes of a low WNW-ESE trending rocky ridge in the western part of the blind-ending Leeuhoek valley, bounded by the Waboomberge in the north and the Kooberge in the south (Figs 2 & 4). The pit is excavated into Middle Devonian sediments of the **Klipbokkop Formation** (**Dk**, Upper Bokkeveld Group / Bidouw Subgroup), close to the base of the succession. Sandstones of the underlying Wuppertal Formation (Dwu) build a more prominent ridge to the southwest. The Bokkeveld Group rocks in the Koo region are folded into a major west-east trending syncline whose axis runs along along the Kooberg Range (Fig. 3).

The Bokkeveld rocks in pit OP5958/0.74/R/100 consist of thinly interbedded to laminated greyish wackes (impure sandstones) and darker grey siltstones. Primary sedimentary structures such as wave ripples and horizontal lamination are often obscured by bioturbation, causing mottling, and the bedrocks are sliced up by a steep spaced tectonic cleavage. Almost no primary bedding planes are available for inspection. Weathering is not markedly advanced so the rocks are still well consolidated.

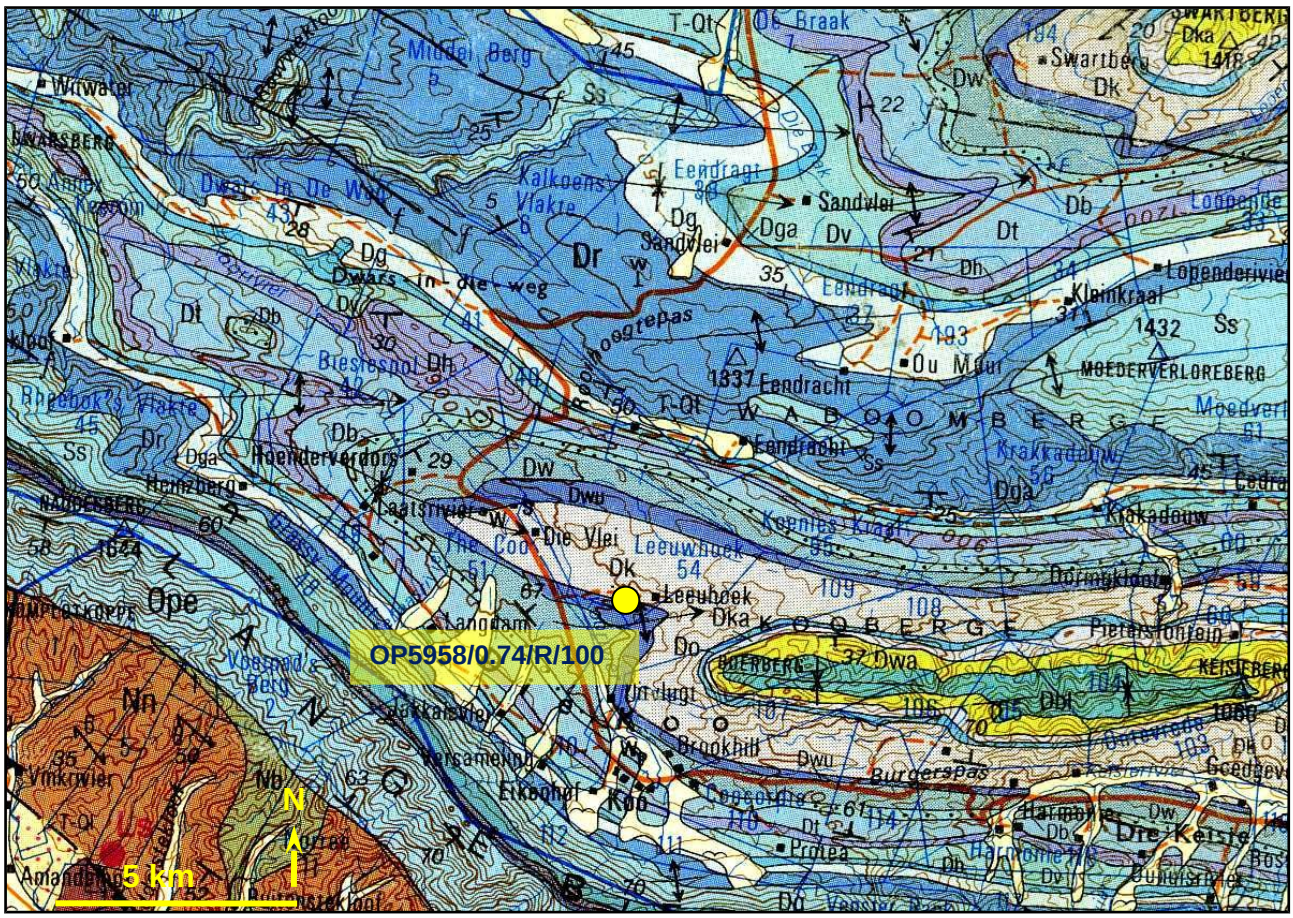

Fig. 3. Extract from 1: 250 000 geology sheet 3119 Worcester (Council for Geoscience, Pretoria) showing location of the OP5958/0.74/R/100 borrow pit *c*. 30 km NW of Montagu. The pit is excavated into cleaved sandstones and siltstones of the Klipbokkop Formation (Dk, Upper Bokkeveld Group).

Fig. 4. View southwest across the OP5958/0.74/R/100 borrow pit area towards the Langeberg Range on the other side of the Koo Valley.

Fig. 5. Greyish laminated wackes and siltstones of the Klipbokkop Formation showing well-developed, south-dipping spaced cleavage.

Fig. 6. Close up of exposure seen in previous figure showing primary sedimentray lamination dipping gently northwards cut by steeply south-dipping spaced cleavage (Hammer = 29 cm).

4. PALAEONTOLOGICAL HERITAGE

An important, albeit low-diversity, non-marine fossil biota has been recorded from the Bidouw Subgroup (Klipbokkop and upper Kanies Formations in the western Bokkeveld outcrop area) as well as from laterally equivalent Middle Devonian sediments to the east – *i.e.* the Adolphspoort Formation of the Traka Subgroup (Plumstead 1977, Chaloner *et al.* 1980, Anderson & Anderson 1985, Almond 1997, Anderson *et al.* 1999a, 1999b, Anderson *in* MacRae 1999, Almond 2008a, 2008b, 2009). The Klipbokkop / Adolphspoort fossil assemblages are mainly preserved as moulds and comprise:

- Fragmentary vascular plants, including several species of lycopods (the club mosses *Archaeosigillaria*, *Haplostigma*) *plus* possible psilopsids;
- Non-marine, thin-shelled bivalves (possibly unionids), often preserved in dense clumps;
- Rare marine invertebrates (*e.g.* the articulate brachiopod *Australospirifer*);
- A limited variety of trace fossils including rare trilobite burrows (*Cruziana*), and unusually small versions of the complex helical burrow *Spirophyton*;
- A low-diversity assemblage of bony and cartilaginous fish, including acanthodians ("spiny sharks"), several primitive sharks, bony-plated jawed fish known as placoderms (Fig. 7), and rare crossopterygians (lobe-finned bony fish). These important Middle Devonian fossil fish have been described and illustrated in detail by Chaloner *et al.* (1980), Almond (1997), Anderson *et al.* (1999a, 1999b) and Long *et al*. (in prep). General accounts of Devonian fish groups from Gondwana are given by Anderson *in* MacRae (1999) and Long (1995).

Klipbokkop / Adolphspoort fish fossils mainly consist of disarticulated placoderm plates as well as isolated teeth and fin spines of antarctilamnid sharks and acanthodians. The fossils are found scattered throughout the succession within silty mudrocks and occasionally within ferruginous carbonate-rich concretions. Thin conglomeratic layers of transported mudflakes mixed with fish teeth, spines and other skeletal elements are recorded from the mid to upper Klipbokkop

Formation in the Cederberg region and elsewhere. Those parts of the succession with unionid-like bivalves, low-diversity trace assemblages dominated by small *Spirophyton*, vascular plants and fish fossils are considered to be non-marine in origin, perhaps accumulated on an extensive delta platform or prograding (advancing) shoreline zone. A mixture of fish originally from brackish to freshwater bodies near to the coastline (estuaries, lagoons, rivers. lakes) as well as salinity-tolerant marine forms may be represented in the fossil assemblages.

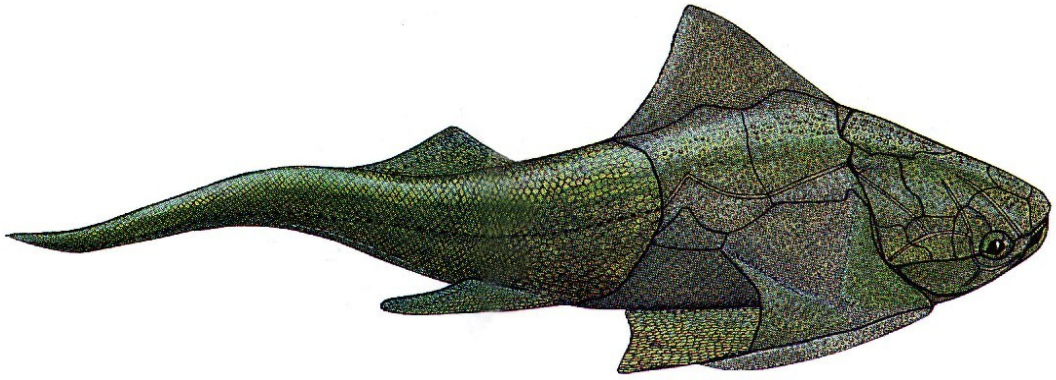

Fig. 7. Reconstruction of the armour-plated placoderm fish *Groenlandaspis*, which is recorded from Middle to Late Devonian sediments worldwide, including the Bidouw and Traka Subgroups of South Africa (From Long 1995).

No body fossils were recorded within the OP5958/0.74/R/100 borrow pit study area. Potentially fossiliferous ferruginous nodules were not observed here. There is evidence for extensive bioturbation of some horizons, but discrete ichnogenera were not recognised.

5. CONCLUSIONS & RECOMMENDATIONS

The small, recently established OP5958/0.74/R/100 pit is excavated into non-marine sandstones and mudrocks of the Middle Devonian Klipbokkop Formation (Upper Bokkeveld Group) that elsewhere are well-known for their Middle Devonian fish fauna and vascular plants. However, the Klipbokkop sediments in the study area are highly cleaved and show no evidence of potentially fossiliferous ferruginous nodules. The palaeontological sensitivity of the site is correspondingly LOW and, pending the discovery of substantial new fossil material such as shelly fossil, fish or plant remains, no further mitigation of fossil heritage for this borrow pit is recommended.

6. ACKNOWLEDGEMENTS

Ms Quahnita Samie of Vidamemoria Heritage Consultants, Cape Town, is thanked for commissioning this specialist study and for kindly providing the necessary background information. I am also very grateful to Ms Madelon Tusenius for logistical support and assistance with these borrow pit projects.

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8. 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 under the aegis of his Cape Town-based company *Natura Viva* cc. He is 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 APHP (Association of Professional Heritage Assessment 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 borrow pit 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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