RECOMMENDED EXEMPTION FROM FURTHER PALAEONTOLOGICAL STUDIES:

Prospecting Rights Application for Farm Keikamspoort 71, Northern Cape Province

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EXECUTIVE SUMMARY

Wingimix (Pty) Ltd has applied for a Prospecting Right for a wide spectrum of minerals on the Farm Keikamspoort 71, Prieska District, Northern Cape Province. The prospecting study area is underlain at depth by unfossiliferous Precambrian metamorphic rocks. These ancient bedrocks are locally overlain by small relict patches of glacial sediments of the Dwyka Group that are likely to be highly weathered and contain very few fossils (mainly reworked blocks of stromatolitic carbonate). The overlying superficial sediments (alluvium, gravels, aeolian sands, calcretes, soils *etc*) are likewise of low palaeontological sensitivity, although Pleistocene mammalian remains (teeth, bones, horncores) might occur very sporadically here. Given the small combined footprint of the proposed prospecting activities, their impact significance on local fossil heritage resources is considered to be VERY LOW.

It is therefore recommended that, pending the discovery of substantial new fossil remains during prospecting, exemption from further specialist palaeontological studies is granted for the proposed mineral prospecting on Farm Keikamspoort 71.

A tabulated Chance Fossil Finds procedure for this project is appended to this report. Any substantial fossil remains (*e.g.* fossil shells, petrified wood or plant remains, vertebrate bones, teeth) encountered during excavation should be reported to SAHRA (P.O. Box 4637, Cape Town 8000. Contact: Dr Ragna Redelstorff. Tel: 021 202 8651. Email: rredelstorff@sahra.org.za or Ms Natasha Higgitt. Tel: 021 462 4502. Email: nhiggitt@sahra.org.za) for possible mitigation by a professional palaeontologist at the developers expense.

1. OUTLINE OF PROPOSED DEVELOPMENT

Wingimix (Pty) Ltd has applied for a Prospecting Right for Copper, Zinc, Lead, Gold, Silver, Cobalt, Sulphur, Barytes, Pyrite, Molybdenum, Chrome, Platinum Group Metals, Nickel, Tungsten, Limestone, Stone Aggregate and Sand on the Farm Keikamspoort 71, near Prieska in the Prieska District of the Northern Cape Province which application was accepted by the Department of Mineral Resources.

Prospecting activities are planned to be conducted in phases over a period of four years.

Description of planned non-invasive activities:
(These activities do not disturb the land where prospecting will take place e.g. aerial photography, desktop studies, aeromagnetic surveys, etc.)

Phase 1:
In order to direct the exploration programme in an efficient manner, there will be a review of all available information and data gathered by previous exploration on the farm. A desktop study will be undertaken of the base metal potential of the area. A site investigation of the target areas will be undertaken to identify infrastructure and determine any potential problems that may need to be addressed.

Phase 2:
Any anomalous features identified will be mapped in detail. The various rock types and their contacts will also be mapped.

Phase 3:

A 3 line kilometer magnetic survey (or any other suitable geophysical method) will be undertaken using a proton 5 magnetometer over selected areas as identified during the desktop study. This study will result in identifying potential base metal / sulphide mineralization.

Phases 5, 7 & 9:
Drill samples will be collected in one meter intervals and logging will be done by a qualified geologist who will record the lithology, mineralogy, degree of mineralization and structural features. Mineralized samples will be analyzed at an internationally recognized (ISO certified) laboratory.

Phase 10:
A detailed feasibility report, containing resource calculations, will be compiled after drilling operations have been completed to evaluate the economic viability of the project.

Description of Planned Invasive Activities:
(These activities result in land disturbances e.g. sampling, drilling, bulk sampling, etc.)

Phase 4: Percussion drilling
Percussion drilling will be used initially to identify the position of a suspected base metal deposit. The position of the boreholes is dependent on the results of the review of historical activities, geological mapping, desktop study and geophysical survey.

Forty boreholes, on average 50m deep each, are planned. The collar position of all boreholes will be surveyed. All drilling will be short term and undertaken by a contractor using truck-mounted equipment.

Angled percussion holes are planned to locate and intersect the mineralization. A traverse line or grid drilling is used to identify and define the extent of any mineralization. The sizes of the boreholes drilled will be determined by such factors as cost, proposed sampling, availability of drilling machines and the volume of sample required, among others.

Each drill site will be rehabilitated. The boreholes will be filled with drill chips and covered with topsoil.

Phases 6: Core drilling
Depending on the results from the non-invasive prospecting activities as well as the percussion drilling phase, further confirmation and exploratory drilling may be required. Core drilling will only be used if mineralization has been found. The position of the boreholes is dependent on the results of the non-invasive activities.

Ten boreholes, on average 75m deep, are planned for phase 6, but depending on results this could be more. The collar position of all boreholes will be surveyed.

Each drill site will be rehabilitated before a new site is established. The boreholes will be covered with a metal plate and 0.2m previously stored topsoil.

Following a request for a desktop palaeontological assessment for this project combined with the Hedley Plains Report submitted earlier, this palaeontological heritage assessment comment was commissioned to supplement the Heritage Impact Assessment Report (Gaigher 2018) by G&A Heritage (Pty) Ltd, Louis Trichardt (Contact details: Mr Stephan Gaigher Chief Executive Officer, G&A Heritage (Pty) Ltd, 38A Vorster Street, Louis Trichardt 0920, RSA. E-mail: stephan@gaheritage.co.za; Tel: 073 752 6583, 015 516 1561).

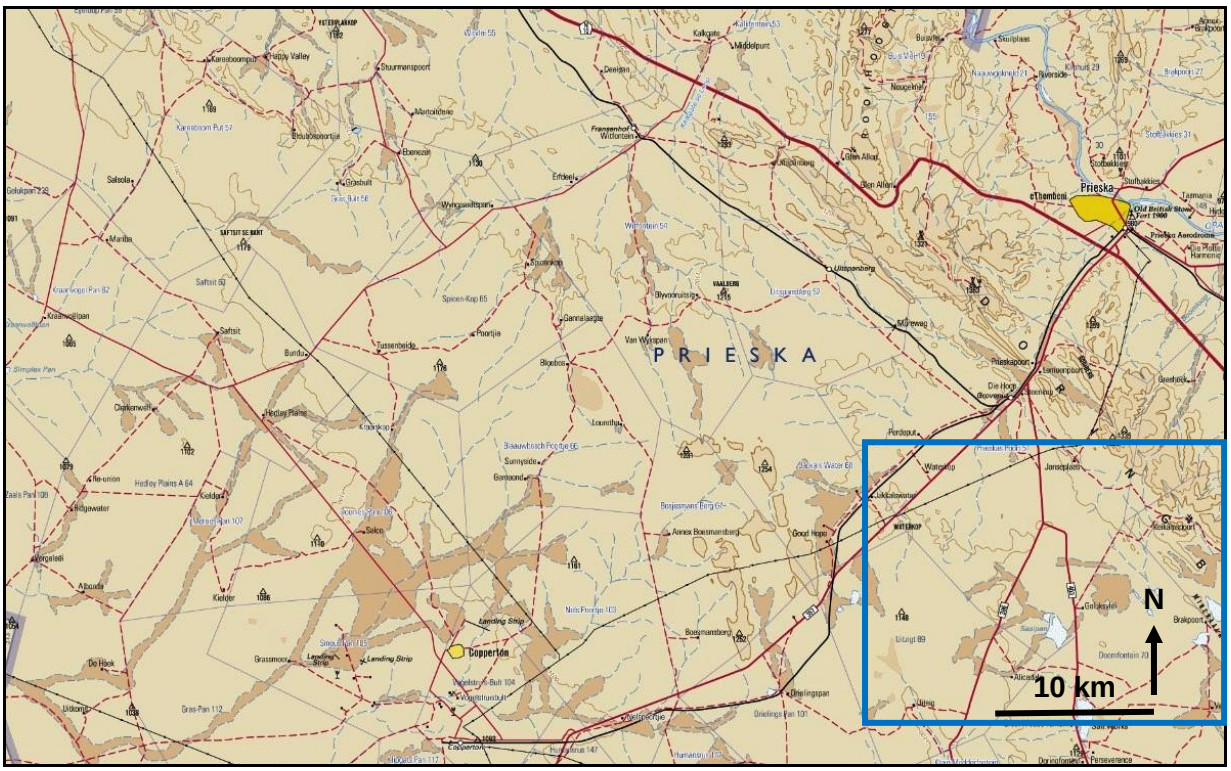

Figure 1: Extract from 1: 250 000 topographical sheet 2922 Prieska (Courtesy of the Chief Directorate: National Geospatial Information, Mowbray) showing the approximate location of the prospecting study area on The Farm Keikamspoort 71, Prieska, Northern Cape (blue rectangle).

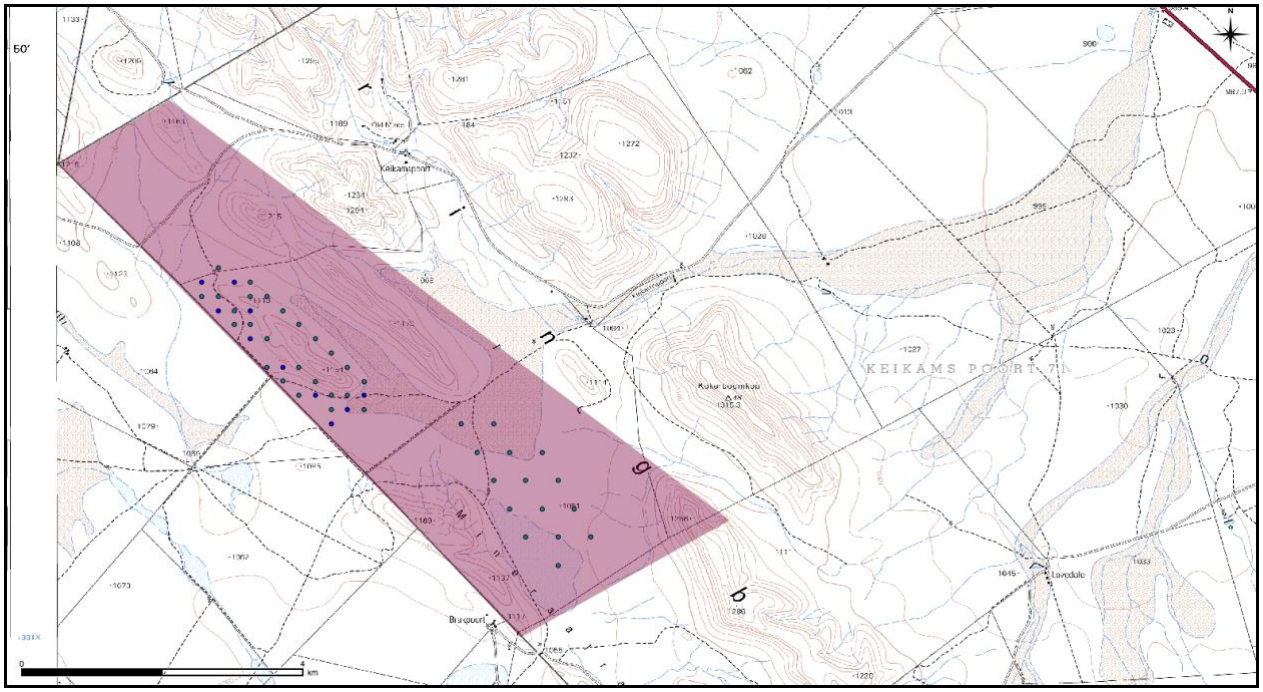

Figure 2: Map showing provisional siting of prospecting phase activities on the Farm Keikamspoort 71 (Abstracted from Gaigher 2018).

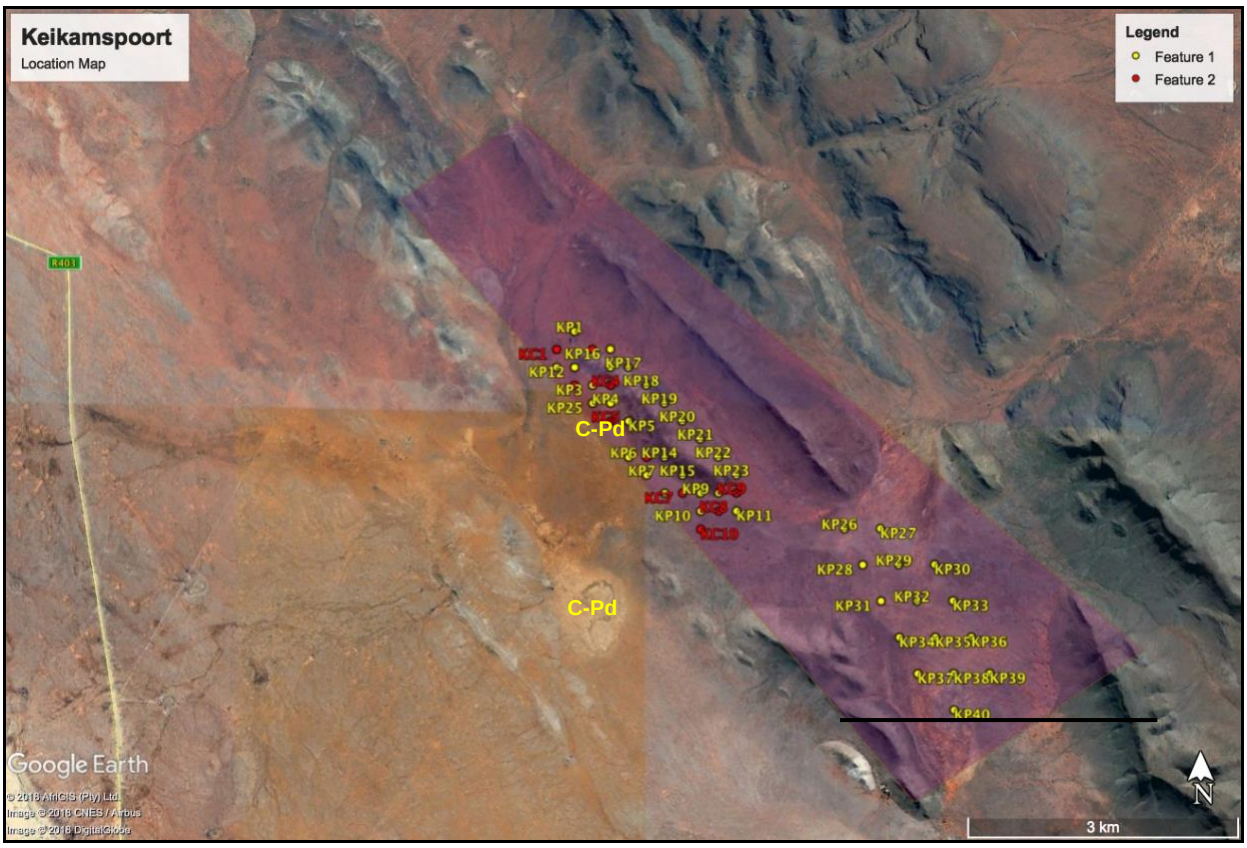

Figure 3: Google earth© satellite image showing the desert terrain within the prospecting study area on the Farm Keikamspoort 71. Note the complex, "swirly" folded fabric of the basement rocks in this region. Relict outcrops of Dwyka Group sediments (C-Pd) occasionally show up as pale patches, but this is not invariably the case. Other pale areas represent small pans (and associated calcretes) and basement exposures. Orange hues reflect aeolian cover sands of the Gordonia Formation that are reworked along drainage lines and into topographic depressions. Scale bar = 6 km. N is towards top of image.

2. GEOLOGICAL BACKGROUND

The prospecting rights study area on Farm Keikamspoort lies within fairly low-relief, desert terrain at *c*. 1000-1100 m amsl in the Kaaingvlakte area of eastern Bushmanland (Fig. 3). This sandy to gravelly area with low rocky exposures lies to the west of the Doringberge range and is drained by several west- to SW-trending shallow drainage lines, tributaries of the Carnarvonleegte – Hartbeesrivier drainage system. It forms part of the Northern Cape Panveld Geomorphic Province of Partridge *et al.* (2010). Bedrock exposure is patchy due to the extensive cover by superficial sediments.

The geology of the study area near Copperton is shown on 1: 250 000 geological map 2922 Prieska, for which a sheet explanation has yet to be published (Fig. 4). The area is largely mantled near-surface by unconsolidated orange-brown aeolian (*i.e.* wind-blown) sands of the Quaternary **Gordonia Formation** (**Kalahari Group**) (**Qg**) (*cf* field photos in Gaigher 2018) whose thickness in the study region is uncertain. Thicker sands are concentrated along drainage lines and within basement depressions. The geology of the Late Cretaceous to Recent Kalahari Group is reviewed by Thomas (1981), Dingle *et al.* (1983), Thomas & Shaw 1991, Haddon (2000) and Partridge *et al.* (2006). The Gordonia Formation dune sands are considered to range in age from the Late Pliocene / Early Pleistocene, dated in part from enclosed Middle to Late Stone Age stone tools (Dingle *et al*., 1983, p. 291). In addition to aeolian sands, the superficial sediments in the study area also include stream alluvium, colluvial deposits (*e.g.* scree) and downwasted surface gravels. Based on field photos in Gaigher (2018) several small pans and depressions are associated with semi-consolidated sands and calcrete hardpans that may be Quaternary in age.

Several small relict inliers of Permo-Carboniferous glacial sediments of the **Dwyka Group** (**C-Pd, Karoo Supergroup**) are mapped within the study area and similar rocks probably underlie the thin, superficial cover of Gordonia sands elsewhere. Dwyka rocks may therefore be intersected by deeper excavations during prospecting. The geology of the Dwyka Group has been summarized by Visser (1989), Visser *et al.* (1990)

and Johnson *et al.* (2006), among others. Some – but not all - of the Dwyka inliers appear as pale patches on satellite images (Fig. 3).

Numerous small inliers of ancient **Precambrian basement rocks** with a predominantly NW-SE trend also emerge through the cover of Kalahari sands in the Copperton region (See "swirly" patterns in Fig. 3). East of the Brakbosch Fault a complex succession of metasediments (quartzites, schists) and metavolcanics (amphibolites) of the **Spioenkop Formation** form part of the Archaean **Marydale Greenstone Belt** (Brandl *et al.* 2006). Metasedimentary basement rocks to the southwest of the NW-SE striking Brakbosch fault line running past Copperton are assigned to the **Vogelstruisbult and Hedley Plains Formations** of the **Jacobmyns Pan Group.** They consist mainly of highly metamorphosed sediments (banded and migmatitic gneisses) and form part of the *circa* one billion year old Namaqua-Natal Province (Prinsloo 1989, Cornell *et al.* 2006).

3. PALAEONTOLOGICAL HERITAGE

Although they may originally have contained microfossils (*e.g.* ancient bacteria) the Archaean and Proterozoic basement metasedimentary rocks have been too intensely metamorphosed to preserve fossils.

The fossil record of the Permo-Carboniferous **Dwyka Group** is generally poor, as expected for a glacial sedimentary succession (McLachlan & Anderson 1973, Anderson & McLachlan 1976, Visser 1989, Visser *et al*., 1990, MacRae 1999, Visser 2003, Almond 2008, 2009, Almond & Pether 2008). A wide range of fossil groups is recorded from the **Dwyka Group** of the Northern Cape but recent field studies suggest that the glacially-related sediments are generally highly weathered and calcretised near-surface in the Copperton region while well-preserved, potentially fossiliferous interglacial beds are not well-represented at surface in the area (*e.g.* Almond 2013a, 2013b). The only fossils recorded from the Dwyka rocks in the general region are small domical to columnar stromatolites preserved within bouldery erratics of grey carbonate (probably dolomite) have been reported from the farm Klipgats Pan by Almond (2013b). These erratics have probably been transported by ice movement from the Campbell Rand Subgroup (Ghaap Group) that crops out in the Ghaap Plateau to the north of Prieska. These reworked fossils are not of great palaeontological significance.

The fossil record of the **Kalahari Group** is also generally sparse and low in diversity. The **Gordonia Formation** dune sands were mainly active during cold, drier intervals of the Pleistocene Epoch that were inimical to most forms of life, apart from hardy, desert-adapted species. Porous dune sands are not generally conducive to fossil preservation. However, mummification of soft tissues may play a role here and migrating lime-rich groundwaters derived from the underlying bedrocks (including, for example, dolerite) may lead to the rapid calcretisation of organic structures such as burrows and root casts. Occasional terrestrial fossil remains that might be expected within this unit include calcretized rhizoliths (root casts) and termitaria (*e.g. Hodotermes*, the harvester termite), ostrich egg shells (*Struthio*) and shells of land snails (*e.g. Trigonephrus*) (Almond 2008, Almond & Pether 2008). Other fossil groups such as freshwater bivalves and gastropods (*e.g. Corbula, Unio*) and snails, ostracods (seed shrimps), charophytes (stonewort algae), diatoms (microscopic algae within siliceous shells) and stromatolites (laminated microbial limestones) are associated with local watercourses and pans. Microfossils such as diatoms may be blown by wind into nearby dune sands. These Kalahari fossils (or subfossils) can be expected to occur sporadically but widely, and the overall palaeontological sensitivity of the Gordonia Formation is therefore considered to be low. Underlying calcretes of the **Mokolanen Formation** as well as younger calcretes associated with modern pans and drainage lines might also contain trace fossils such as rhizoliths, termite and other insect burrows, or even mammalian trackways.

Mammalian bones, teeth and horn cores (also tortoise remains, and fish, amphibian or even crocodiles in wetter depositional settings such as pans) may be expected occasionally expected within Kalahari Group sediments and calcretes, notably those associated with ancient, Plio-Pleistocene alluvial gravels. Important fossil mammalian remains assigned to the Florisian Mammal Age (*c*. 300 000 – 12 000 BP; MacRae 1999) have recently been documented from stratigraphic units designated Group 4 to Group 6 (*i.e.* calcrete hardpan and below) at Bundu Pan, some 22 km northwest of Copperton (Kiberd 2006 and refs. therein). Orton (2012) recently recorded a single fossil equid tooth associated with a rich MSA artefact assemblage exposed in an erosion donga leading into the southern edge of a small quarry on the farm Hoekplaas (originally a pan area), near Copperton and south of the present study area. The tooth may have originally eroded out of a thin, MSA artefact-rich gravel horizon (palaoesurface) within soils exposed in section at the southern end of the gully. This horizon is probably equivalent to Group 2 of Kiberd's stratigraphy at Bundu Pan, and therefore somewhat younger than the Florisian mammal fauna reported there. However, since the erosion gully where the tooth was collected also incises older, coarser fluvial gravels that directly overlie the calcrete hardpan here, the source may in fact be equivalent to the slightly older Group 3 of Kiberd's scheme

(Almond 2013a). It is possible that fossil bones and teeth of mammals are preserved within buried Pleistocene fluvial and pan sediments within the present study area, as seen at Bundu Pan. However, such fossil sites are likely to be sparsely distributed and their locations difficult to predict, given the extensive younger sedimentary cover.

It is concluded that the mineral prospecting study area on Keikamspoort 71 is generally of LOW palaeontological sensitivity, although sparse occurrences of Plio-Pleistocene mammal remains might occur here in association with older, consolidated alluvial and pan deposits.

4. CONCLUSIONS & RECOMMENDATIONS

The study area of the proposed mineral prospecting on Farm Keikamspoort 71 near Copperton, Northern Cape, is underlain at depth by unfossiliferous Precambrian metamorphic rocks. These ancient bedrocks are locally overlain by small relict patches of glacial sediments of the Dwyka Group that are likely to be highly weathered and contain very few fossils (mainly reworked blocks of stromatolitic carbonate). The overlying superficial sediments (alluvium, gravels, aeolian sands, calcretes, soils *etc*) are likewise of low palaeontological sensitivity, although Pleistocene mammalian remains (teeth, bones, horncores) might occur very sporadically here. Given the small combined footprint of the prospecting activities, their impact significance on local fossil heritage resources is considered to be VERY LOW.

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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, Mpumalanga, KwaZulu-Natal 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 APHP (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 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.

Dr John E. Almond
Palaeontologist
***Natura Viva* cc**

<table>
<tr><td colspan="3">CHANCE FOSSIL FINDS PROCEDURE: Mineral prospecting on Farm Keikamspoort 71</td></tr>
<tr><td>Province & region:</td><td colspan="2">NORTHERN CAPE, Prieska District</td></tr>
<tr><td>Responsible Heritage Resources Authority</td><td colspan="2">SAHRA, P.O. Box 4637, Cape Town 8000.
Contact: Dr Ragna Redelstorff. Tel: 021 202 8651. Email: rredelstorff@sahra.org.za
or Ms Natasha Higgitt. Tel: 021 462 4502. Email: nhiggitt@sahra.org.za</td></tr>
<tr><td>Rock unit(s)</td><td colspan="2">Late Caenozoic alluvium and calcretes including sands and gravels</td></tr>
<tr><td>Potential fossils</td><td colspan="2">Vertebrate bones, teeth and horn cores, mollusc and crustacean remains or plant material such as subfossil wood</td></tr>
<tr><td rowspan="5">ECO protocol</td><td colspan="2">1. Once alerted to fossil occurrence(s): alert site foreman, stop work in area immediately (N.B. safety first!), safeguard site with security tape / fence / sand bags if necessary.</td></tr>
<tr><td colspan="2">2. Record key data while fossil remains are still in situ:
Accurate geographic location – describe and mark on site map / 1: 50 000 map / satellite image / aerial photo
Context – describe position of fossils within stratigraphy (rock layering), depth below surface
Photograph fossil(s) in situ with scale, from different angles, including images showing context (e.g. rock layering)</td></tr>
<tr><td>3. If feasible to leave fossils in situ:
Alert Heritage Resources Authority and project palaeontologist (if any) who will advise on any necessary mitigation
Ensure fossil site remains safeguarded until clearance is given by the Heritage Resources Authority for work to resume</td><td>3. If not feasible to leave fossils in situ (emergency procedure only):
Carefully remove fossils, as far as possible still enclosed within the original sedimentary matrix (e.g. entire block of fossiliferous rock)
Photograph fossils against a plain, level background, with scale
Carefully wrap fossils in several layers of newspaper / tissue paper / plastic bags
Safeguard fossils together with locality and collection data (including collector and date) in a box in a safe place for examination by a palaeontologist
Alert Heritage Resources Authority and project palaeontologist (if any) who will advise on any necessary mitigation</td></tr>
<tr><td colspan="2">4. If required by Heritage Resources Authority, ensure that a suitably-qualified specialist palaeontologist is appointed as soon as possible by the developer.</td></tr>
<tr><td colspan="2">5. Implement any further mitigation measures proposed by the palaeontologist and Heritage Resources Authority</td></tr>
<tr><td>Specialist palaeontologist</td><td colspan="2">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.</td></tr>
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