

**Proposed Khutsong South Extension 8 Development situated in the
West Rand District Municipality, Gauteng Province**

FOR

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EXECUTIVE SUMMARY

The Department of Human Settlement (Gauteng) proposes the establishment of a Khutsong South Extension 8 Development, located in the West Rand District Municipality, Gauteng Province. The proposed development is on Dolomite. This rock contains stromatolite fossils, but these are very common, and although important to the story of Planet Earth, are not individually of importance.

Should caverns or caves be encountered, sinkholes become possible and development will be stopped in these areas. These sites can then be demarcated for future paleontological investigation with respect to hominid fossils.

A Chance Find Protocol has been inserted in case loose fossils are found on the surface.

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1. BACKGROUND AND PROPOSED PROJECT

The Gauteng Department of Human Settlement proposes to relocate residents of Khutsong Proper, Extensions 1 and 6 to the proposed Khutsong South Extension 8 Development (Fig. 1). The area is located in the West Rand District Municipality, Gauteng Province. A Council for Geosciences study (1989) recommended that development in the existing area of Khutsong be frozen and geologically suitable land be identified elsewhere (G & A Heritage, 2020). Intraconsult conducted a geotechnical study (1997) which revealed that 90% of the Khutsong's residential area falls within the extremely high rich dolomite zones 3 and 4, which are not suitable for human settlement developments (G & A Heritage, 2020). This resulted in the West Rand District Municipality seeking a process of relocation of the residents of Khutsong Proper, Extensions 1 and 6, including the informal settlement, to an area of low to medium risk, viz. Khutsong South. The proposed Khutsong South Extension 8 Development Project aims to relocate the occupants of Khutsong Proper, Extensions 1 and 6, including the informal settlement. A total of 25 100 units are required and the identified land can accommodate 27 000 stands. The sites (1 and 2) are located on the farm Welverdiend 97 IQ and the combined approximate 396 ha area is accessible from Welverdiend Road (G & A Heritage, 2020).

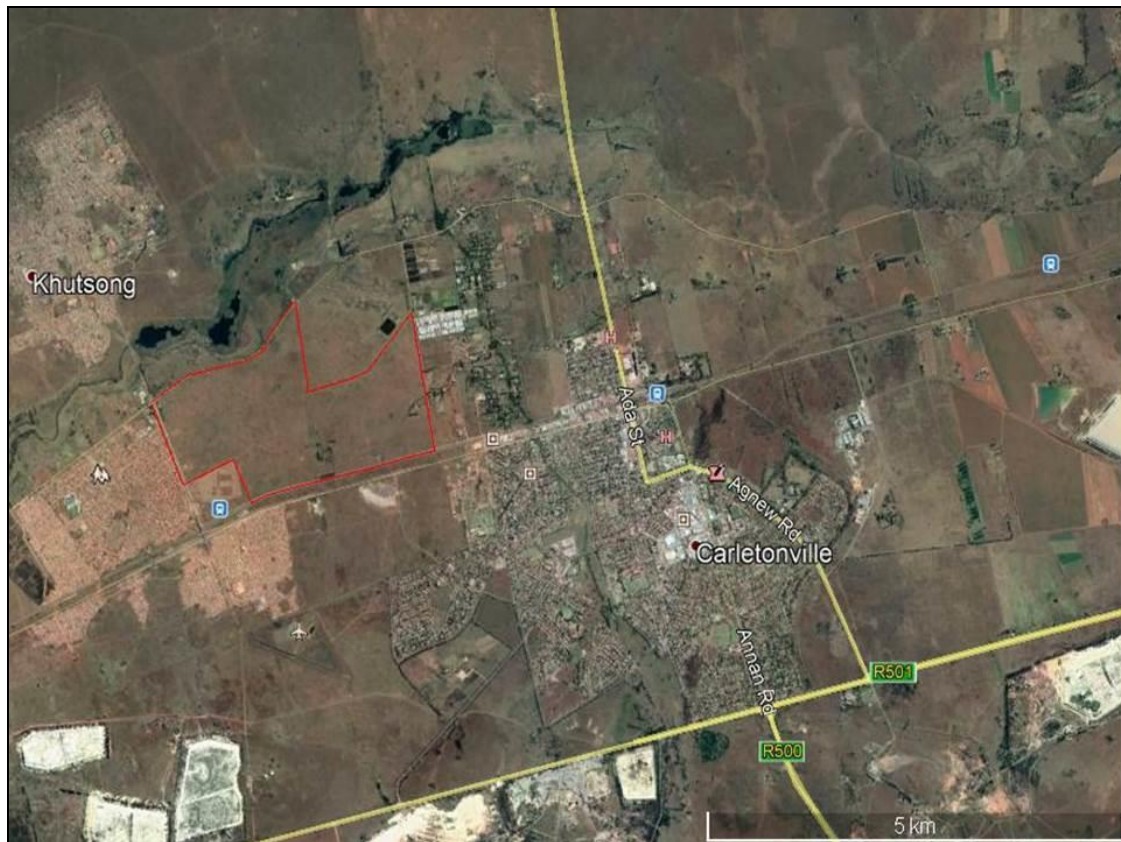


Figure 1: Location of the proposed project (red box). Source map GoogleEarth.

2. GEOLOGY

The Malmani Dolomite formed on the edge of an ancient sea 2.5-2.6 Ga (billion years ago) (Erickson and Altermann, 1998). Figure 2 shows an extract from the Wes-Rand 2626 1: 250 000 Geological Map. The area in question is coloured light blue (Malmani Dolomite).

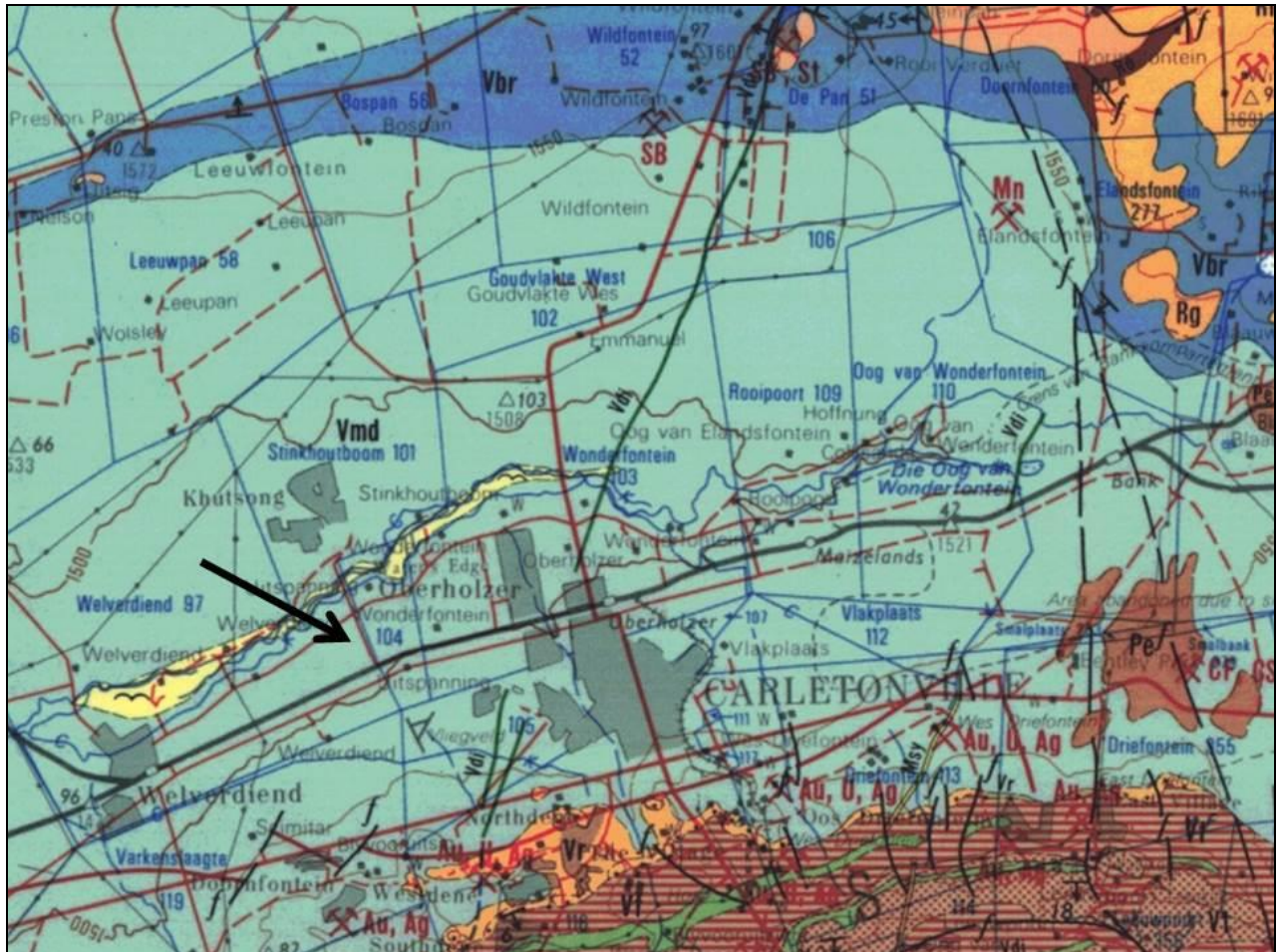


Figure 2: Extract from the Wes-Rand 2626 1: 250 000 scale Geological Map. Light blue is the Malmani Dolomite on which Khutsong is located (black arrow).

3. PALAEOONTOLOGY

According to the Sahrís Palaeosensitivity Map this area is zoned red (Fig. 3). This is because hominid fossils have been found in caves within this region.

Cave Environments

The Malmani Dolomite being composed of carbonate is prone to dissolution by water and the creation of caverns. Early hominid fossils are known from such caves, such as the 414 to 236 Ka Khutsong Development Project Desk-Top PIA

(thousand years) *Homo naledi* from the Rising Star Cave. Hominid fossils are **Extremely Important Palaeontological Material** (Dirks et al., 2020).

Due to the presence of caverns, the Malmani Dolomite is prone to sinkholes due to their roofs collapsing. However such areas are zoned unsuitable for construction. In this case I am assuming that this area has been competently geotechnically investigated and zoned for construction, so the presence of sinkholes/ caves will have been assessed. Should caves or sinkholes be encountered building will be stopped in any event.

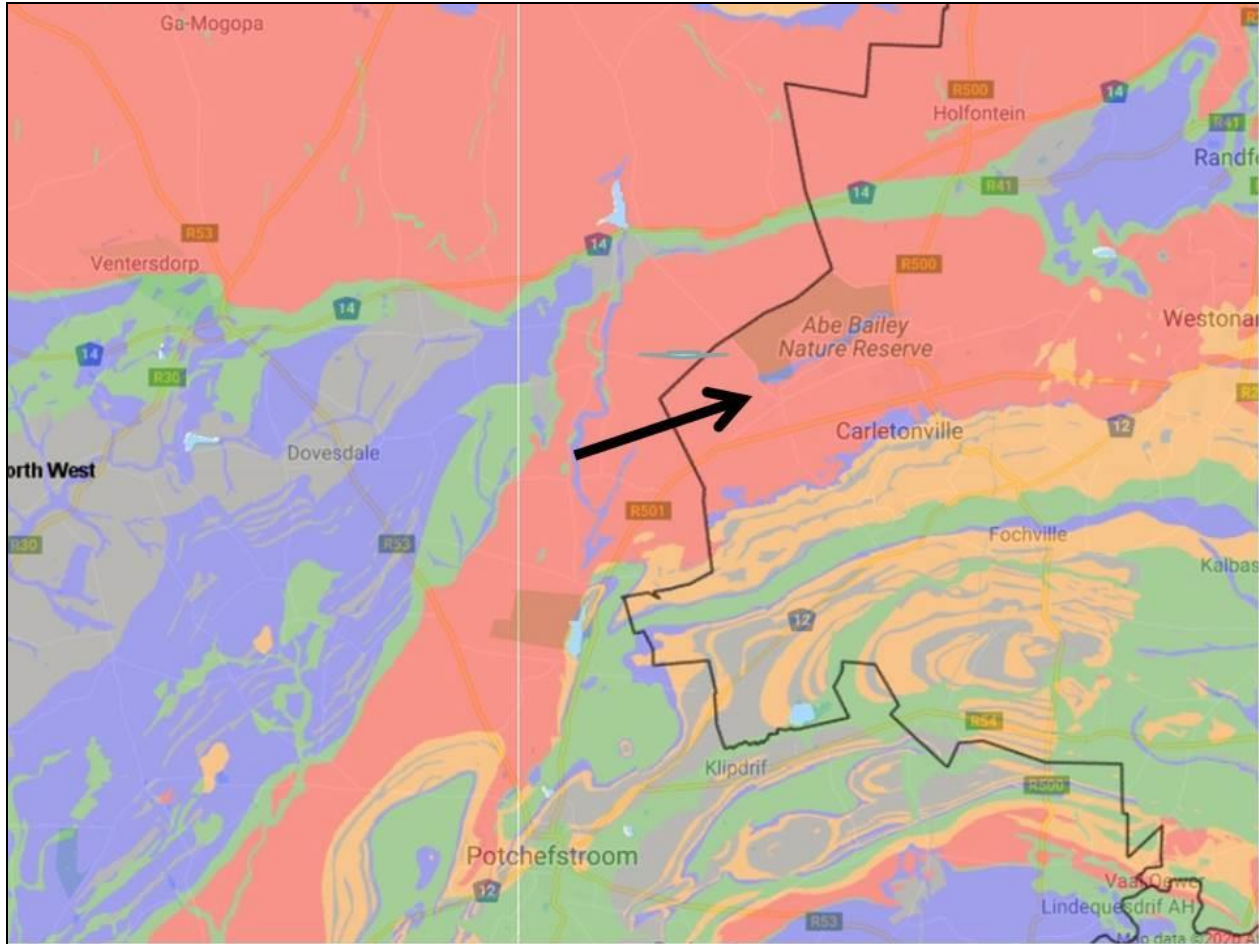


Figure 3: SAHRIS Palaeosensitivity map of the proposed development area (black arrow).

Malmani Dolomite

The Malmani Dolomite is part of the Transvaal Supergroup. This dolomite (carbonate rock) is 2.5-2.6 Ga (billion years old). It has been created by single celled organisms, most of which are cyanobacteria. Cyanobacteria photosynthesise (use light to produce energy) and in the process

convert carbon dioxide into oxygen and water. These organisms were responsible for kick-starting the oxygen atmosphere on planet Earth (Homan, 2019) and still exist today. Cyanobacteria paved the way for life as we know it.

Cyanobacteria construct biohomes (fossil reefs) called stromatolites, which are some of the earliest fossils in the geological column. The earliest known are 3.45 Ga, found in Australia. Other examples include the 3.4 Ga and 3.0 Ga stromatolites from Nondweni and the White Mfolozi in KwaZulu-Natal (Xie et al., 2012; Siayi et al., 2016). Stromatolites occur throughout the geological column and growing examples are known from rocky coastlines on the southeast African coast (Smith et al., 2020). Stromatolite occurrences are important in terms of general palaeontology, but individual stromatolites are not. These are trace fossils and are very common within the Malmani Dolomite

Stromatolites are typically laminated limestone structures. These can vary in scale (see examples in Figures 4 and 5).



Figure 4: Example of Malmani Dolomite stromatolites from a roadside (Photo: L Guastella).



Figure 5: Example of smaller scale Malmani Dolomite stromatolite structure (Photo: L Guastella).

4. CHANCE FIND PROTOCOL

As this site includes areas flagged red on the SAHRIS PalaeoSensitivity Map (Fig. 2), a “Chance Find Protocol” is **Recommended**.

In the case of any unusual finds, a Palaeontologist must be notified immediately by the ECO and/or EAP and a site visit must be arranged at the earliest possible time with the Palaeontologist. Contact **The Cradle of Humankind** (tel: 014 577 9000) for assistance.

In the case of the ECO or the Site Manager becoming aware of suspicious looking palaeo-material:

- The construction must be halted in that specific area and the Palaeontologist must be given enough time to reach the site and remove the material before excavation continues.

- Mitigation will involve the attempt to capture all rare fossils and systematic collection of all fossils discovered. This will take place in conjunction with descriptive, diagrammatic and photographic recording of exposures, also involving sediment samples and samples of both representative and unusual sedimentary or biogenic features. The fossils and contextual samples will be processed (sorted, sub-sampled, labeled, boxed) and documentation consolidated, to create an archive collection from the excavated sites for future researchers.

Functional responsibilities of the Developer

1. At full cost to the project, and guided by the appointed Palaeontological Specialist, ensure that a representative archive of palaeontological samples and other records is assembled to characterize the palaeontological occurrences affected by the excavation operation.
2. Provide field aid, if necessary, in the supply of materials, labour and machinery to excavate, load and transport sampled material from the excavation areas to the sorting areas, removal of overburden if necessary, and the return of discarded material to the disposal areas.
3. Facilitate systematic recording of the stratigraphic and palaeo-environmental features in exposures in the fossil-bearing excavations, by described and measured geological sections, and by providing aid in the surveying of positions where significant fossils are found.
4. Provide safe storage for fossil material found routinely during excavation operations by construction personnel. In this context, isolated fossil finds in disturbed material qualify as “normal” fossil finds.
5. Provide covered, dry storage for samples and facilities for a work area for sorting, labeling and boxing/bagging samples.
6. Costs of basic curation and storage until collected. Documentary record of palaeontological occurrences must be done.
7. The contractor will, in collaboration with the Palaeontologist, make the excavation plan available to the appointed specialist, in which appropriate information regarding plans for excavations and work schedules must be indicated on the plan of the excavation sites. This must be done in conjunction with the appointed specialist.
8. Initially, all known specific palaeontological information will be indicated on the plan. This will be updated throughout the excavation period.

9. Locations of samples and measured sections are to be pegged, and routinely and accurately surveyed. Sample locations, measured sections, etc., must be recorded three-dimensionally if any “significant fossils” are recorded during the time of excavation.

5. CONCLUSIONS & RECOMMENDATIONS

The proposed development is on Dolomite. This rock contains stromatolite fossils, but these are very common, and although important to the story of Earth, are not individually important.

Should caverns or caves be encountered development will be stopped in these areas. These sites can then be demarcated for future investigation.

6. REFERENCES

Eriksson, P and Altermann, W (1998). An overview of the Transvaal Supergroup dolomites (South Africa). *Environmental Geology*, 36, 1-2.

Dirks HGM, Roberts EM et al (2020 – viewed 26 June, 2020). The age of Homo naledi and associated sediments in Rising Star Cave. *Elife*, <https://elifesciences.org/articles/24231>

G & H Heritage, 2020. Heritage Impact Assessment for the Proposed Khutsong South Extension 8 Development Situated in the West Rand District Municipality of the Gauteng Province. Prepared for Afzelia.

Geoscience (1989). In G & H Heritage, 2020. Heritage Impact Assessment for the Proposed Khutsong South Extension 8 Development Situated in the West Rand District Municipality of the Gauteng Province. Prepared for Afzelia.

Intraconsult (1997). In: G & H Heritage, 2020. Heritage Impact Assessment for the Proposed Khutsong South Extension 8 Development Situated in the West Rand District Municipality of the Gauteng Province. Prepared for Afzelia. Homan, M (2019). Earliest life on Earth: Evidence from the Barberton Greenstone Belt, South Africa. *Earth Science Reviews*, 196.

<https://sahris.sahra.org.za/map/palaeo>

Siahi, M; Hofmann, A; Hegner, E; Master, S (2016). Sedimentology and facies analysis of Mesoarchaeon stromatolitic carbonate rocks of the Pongola Supergroup, South Africa. *Precambrian Research* 278.

Smith, A; Cooper, J; Guastella A; Bharath, V (2020) Wave influences in contemporary and Mesoarchaeon stromatolites. *Sedimentary Geology*, 396, 1-9.

Xie, H; Hofmann, A et al. (2012). Zircon SHRIMP dating confirms a Palaeoarchaeon supracrustal terrain in the southeastern Kaapvaal Craton, southern Africa, *Gondwana Research* 21(4).

Wes-Rand 2626 1: 250 000 Geological Map. Council for Geosciences, Pretoria.

7. DETAILS OF SPECIALIST

Dr Alan Smith

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Honorary Research Fellow: Discipline of Geology, School of Agriculture, Earth and Environmental Sciences, University of KwaZulu-Natal, Durban.

Role: Specialist Palaeontological Report production

Expertise of the specialist:

- PhD in Geology (University of KwaZulu-Natal), Pr. Sc. Nat., I.A.H.S.
- Expert in Vryheid Formation (Ecca Group) in northern KZN, this having been the subject of PhD.
- Scientific Research experience includes: Fluvial geomorphology, palaeoflood hydrology, Cretaceous deposits.
- Experience includes understanding Earth Surface Processes in both fluvial and coastal environments (modern & ancient).
- Alan has published in both national and international, peer-reviewed journals. He has published more than 50 journal articles with 360 citations (detailed CV available on request).
- Attended and presented scientific papers and posters at numerous international and local conferences (UK, Canada, South Africa) and is actively involved in research.

Selected recent palaeo-related work includes:

- Desktop PIA: Proposed middle income housing units on Portion 23 of Farm Lot H Weston 13026, Bruntville, Mpofana Local Municipality. Client: UMLANDO.
- Desktop PIA: Proposed ByPass Pipeline for Ulundi bulk water pipeline upgrade. Client: UMLANDO.
- Fieldwork PIA: Bhekuzulu Epangweni KZN water reticulation project, Cathkin Park. Client: Mike Webster, HSG Attorneys.
- Desktop PIA: Zuka valley, Ballito. Client: Mike Webster, HSG Attorneys.
- Mevamhlope proposed quarry palaeontology report. Client: Enviropro.
- Desktop PIA: Proposed Lovu Desalination site. Client: eThembeni Cultural Heritage.
- Desktop PIA: Tinley Manor phase 2 North & South banks: eThembeni Cultural Heritage
- Desktop PIA: Tongaat. Client: eThembeni Cultural Heritage.
- Palaeontological Assessment Reports (3) to Scatec Solar SA (Pty) Ltd on an Appraisal of Inferred Palaeontological Sensitivity for a Potential Photo Voltaic Park at (1) Farm Rooilyf near Groblershoop, N Cape; (2) Farm Riet Fountain No. Portions 1 and 6, 18km SE of De Aar, N Cape; and (3) Dreunberg, near Burgersdorp, Eastern Cape. Client: Sustainable Development Projects.

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