

N11 X13 PROJECT

**PALAEONTOLOGICAL ASSESSMENT OF THE N1 SEBETIELA TOLL PLAZA
OFFRAMP AREA, MOKOPANE. IMPACTS BY PROPOSED CONSTRUCTION OF
N1 / N11 INTERCHANGE AND ASSOCIATED BORROWPIT**

DESKTOP STUDY AND PROTOCOL FOR PALAEONTOLOGICAL FINDS

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EXECUTIVE SUMMARY

This study was carried out to assess the potential palaeontological impact of proposed highway construction, interchange, offramp and associated excavation of a borrow pit in the vicinity of the N1 Sebetiela toll plaza / R101 Mokopane offramp. The regional 1:250 000 geological map shows the area to be underlain by rocks of the Transvaal Supergroup. Area 1 (Sebetiela toll plaza) is underlain by shale, quartzite, conglomerate and breccia of the Pretoria Group. Areas 2 and 3 (proposed interchange and borrow pit respectively) are underlain by dolomitic limestone of the Chuniespoort Group. This report indicates the existence of fossils in this area to be extremely unlikely, other than stromatolites (primitive algal mats) in the Chuniespoort dolomites. There is a possibility of Caenozoic fossils within breccia developed in sinkholes within the dolomite (Cave Breccia).

DESKTOP STUDY

The 1:250 000 geological map 2428 (Nylstroom) was consulted to establish the regional and local geology. The map indicates the three adjacent areas under discussion are underlain by dolomitic limestone, breccia and chert of the Transvaal Supergroup.

Area 1
Sebetiela toll plaza

Area 2
Proposed interchange

Area 3
Proposed borrow pit

REGIONAL GEOLOGY

Transvaal Supergroup

The Late Archaean to Early Proterozoic Transvaal Basin consists of a basal sandstone, chemically precipitated dolomitic limestone, banded iron formations, conglomerates and fluvial siltstones.

Chuniespoort Group
Duitschland Formation

In the study area, carbonaceous mudrocks, dolomites and subordinate diamictites and lavas of the Duitschland Formation occur. The palaeoenvironment is interpreted as a final, shallow, regressive sea which ended the shallow carbonate platform of Chuniespoort times.

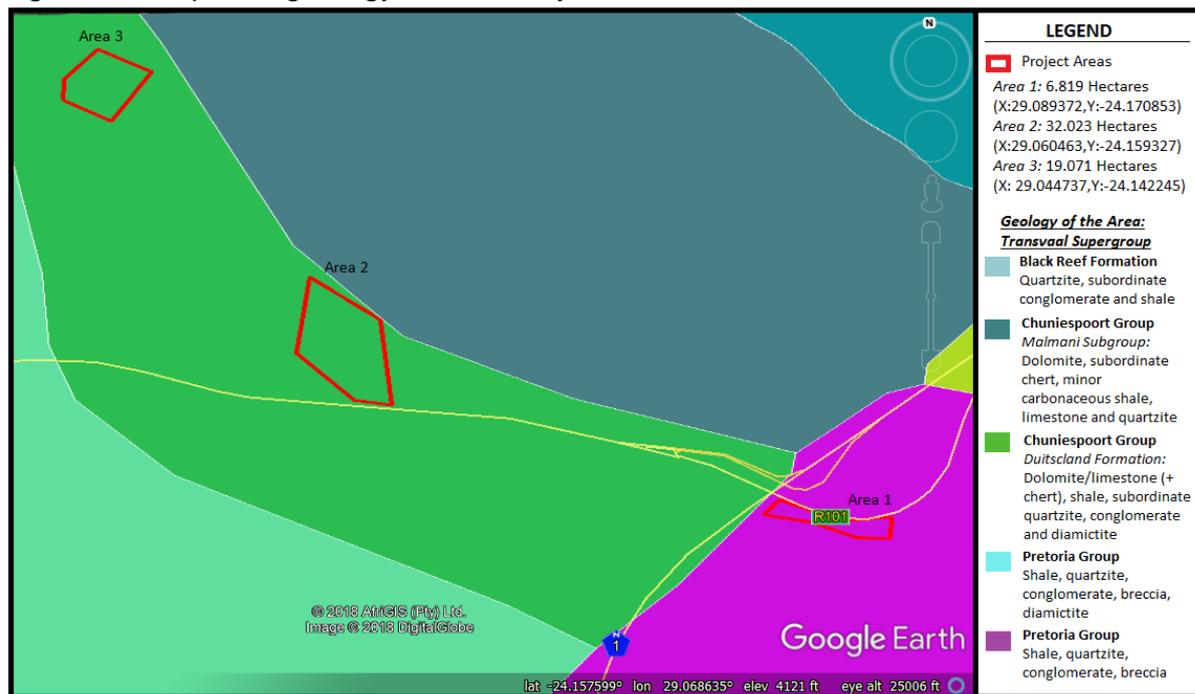
Pretoria Group

Timeball Hill Formation

These rocks consist of a sequence of mudrock and quartzite. The palaeoenvironment is interpreted as lacustrine and fluvial.

Due to the reaction of slightly acidic water with dolomitic limestones of the Transvaal Supergroup, sinkholes have developed. These have filled with material to form distinctive “cave breccia” which is well documented but has never been individually mapped.

Figure 1: Simplified geology of the study areas



PALAEONTOLOGY

Transvaal Supergroup

Chuniespoort Group

Duitschland Formation

Stromatolites are common in the Chuniespoort Group, especially in the Malmani Formation, but they are rare in the Duitschland Formation.

Stromatolites are stratified accretionary deposits, formed in shallow water often by the entrapment of fine sediments by primitive photosynthetic micro-organisms such as cyanobacteria. Stromatolites are very common in shallow carbonate deposits of the Archaean and Proterozoic but uncommon today.

Pretoria Group
Timeball Hill Formation

Fossils have not been reported from these rocks.

Cave Breccia

Breccia formed in sinkholes which developed in dolomites throughout the Transvaal Supergroup. Cave breccia can be found in both the Duitschland Formation of the Chuniespoort Group and Timeball Hill Formation of the Pretoria Group in this area. There is a potential for Cenozoic fossils in the breccia.

South African Palaeontology Legislation

SOUTH AFRICAN NATIONAL HERITAGE RESOURCE ACT NO 25/1999

This Palaeontological Assessment forms part of the Heritage Impact Assessment (HIA) and complies with the requirements of the South African National Heritage Resource Act No 25 of 1999. A HIA is required under Section 38 (Heritage Resources Management) to assess any potential impact to the palaeontology of the area by a proposed development. The term *palaeontological* in this context is defined by the NHRA as "...any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rocks intended for industrial use and any site which contains such fossilised remains or traces" (NHRA, 1999, p.10). The following clauses detailed below are relevant to palaeontological aspects for a terrain suitability assessment.

Subsection 35 (4)

- No person may, without a permit issued by the responsible heritage resource authority:
- (a) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or meteorite;
- (b) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;
- (c) trade in, sell for private gain, export or attempt to export from the republic any category of archaeological or palaeontological material or object, or any meteorite; or
- (d) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assists with the detection or recovery of metals or archaeological material or objects, or use such equipment for the recovery of meteorites.

Subsection 35 (5)

- When the responsible heritage resources authority has reasonable cause to believe that any activity or development which will destroy, damage or alter any archaeological or palaeontological site is under way, and where no

application for a permit has been submitted and no heritage resources management procedures in terms of section 38 has been followed, it may:

- (a) serve on the owner or occupier of the site or on the person undertaking such development an order for the development to cease immediately for such period as is specified in the order;
- (b) carry out an investigation for the purpose of obtaining information on whether or not an archaeological or palaeontological site exists and whether mitigation is necessary;
- (c) if mitigation is deemed by the heritage resources authority to be necessary, assist the person on whom the order has been served under paragraph (a) to apply for a permit as required in subsection (4); and
- (d) recover the costs of such investigation from the owner or occupier of the land on which it is believed an archaeological or palaeontological site is located or from the person proposing to undertake the development if no application for a permit is received within two weeks of the order being served.

Recommendations and Conclusion

Bearing in mind the age and nature of the strata affected by the proposed development it is considered highly unlikely that any fossils will be encountered, save stromatolites. However, there remains a possibility that Caenozoic aged fossils may be present in cave breccia, although no work has been carried out in this area. In mitigation it is recommended that a SACNASP accredited palaeontologist from a local institution such as the University of Limpopo makes one visit to the site during the excavation process to examine new outcrops.

References

Button, A and Vos, R.G. (1977). Subtidal and intertidal clastic and carbonate sedimentation in a macrotidal environment: an example from the lower Proterozoic of South Africa. *Sediment. Geol.*, **18**, 175-200.

Eriksson, K.A., Truswell, J.F., and Button, A. (1976). Palaeoenvironmental and geochemical models from an early Proterozoic carbonate succession in South Africa. *In: Walter, M.R. (Ed.), Stromatolites*. Blackwell, Oxford, 635-643.

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