



BPI for Palaeontological Research

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20 April 2013

Ms Riana Panaino
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Dear Ms Panaino,

Palaeontological Desktop Study – Leeuwpan Mine, Delmas

As requested, herewith a Desktop Palaeontological Impact Assessment with regard to the proposed extension of Leeuwpan Mine, Delmas, Nkangala District Municipality in the Mpumalanga Province.

Yours sincerely

A handwritten signature in blue ink, appearing to read 'B. Rubidge'.

Bruce Rubidge PhD, FGSSA, FRSSA, Pr Sci Nat

**PALAEONTOLOGICAL DESKTOP STUDY
LEEUPAN MINE, DELMAS,
NKANGALA DISTRICT MUNICIPALITY, MPUMALANGA PROVINCE.**

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DATE: 20 April 2013

EXECUTIVE SUMMARY

A desktop Palaeontological Impact Assessment was undertaken on the proposed expansion of the existing Leeuwpans Coal, situated south east of Delmas, in the Victor Khanye Local Municipality. It further falls under the Nkangala District Municipality in the Mpumalanga Province. The proposed development is for expansion of opencast mining for coal.

The entire study area is deeply underlain by rocks of the Transvaal Supergroup and more superficially by the Karoo Supergroup comprising sedimentary rocks of the Carboniferous Dwyka Group and the Permian Vryheid Formation. In places Quaternary alluvial deposits are present along the banks of water courses.

Rocks of the Vryheid Formation contain rich coal deposits which are derived from the famous Permian *Glossopteris* flora which has Gondwana-wide distribution. As large parts of the proposed development will be on rocks of the Vryheid Formation this has the potential to affect fossil plants.

The process of coal mining has the potential to destroy palaeontological heritage, and by its nature coal mining will destroy plant fossils. However, as these fossils are not currently exposed, the development of a coal mine will enhance possibilities to discover plant fossils. If fossils are exposed in the course expanding the mining development at Leeuwpans Mine a qualified palaeontologist must be contacted to assess the exposure for fossils so that the necessary rescue operations are implemented.

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REPORT

Background Information of the development

This desktop report is part of a Heritage Impact Assessment to determine the effect of the proposed expansion of the Exxaro Leeuwpaan Coal Mine on palaeontological heritage. The expansion of the Leeuwpaan Mine situated close to Delmas in Mpumalanga Province, comprises an expansion of opencast mining of an existing coal mine on portions of the farms Moabsvelden 248 IR and Rietkuil 249 IR and will not require any rezoning of land.

The study was commissioned by GCS Water and Environmental Consultants and, following a directive from SAHRA, I was asked to provide a desktop assessment of the affect that the proposed development will have on the palaeontological heritage.

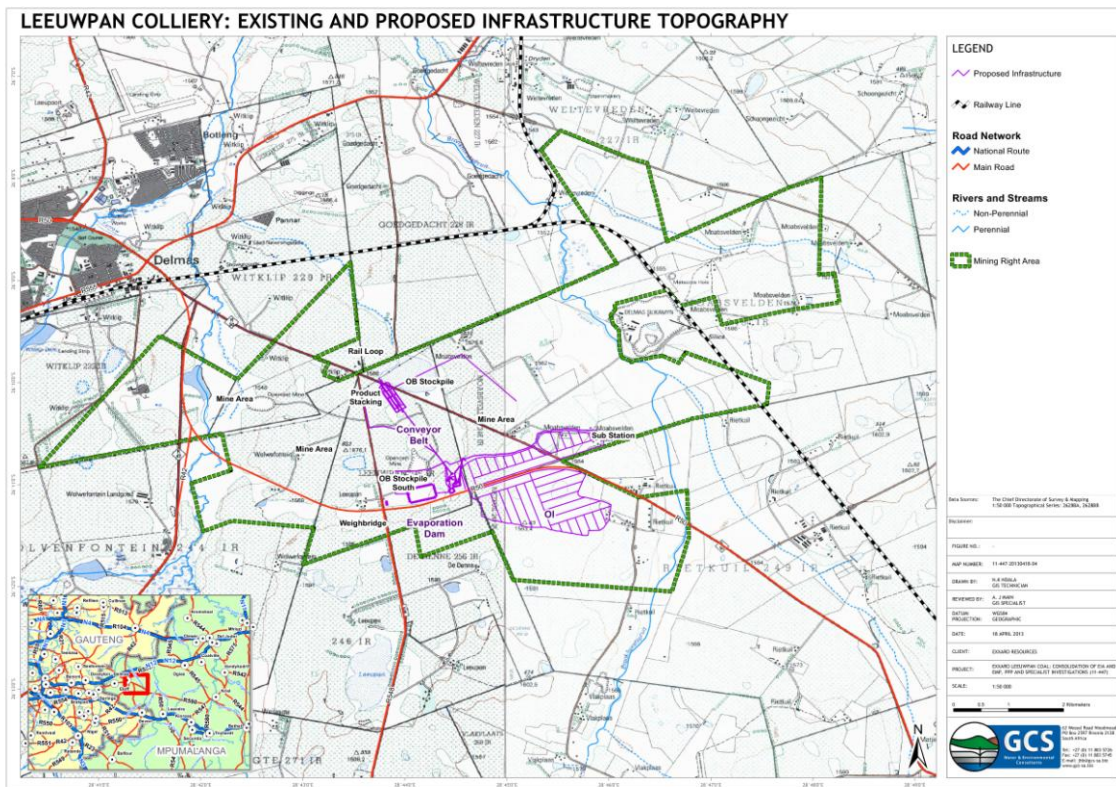


Figure 1: Map of Leeuwpaan Colliery showing existing and proposed infrastructure topography as well as the extent of the development relative to farm boundaries.

Details of the study area

The study area forms portion of the proposed expansion of Leeuwpan Mine situated close to Delmas in Mpumalanga Province (Figure 1) and is covered by the 1:50 000 topographical map Sheets 2628BA Delmas and 2628BB Kendal. This upgrade will occur on portions of the farms Moabsvelden 248 IR and Rietkuil 249 IR (Figure 1).

Geological Setting

The entire area is underlain by rocks of the Karoo Supergroup comprising sedimentary rocks of the Carboniferous Dwyka Group and the Permian Vryheid Formation. The mudrocks, coals and sandstones of the Vryheid Formation are the lower part of the Vryheid Formation as the upper part of the succession has been eroded away. In the study area the thickness of the Vryheid Formation varies from 0 to 60m. The rocks of the Dwyka Group were deposited by glaciers while those of the Vryheid Formation were deposited in a delta plain depositional environment.

In places Quaternary alluvial deposits are present along the banks of water courses (Figure 2).

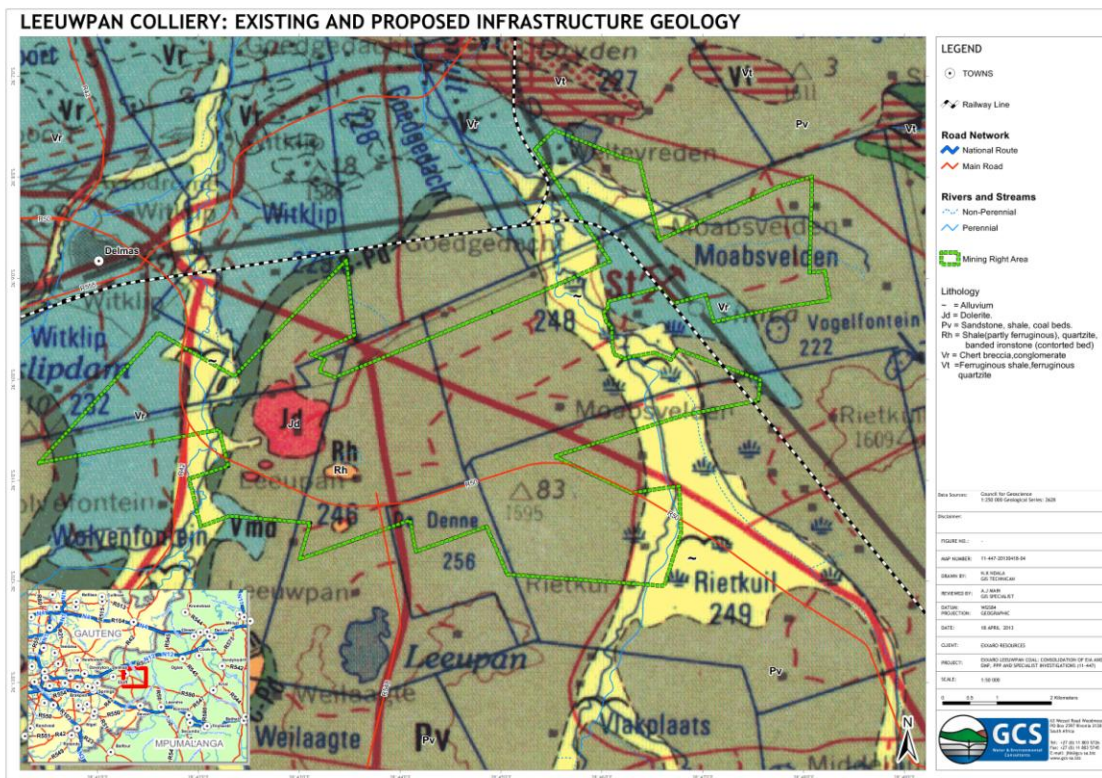


Figure 2: Geology of the Study area (1:250 000 Geological Map Series of the Republic of South Africa, Sheet 2628 East Rand)

Palaeontological Heritage

The coarse grained diamictites of the Karoo Supergroup which are present as a thin bed below the Vryheid Formation were deposited by grounded glaciers, and because of their coarse-grained nature they are unlikely to contain fossils.

The rocks of the Vryheid Formation of the Ecca Group are renowned for their wealth of plant fossils of the famous Gondwanan *Glossopteris* flora which has been described from Permian-aged rocks. This flora is the source of the coal which is mined from the Vryheid Formation in South Africa and is the reason for the coal mining operations. Within the Vryheid Formation there are occurrences of well-preserved elements *Glossopteris* flora comprising wood and/or leaves. Large collections of fossil flora from this Formation are present in the collections of the Council for Geoscience in Pretoria and the BPI Palaeontology at the University of the Witwatersrand in Johannesburg.

There is a slight chance that the Quaternary alluvial deposits could contain fossils, but this is unlikely.

Recommendation

Because important plant fossil localities are known from the Vryheid Formation the proposed mining development activities will expose rocks of the Vryheid Formation which are not currently visible as they are covered by soil and vegetation.

If construction activities expose extensive mudrocks of the Vryheid Formation, it will create a unique opportunity to explore the area for fossils. It is thus recommended that, should fossils be exposed, a qualified palaeontologist be contacted to assess the exposure for fossils before further development takes place so that the necessary rescue operations are implemented. Depending on the nature of the fossils discovered this could entail excavation and removal to a registered palaeontological museum collection. A list of professional palaeontologists is available from South African Heritage Resources Agency (SAHRA).

Conclusions

The proposed extension of the Exxaro Leeuwpan Mine will extend over Permian-aged sedimentary rocks of the Vryheid Formation of the Karoo Supergroup as well as Quaternary alluvial deposits. There is a good possibility that the rocks of the Vryheid Formation could contain fossil plant material of *Glossopteris* flora, and only a very slight chance of fossils in the Quaternary deposits. It is considered that the expansion of the Leeuwpan Coal Mine as set out in Figure 1 should proceed, but that if fossils are uncovered in the course of construction activities, the developer immediately calls in a qualified palaeontologist to assess the situation and, if necessary, undertake excavation of the fossils.

Bibliography

Almond J.E., de Klerk B, and Gess R.W. (in prep). Palaeontological heritage of the Eastern Cape. SAHRA technical report.

Catuneanu O., Wopfner H., Eriksson P.G., Cairncross B & Rubidge B.S., Smith, R.M.H., and Hancox P.J. 2005. The Karoo basins of south-central Africa. *Journal of African Earth Sciences*, 43, 211-253.

Johnson M.R., van Vuuren C.J., Visser J.N.J., Cole, D.I., Wickens H.deV., Christie A.M., Roberts D.L. & Brandl G. 2006. Sedimentary rocks of the Karoo Supergroup. In: Johnson MR, Anhaeusser and Thomas RJ (Eds). *The Geology of South Africa*. Geological Society of South Africa, Johannesburg/Council for Geoscience, Pretoria. 361-500.

Mac Rae C. 1999. *Life etched in stone: fossils of South Africa*. The Geological Society of South Africa, Johannesburg, pp 305.

McCarthy, T.S. and Rubidge, B.S. 2005. *The story of Earth and Life – a southern African perspective on the 4.6 billion year journey*. Struik Publishers, Cape Town. pp 333.

Partridge TC, Botha GA, and Haddon IG. 2006. Cenozoic deposits of the interior. In: Johnson MR, Anhaeusser and Thomas RJ (Eds). *The Geology of South Africa*. Geological Society of South Africa, Johannesburg/Council for Geoscience, Pretoria. pp. 585-604.