**Palaeontological Heritage Assessment for Farm portions 640/1 and 640/29, East London**

**November 2010**

**Prepared for:** Biotechnology & Environmental Specialist Consultancy cc

**Compiled by:** Robert Gess
Bernard Price Institute for Palaeontological Research
University of the Witwatersrand

c/o Box 40
Bathurst
6166
robg@imaginet.co.za

**Contents:**

## Geology

Most of the study area is underlain by strata of the Middleton Formation of the Adelaide subgroup This is a subdivision of the Beaufort Group, which, in turn, constitutes the central subdivision of the Karoo Supergroup.

The strata of the Karoo Supergroup were deposited within the Karoo sedimentary Basin, which resulted from shortening and thickening of the southern margin of Africa, with coeval folding and uplift of the Cape Supergroup strata along its southern margin. The Karoo Supergroup strata are between 310 and 182 million years old and span the Upper Carboniferous to Middle Jurassic Periods. During this interval the basin evolved from an inland sea, to a giant lake fed by seasonal meandering rivers. This lake steadily shrank as it filled with sediment and the basin's rate of subsidence stabilised. The land became increasingly arid and was covered with wind blown sand towards the end of its cycle. Finally the subcontinent was inundated with basaltic lava (of the Stormsberg Group), that issued from widespread linear cracks within the crust.

The sediments of the early Beaufort Group were deposited at a time when the Karoo Sea was largely silted up and rivers arising in the Cape Fold Belt Mountains, to the south, meandered across extensive flood planes into an inland lake. Sandstone lenses of the Middleton subgroup were deposited as river channel deposits, whereas the mudstone layers represent flood plane deposits.

Within the study area dark greenish grey mudstones are interbedded with thick, extensive, sandstone lenses.

The southern part of the area is underlain by dolerite that was intruded into the older sedimentary strata during the eruption of the Stormsberg lavas.

## Palaeontology

The flood planes of the Beaufort Group provide an internationally important record of life during the diversification of reptiles. This includes the evolution of the Therapsids, which would ultimately give rise to the mammals.

The Middleton Formation spans the upper *Pristerognathus*, *Tropidostoma* and lower *Cistecephalus* Bostratigraphic Assemblage Zone. A diverse range of skeletal material of Dicynodont, Gorgonopsian, Biarmosuchian and Therocephalian Therapsids have been described from the Middleton Formation, in addition to Captorhinid Reptilia, Rhinesuchid Amphibia, the fish, *Namaichthus* and *Atherstonia,* as well as the mollusc, *Palaeomutela,* and plants including, '*Glossopteris', Schizoneura, Phyllotheca,* and *Dadoxylon*.

Vertebrate and plant fossils are mostly preserved in interchannel mudrocks within the sandstones, usually as dispersed isolated elements.

**Site Visit**

The site was surveyed on the 16th of November, 2010.

The south of the area is underlain by dolerite.

Pineapple fields in the centre of the area are situated on crumbly mudstones exposed by the wash away of thin topsoil. Although these were in places subjected to a preliminary inspection, with the hope of recovering vertebrate material, none was found. The possibility of presence is not, however, excluded.

A large flooded quarry, near the eastern boundary, provides an unusually good section of local stratigraphy in its stepped southern wall. This was examined. Fossil plant localities were located in mudstones of the top terrace, (adjacent to fossil shallow water ripple impressions) and the lowest exposed bench above water level. Initial investigation revealed branched plant axes and remains sphenophyte remains attributable to *Schizoneura* and *Equisetum* (*sensa* Anderson and Anderson, 1985). The bottom terrace also has abundant plant remains including sphenophyte stems of the *Phyllotheca* type, and leaves of a glossopterid progymnosperm.

*Southern wall of quarry: plant fossil localities are situated on the top bench, to the right, and in the foreground to the left.*

*Fossiliferous mudstones on the upper bench of the quarry*

*Plant fossils from the uppermost terrace: top: branched axes; middle*, Schizoneura *, bottom: '*Equisitum*' stem.*

*Fossiliferous mudstone layers on the lowest terrace*

Phyllotheca *stems from the bottom terrace*

*Glossopterid leaf from the bottom terrace*

## Conclusions and Recommendations

1. Two potentially significant plant fossil localities are situated within the quarry. There is currently a project to study the plant biostratigraphy of the Karoo basin in the Eastern Cape. It is therefore recommended that, prior to the commencement of works, a qualified palaeontologist is contracted to spend a day more fully sampling these specific sites, in order that samples may be accessioned into a recognised repository, for ongoing and future research.

2. As there is a reasonable chance that vertebrate fossils will be disturbed during development in the central area, it is recommended that, at a point in the development where bulk service trenches have been excavated but not refilled, they should be subject to inspection by a qualified palaeontologist.