Palaeontological Impact Assessment for the Proposed Belfast Opencast Coal Mine Project, Belfast, Mpumalanga

Desktop Study

For
Digby Wells Environmental

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Background

As requested by Mr Justin du Piesanie of Digby Wells Environmental, on behalf of their client, Exxaro, here is a desktop or Phase 1 Palaeontological Impact Assessment, as per interim comment received from SAHRA (SAHRIS CaseID: 6278).

SAHRA recommended that a site visit be made by a palaeontologist to perform a Phase 2 Palaeontological Impact assessment.

The Belfast Project for which an EIA has been conducted entails the development of an opencast mine to produce 2.0 Mtpa of coal for Eskom and 1.5 Mtpa of A-grade thermal coal for export markets. The proposed Belfast Project will consist of two mining areas (A and B block) of 2,390ha in extent. Exxaro plans to undertake opencast mining using a conventional truck and shovel operation, assisted by roll-over dozing, to allow for continuous backfilling and rehabilitation of the mined-out area, which will in all likelihood not exceed 200ha at any time. A Phase 1 and Phase 2 plant will be constructed for the processing of raw coal to produce both export quality and Eskom product coal. The process will consist of crushing, screening and washing of coal. The current planned life-of-mine consists of two years for the construction phase, followed by an estimated 30 year operational (production) phase, and four years for decommissioning, closure, rehabilitation, monitoring and maintenance.

Methods and Terms of Reference

1. In order to determine the likelihood of fossils occurring in the affected area geological maps, literature, palaeontological databases and published and unpublished records must be consulted.

2. If fossils are likely to occur then a site visit must be made by a qualified palaeontologist to locate and assess the fossils and their importance.

3. Unique or rare fossils should either be collected (with the relevant SAHRA permit) and removed to a suitable storage and curation facility, for example a Museum or University palaeontology department or protected on site.

4. Common fossils can be sacrificed if they are of minimal or no scientific importance but a representative collection could be made if deemed necessary.

The published geological and palaeontological literature, unpublished records and databases were consulted to determine if there are any records of fossils from the sites and the likelihood of any fossils occurring there.

Geology and Palaeontology

According to the geological map the proposed Belfast Project lies in the Permian Vryheid Formation and are "red" in the SAHRIS palaeosensitivity map (Fig 1). There are extensive coal deposits in this region comprising five coal seams underground, with seams 2 and 4 being the thickest (Snyman, 1998) and of economic importance. On average seam 5 is more than 10m below the surface, and seam 4 upper is more than 35m below the surface.

Based on the literature (Cadle et al., 1993; Aitken, 1994; Falcon, 1989; Glasspool, 2003;) and from personal experience visiting South African coal mines, fossil plants are present in the shales and mudstones between coal seams but seldom within coal seams. The distribution, however, is extremely sporadic and unpredictable. Furthermore, coal flora plants are not a rare. It takes time and opportunistic finds to locate any pockets of preserved plants. Insect wings are extremely rare and vertebrates are always absent.

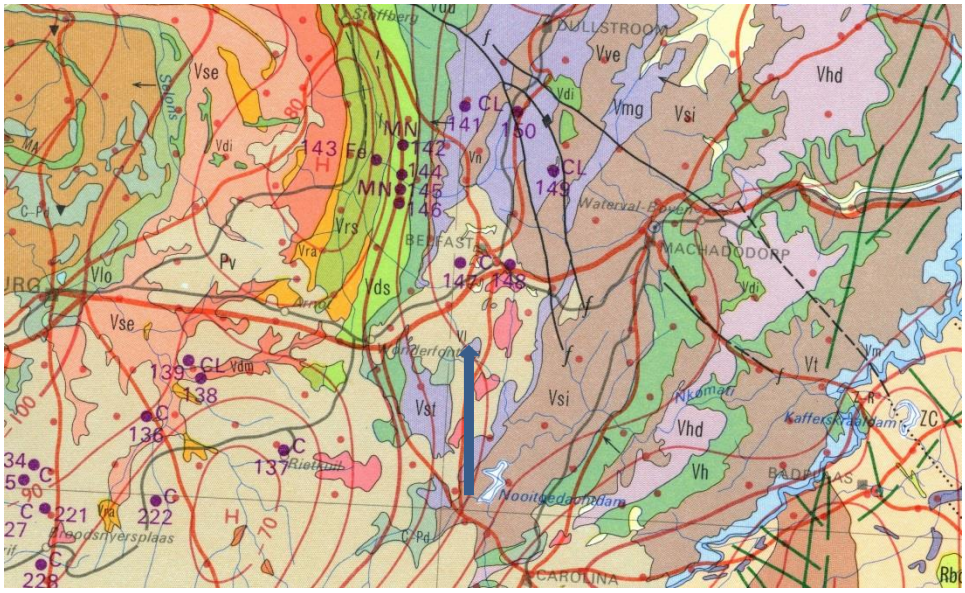

Figure 1. Geological map of the area between Belfast and Wonderfontein. The approximate location of the proposed opencast mine is indicated with the arrow. Abbreviations of the rock types are explained in Table 1. Map enlarged from the Geological Survey 1: 1 000 000 map 1984.

Symbol	Group/Formation	Lithology	Approximate Age
Jd	Jurassic	Dolerite dykes, intrusive	Jurassic, approx. 180 Ma
Pa	Adelaide & Estcourt	Mudstones, shales	Upper Permian, Lower Beaufort (min. 260 Ma)
Pvo	Volksrust	shale	Middle Permian,Upper Ecca
Pv	Vryheid	Shales, sandstone, coal	Lower Permian, Middle Ecca
Pp	Pietermaritzburg	Shale	Lower Permian, Lower Ecca
Vst	Steenkampsberg	quartsite	Pretoria Group >2200Ma

Table 1: Explanation of symbols for the geological map and approximate ages (Eriksson et al., 2006; Johnson et al., 2006; Snyman, 1998).

Recommendation

Since the proposed mine is to be an opencast mine with strip-mining it means that there are no surface exposures of the coal seams and associated shales and mudstones. Therefore there is no need for any further palaeontological assessment until excavation and mining activities have commenced. It is also highly unlikely that good fossil material will be extracted as such operations crush the coals.

If fossil plant material is discovered during mining operations, then it is strongly recommended that a professional palaeontologist be called to assess the importance and rescue them if necessary (with the relevant SAHRA permit).

If the fossil material is deemed to be of scientific interest then further visits by a professional palaeontologist would be required to collect more material. Given the shortage of such qualified people in South Africa and the stringent safely laws for access by the mining companies, any long term monitoring of the fossils is impractical. Nonetheless a monitoring programme is outline below.

As far as the palaeontology is concerned the proposed development can go ahead. Any further palaeontological assessment would only be required AFTER mining has commenced and IF fossils are found by the geologist or environmental personnel.

Monitoring Programme for Palaeontology –to commence once the mine is operational.

1. The following procedure is only required if and when underground mining commences. The surface activities would not impact on the fossil heritage as the coals and any associated fossil plants are below ground.
2. When mining operations commence the shales and mudstones (of no economic value) must be given a cursory inspection by the mine geologist or designated person before being added to the dumps used by the mine. Any fossiliferous material should be put aside in a suitably protected place. This way the mining activities will not be interrupted.
3. Photographs of similar fossil plants must be provided to the mine to assist in recognizing the fossil plants in the shales and mudstones.
4. On a regular basis, to be agreed upon by the mine management and the qualified palaeobotanist sub-contracted for this project, the palaeobotanist should visit the mine to inspect the selected material and check the dumps where feasible. The frequency of inspections should be monthly. If the geologist/deputy is diligent and extracts the fossil material then inspections can be less frequent.
5. Fossil plants considered to be of good quality or scientific interest by the palaeobotanist must be removed, catalogued and housed in a suitable institution where they can be made available for further study. Before the fossils are removed from the mine a SAHRA permit must be obtained. Annual reports must be submitted to SAHRA.
6. If any underground inspection is deemed necessary then the normal safety procedures that the mine management endorses, must be followed by the palaeobotanist and associated mine employees.
7. If no good fossil material is recovered then the site inspections by the palaeobotanist can be reduced to annual events until mining operations cease. Annual reports by the palaeobotanist must be sent to SAHRA.

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