Palaeontological Impact Assessment for the proposed Witfield Stormwater Management project, Gauteng Province.

Desktop Study

For

Delta Built Environment Consultants

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Prof Marion Bamford
Evolutionary Studies Institute
University of the Witwatersrand
P Bag 3, WITS 2050
Johannesburg, South Africa
Marion.bamford@wits.ac.za

Expertise of Specialist

The Palaeontologist Consultant is: Prof Marion Bamford
Qualifications: PhD (Wits Univ, 1990); FRSSAf, ASSAf
Experience: 30 years research; 20 year PIA studies

Declaration of Independence

This report has been compiled by Professor Marion Bamford, of the University of the Witwatersrand, sub-contracted by Delta Built Environment Consultants. The views expressed in this report are entirely those of the author and Delta and no other interest was displayed during the decision making process for the project.

Specialist: …….. Prof Marion Bamford……..

Signature: ……. 

Executive Summary

The desktop Palaeontological Impact Assessment for the proposed stormwater management project in the suburb Witfield, southwest of OR Tambo International Airport, Gauteng Province, concludes that there is very little likelihood of any fossils of scientific interest being found during the excavation for stormwater drainage because the rocks are mostly much too old to contain any fossils. There are some outcrops of Dwyka Group and Vryheid Formation that could possibly contain plant fossils but as the surface has been highly disturbed by the urban development, and further by the periodic flooding, the likely hood of finding fossils of any scientific value is extremely small. If however fossils are found once excavation has begun then a palaeontologist should be called to assess their value and make a representative collection.

Palaeontological Impact Assessment for the proposed Witfield Stormwater Management project, Gauteng Province

1. Background

Delta Built Environment Consultants was appointed by Ekurhuleni Metropolitan Municipality (EMM) for the design, EIA, procurement, and construction supervision in order to improve the current stormwater management in the Witfield area.
According to the Preliminary Design Report compiled by Messrs Bigen Africa, the houses located in the Witfield area are prone to flooding. A preliminary design report was compiled with proposals to mitigate the effects of the flooding, as well as cost estimates for the different designs. The report further states that that houses were permitted to be built over an existing stormwater culvert, which subsequently resulted in flooding.
The Witfield Dam is located towards the south east of the drainage area and currently the aim is to reroute all the stormwater into the dam to serve as an attenuation facility."

There are three options for the routes and dams for this project but they are all within the same space in the suburb.

The National Heritage Resources Act (Act 25 of 1999) and the National Environmental Management Act (Act 107 of 1998) requires that the proposed development must be preceded by the relevant impact assessment, in this case for palaeontology. SAHRA has requested a desktop palaeontological assessment Case ID: 9540

This report complies with the requirements of the NEMA and environmental impact assessment (EIA) regulations (GNR 982 of 2014). The table below provides a summary of the requirements, with cross references to the report sections where these requirements have been addressed.

Table 1.1: Specialist report requirements in terms of Appendix 6 of the EIA Regulations (2014)

A specialist report prepared in terms of the Environmental Impact Regulations of 2014 must contain:	Relevant section in report
Details of the specialist who prepared the report	Prof Marion Bamford
The expertise of that person to compile a specialist report including a curriculum vitae	Palaeontologist (PhD Wits 1990) CV attached
A declaration that the person is independent in a form as may be specified by the competent authority	Page 2
An indication of the scope of, and the purpose for which, the report was prepared	Section 1
The date and season of the site investigation and the relevance of the season to the outcome of the assessment	n/a Seasons make no difference to buried coals
A description of the methodology adopted in preparing the report or carrying out the specialised process	Section 2
The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure	See table 2
An identification of any areas to be avoided, including buffers	n/a
A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be	n/a

avoided, including buffers;	
A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 6
A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment	n/a
Any mitigation measures for inclusion in the EMPr	Section 8
Any conditions for inclusion in the environmental authorisation	Section 8
Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 8
A reasoned opinion as to whether the proposed activity or portions thereof should be authorised and	Section 7
If the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	Section 7
A description of any consultation process that was undertaken during the course of carrying out the study	n/a
A summary and copies if any comments that were received during any consultation process	n/a
Any other information requested by the competent authority.	n/a

2. 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.

Figure 1.1: Locality of proposed stormwater drainage project in Witfield, Gauteng Province. Map provided by Delta.

3. Unique or rare fossils should either be collected (with the relevant South African Heritage Resources Agency (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 of fossil sites, catalogues and reports housed in the Evolutionary Studies Institute, University of the Witwatersrand, and SAHRA databases were consulted to determine if there are any records of fossils from the sites and the likelihood of any fossils occurring there.

3. Consultation Process

No consultations were carried out during the desktop study. Apart from reviewing interested and/or affected party (IAP) comments received by the EIA consultant during the EIA process, no other consultation took place as part of the paleontological study.

4. Geology and Palaeontology

<u>Project location and geological setting</u>

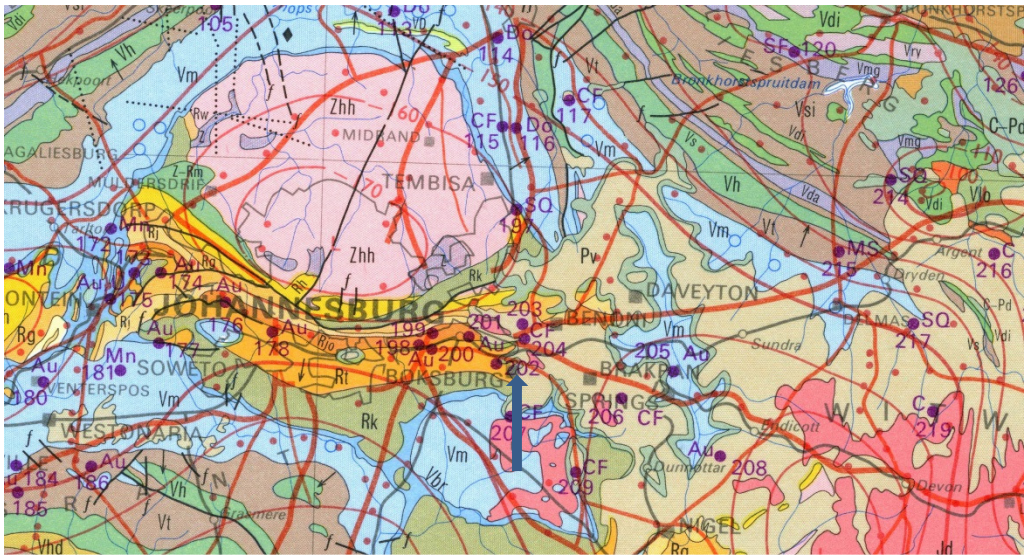

Figure 1.2 Geological map of the area around the proposed stormwater management project, Witfield.. The approximate location of the proposed project is indicated with the

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
Pv	Vryheid Formation	Shales, sandstone, coal	Lower Permian, Middle Ecca
C-Pd	Dwyka Group	Tillite, sandstone, mudstone, shale	Upper Carboniferous to Lower Permian
Vm	Malmani subgroup, Chuniespoort Group	Dolomite, chert	2640 – 2500 Ma
Vbr	Black Reef Formation	Quartzite, conglomerate, shale, basalt	Ca 2650 Ma
Rk	Klipriviersberg Group, Ventersdorp Supergroup	Andesite, tuff	2714 Ma
Rt	Turffontein subgroup, Central Rand Group	Conglomerate, quartzite	
Rjo	Johannesburg subgroup, Central Rand Group, Witwatersrand Basin	Quartzite, conglomerate, shale	3074 Ma
Rj	Jeppestown subgroup, Central Rand Group	Shale, quartzite, shale, lava	>3074 Ma

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

Geology

Most of the rocks in the area are very old, ranging from those of the Central Rand Group (Witwatersrand Basin), i.e. the Jeppestown, Johannesburg and Turffontein Subgroups, which are more than 3000 million years old and too old for invertebrate, vertebrate or plant fossils. Algae and bacteria were present at this stage but these rocks have been metamorphosed and do not preserve fossils. The slightly younger rocks of the Ventersdorp and Chuniespoort Groups are too old for fossils. Some marginal outcrops of the Main Karoo Basin occur to the east, the Dwyka Group and Vryheid Formation which are young enough to contain fossil plants of the Glossopteris flora but too old for vertebrate fossils.

Palaeontology

Fossil plants are very rarely preserved in the shales of the Dwyka Group and can be common in the shales of the Vryheid Formation, however they can be very sporadic. The previous development in this urban area would have destroyed any surface fossils. Furthermore, the periodic flooding would have destroyed any surface or below surface fossils.

The SAHRIS palaeosensitivity map for the site indicates red (very sensitive and very high probability of fossils occurring there), orange (high probability), green (moderate) and grey (insignificant to zero). There are, however, no records of fossils plants from this area. There is no record of coal or clays where fossils may be preserved (Snyman, 1998; Bredell, 1979).

5. Impact assessment

The surface activities would not impact on the fossil heritage as any fossils would have been destroyed when the area was first developed and by the flooding. The impact is nil.

Once excavation for the drainage infrastructure start there would be minor deterioration of the site and no impact on people. Therefore the SEVERITY/NATURE of the environmental impact would be L (according to the scheme in Table 2.

DURATION of the impact would be permanent: L.

Since only the possible fossils within the stormwater drainage will be affected the SPATIAL SCALE will be localised within the site boundary: L.

There is a very small chance of finding fossils on the surface or below the surface. However, the PROBABILITY of affecting any fossils is unlikely or seldom: L

TABLE 2: CRITERIA FOR ASSESSING IMPACTS

PART A: DEFINITION AND CRITERIA		
Criteria for ranking of the SEVERITY/NATURE of environmental impacts	**H**	Substantial deterioration (death, illness or injury). Recommended level will often be violated. Vigorous community action.
	M	Moderate/ measurable deterioration (discomfort). Recommended level will occasionally be violated. Widespread complaints.
	L	Minor deterioration (nuisance or minor deterioration). Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	L+	Minor improvement. Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	M+	Moderate improvement. Will be within or better than the recommended level. No observed reaction.
	H+	Substantial improvement. Will be within or better than the recommended level. Favourable publicity.
Criteria for ranking the DURATION of impacts	**L**	Quickly reversible. Less than the project life. Short term
	M	Reversible over time. Life of the project. Medium term
	H	Permanent. Beyond closure. Long term.
Criteria for ranking the SPATIAL SCALE of impacts	**L**	Localised - Within the site boundary.
	M	Fairly widespread – Beyond the site boundary. Local
	H	Widespread – Far beyond site boundary. Regional/ national
PROBABILITY (of exposure to impacts)	**H**	Definite/ Continuous
	M	Possible/ frequent
	L	Unlikely/ seldom

6. Assumptions and uncertainties

Based on the geology of the area and the palaeontological record as we know it, it can be assumed that the formation and layout of the shales are typical of other deposits in the Karoo Basin, so no fossil animals will occur there. Coal is made from fossil plants but compressed and altered to such an extent that the original plant material is unrecognizable. Fossil plants may be associated with the adjacent shales and shale lenses but are assumed to be the same as other coal deposits and therefore very common. Until the coal seams and shales are exposed and examined this remains an uncertainty, but a minor one. The same applies for any shales or clay deposits.

7. Recommendation

While it is possible that plant fossils occur in the proposed stormwater drainage or infrastructure area they will not be detected until excavations begin. A site visit is therefore not feasible until such stage.

If fossil plant material is discovered during the excavations, then it is strongly recommended that a professional palaeontologist, preferably a palaeobotanist, be called to assess the importance and to 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.

As far as the palaeontology is concerned the proposed development can go ahead. Any further palaeontological assessment would only be required after excavations have commenced and if fossils are found by the engineer or environmental personnel.

1. References

Bredell, J.H., 1979. The nature and distribution of the Karoo Sequence on the East and West Rand with special reference to refractory clay deposits. Geokongress 77: geological Society of Southern Africa Special Publications 6, 151-160.

Erikssen, P.G., Altermann, W., Hartzer, F.J., 2006. The Transvaal Supergroup and its pre-cursors. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). The Geology of South Africa. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. pp 237-260.

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Snyman, C.P., 1998. Coal. In: Wilson, M.G.C., and Anhaeusser, C.P., (Eds). The Mineral Resources of South Africa: Handbook, Council for Geosciences 16, 136-205.

MKB – 07 June 2016