Palaeontological Impact Assessment for the Section 102 amendment for Nndanganeni Colliery expansion, 20km east of Middelburg, Mpumalanga Province

Site Visit Report (Phase 2)

For

Eco-Elementum

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Expertise of Specialist

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Experience: 33 years research; 25 years PIA studies

Declaration of Independence

This report has been compiled by Professor Marion Bamford, of the University of the Witwatersrand, sub-contracted by Eco-Elementum Environmental and Engineering, Pretoria, South Africa. The views expressed in this report are entirely those of the author and no other interest was displayed during the decision making process for the Project.

Specialist: Prof Marion Bamford

Signature: 

Executive Summary

A site visit Palaeontological Impact Assessment (PIA) is required for a Section 102 Mining Right amendment for Nndanganeni Colliery on behalf of IPP Mining Equipment (Pty) Ltd in order to mine on the northern part of the Mining Right on Farm Hartogshof 413. The colliery is about 20 km east of Middelburg, between the R104 and the N4 highway, Mpumalanga Province.

To comply with the regulations of the South African Heritage Resources Agency (SAHRA) in terms of Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), a site visit (Phase 2) Palaeontological Impact Assessment (PIA) was completed for the proposed development.

The site lies on the potentially very highly sensitive Vryheid Formation (Ecca Group, Karoo Supergroup) that could have fossils of the *Glossopteris* flora in the carbonaceous lenses associated with the coal seams. The site visit and walk through on 31st October 2022 by palaeontologists confirmed that there are NO FOSSILS visible on the surface. The area is flat and has been cultivated for decades so the deep sandy soils cover the surface. Most of the area is lying fallow and has thick grass cover. There was one rocky outcrops that could have fossils but this turned out to be only coarse sandstone with no fossil impressions. Nonetheless, a Fossil Chance Find Protocol should be added to the EMPr. Based on this information it is recommended that no further palaeontological impact assessment is required unless fossils are found by the contractor, developer, environmental officer or other designated responsible person once excavations, drilling or mining activities have commenced. Since the impact will be low to moderate, as far as the palaeontology is concerned, the project should be authorised provided that the Fossil Chance Find Protocol is followed.

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1. Background

A site visit Palaeontological Impact Assessment (PIA) is required for a Section 102 Mining Right amendment on behalf of IPP Mining Equiment (Pty) Ltd in order to mine on the southern part of the Mining Right on Farm Hartogshof 413. The Nndanganeni Colliery is about 20 km east of Middleburg, along the N4 highway towards Bethal, Mpumalanga Province. The Nndanganeni Colliery is active and can be seen in the images The area is adjacent to old dumps (Figures 1-2). The proposed area for new mining operations is adjacent to and north of the active colliery and surrounds an artificial water body (purple polygon in Figure 2).

A Palaeontological Impact Assessment was requested for the S102 amendment to the Nndanganeni Mining Right. To comply with the regulations of the South African Heritage Resources Agency (SAHRA) in terms of Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), a site visit and walkthrough (Phase 2) Palaeontological Impact Assessment (PIA) was completed for the proposed development and is reported herein.

Table 1: National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and Environmental Impact Assessment (EIA) Regulations, 2014 (as amended) - Requirements for Specialist Reports (Appendix 6).

	A specialist report prepared in terms of the Environmental Impact Regulations of 2017 must contain:	**Relevant section in report**
ai	Details of the specialist who prepared the report,	Appendix B
aii	The expertise of that person to compile a specialist report including a curriculum vitae	Appendix B
b	A declaration that the person is independent in a form as may be specified by the competent authority	Page 2
c	An indication of the scope of, and the purpose for which, the report was prepared	Section 1
ci	An indication of the quality and age of the base data used for the specialist report: SAHRIS palaeosensitivity map accessed – date of this report	Yes
cii	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change	Section 5
d	The date and season of the site investigation and the relevance of the season to the outcome of the assessment	June; winter
e	A description of the methodology adopted in preparing the report or carrying out the specialised process	Section 2
f	The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure	Section 4
g	An identification of any areas to be avoided, including buffers	N/A

	A specialist report prepared in terms of the Environmental Impact Regulations of 2017 must contain:	**Relevant section in report**
h	A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	N/A
i	A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 5
j	A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment	Section 4
k	Any mitigation measures for inclusion in the EMPr	Section 8, Appendix A
l	Any conditions for inclusion in the environmental authorisation	N/A
m	Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 8, Appendix A
ni	A reasoned opinion as to whether the proposed activity or portions thereof should be authorised	Section 6
nii	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	Sections 6, 8
o	A description of any consultation process that was undertaken during the course of carrying out the study	N/A
p	A summary and copies of any comments that were received during any consultation process	N/A
q	Any other information requested by the competent authority.	N/A
2	Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	N/A

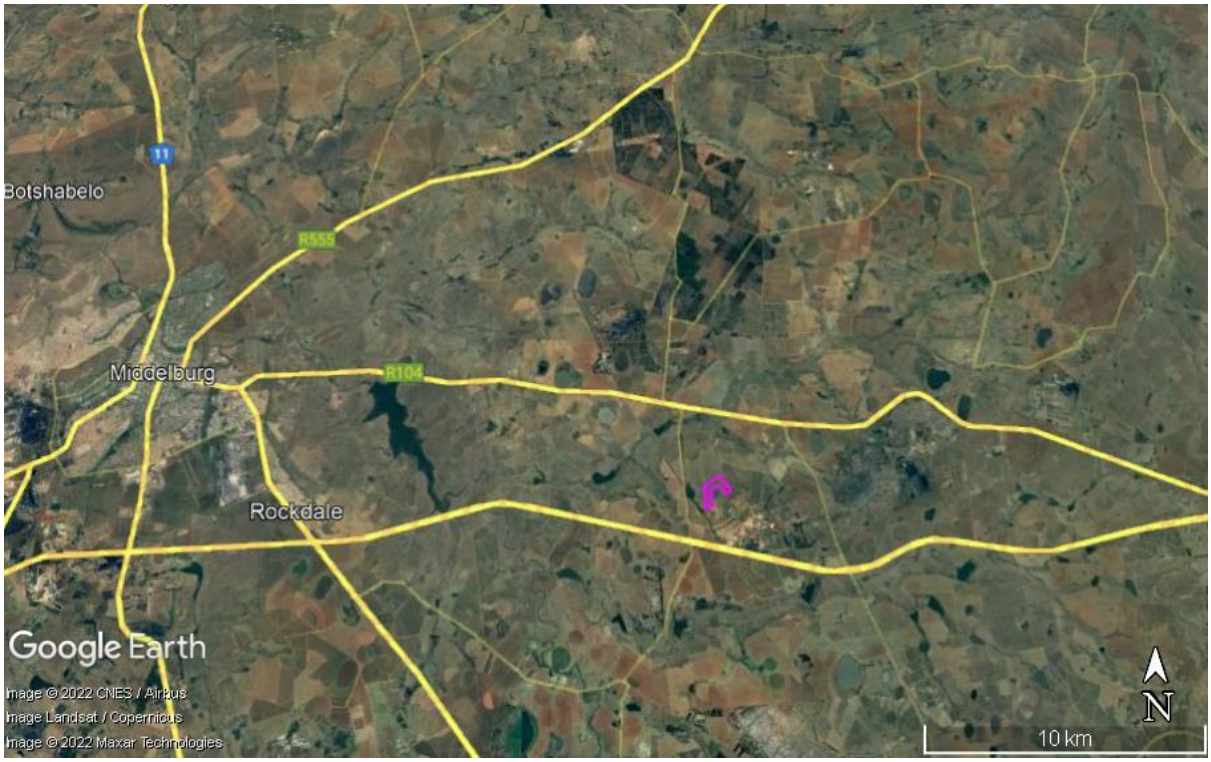

Figure 1: Google Earth map of the proposed development by Nndanganeni Colliery (purple polygon) showing the relevant land marks.

Figure 2: Aerial map for the Nndanganeni Colliery Mining right area north of the N4 highway. Map supplied by Eco-Elementum.

2. Methods and Terms of Reference

The Terms of Reference (ToR) for this study were to undertake a PIA and provide feasible management measures to comply with the requirements of SAHRA.
The methods employed to address the ToR included:

1. Consultation of geological maps, literature, palaeontological databases, published and unpublished records to determine the likelihood of fossils occurring in the affected areas. Sources included records housed at the Evolutionary Studies Institute at the University of the Witwatersrand and SAHRA databases;
2. Where necessary, site visits by a qualified palaeontologist to locate any fossils and assess their importance, as is the case here;
3. Where appropriate, collection of unique or rare fossils with the necessary permits for storage and curation at an appropriate facility (*not applicable to this assessment*); and
4. Determination of fossils' representivity or scientific importance to decide if the fossils can be destroyed or a representative sample collected (*not applicable to this assessment*).

3. Geology and Palaeontology

i. Project location and geological context

The site lies in the north-central part of the Karoo basin where the early Karoo Supergroup strata unconformably overlie the much older quartzites of the Transvaal Supergroup, in the Transvaal Basin. Intruding through the Pretoria Group rocks are sills and dykes composed of diabase, a volcanic and non-fossiliferous rock (Figure 3). The southeastern extension of the Rooiberg Group (Damwal and Schrikkloof Formations) is present around the farm. The volcanic rocks of the Rooiberg Group were intruded by the Rustenburg Layered Suite (Bushveld Igneous Complex) in the Terminal Transvaal Sequence around 2055 million years ago so were partially melted (Buchanan, 2006; Nazari-Dekhordi and Robb, 2022). No fossils would occur in metamorphosed volcanic rocks.

The Karoo Supergroup rocks cover a very large proportion of South Africa and extend from the northeast (east of Pretoria) to the southwest and across to almost the KwaZulu Natal south coast. It is bounded along the southern margin by the Cape Fold Belt and along the northern margin by the much older Transvaal Supergroup rocks. Representing some 120 million years (300 – 183Ma), the Karoo Supergroup rocks have preserved a diversity of fossil plants, insects, vertebrates and invertebrates.

During the Carboniferous Period South Africa was part of the huge continental landmass known as Gondwanaland and it was positioned over the South Pole. As a result, there were several ice sheets that formed and melted, and covered most of South Africa (Visser, 1986, 1989; Isbell et al., 2012). Gradual melting of the ice as the continental mass moved northwards and the earth warmed, formed fine-grained sediments in the large inland sea. These are the oldest rocks in the system and are exposed around the outer part of the ancient Karoo Basin, and are known as the Dwyka Group (Johnson et al., 2006).

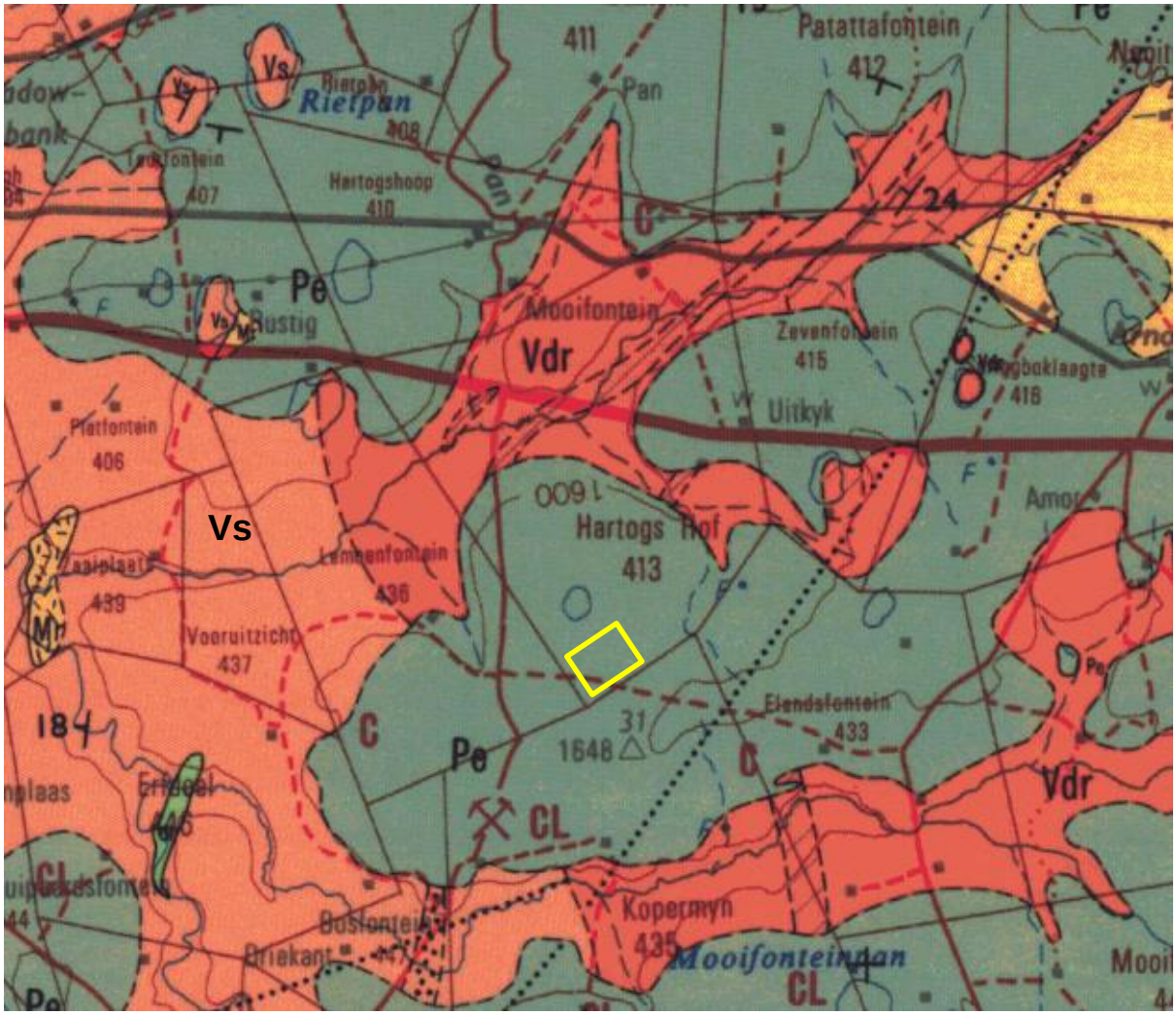

Figure 3: Geological map of the area around the Nndanganeni Colliery with the project area within the yellow outline. Abbreviations of the rock types are explained in Table 2. Map enlarged from the Geological Survey 1: 250 000 map 2528 Pretoria.

Table 2: Explanation of symbols for the geological map and approximate ages (Johnson et al., 2006; Zeh et al., 2020). SG = Supergroup; Fm = Formation; Ma = million years; grey shading = formations impacted by the project.

Symbol	Group/Formation	Lithology	Approximate Age
Pe	Vryheid F, Ecca Group, Karoo SG	Siltstone, shale, sandstone, coal	Early Permian ca 290-280 Ma
Pd	Dwyka Group, Karoo SG	Tillites, diamictite, mudstones	Late Carboniferous to Early Permian. Ca 290 Ma
Di	diabase	Intrusive volcanic rocks	Post-Transvaal SG
Vs	Schrikkloof Fm, (previously Selons River) Rooiberg Group, Transvaal SG	Felsic lavas, volcanic rocks	Palaeoproterozoic Ca 2055 Ma
Vdr	Damval Fm, Rooiberg Group, Transvaal SG	Volcanic rocks	Palaeoproterozoic Ca 2056 Ma

Overlying the Dwyka Group rocks are rocks of the Ecca Group that are Early Permian in age. There are eleven formations recognised in this group but they do not all extend throughout the Karoo Basin. In the Free State, Mpumalanga and KwaZulu Natal, from the base upwards are the Pietermaritzburg Formation, **Vryheid Formation** and the Volksrust Formation. All of these sediments have varying proportions of sandstones, mudstones, shales and siltstones and represent shallow to deep water settings, deltas, rivers, streams and overbank depositional environments.

ii. Palaeontological context

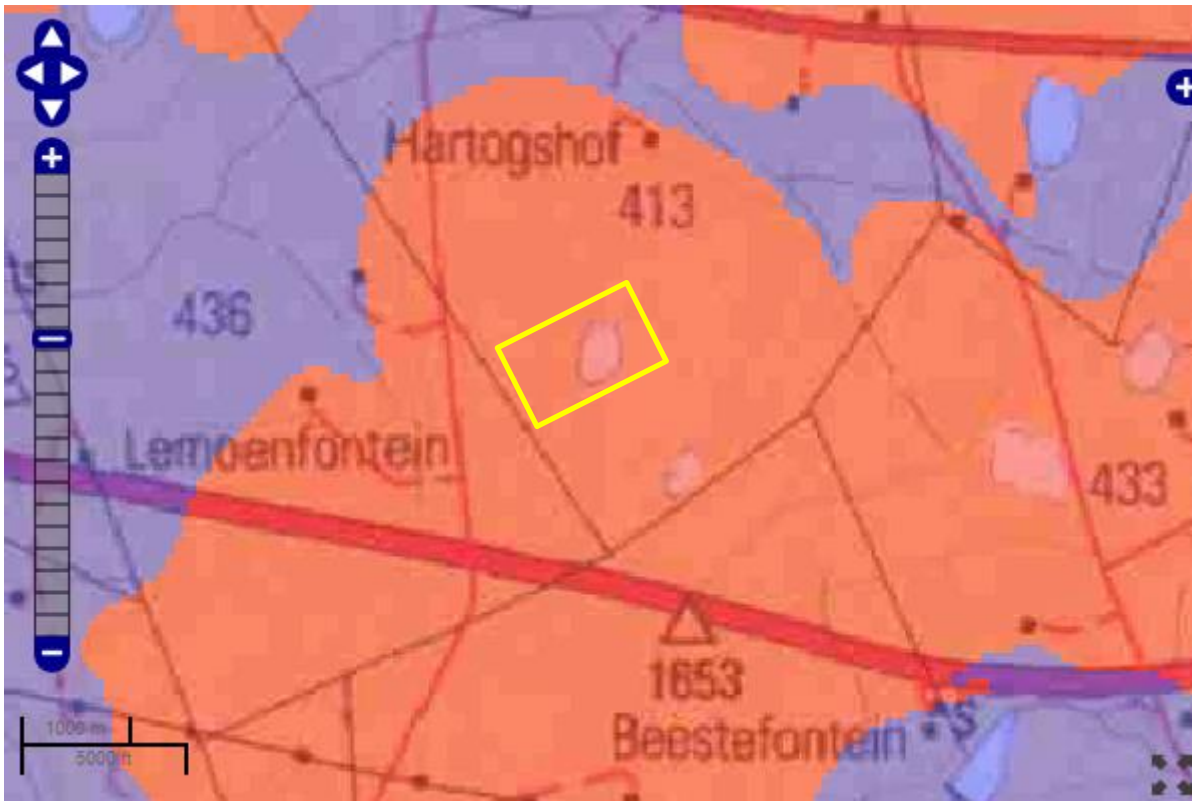

Figure 4: SAHRIS palaeosensitivity map for the Nndanganeni Colliery shown within the yellow rectangle. Background colours indicate the following degrees of sensitivity: red = very highly sensitive; orange/yellow = high; green = moderate; blue = low; grey = insignificant/zero.

The palaeontological sensitivity of the area under consideration is presented in Figure 4. The site for development is in the very highly sensitive Vryheid Formation (red) for the whole area.

The Vryheid Formation contains the main coal reserves of South Africa. Coals are the product of the alteration of buried peats by heat and pressure to form amorphous organic matter. No fossil plants are visible in the coal itself but can sometimes be found in the carbonaceous lenses between and adjacent to the coal seams. Here the original plants can be seen, the *Glossopteris* flora. This flora is dominated by the extinct seed fern, *Glossopteris*, but other plants were also present such as lycopods, sphenophytes, ferns, cordaitaleans and early gymnosperms (Plumstead, 1969; Anderson and Anderson, 1985;

Bamford, 2004). Vertebrate fossils are seldom found with plant fossils because they require different environments for preservation. Plants require a more reducing environment while bones need a more oxidizing environment (Cowan, 1995).

Although the *Glossopteris* flora is widespread in Gondwana, the occurrence is sporadic and difficult to predict. In this area, the Witbank Coalfield, there are usually five coal seams, from bottom to top called 1-5 (Snyman, 1988). The uppermost seam is overlain by sandstone in most areas and is 20 or meters below the lands surface (Snyman, 1998; fig 16).

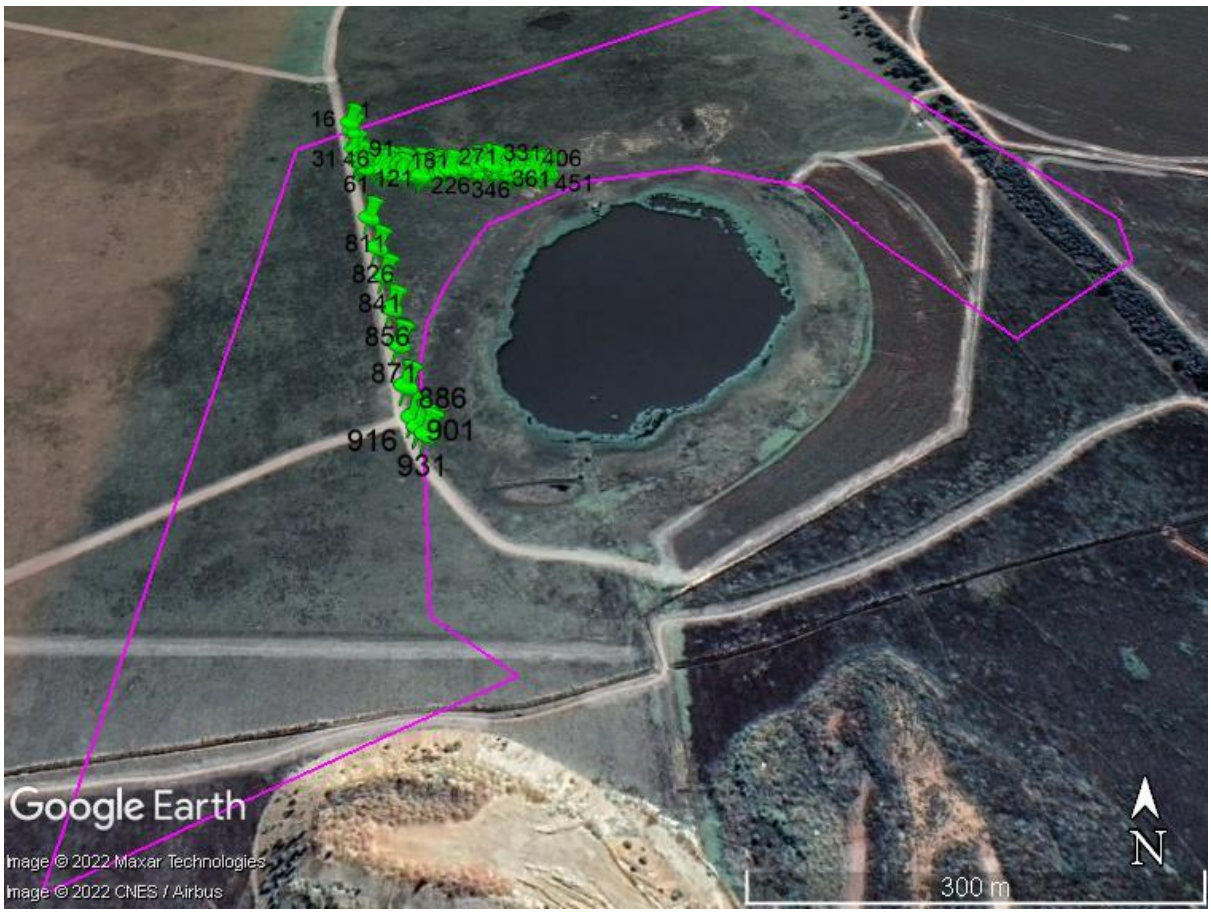

Figure 5: Google Earth map of the Nndanganeni Colliery and new area to be mined. Green numbered pins indicate the observation stops (see Table 3 and Figures 6-8).

iii. Site visit observations

The area was walked through by palaeontologists Bailey Weiss and Chandelé Montgomery on 30 October 2022. They searched for rocky outcrops because soils do not preserve fossils. The area has been farmed in the past and most rocks have been removed. There were no outcrops or fossils visible on the surface. Photographs of the area and GPS points (Appendix A) and photostops are given in Table 3 and Figures 6-8. Photographs taken by Bailey Weiss.

Table 3: Site observations, GPS points and relevant figures.

Photo stops	Observations	Figures
Stop 1 (Nos 16 and 31 in App. A)	Southwestern part of the site, heading northwards along the road. Note the fields have been ploughed and cultivated in the past, and are now covered with thick but short grasslands on deep sandy soils. No rocks and no fossils seen.	6A - D
Stop 2 (31)	Northern part of the field looking southwards to old mine dump in front of heavy storm clouds. Note thick cover of sandy soils, secondary grassland and no fossils.	7A
Stop 3 (412)	The only rocky outcrop in the site under study. It was carefully examined for impressions of *Glossopteris* leaves and other plants but was found to be coarse-grained, very weathered and barren of fossils. Around the rocks are	7C - D
Stop 4 (826, 886, 931)	North central part heading towards the pan. Deep soils and short to medium height secondary grassland. No rocky outcrops and no fossils seen on the surface.	8A-D

Figure 6: Photographs from the site visit of the proposed Amendment for the S102 Nndanganeni Colliery Mining Right. (See Table 3 for details).

Figure 7: Photographs from the site visit of the proposed Amendment for the S102 Nndanganeni Colliery Mining Right.

Figure 8: Photographs from the site visit of the proposed Amendment for the S102 Nndanganeni Colliery Mining Right (see Table 3 for details).

Summary of site observations

No fossils and no rocky outcrops of shales that could preserve fossils were visible in the unmined areas. These fields have been cleared and planted in the past. They have deep sandy soils covering the underground strata so it is unknown at what depth any carbonaceous shales might occur. No shales or carbonaceous shales were evident on the surface in the area, and no fossils were seen.

4. Impact assessment

An assessment of the potential impacts to possible palaeontological resources considers the criteria encapsulated in Table :

Table 4a: 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

Table 4b: Impact Assessment

PART B: Assessment		
SEVERITY/NATURE	**H**	-
	M	-
	L	Soils and sands do not preserve plant fossils; so far there are no records from the Vryheid Fm of plant or animal fossils in this site so it is very unlikely that fossils occur on the site. The impact would be very unlikely.
	L+	-
	M+	-
	H+	-
DURATION	**L**	-
	M	-
	H	Where manifest, the impact will be permanent.

PART B: Assessment		
SPATIAL SCALE	**L**	Since the only possible fossils within the area would be fossil plants from the *Glossopteris* flora in the shales, the spatial scale will be localised within the site boundary.
	M	-
	H	-
PROBABILITY	**H**	**-**
	M	It is extremely unlikely that any fossils would be found in the loose sand and soil that cover the area but there might be fossils below the ground. Therefore, a Fossil Chance Find Protocol should be added to the eventual EMPr.
	L	

Based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the development footprint. The geological structures suggest that the rocks are the correct age and type to preserve fossils. The site visit and walk through confirmed that there were NO FOSSILS on the surface of the project footprint. Since there is a chance that fossils from the Vryheid Formation may occur below ground and be disturbed, a Fossil Chance Find Protocol has been added to this report. Taking account of the defined criteria, the potential impact to fossil heritage resources is low to moderate.

5. 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 dolomites, sandstones, shales and sands are typical for the country and do contain fossil plant, insect, invertebrate and vertebrate material. The site visit and walk through on confirmed that there are no fossils on the surface. The sands of the Quaternary period would not preserve fossils. It is not known if there are fossils below the surface associated with the deeper coal seams.

6. Recommendation

Based on the fossil record but confirmed by the site visit and walk through there are NO FOSSILS of the *Glossopteris* flora on the surface even though fossils have been collected and recorded from rocks of a similar age and type in South Africa. It is extremely unlikely that any fossils would be preserved in the overlying soils and sands of the Quaternary. There is a chance that fossils may occur in below the ground surface in the shales of the Vryheid Formation so a Fossil Chance Find Protocol should be added to the EMPr. If fossils are found by the environmental officer, or other responsible person once mining, excavations or drilling have commenced, then they should be rescued and a palaeontologist called to assess and collect a representative sample.

7. References

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8. Chance Find Protocol

Monitoring Programme for Palaeontology – to commence once the excavations / drilling / mining activities begin.

1. The following procedure is only required if fossils are seen on the surface and when drilling/excavations/mining commence.
2. When excavations begin the rocks and must be given a cursory inspection by the environmental officer or designated person. Any fossiliferous material (trace fossils, fossils of plants, insects, bone or coalified material) should be put aside in a suitably protected place. This way the project activities will not be interrupted.
3. Photographs of similar fossils must be provided to the developer to assist in recognizing the fossil plants, vertebrates, invertebrates or trace fossils in the shales and mudstones (for example see Figure 9). This information will be built into the EMP's training and awareness plan and procedures.
4. Photographs of the putative fossils can be sent to the palaeontologist for a preliminary assessment.
5. If there is any possible fossil material found by the environmental officer/miners then the qualified palaeontologist sub-contracted for this project, should visit the site to inspect the selected material and check the dumps where feasible.
6. Fossil plants or vertebrates that are considered to be of good quality or scientific interest by the palaeontologist 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 site a SAHRA permit must be obtained. Annual reports must be submitted to SAHRA as required by the relevant permits.
7. If no good fossil material is recovered then no site inspections by the palaeontologist will be necessary. A final report by the palaeontologist must be sent to SAHRA once the project has been completed and only if there are fossils.
8. If no fossils are found and the excavations have finished then no further monitoring is required.

9. Appendix A – Site Visit GPS points

Name	Easting / Southing	Elevation (m)
1	29.67534635,-25.81020792,	1656.644
16	29.67539902,-25.81038614,	1656.4
31	29.67548764,-25.81072831,	1656.57
36	29.67559581,-25.81094045,	1656.197
61	29.67559581,-25.81094045,	1656.115
76	29.67559581,-25.81094045,	1655.26
91	29.67559112,-25.81096603,	1656.039
106	29.67564326,-25.81104205,	1656.143
121	29.67567158,-25.81108929,	1656.502
136	29.67582996,-25.81109687,	1655.521
151	29.67588371,-25.81112794,	1654.409
166	29.67596114,-25.81117647,	1655.449
181	29.67610649,-25.81119152,	1655.861
196	29.67623403,-25.81120549,	1655.291
211	29.67635167,-25.81121215,	1655.169
226	29.67635167,-25.81121215,	1653.929
241	29.67639992,-25.81120584,	1654.202
256	29.67649576,-25.81115062,	1654.903
271	29.67666274,-25.81110809,	1655.152
286	29.67682217,-25.81107844,	1655.146
301	29.67695611,-25.8110189,	1654.841
316	29.67711191,-25.81099635,	1654.616
331	29.67717792,-25.8110212,	1653.813
346	29.6771895,-25.81101761,	1654.296
361	29.67728121,-25.81107043,	1654.804
376	29.67745971,-25.81111256,	1653.651
391	29.67756675,-25.81111548,	1653.807
406	29.67764458,-25.81110508,	1652.986
421	29.67771339,-25.81110979,	1653.877
436	29.67774362,-25.81111987,	1653.252
451	29.67779019,-25.81112968,	1652.756
466	29.67781403,-25.81114018,	1652.259
481	29.67783379,-25.81112031,	1652.512
496	29.67781403,-25.81108027,	1652.826
511	29.67767622,-25.81106461,	1653.143
526	29.67761118,-25.811098,	1652.897
541	29.67757268,-25.81110897,	1653.07
556	29.67757535,-25.81111309,	1653.27
571	29.67747711,-25.81114497,	1653.641
586	29.67742157,-25.81116612,	1654.725
601	29.67734194,-25.81115943,	1654.691

616	29.67718942,-25.81114369,	1654.955
631	29.67700077,-25.81115034,	1655.471
646	29.67684656,-25.81113639,	1655.298
661	29.67668605,-25.81113686,	1654.85
676	29.67653223,-25.8111175,	1655.855
691	29.67643636,-25.8110952,	1655.706
706	29.67629505,-25.81108038,	1656.445
721	29.67610634,-25.81108188,	1655.813
736	29.6759303,-25.81105428,	1656.482
751	29.67577969,-25.81101947,	1655.972
766	29.67564314,-25.81103076,	1656.09
781	29.67557925,-25.81093237,	1655.73
796	29.67558298,-25.81093925,	1655.794
811	29.67587722,-25.81196411,	1656.327
826	29.67604023,-25.81244439,	1655.485
841	29.67618173,-25.81287682,	1654.681
856	29.67633085,-25.81333913,	1654.127
871	29.67647075,-25.81381902,	1653.704
886	29.67661595,-25.81433296,	1652.768
901	29.67673817,-25.81470544,	1652.918
916	29.67680661,-25.81481596,	1653.003
931	29.676884,-25.81488753,	1652.74

10. Appendix B - Examples of fossils from the Vryheid Formation

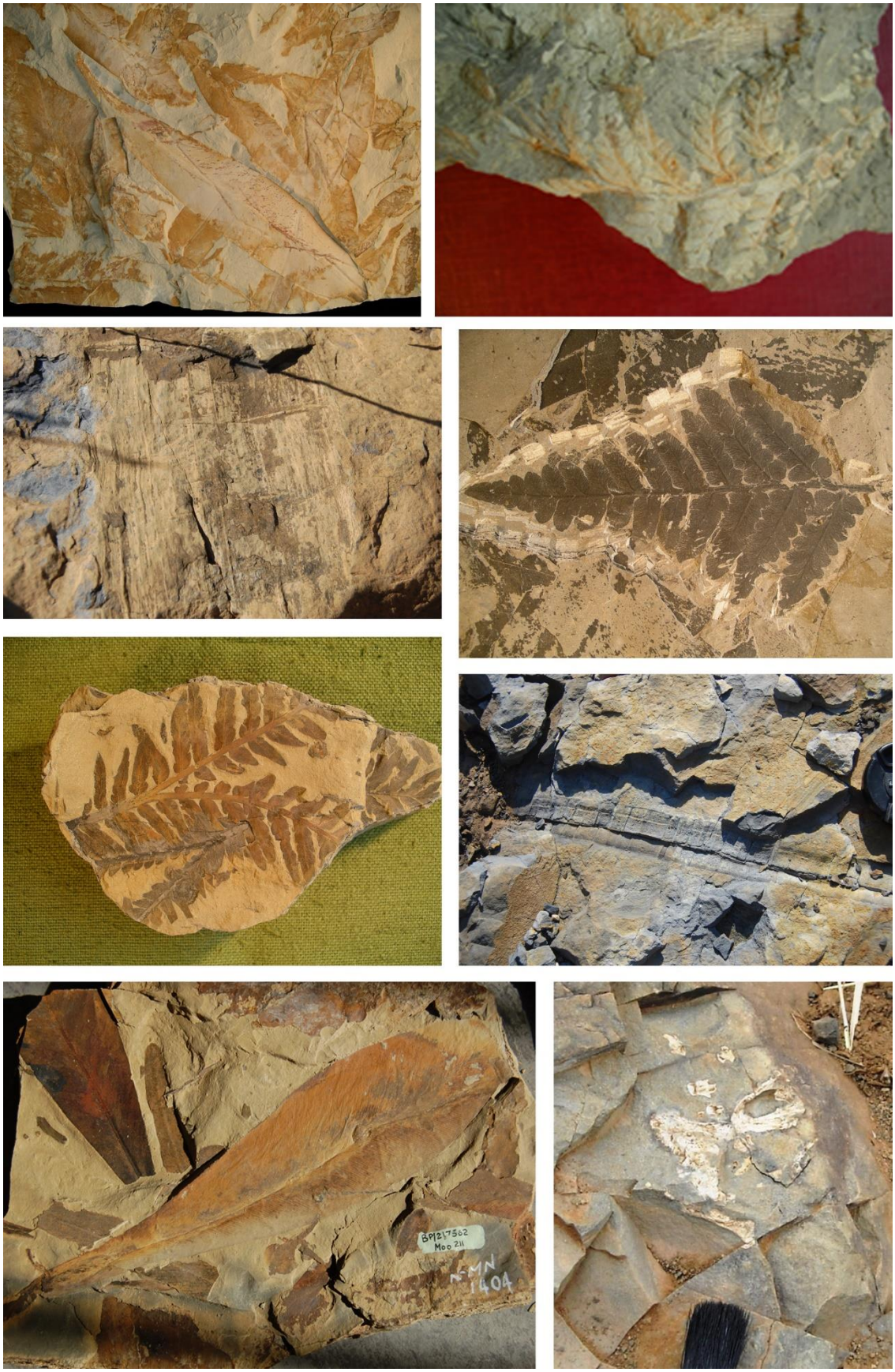

Figure 9: Photographs of fossil plants from the Vryheid Formation. Bottom right shows fossils bones still in the rocks of a river bed.

11. Appendix C – Details of specialists

Marion Bamford (PhD)

Short CV for PIAs – July 2022

I) **Personal details**

Present employment: Professor; Director of the Evolutionary Studies Institute. Member Management Committee of the NRF/DST Centre of Excellence Palaeosciences, University of the Witwatersrand, Johannesburg, South Africa

Telephone : +27 11 717 6690
Fax : +27 11 717 6694
Cell : 082 555 6937
E-mail : marion.bamford@wits.ac.za ; marionbamford12@gmail.com

ii) **Academic qualifications**

Tertiary Education: All at the University of the Witwatersrand:
1980-1982: BSc, majors in Botany and Microbiology. Graduated April 1983.
1983: BSc Honours, Botany and Palaeobotany. Graduated April 1984.
1984-1986: MSc in Palaeobotany. Graduated with Distinction, November 1986.
1986-1989: PhD in Palaeobotany. Graduated in June 1990.

iii) **Professional qualifications**

Wood Anatomy Training (overseas as nothing was available in South Africa):
1994 - Service d'Anatomie des Bois, Musée Royal de l'Afrique Centrale, Tervuren, Belgium, by Roger Dechamps
1997 - Université Pierre et Marie Curie, Paris, France, by Dr Jean-Claude Koeniguer
1997 - Université Claude Bernard, Lyon, France by Prof Georges Barale, Dr Jean-Pierre Gros, and Dr Marc Philippe

iv) **Membership of professional bodies/associations**

Palaeontological Society of Southern Africa
Royal Society of Southern Africa - Fellow: 2006 onwards
Academy of Sciences of South Africa - Member: Oct 2014 onwards
International Association of Wood Anatomists - First enrolled: January 1991
International Organization of Palaeobotany – 1993+
Botanical Society of South Africa
South African Committee on Stratigraphy – Biostratigraphy - 1997 - 2016
SASQUA (South African Society for Quaternary Research) – 1997+
PAGES - 2008 –onwards: South African representative
ROCEEH / WAVE – 2008+
INQUA – PALCOMM – 2011+onwards

vii) **Supervision of Higher Degrees**

All at Wits University

Degree	Graduated/completed	Current
Honours	11	0
Masters	14	1
PhD	11	6
Postdoctoral fellows	12	2

viii) **Undergraduate teaching**
Geology II – Palaeobotany GEOL2008 – average 65 students per year
Biology III – Palaeobotany APES3029 – average 25 students per year
Honours – Evolution of Terrestrial Ecosystems; African Plio-Pleistocene Palaeoecology; Micropalaeontology – average 12 - 20 students per year.

ix) **Editing and reviewing**
Editor: Palaeontologia africana: 2003 to 2013; 2014 – Assistant editor
Guest Editor: Quaternary International: 2005 volume
Member of Board of Review: Review of Palaeobotany and Palynology: 2010 –
Associate Editor: Cretaceous Research: 2018-2020
Associate Editor: Royal Society Open: 2021 -
Review of manuscripts for ISI-listed journals: 25 local and international journals

x) **Palaeontological Impact Assessments**

Selected from recent project only – list not complete:

- Mala Mala 2017 for Henwood
- Modimolle 2017 for Green Vision
- Klipoortjie and Finaalspan 2017 for Delta BEC
- Ledjadja borrow pits 2018 for Digby Wells
- Lungile poultry farm 2018 for CTS
- Olienhout Dam 2018 for JP Celliers
- Isondlo and Kwasobabili 2018 for GCS
- Kanakies Gypsum 2018 for Cabanga
- Nababeep Copper mine 2018
- Glencore-Mbali pipeline 2018 for Digby Wells
- Remhoogte PR 2019 for A&HAS
- Bospoort Agriculture 2019 for Kudzala
- Overlooked Quarry 2019 for Cabanga
- Richards Bay Powerline 2019 for NGT
- Eilandia dam 2019 for ACO
- Eastlands Residential 2019 for HCAC
- Fairview MR 2019 for Cabanga
- Graspan project 2019 for HCAC
- Lieliefontein N&D 2019 for Enviropro
- Skeerpoort Farm Mast 2020 for HCAC
- Vulindlela Eco village 2020 for 1World
- KwaZamakhule Township 2020 for Kudzala
- Sunset Copper 2020 for Digby Wells
- McCarthy-Salene 2020 for Prescali
- VLNR Lodge 2020 for HCAC
- Madadeni mixed use 2020 for Enviropro

- Frankfort-Windfield Eskom Powerline 2020 for 1World
- Beaufort West PV Facility 2021 for ACO Associates
- Copper Sunset MR 2021 for Digby Wells
- Sannaspos PV facility 2021 for CTS Heritage
- Smithfield-Rouxville-Zastron PL 2021 for TheroServe
- Glosam Mine 2021 for AHSA

Xi) **Research Output**
Publications by M K Bamford up to July 2022 peer-reviewed journals or scholarly books: over 165 articles published; 5 submitted/in press; 10 book chapters.
Scopus h-index = 30; Google Scholar h-index = 36; -i10-index = 95
Conferences: numerous presentations at local and international conferences.

Bailey M. Weiss CV

October 2022

I am currently enrolled as a PhD student at the University of the Witwatersrand, Evolutionary Studies Institute under the supervision of Prof Jonah Choiniere. The title of my thesis is "*The origin of crocodilians: functional anatomy, growth history, systematics, and phenotypic variation*." In 2021 I completed an MSc at the University of the Free State (UFS), on a research project entitled: *Bone microanatomy of Anomodontia (Synapsida: Therapsida) from the Karoo Basin of South Africa*. That project was supervised by Dr Jennifer Botha (National Museum, Bloemfontein) and Co-Supervised by Dr Alexandra Houssaye (Muséum national d'Histoire naturelle, Paris). I completed my BSc honours degree in which I completed a research project entitled: *Limb bone histology of theropod dinosaurs from the Early Jurassic of South Africa*. This project was supervised by Dr Jennifer Botha. I majored in Genetics and Zoology for my BSc degree. I have worked as an Osteohistology Technician at the National Museum, Bloemfontein, as well as a Laboratory Assistant at the UFS. I have been on two Palaeontological field trips one with the National Museum in the Balfour and Katberg Formations. The other with the University of the Witwatersrand in the Lower Elliot Formation of South Africa.

Qualifications

BSc – Majors: Genetics and Geology - University of the Free State – 2018
BSc Honours – Palaeontology – University of the Free State – 2019
MSc – Palaeontology – University of the Free State – 2021
PhD – Palaeontology – University of the Witwatersrand – 2022 -

PIA fieldwork Experience

July 2021 – Sannaspos PV Facility, Free State for CTS Heritage
October 2021 – Beatrix Mine-Theunissen Eskom powerline for 1World

March 2022 – Taaibosch Puts PV – for CTS Heritage
March 2022 – Transnet MPP Coastal access routes – for ENVASS

References:

Dr Jennifer Botha, Head of Palaeontology, National Museum, Bloemfontein
jbotha@nasmus.ac.za

Prof Jonah Choiniere, Evolutionary Studies Institute, University of the Witwatersrand, Johannesburg
Jonah.choiniere@wits.ac.za

Curriculum Vitae – Chandelé Montgomery
October 2022

Present position:
2022 –present: PhD Candidate - University of the Witwatersrand, School of Geosciences, based in the Evolutionary Studies Institute.
Title of thesis: Comparative morphology and composition of Permo-Triassic coprolites and modern vertebrate faeces using 3D X-ray imaging.
Supervisors: Prof Jonah Choiniere, Prof John Hancox
ORCID number: 0000-0002-3718-1648

Qualifications
2021 – MSc in Palaeontology. Distinction
2020 – BSc Honours in Palaeontology, Wits University
2017-2019 – BSc in Biological Sciences, University of the Witwatersrand
2019 – Accelerator programme for palaeontology.

References:
Prof Jonah Choiniere – ESI, Wits University. Jonah.choiniere@wits.ac.za

Prof John Hancox – CCIC – jhancox@cciconline.com

Palaeontological Impact Assessments
Honours topic 2020 – Introduction by Prof Bamford; Fieldwork with Dr Julien Benoit – cancelled.
Site Visit: Doornrug & Kleinwater – July 2022 – for Eco-Elementum

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