

Proposed Walkerville Village Mews Development

Midvaal Local Municipality, Sedibeng District, Gauteng Province

Farm: Portion 174 (a Portion of Portion 29) of Faroasfontein 372-IQ

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Palaeontological Impact Assessment: Addendum

Facilitated by: ENVIROSYNERGY CONSULTING

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B. Executive summary

Outline of the development project: ENVIROSYNERGY CONSULTING has facilitated the appointment of Dr H. Fourie, a palaeontologist, to undertake a Paleontological Impact Assessment (PIA), Desktop Study of the suitability of the proposed Walkerville Village Mews development, with related infrastructure on Portion 174 (a Portion of Portion 29) of the Farm Faroasfontein 372-IQ in the Midvaal Local Municipality, Sedibeng District in the Gauteng Province. The request for the study came from SAHRA's initial comment on the Draft Basic Assessment Report (April 2017) that was circulated for public comment. This is an addendum to the Desktop study.

This addendum aims to provide comment and recommendations on the potential impacts that the proposed development could have on the fossil heritage of the area and to state if any mitigation or conservation measures are necessary.

The applicant, Walkerville Village Mews, proposes to develop the property in to a 'sustainable living' and greener technologies facilities including retirement housing and open spaces.

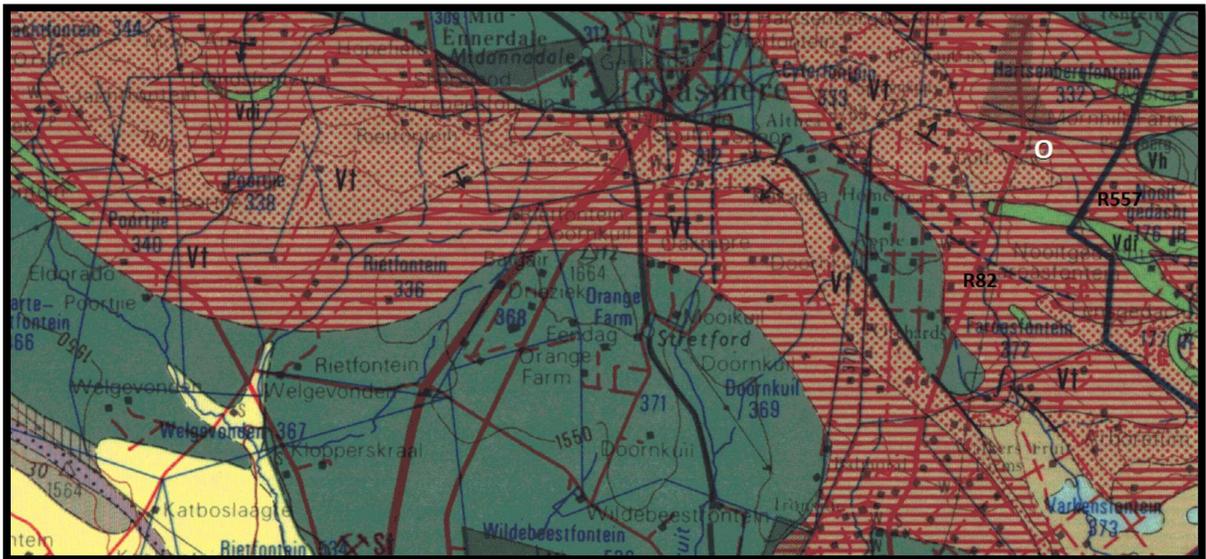
The Project includes one layout alternative (see google.earth image):

Option 1: A block outlined in blue with the R82 Road as the north-south route which links Vereeniging and Johannesburg via Walkerville, the R557 Road is to the northeast. The site is approximately 19.872 hectares including 4.396 hectares of open space.

Outline of the geology and the palaeontology:

The geology was obtained from map 1:100 000, Geology of the Republic of South Africa (Visser 1984) and the 1:250 000 (2626) Geological Map of the West Rand (Keyser 1986).

Figure 3: The geology of the development area (Keyser 1986).



Legend to Map and short explanation.

Vdi – Diabase (green), Vaalian.

Vh – Andesite, agglomerate, tuff (green), Hekpoort Formation, Pretoria Group, Transvaal Supergroup.

Vt – Ferruginous quartzite [::], ferruginous shale, hornfels [=] (brown), Time Ball Hill Formation, Pretoria Group, Transvaal Supergroup.

--f-- – (black) Fault.

└ 20 - Strike and dip of bed.
O – Approximate position of Walkerville (edge of map).

Mining Activities

None.

Summary of findings: The Palaeontological Impact Assessment: Desktop study was undertaken in November 2016 in the summer in dry and hot conditions, as this was a desktop study the season (Appendix 6 of Act, 1(d)) has no influence on the outcome, and the following was reported:

The development is taking place on the Time Ball Hill quartzite Formation of the Pretoria Group, Transvaal Supergroup.

The Transvaal Supergroup fills an east-west elongated basin in the south-central part of the old Transvaal (now North – West, Gauteng and Mpumalanga) as far south as Potchefstroom. It is Vaalian in age, approximately 2600 Ma to 2100 Ma. A maximum thickness of the Transvaal Supergroup reaches 2000 m in the north-eastern section. The east-west elongated basin is filled with clastic, volcanic and chemical sedimentary rocks. Three groups based on lithological differences have been established: they are the Rooiberg, Chuniespoort, and Pretoria Groups as well as other smaller groups (Kent 1980, Snyman 1996). It is the Bushveld Complex that is responsible for the tilting of the Transvaal sediments and the heat of its intrusion having created andalusite crystals (Norman and Whitfield 2006). This Supergroup is underlain by the Ventersdorp, Witwatersrand and Pongola Supergroups, and the Dominion Group. Three prominent ridges are present from the oldest to the youngest, the Time Ball Hill, Daspoort and Magaliesberg Formations (Norman and Whitfield 2006).

The Pretoria Group consists predominantly of quartzite and shale, together with a prominent volcanic unit, minor conglomerate, chemical and volcanic members. It comprises the Hekpoort Andesite, Dullstroom Basalt, Time Ball Hill, Silverton, and Magaliesberg Quartzite Formations as well as several smaller formations (in total 15) and overlies the Chuniespoort Group (Kent 1980). Both the shale and quartzite of the Pretoria Group are utilised in the building industry (Snyman 1996). The Time Ball Hill shale Formation is known to contain 'algal microfossils' diagenetic in origin. Stromatolites as they are known are preserved in the subordinate carbonate rocks (Kent 1980). The Pretoria Group is clastic sedimentary in nature (Eriksson 1999). The pile of sedimentary rocks, mainly mudstones and quartzites with some basalt can collectively reach a thickness of up to 5 km.

Fossils in South Africa mainly occur in rocks of sedimentary nature and not in rocks from igneous or metamorphic nature. Therefore, if there is the presence of Karoo Supergroup strata the palaeontological sensitivity can generally be LOW to VERY HIGH, and here locally HIGH for the Pretoria Group including the Time Ball Hill Formation (SG 2.2 SAHRA APMHOB, 2012).

Recommendation:

The impact of the development on fossil heritage is HIGH and therefore a field survey or further mitigation or conservation measures may have been necessary for this development (according to SAHRA protocol). A Phase 1 Palaeontological Impact Assessment and or mitigation may have been recommended.

It is the recommendation in this Addendum that a site visit/field verification is however not necessary, based on the following reasoning:

- The site has previously been used for agriculture purposes and so has been disturbed.
- A site visit will not find any outcrops and therefore also miss a fossil which may be buried below the surface.
- As part the Environmental Authorisation conditions, an Environmental Control Officer (ECO) will be appointed to oversee the construction activities in line with legally binding Environmental Management Programme(EMPr)
- The EMPr already covers the conservation of heritage and paleontological artefacts that may be exposed during construction activities. The protocol is to immediately cease all construction activities and contact SAHRA for further investigation. It is recommended that the EMPr be updated to include the involvement of a paleontological specialist during the digging and excavation phase of the development.

- Special care must be taken during the digging, drilling, blasting and excavating of foundations, trenches, channels and footings and removal of overburden not to intrude fossiliferous layers.

Table 2: Criteria used (Fossil Heritage Layer Browser/SAHRA):

Rock Unit	Significance/vulnerability	Recommended Action
Pretoria Group	High	Desktop study is required and based on the outcome of the desktop study, a field assessment is likely
Time Ball Hill	High	Desktop study is required and based on the outcome of the desktop study, a field assessment is likely
Hekpoort Formation	Moderate	Desktop study is required

The Time Ball Hill Formation is present here in the development area. It contains stromatolites.

The Project includes one layout alternative (see google.earth image) as approved by the Gauteng Department of Agriculture and Rural Development on 20 October 2016:

Option 1: A block outlined in blue with the R82 Road as the north-south route which links Vereeniging and Johannesburg via Walkerville, the R557 Road is to the northeast. The site is approximately 19.872 hectares including 4.396 hectares of open space.

Concerns/threats:

1. Threats are earth moving equipment/machinery (front end loaders, excavators, graders, dozers) during construction, the sealing-in, disturbance, damage or destruction of the fossils by development, vehicle traffic and human disturbance.
2. Mitigation is not needed, but will be when a fossil is found (covered by the already approved EMPr)
3. No consultation with parties was necessary.
4. Caution is recommended as stated above (due to the presence of stromatolites), a field assessment is not recommended, but the developer needs to follow protocol (attached) for the shale layer if any fossils are uncovered. In such a case SAHRA must be notified immediately (Appendix 1).

Stakeholders: Developer – Walkerville Village Mews – P.O. Box 932, Walkerville, 1876.

Environmental – ENVIROSYNERGY, Postnet Suite 783, Private Bag 37, Lynwoodridge, 0040, Tel. 079 824 7255.

Landowner – Walkerville Village Mews – 84 On Main Shopping Centre, 82 Main Road, Walkerville.

D. Background information on the project

Outline of development

The applicant, Walkerville Village Mews, proposes to develop the property in to a 'sustainable living' and greener technologies facilities including retirement housing and open spaces.

The design includes:

Erf 1 - 2: Community Facility,

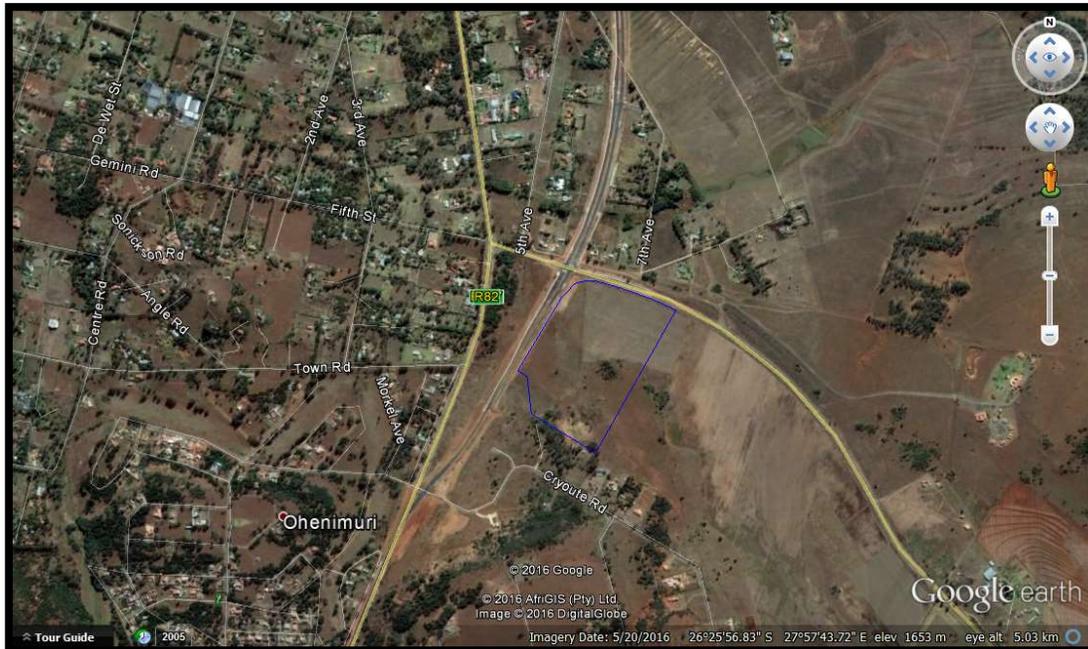
Erf 3 - 7: Retirement Housing,

Erf 8: Living Units,

Erf 9: Private Open Space, and

Erf 10: Private Open Space with sewage plant.

Figure 1: Layout plan of Walkerville Village Mews (ENVIROSYNERGY).



The site is underlain by the Transvaal Supergroup rocks.

G. Background to Palaeontology of the area

Summary: When rock units of moderate to very high palaeontological sensitivity are present within the development footprint, a desk top and or field scoping (survey) study by a professional palaeontologist is usually warranted. The main purpose of a field scoping (survey) study would be to identify any areas within the development footprint where specialist palaeontological mitigation during the construction phase may be required (SG 2.2 SAHRA AMPHOB, 2012).

'Algal microfossils' have been reported from the Time Ball Hill Formation shales and are probably of diagenetic origin. Stromatolites are preserved also in the subordinate carbonate rocks of the Pretoria Group (Eriksson 1999). Stromatolites are significant indicators of palaeoenvironments and provide evidence of algal growth between 2640 and 2432 million years ago (Groenewald and Groenewald 2014).

Table 1: Taken from Palaeotechnical Report (Groenewald and Groenewald 2014).

Subgroup/sequence	Group	Formation	Fossil Heritage	Comment
Transvaal Supergroup	Pretoria	Hekpoort Formation (Vh).	None.	-
Transvaal Supergroup	Pretoria	Time Ball Hill Formation (Vt)	Stromatolites	Also contain microfossils. This may also apply to carbonaceous mudrocks

Fossils in South Africa mainly occur in rocks of sedimentary nature and not in rocks from igneous or metamorphic nature. Therefore, if there is the presence of Karoo Supergroup strata the palaeontological sensitivity is generally LOW to VERY HIGH, but here locally HIGH for the Pretoria Group including the Time Ball Hill Formation, Transvaal Supergroup.

Table 2: Criteria used (Fossil Heritage Layer Browser/SAHRA):

Rock Unit	Significance/vulnerability	Recommended Action
Pretoria Group	High	Desktop study is required and based on the outcome of the desktop study, a field assessment is likely
Time Ball Hill	High	Desktop study is required and based on the outcome of the desktop study, a field assessment is likely
Hekpoort Formation	Moderate	Desktop study is required

Databases and collections: Ditsong: National Museum of Natural History.

Impact: HIGH for the Pretoria Group including the Time Ball Hill Formation, Transvaal Supergroup. There are significant fossil resources that may be impacted by the development and if destroyed are no longer available for scientific research or other public good.

H. Description of the Methodology

The palaeontological impact assessment desktop study was undertaken in November 2016. A literature survey was included and the study relied on literature, geological maps, google.maps and google.earth images.

Assumptions and Limitations (Appendix 6 of Act 1(i):-

The accuracy and reliability of the report may be limited by the following constraints:

1. Most development areas have never been surveyed by a palaeontologist or geophysicist.
2. Variable accuracy of geological maps and associated information.
3. Poor locality information on sheet explanations for geological maps.
4. Lack of published data.
5. Lack of rocky outcrops.
6. Insufficient data from developer and exact lay-out plan for all structures.

A Phase 1 Palaeontological Impact Assessment: Field Study will include:

1. Recommendations for the future of the site.
2. Background information on the project.
3. Description of the property of affected environment with details of the study area.
4. Description of the geological setting and field observations.
5. Background to palaeontology of the area.
6. Field Rating.
7. Stating of Significance (Heritage Value).

A Phase 2 Palaeontological Impact Assessment: Mitigation will include:

1. Recommendations for the future of the site.
2. Description of work done (including number of people and their responsibilities).
3. A written assessment of the work done, fossils excavated, not removed or collected and observed.
4. Conclusion reached regarding the fossil material.
5. A detailed site plan.
6. Possible declaration as a heritage site or Site Management Plan.

The National Heritage Resources Act No. 25 of 1999 further prescribes.

Act No. 25 of 1999. National Heritage Resources Act, 1999.

National Estate: 3 (2) (f) archaeological and palaeontological sites,

(i)(1) objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens,

Heritage assessment criteria and grading: (a) Grade 1: Heritage resources with qualities so exceptional that they are of special national significance;

(b) Grade 11: Heritage resources which, although forming part of the national estate, can be considered to have special qualities which make them significant within the context of a province or a region; and (c) Grade 111: Other heritage resources worthy of conservation.

SAHRA is responsible for the identification and management of Grade 1 heritage resources.

Provincial Heritage Resources Authority (PHRA) identifies and manages Grade 11 heritage resources.

Local authorities identify and manage Grade 111 heritage resources.

No person may damage, deface, excavate, alter, remove from its original position, subdivide or change the planning status of a provincially protected place or object without a permit issued by a heritage resources authority or local authority responsible for the provincial protection.

Archaeology, palaeontology and meteorites: Section 35.

(2) Subject to the provisions of subsection (8) (a), all archaeological objects, palaeontological material and meteorites are the property of the State.

(3) Any person who discovers archaeological or palaeontological objects or material or a meteorite in the course of development or agricultural activity must immediately report the find to the responsible heritage resources authority, or to the nearest local authority offices or museum, which must immediately notify such heritage resources authority.

Mitigation involves planning the protection of significant fossil sites, rock units or other palaeontological resources and/or excavation, recording and sampling of fossil heritage that might be lost during development, together with pertinent geological data. The mitigation may take place before and / or during the construction phase of development. The specialist will require a Phase 2 mitigation permit from the relevant Heritage Resources Authority before a Phase 2 may be implemented.

The Mitigation is done in order to rescue representative fossil material from the study area to allow and record the nature of each locality and establish its age before it is destroyed and to make samples accessible for future research. It also interprets the evidence recovered to allow for education of the public and promotion of palaeontological heritage.

Should further fossil material be discovered during the course of the development (*e. g.* during bedrock excavations), this must be safeguarded, where feasible *in situ*, and reported to a palaeontologist or to the Heritage Resources authority. In situations where the area is considered palaeontologically sensitive (*e. g.* Karoo Supergroup Formations, ancient marine deposits in the interior or along the coast) the palaeontologist might need to monitor all newly excavated bedrock. The developer needs to give the palaeontologist sufficient time to assess and document the finds and, if necessary, to rescue a representative sample.

When a Phase 2 palaeontological impact study is recommended, permission for the development to proceed can be given only once the heritage resources authority has received and approved a Phase 2 report and is satisfied that:

- (a) the palaeontological resources under threat have been adequately recorded and sampled, and
- (b) adequate development on fossil heritage, including, where necessary, *in situ* conservation of heritage of high significance.

Careful planning, including early consultation with a palaeontologist and heritage management authorities, can minimise the impact of palaeontological surveys on development projects by selecting options that cause the least amount of inconvenience and delay.

Three types of permits are available; Mitigation, Destruction and Interpretation. The specialist will apply for the permit at the beginning of the process (SAHRA 2012).

I. Description of significant fossil occurrences

Details of the location and distribution of all significant fossil sites or key fossiliferous rock units are often difficult to determine due to thick topsoil, subsoil, overburden and alluvium. Depth of the overburden may vary a lot.

Stromatolites are likely to be present in the shale. These structures range from a centimetre to several tens of metres in size. They are the result of algal growth in shallow water, indicating a very rich growth that would have caused an enrichment in the amount of oxygen in the atmosphere (Groenewald and Groenewald 2014). These are present in the surrounding Time Ball Hill Formation which is underlying the Hekpoort Formation.

Figure 5: Thin section of a stromatolite (De Zanche and Mietto 1977).



The threats are:- earth moving equipment/machinery (front end loaders, excavators, graders, dozers) during construction, the sealing-in or destruction of fossils by development, vehicle traffic, and human disturbance. See Description of the Geological Setting (F) above.

Declaration / disclaimer

I, Heidi Fourie, declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed development project for which I was appointed to do a palaeontological assessment. There are no circumstances that compromise the objectivity of me performing such work.

I accept no liability, and the client, by receiving this document, indemnifies me against all actions, claims, demands, losses, liabilities, costs, damages and expenses arising from or in connection with services rendered, directly or indirectly by the use of the information contained in this document.

It may be possible that the desktop study may have missed palaeontological resources in the Project Area as the presence of outcrops are not known and may only be found once development commences.

This report may not be altered in any way and any parts drawn from this report must make reference to this report.

Heidi Fourie
2017/04/28

Appendix 1: Protocol for Finds and Management Plan.

Section G covers the recommended protocol for a Phase 2 Mitigation process as well as for reports where the Palaeontological Sensitivity is **LOW or HIGH**; this process guides the palaeontologist / palaeobotanist / ECO on site and should not be attempted by the layman / developer. The developer needs to employ an Environmental Control Officer (ECO) to oversee the construction activities so that when a fossil is unearthed they can notify the relevant department and specialist to further investigate. The ECO should familiarise him- or herself with the applicable formations and its fossils. Miners or construction workers should be informed that fenced-off areas are no-go areas. The Evolutionary Studies Institute, University of the Witwatersrand has good examples of fossils that can be studied.

The developer must survey the areas affected by the development and then indicate on plan where the construction / development / mining will take place. Trenches have to be dug to ascertain how deep the sediments are above the bedrock (can be a few hundred metres). This will give an indication of the depth of the topsoil, subsoil, and overburden, if need be trenches should be dug deeper to expose the interburden.

Mitigation will involve recording, rescue and judicious sampling of the fossil material present in the layers sandwiched between the geological / coal layers. It must include information on number of taxa, fossil abundance, preservational style, and taphonomy. This can only be done during excavations. In order for this to happen, in case of mining operations, the process will have to be closely scrutinised by a professional palaeontologist / palaeobotanist / ECO to ensure that only the coal layers are mined and the interlayers (siltstone and mudstone) are surveyed for fossils or representative sampling of fossils are taking place.

The palaeontological impact assessment process presents an opportunity for identification, access and possibly salvage of fossils and add to the few good plant localities. Mitigation can provide valuable onsite research that can benefit both the community and the palaeontological fraternity.