PHASE 1 HERITAGE IMPACT ASSESSMENT FOR THE PROPOSED CONSTRUCTION OF THE NEW GRAVEL ROAD L3415, ALFRED DUMA LOCAL MUNICIPALITY, KWAZULU-NATAL

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Declaration of Consultants independence

I, Gary Trower, am an independent consultant and have no business, financial, personal or other interest in the proposed development project in respect of which I was appointed to do a palaeontological assessment other than fair remuneration for work performed. There are no circumstances whatsoever that compromise the objectivity of this specialist performing such work.

Gary Trower

Introduction

In terms of the National Environmental Management Act 107 of 1998, and Section 38 (8) of the National Heritage Resources Act 25 of 1999 (sections 34-36), all aspects of heritage are protected. Proposed developments that are likely to impact on heritage resources (i.e. historical, archaeological, palaeontological & cosmological) require a desktop and/or field assessment to gauge the importance of such resources in order to ensure that such sites are not damaged or destroyed by the processes that threaten them. Identified heritage resources should be recorded through detailed documentation, and mitigation measures applied if resources are threatened, or collection and/or a rescue excavation carried out if necessary.

The KwaZulu-Natal Department of Transport is currently addressing the needs of rural communities by providing service delivery in terms of infrastructure development. In line with is the upgrading of various rural roads to improve accessibility for numerous homesteads located along one of branches of the Tugela Valley. To meet these goals they are proposing the creation of a new road (L3415) near Langa, Alfred Duma Municipality, KwaZulu-Natal. The type of structural upgrades for the proposed new road have not yet been decided but will probably include the appropriate infrastructure (e.g. culverts) for watercourse crossings to accommodate stormwater flow.

The road will cross through a part of the landscape where the underlying geology could contain heritage-related material. According to the SAHRIS palaeo-sensitivity map summarised in Figure5 (www.sahra.org.za/sahris/map/palaeo), portions of the property are given the highest ranking of red (highly sensitive), whereas the majority of site comprises of dolerite intrusions with a grey ranking (zero/insignificant). Due to the high palaeo-sensitivity of some portions of the underlying bedrock, a ground survey was conducted as part of a Phase 1 Heritage Impact Assessment to locate and record any archaeological and/or fossil

material within the boundaries of the proposed development, as well as within a buffer zone surrounding the site footprint.

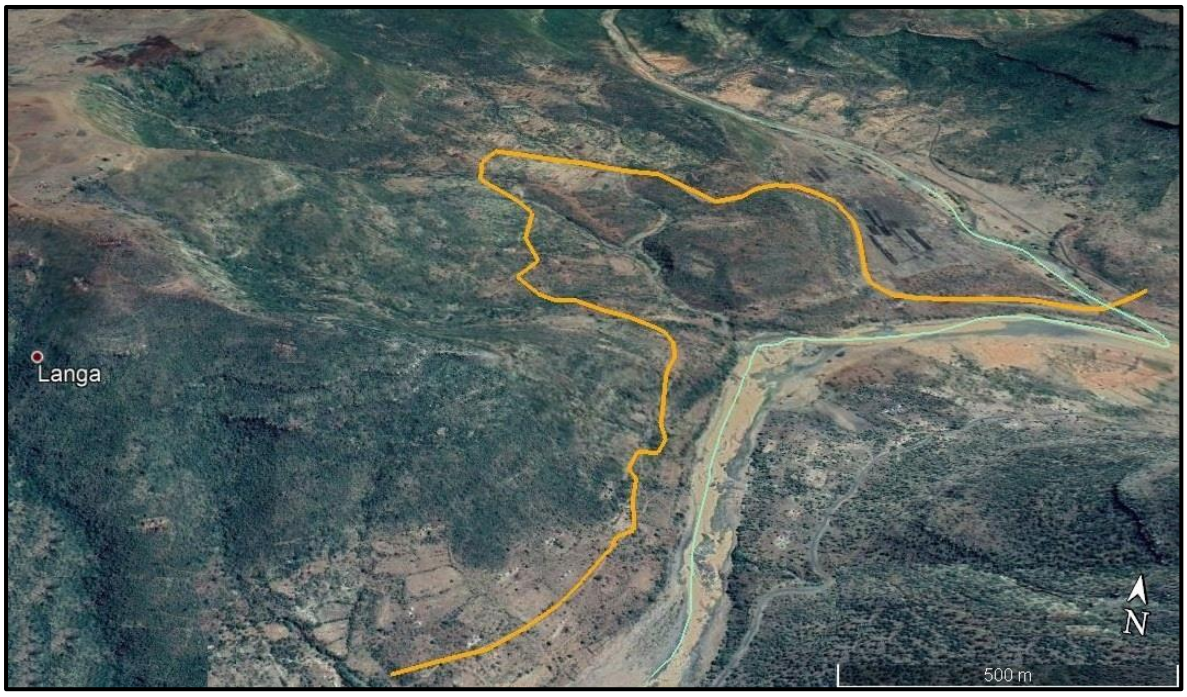

Figure 1: Satellite image showing the layout (yellow line) of the proposed road in the context of existing road accessibility and in relation to the position of Langa. North is at the top of the image. Modified Google Earth image, AfriGIS 2019

Figure 2: Satellite image showing the starting point of the proposed road, at the bridge crossing. This section of the road is already well established and is built on top of dolerite and Quaternary deposits. North is to the right of the image. Modified Google Earth image, AfriGIS 2019

Figure 3: Satellite image showing the starting point of the proposed road, looking north-west. The underlying geology along this stretch of the road predominantly comprises of dolerite, with a small patch of Pietermaritzburg Formation and Quaternary deposits. There is already an existing road along most of the proposed route and only small sections of it will be newly built. This is also the ideal location for construction/stockpile camps as it is flat, accessible, and does not contain fossiliferous bedrock, as long as such camps are more than 100 metres from the river. North is to the top right of the image. Modified Google Earth image, AfriGIS 2019

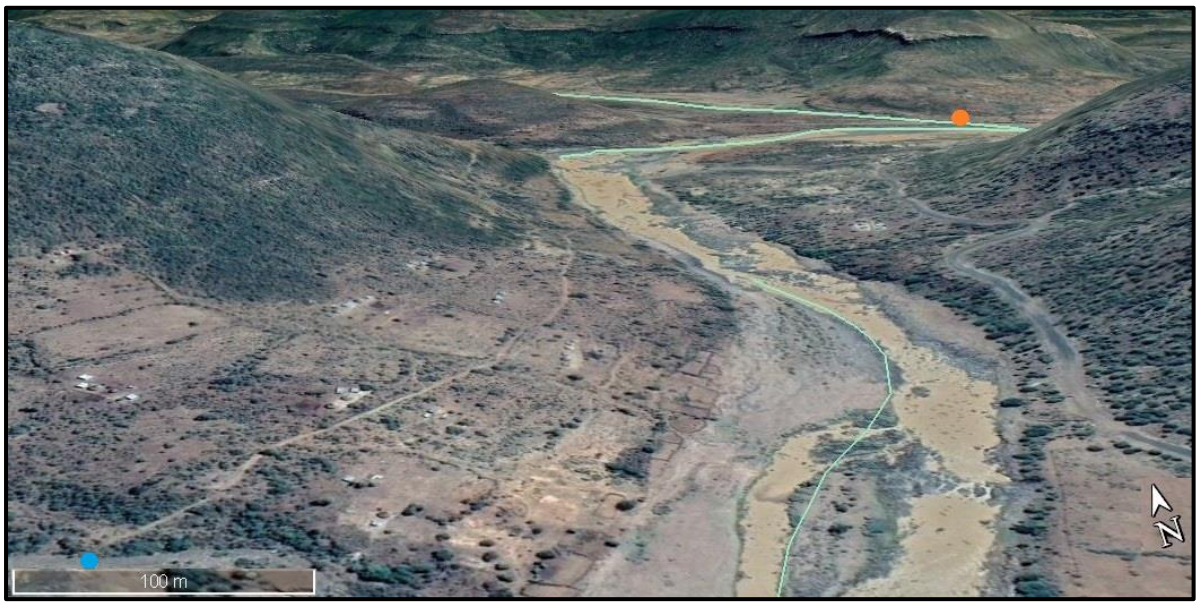

Figure 4: Looking north towards the Tugela Valley. The orange dot indicates the starting point of the proposed road and the blue dot the end of it. Most of the underlying geology in this part of the valley comprises of dolerite, with only a thin section of Vryheid Formation overlapping on the edge of the site footprint. North is at the top of the image. Modified Google Earth image, AfriGIS 2019

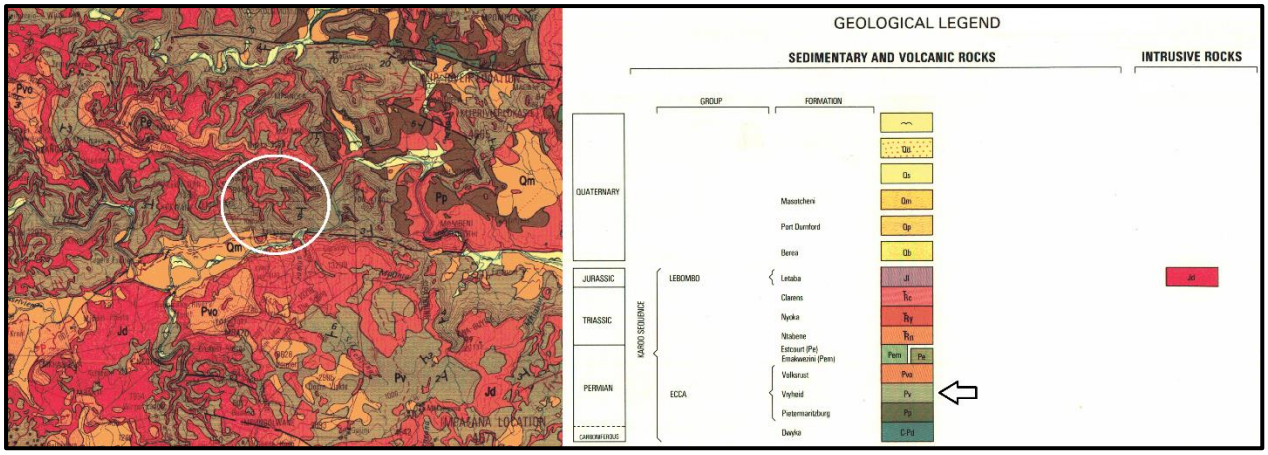

Figure 5: Map showing the geology of the region, with the site footprint occurring within the white circle. The proposed road crosses over rocks of the Vryheid Formation, a geological unit with high sensitivity. Modified from 2830Dundee, 1:250 000 Geological Series, Geological Survey, 1988)

Geology

Rocks of the Karoo Basin are rich repositories for palaeontological material, necessitating measures to minimize activities which may disturb or destroy fossils preserved in underlying beds. The geology in the area of the proposed development comprises of dolerite, some Quaternary sediments and Middle Permian deposits of the Ecca Group, more specifically the Vryheid and Pietermaritzburg Formations (Figure 5). The Quaternary alluvium may contain archaeological material spanning the entire Stone Age and part of the Iron Age, but fossil material is not common in these deposits as the soil chemistry often prevents the skeletal material of Pleistocene fauna from preserving.

The Ecca sedimentary package accumulated as deposits within a giant inland sea and comprise of medium to coarse-grained sandstone, dark grey shale, grey micaceous shale, and coal (Figure 5). These deposits form an important component and subdivision of the stratigraphy of the Karoo Supergroup, an extensive inland basin which preserves a rich array of tetrapod fauna which existed through the Permian and Triassic of southern Gondwana (Rubidge 2005, Smith *et al*. 1993). The existence of several ecosystems in this palaeo-

landscape means that an array of important fossil plants and animals which flourished during the Permian may be present within this geological unit, and this is also the reason why sections of it have a palaeo-sensitivity rating of moderate and very high (Figure 6).

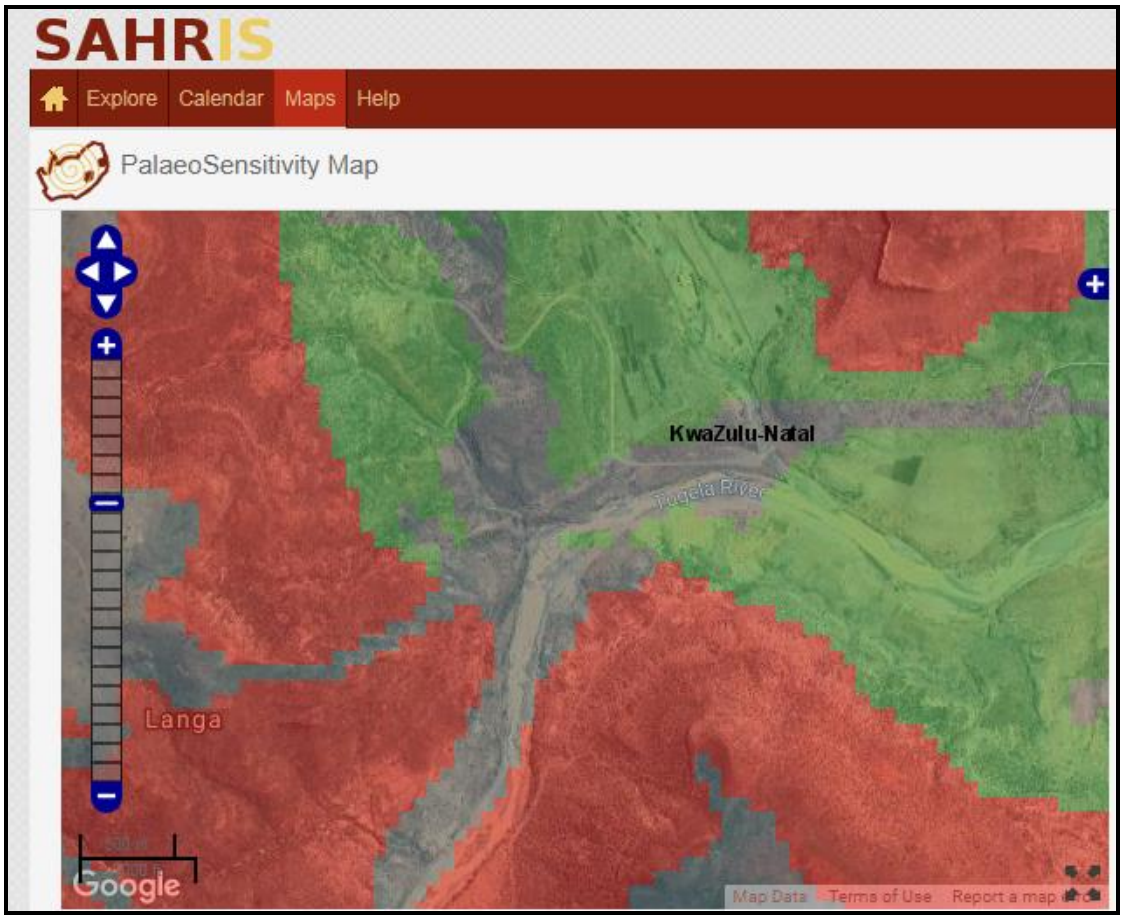

Figure 6: Map showing how the geology of the region translates into palaeo-sensitivity. The patches of red represent the Vryheid Formation of the Ecca Group, a rock type with a high sensitivity for possible fossil occurrences. The green has a moderate sensitivity and represents the Pietermaritzburg Formation as well as Quaternary deposits. The grey areas represent dolerite outcrops which have a zero/insignificant palaeontology rating and large portions of the route of the proposed road will be constructed on top of this rock-type. Modified from the SAHRIS map, www.sahra.org.za/sahris/map/palaeo

Site observations

Before the ground survey commenced, an aerial survey of the study site was first carried out using Google Earth. The relevant geology map of the area and SAHRIS palaeo-sensitivity map were both used in combination to gain an understanding of the underlying bedrock along the route, and how it is ranked in terms of possible fossil occurrences.

As portions of the proposed road cross through a palaeontologically sensitive area, with archaeological and historical material likely as well, the terrain was surveyed on foot using a Garmen eTrex. The weather was slightly overcast but the visibility was good. The terrain within the surrounding landscape has an aesthetic value including streams, rivers, rock formations and densely vegetated hills (Figure 8). Large portions of the site footprint were therefore challenging to survey as they were covered with well-established vegetation, so it was difficult to gauge the nature of the underlying sediment and/or bedrock. In addition, there were no good cuttings/dongas/exposed outcrops where it was possible to view what was present below the surface, and where potential fossil or archaeological material may be exposed. As the rocks of this region are highly fossiliferous it is probable that fossil material is located within the broader landscape but was not observed due to its hidden or buried nature.

Several stone-walled features were noted along the flanks of many of the hills in this area, and most of these walls and terracing structures were fairly new and associated with modern homesteads, although some of them may be historical or remnants from Iron Age architecture. Man-made stone features also included graves which comprised of a low pile of stones in a rectangular shape. Less common but similar looking piles of rock were also noted which were more oval to round in shape and the rocks were piled high, and these were not

graves but appeared to be people tidying up and piling the rocks to clear space for paths, roads or homesteads.

This part of the valley is sparsely populated and very few graves were observed, and none of these were in the direct path of the road. The problem is that the location of graves which are older than a hundred years may not be remembered by locals or may be hidden amongst the vegetation as trees, bushes and long grass become established amongst the rocks on top of a grave, so site engineers should (as best as possible) stick to existing roads and footpaths with the planned route of the L3415, and avoid dense bush with semi-buried piles of rocks/boulders where old graves may be hidden.

Pottery fragments were fairly common on the site footprint, with both decorated (red ochre) and undecorated pieces observed, as well as the occasional stone flake. They were however fragmentary, out-of-context, surface finds and did appear to be part of an archaeological site but rather individual occurrences (Figure 9 & 10).

Figure 7: The first part of the route had a driveable road but it ended before the half-way mark, so the rest of the survey was done on foot

Figure 8: Photograph taken at GPS co-ordinates 28° 41' 44.23" S 30° 16' 06.93" E along the route of the proposed road. The last section of the road is built on the river floodplain so archaeological material and possibly Pleistocene fauna is likely to be preserved in pockets of Quaternary alluvium

Figure 9 & 10: Pottery fragments are fairly common in the valleys, as some pots used for collecting water likely got accidentally dropped during visits down to the river. These pottery fragments accumulated over many generations and could be hundreds or even over a thousand years old. They therefore likely represent pots from a specific occasion and are not necessarily part of collection of artefacts eroding out of an archaeological site

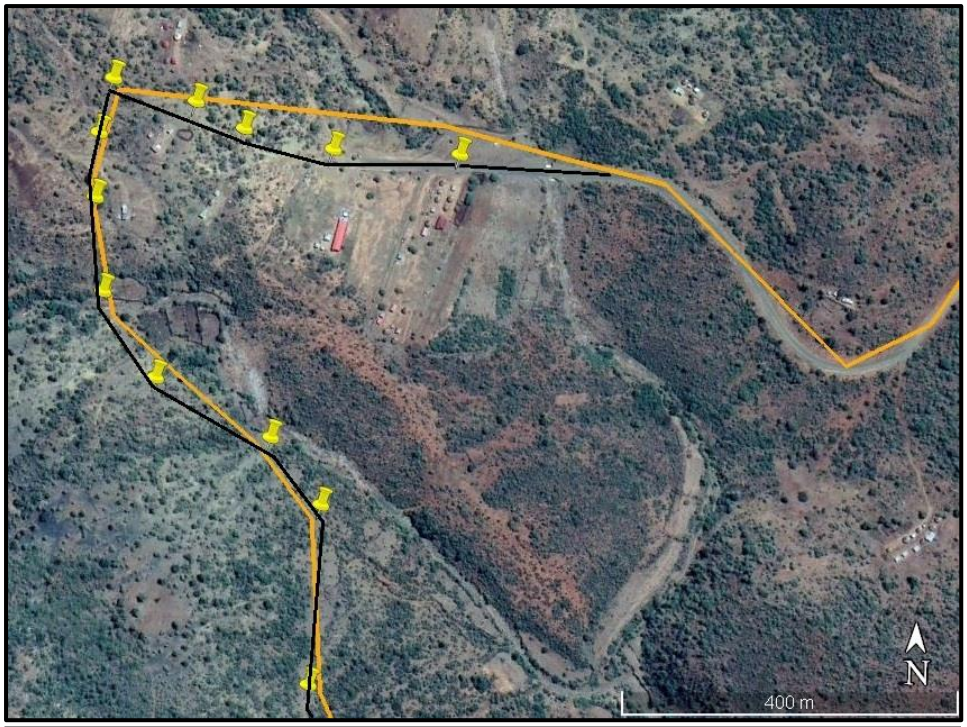

Figure 11: Satellite image showing a suggested alternative route for the proposed road, indicated in black. This option tries to avoid vegetated areas and to rather stick to existing paths and open patches of ground

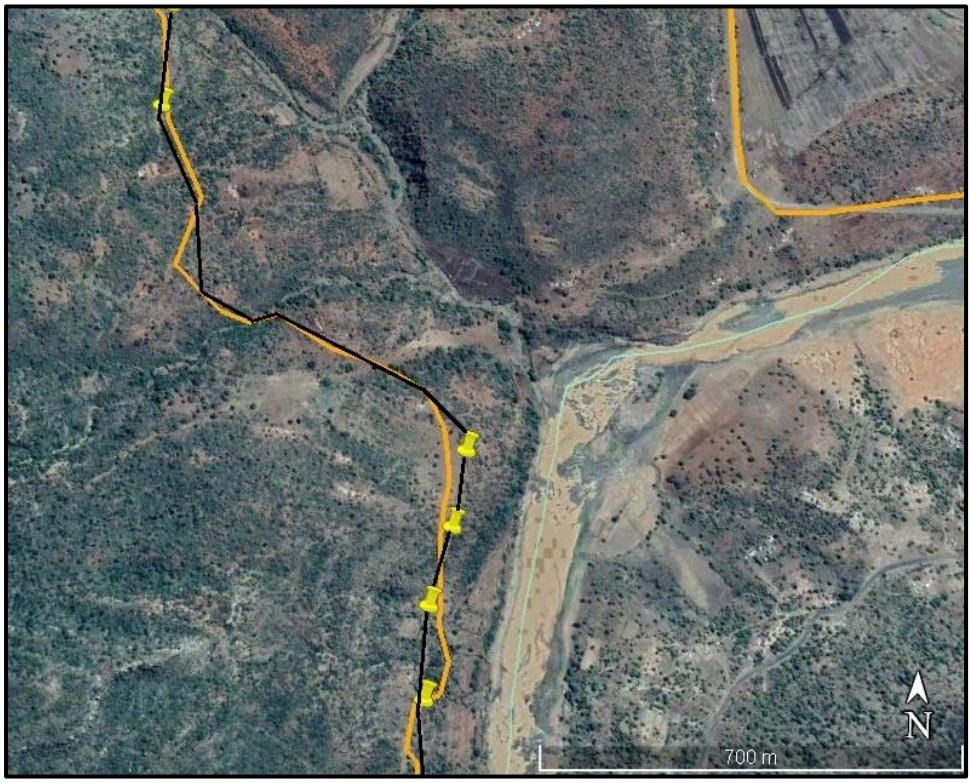

Figure 12: Satellite image showing a suggested alternative route for the proposed road, indicated in black. This option tries to avoid vegetated areas and to rather stick to existing paths and open patches of ground

Contingency plan for possible heritage-related discoveries:

CHANCE FIND PROTOCOL

Based on the work of Almond *et al*. (2009) and Groenewald *et al*. (2014) and summarised on the SAHRIS website (www.sahra.org.za/sahris/map/palaeo), if a development occurs within a red zone a desktop study is required, as well as a phase 1 Palaeontological Impact Assessment (PIA) comprising a field survey and recording of fossils. A phase 2 PIA is also required, which entails the rescue of fossil material during construction activities, as well as the compulsory application for a collection and destruction permit. If the development occurs in an orange zone, a desktop survey as well as a phase 1 PIA comprising of a field survey and collection of fossils is compulsory. A prior application for a collection permit is therefore recommended and a phase 2 PIA may be necessary during the construction phase of the project. If the development occurs in a green zone, a desktop survey as well as phase 1 PIA comprising a field survey is recommended. Lastly developments which occur in a blue or grey zone may require a desktop survey, based on the known heritage sites in the area as well as the nature of surrounding geological units.

The normal procedure for recovering palaeontological and/or archaeological material would be to identify areas which show investigative potential through a concentration of fossils or artefacts and whose recovery and preparation could address certain scientific questions. The process would then entail obtaining permission from the landowner/s and applying to SAHRA (South African Heritage Resources Agency) or another provincial heritage agency for a collection permit to excavate or remove blocks of bedrock for preparation in the lab. This is a slow and time-consuming process which requires the skills of a field archaeologist/palaeontologist to spot worthy material within geological/stratigraphic

exposures, and skilled fossil excavators and/or preparators who can successfully recover fossilsfrom sediment or slabs of bedrock.

But in the case of developments artefacts, fossils or graves may be exposed which were not being targeted as a part of a formal scientific investigation, which then requires intervention to ensure that such heritage resources are documented and evaluated, and possibly recovered or relocated. In this way, construction activities can provide an opportunity for scientists in that sediments or bedrock will be exposed which otherwise would have gone unnoticed as it was hidden from view and would have been costly to excavate.

Heritage consultants are required to evaluate proposed development sites in the hope of recording graves, and recording and/or recovering important objects and artefacts before they are damaged or destroyed, but during the entire timeline of a project a HIA consultant is generally only on site for a few hours. Having a palaeontologist or archaeologist on site to examine every scoop of a back actor/JCB would be very costly and impractical, so additional site visits may be required for certain large-scale projects, or developments in highly sensitive areas. If fossils or archaeological artefacts are unearthed during the rest of the project timeline when no heritage assessor is on site, they (fossils or archaeological artefacts) may be difficult for the on-site layman to identify as many geological formations superficially resemble palaeontological and/or archaeological material. Pseudo-fossils and certain mineral deposits often form into a variety of shapes which may closely resemble plant and animal fossils, making it more difficult for laypersons to positively identify chance finds in the field.

It is not the responsibility of site workers to keep an eye out for heritage objects neither are they likely to have had the appropriate training on what to look for but they are on the ground witnessing and observing, which is a helpful tool when there is a flow of information from on-site staff to management and protocol dictates that you convey when something unusual

or out of the ordinary is observed during work operations. The probability of on-site foremen or construction workers operating heavy earth moving equipment and working to a strict time schedule spotting heritage objects amongst tons of bedrock or sediment is unlikely but nonetheless possible. In South Africa many important archaeological and palaeontological discoveries have been made during construction projects, and companies can play their part by following the law and making the effort to report heritage resources which have been unearthed during digging operations. In so doing, developers can improve their public image and potentially contribute to a rare fossil or object reaching a museum or tertiary institution where it can studied and eventually displayed to the public as heritage belongs to the entire nation and should be preserved as best as possible.

If by chance fossils or any other heritage-related material were to be discovered which was not anticipated in this Phase 1 HIA report, construction would need to cease immediately and a protocol should be followed whereby the relevant provincial or national heritage custodians in the relevant province (e.g. Amafa or Natal Museum) would need to be informed. Developers would also need to acquire the services of a suitably qualified archaeologist and/or palaeontologist as a Phase 2 heritage study may be necessary so that scientists can be given the opportunity to record and/or recover archaeological and/or fossil material if it is ranked as significant and likely to make a positive contribution to the field of science. If anything relevant is observed, mitigation measures may be necessary and an application for a collection permit may be required.

Assumptions and limitations

According to the amended 2017 EIA regulations, various assumptions and limitations need to be stated when reporting on proposed developments. The professional opinion given in this HIA report is based on the results of a field survey which was used to gauge the fossiliferous

potential of the bedrock likely to be exposed during the proposed development,as well as to evaluate the existence of possible archaeological sites and/or graves on the site footprint. As a general rule, field observations are based on recording archaeological/palaeontological material which is eroding out or visible on the surface. As many developments require a degree of digging down into the soil and/or underlying stratigraphy, artefacts/fossils will only be exposed once they have been disturbed from their original positions. Therefore such objects would have been hidden from the assessor during the fieldwork survey as they had not yet started eroding out from the stratigraphy they are preserved in.

In addition, the results reported herein are based upon a thorough field survey and careful scrutiny of the best available maps and data sets and all attempts were made to take a holistic, informed decision. Yet in spite of this it is possible that fossils, archaeological sites or old graves may be present somewhere along the route of the proposed development but are hidden from view due to their buried nature. Moreover, certain predictions about the likelihood of encountering heritage-related material was based on all available evidence and may prove to be less or more likely than anticipated .

A key assumption for this report is that the kml/kmz file sent to the heritage specialist accurately conveys the layout and nature of the development, which is not always the case as plans are often revised or the site layout has not been accurately drawn in Google Earth. A further assumption is that the geological maps used in this assessment are accurate and up to date, which may not be the case as there is a continuous refinement and revision of the geological model through new scientific research, some which may still need to become incorporated into available maps. A limitation with large scale maps (1:250 000) is that smaller outcrops of fossiliferous bedrock may not be indicated within the represented geological model. In addition, several potentially fossiliferous outcrops may have been weathered and eroded over millennia, buried under younger deposits in the form of alluvial

and colluvial sediments, or capped by topsoil. Palaeontologically-sensitive bedrock may have also been metamorphosed through its contact with intrusive lavas, damaging or destroying fossil specimens along the contact zone.

Similarly, another limitation is that buried archaeologically-sensitive strata may be capped by an archeologically sterile topsoil observed by the HIA assessor during the fieldwork survey, hiding the true nature of subterranean deposits. Graves that are from unknown individuals and are not visited and maintained by family/descendants as they are very old (historical/archaeological) will revert back to nature and will likely be partially/totally buried by plant cover and will therefore be challenging to observe and document during the ground survey due to their hidden nature.

Lastly, it is assumed that the developers will respect the guidelines set out in the laws of South Africa with regards to good environmental management practices and policies, and will immediately cease all construction activities if any graves, fossils, or archaeological material is discovered. It is also assumed that developers will practice integrity and embrace an unwavering mind-set with regards to respecting and protecting all aspects of heritage, including due consideration for the fact that archaeological and palaeontological objects cannot simply be sacrificed to meet project deadlines.

Conclusion and recommendations

During the ground survey no fossil material was recorded as no sedimentary rock exposures were visible at the surface within the site footprint, and the majority of the underlying bedrock comprised of non-fossiliferous dolerite. Several rock art sites occur in the region, but these are located on the sandstone cliffs above the valley floor and will not be impacted by this proposed development as they are several kilometres from the site footprint. Some of the homesteads had graves adjacent to them, although none of these were in the direct line of the

proposed road. Site engineers and planners will need to be cautious and sensitive to these occurrences as old graves that are overgrown with vegetation will be almost invisible, so the final route for the proposed road should avoid thick patches of bush but rather stick to existing roads, footpaths, cattle trails and small clearings, as indicated in Figure 11 & 12.

During the laying of the gravel/stone foundations for the proposed project it is recommended that non-fossiliferous rocks are used (e.g. dolerite / berg-gruis etc.) as a foundation fill, and that if local rocks are being sourced for this purpose then it is suggested that the quarrying of fossiliferous bedrock be avoided if possible. Sandstone, mudstone or shale that is locally quarried for use in the new development is very likely to contain fossil material. Therefore if local quarrying will be taking place, developers should make the effort to take a greener, more holistic approach to building by considering what visual impact quarrying is having on the aesthetic value of the surrounding landscape, and by ensuring that quarried raw materials are (as far as possible) non-fossiliferous and are being harvested in a manner that reduces the scarring on the landscape. As the aesthetic beauty of the natural landscape also falls under heritage developers should carefully plan the layout of possible quarry sites in order to reduce their visibility,and where possible to select existing quarry sites.

Due to the fact that no fossil material was found during the survey, as well as the fact that no Volksrust bedrock was exposed at the surface along the route of the proposed road and that most of the bedrock within the site footprint was dolerite, no further palaeontological assessment is required and the project can proceed as planned. Furthermore, no significant archaeological material was located during the survey and no historical buildings were recorded anywhere near the site footprint. The pottery pieces recorded were all fragmentary, out-of-context surface finds and were not part of a larger archaeological site eroding out. None of the graves observed were in the direct line of the proposed road, but planners may need to make small adjustments to the route to avoid vegetated patches with possible hidden

graves by utilizing existing roads/paths where possible. If any graves, archaeological or palaeontological material were to be unearthed, developers are reminded that work should immediately cease and the chance find protocol outlined above should be followed to ensure that developments comply with the law so that a rare object stands a good chance of being recorded and/or relocated opposed to likely destruction from planned construction activities, and importantly to ensure that the correct processes are followed should human remains unintentionally be exposed.

The most ideal location for the establishment of stockpile and/or construction camps is along the first stretch of the road as depicted in Figure 3, between GPS co-ordinates 28° 41' 31.36" S 30° 16' 31.92" E and co-ordinates 28° 41' 04.86" S 30° 15' 44.53" E, as long as such sites are not immediately adjacent to the river or its tributaries or located within the floodplain deposits as accidental spillages may contaminate the river. The underlying bedrock is dolerite, this location is accessible and the existing road is in good condition, making it suited for such a site.

The surrounding landscape also has heritage value, with springs, streams and densely vegetated hills, so developers should make the effort to reduce scarring of the terrain by selecting appropriate, well-hidden quarry sites, and to clean-up and rehabilitate stockpile and/or construction camps after completion of the project.

References

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