PALAEONTOLOGICAL HERITAGE IMPACT ASSESSMENT AND MITIGATION APPROACHES

PREPARED FOR GENERAL INFORMATION PURPOSES

By John Pether

Significance of the Heritage Resource

In terms of the National Heritage Resources Act No. 25 of 1999, Sections 35 & 38, palaeontological materials (fossils) are regarded as a heritage resource and appropriate actions are required to mitigate impacts from mining, construction and development on palaeontological heritage. If fossils are turned up in excavations, they must be rescued from destruction and loss.

The significance of fossils and palaeontological objects as natural heritage is primarily their scientific value. They contribute to the understanding of South Africa's geohistory, the progression through "deep time" of changing climates, oceanography and of the biota, both plant and animal, that lived on the land and in the sea. This history ultimately resulted in the landscapes and coasts and the resources that sustain us today. Generally-speaking they are scarce, non-renewable and irreplaceable when destroyed. Their value is also severely compromised when they are collected without proper recording of their geological context. Geological (sedimentological/palaeoecological) observations are indispensable for the interpretation of fossil finds.

The value of fossils extends far beyond the curiosity of palaeontological study in museums, for they provide the basis for biostratigraphy, the division of the sedimentary record into units of distinct ages that can be correlated both regionally and globally. The fossil content of strata is thus very important for understanding the genesis of exploitable mineral resources and for the "geological models" that furnish the basis for ongoing mineral and fossil-fuel exploration.

The Palaeontological Heritage Impact Assessment

The request for a palaeontological HIA should arise in the screening/scoping phase of an Environmental Impact Assessment (EIA), but may arise later in the process.

The main purposes of this assessment are to:

1. Outline the nature of palaeontological heritage resources in the vicinity of the site.
2. Suggest the mitigatory actions to be taken prior to and during the excavation phases at the site with respect to the occurrence of fossils.

The document also serves as the basis for the Agreed Terms of Reference for the heritage impact management part of the project.

Although fossiliferous strata may already be exposed at some sites, in most situations the fossils will be exposed in the excavations made for mining/construction. Palaeontological interventions mainly happen once fossil material is exposed at depth, i.e. once the EIA process is done and mining/construction commences.

The action plans and protocols for palaeontological mitigation must therefore be *included in the Environmental Management Plan (EMP)* and embodied in the Agreed Terms of Reference for the appointed heritage assessment/mitigation practitioner.

Therefore, although the Palaeontology HIA submission occurs at the screening/scoping phase, it may be already be regarded as the draft input for the EIA and EMP phases.

The Palaeontological HIA includes:

Desktop Study. Expected palaeontology/geology. Existing scientific literature and collection holdings of relevance to the palaeontological/geological record of the site will be reviewed, assessed and summarised. On this basis the general expectations wrt. potential fossil occurrences will be outlined.

Specific site features. Identification and basic description of significant features wrt. palaeontological heritage *currently exposed* in the site area. Some of these features may be affected by the proposed works; either directly by potential destruction, or less directly by potential degradation as a result of increased traffic, access, visibility , etc.

The object here is the advance earmarking of fossil sites of such importance that they may constitute a permanent No-Go site, necessitating revision of the siting of the envisaged installations. Alternatively, that

the outcrop/exposure is sufficiently important that mitigation measures should be carried out *before* the commencement of construction activities on the site.

Outcome: Initial HIA Palaeontological Report for the site, with mitigatory recommendations.

EIA Phase

At this stage, any additional information arising and issues from discussions with interested parties wrt. recommendations for mitigatory actions for the selected site-will be elaborated for inclusion in the finalized EIA Report, for the input to the EMP.

EMP Phase

Mitigatory recommendations to be carried out.

Monitoring protocols as agreed in place.

Mitigation during a primary fieldwork phase at the selected site.

Outcome: Final Report.

Rescued fossil material deposited in the appropriate scientific institution.

MITIGATION APPROACHES

First, any exposed fossil occurrences threatened by mining/construction should be sampled and described.

It is suggested that an acceptable degree of monitoring be carried out during the making of excavations.

The primary mitigation task of the specialist entails the inspection of larger, deeper excavations made for mining or infrastructure installations. This activity should co-incide with the time of maximum exposure of the faces of the excavations, for best cost-effectiveness.

Monitoring

In general, fossil bones are sparsely scattered in coastal deposits and much depends on spotting them as they are uncovered during digging. In contrast, shelly layers are usually fairly extensive and normally are exposed in the sides of the finished excavation, when they can be documented and sampled easily.

In archaeologically-sensitive areas, monitoring by a qualified archaeologist of excavations as they are made might be a requirement stipulated by the provincial heritage authority. In such cases the archaeologist is likely to spot, investigate and report fossil material and separate monitoring by a palaeontolgist should not be necessary.

Most areas have relatively low potential for fossil bone material and it is expensive and impractical to have excavations constantly monitored by a professional during the construction phase. Notwithstanding, the sporadic fossil occurrences are then particularly important and efforts made to spot them are often rewarded.

In order to spot the rare occurrences, it is very desirable to have the co-operation of the people "on the ground". By these are meant personnel in supervisory/inspection roles, such as engineers, surveyors, site foremen, etc., who are willing and interested to look out for occurrences of fossils. These personnel are also critical in informing excavator operators and manual workmen, whom being close to the sediments, would be more likely to spot smaller fossils.

Successful and cost-effective monitoring depends a lot on this goodwill and co-operation of managers and on-site people. To aid this process, a general background information document is useful.

There should also be guidelines for potential finds and a reporting/action protocol in place when finds are uncovered.

Isolated finds that are turned up should be handed over to a designated person for safekeeping, noting as far as possible where they came from. Excavated material with a clump of bones included can be stockpiled temporarily for safekeeping, until the site visit by the palaeontologist.

If major bone finds are encountered, the contracted specialist should be immediately informed. A temporary pause in activity at the limited locale will be required. The strategy is to "rescue" the material as quickly as possible. The method would be to remove representative samples and "best" material in encased blocks. In the case of considerable occurrences of bones, the methods could include the removal of a large, disturbed sample by excavator and conveying this by truck from the immediate site to a suitable place for "stockpiling". This material could then be processed locally, by sieving and further preparation.

Primary Mitigation

When the excavations are near or at completion:

The excavation faces will be inspected for fossil content.

Any already-rescued material as above will be examined, processed and packaged.

Representative samples of fossils will be collected. In the case of shelly beds, bulk samples will be taken. If material is delicate/poorly-preserved, it will be removed within blocks of the enclosing sediment, reinforced if required by encasement.

Key vertical sections representative of the exposures will be identified. These will be described in detail sedimentologically (logged), photographed and sampled, to fully record the contexts of the fossils.

For the purposes of planning and costs containment, the contracted specialist must be informed on the scheduled excavation planning and the progress being made i.e. would need to establish liaison protocols with a suitably-placed persons.

A prescribed data requirement is adequate 3D spatial referencing. For this the specialist would require the assistance of the surveyor wrt. co-ordinates and base maps, to plot the locations of finds during monitoring, the measured sections, samples and other observations.

The Report

At the end of the task a detailed report will be submitted.

This report is in the public domain and copies of the report must be deposited at the Heritage Resources authority and/or SAHRA. It must fulfil the reporting standards and data requirements of these bodies.

The report will be in standard scientific format, basically:

A summary/abstract.
Introduction.
Previous work/context.
Observations (incl. graphic sections, images).
Palaeontology.
Interpretation.
Concluding summary.
References.
Appendices

The draft report may be reviewed/screened by the client, or reviewed externally, before submission of the Final Report.

Application for Palaeontological Permit from SAHRA/Provincial Heritage Authority

The specialist is required to obtain a palaeontological permit from the Provincial Heritage Resources Authority or SAHRA in order to carry out the work. For this is needed details of the registered owners of the sites, their permissions and a site-plan map. A permit fee of R150 is now operative.

All samples of fossils and sediments will be deposited at a curatorial institution approved by SAHRA or the appropriate provincial heritage resources authority.

The client might desire a local display/exhibition of findings and features: out of a combination of interest, public-mindedness and to demonstrate diligence w.r.t. heritage/science resources. This would have to be at a location and under conditions approved under the auspices of the Heritage Resources Authority.

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John Pether, M.Sc., Pr. Sci. Nat. (Earth Sci.)
Geological and Palaeontological Consultant
P. O. Box 48318
Kommetjie, 7976
Tel./Fax (021) 7833023
Cellphone 083 744 6295
jpether@iafrica.com

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