

Palaeontological Impact Assessment Phase 1: Desktop Study

Proposed Dinosaur Interpretation Center, Golden Gate Highlands National Park, Free State

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For

South African National Parks (SANParks)

Wednesday, 11 March 2015

EXECUTIVE SUMMARY

This Phase I Palaeontological Impact Assessment concerns the South African National Park authority's proposal to build a Dinosaur Interpretation Center at Golden Gate Highlands National Park, Free State. The proposed development will overlie sedimentary bedrock that is extremely likely to contain vertebrate fossils of scientific and cultural importance. It is strongly recommended that a trained palaeontologist be on hand during site work to monitor all excavations into the sedimentary bedrock. This palaeontologist should have a collection permit from the South African Heritage Resources Agency so that they can legally excavate any important material that is discovered while the site is developed. With this mitigation recommendation in place, it will be possible to simultaneously complete the proposed project and protect valuable heritage resources.

BACKGROUND INFORMATION

This Phase I Palaeontological Impact Assessment (PIA) is a part of an Environmental Impact Assessment being performed by EnviroWorks and commissioned by the developer, South African National Parks (SANParks). The contact person for EnviroWorks is:

Adel Groenewald
072 460 3333
www.enviroworks.co.za

SANParks is proposing to build a Dinosaur Interpretation Center at Golden Gate Highlands National Park, Free State. The project is in planning stages, and preliminary architectural site drawings have been drafted by Mashabane Rose Associates, Johannesburg:

3 Sherwood Ave
Forest Town, Johannesburg 2193
011 486 1057
www.mashabanerose.co.za

The proposed project will include:

- ~2600m² building with exhibition space, several offices, and public and administrative toilet facilities
- Landscaped grounds surrounding the Dinosaur Interpretation Center with trails, informal gathering areas, and similar features
- Parking lot with space for 40 cars and 6 buses
- Additional informal interpretive space east of the building across from the Rooidraai egg site on R712

Rezoning of the site is not required for the development; as it is entirely contained within proclaimed National Park/protected areas.

This PIA is done in accordance with the National Heritage Resources Act, Act No. 25, 1999, Sections 35 and 38 which regulate, among other things, palaeontological sites, palaeontological objects and material, and rare geological specimens.

DESCRIPTION OF THE PROPERTY

The proposed Dinosaur Interpretation Center will be installed at Golden Gate Highlands National Park, Free State Province. The area of the proposed development is located on the North side of R712 between the Glen Reenen guest camp development and an informal parking area located immediately north of the Rooidraai egg site (Kitching, 1979; Reisz et al., 2005), and south of an unnamed tributary of the Little Caledon River that extends approximately NW-SE along the site (see Maps 1 and 2, Appendix). The approximate perimeter of the proposed development site is 1.25km, and the approximate area is 5 hectares. Relevant coordinates for the site are provided in Table 1. Although the proposed building structure will not cover this entire area, the installation of roads, trails, and associated site work will have an impact across the whole specified area shown in Map 1.

Table 1: Geographic coordinates of important points near or within proposed development area at Golden Gate Highlands National Park

Name of point	Decimal degrees S (latitude)	Decimal degrees E (longitude)
Glen Reenen rest camp	-28.506103°	28.617352°
Existing camping area	-28.506179°	28.618549°
Rooidraai informal parking area	-28.508853°	28.622857°
Approximate center of proposed site	-28.507656°	28.620372°
Rooidraai egg site*	-28.509353°	28.622832°

*please note that the Rooidraai egg site falls outside of the proposed development area and is only given as a reference datum.

METHODOLOGICAL DESCRIPTION

This is strictly a desktop assessment, however, the author has worked extensively in Golden Gate Highlands National Park in September 2012, December 2012, September 2013, and January 2014, and is familiar with the area of the proposed development. Geological data was compiled from 1:250,000 geological series maps of the area, procured from the Council for Geosciences. Spatial data was collected using Google Earth Pro v7.1.2.2041. Possible fossil occurrence data was compiled using the collections records of the Evolutionary Studies Institute of the University of the Witwatersrand (accessed February 10th, 2015), published literature on vertebrate fossils from southern Africa (e.g., (Yates et al., 2011)), and personal field notes and GPS waypoints of the author. The boundaries of the proposed development site were gleaned from preliminary architectural drawings provided by Mashabane Rose Associates.

Description of Site

The surface exposure of the proposed development site is composed of a mix of patchy grassland vegetation, primary outcrop of the Elliot and Clarens Formations, and thin areas of alluvium derived locally from these formations. Alluvium and soil horizons at the site are generally <1m thick and in most places <10cm thick. The bedrock geology of the site consists of almost entirely of sedimentary rocks of the Elliot and Clarens Formations. These formations are composed primarily of mudstones and sandstones, respectively, deposited from the Late Triassic to Early Jurassic in the Karoo basin of South Africa and Lesotho (Bordy et al., 2004; Kitching and Raath, 1984). The mudstones are generally poorly indurated and weather rapidly, and the sandstones are generally well-indurated and resistant to weathering. These sediments preserve evidence of a changing palaeoenvironment from seasonally wet, fluvial depositional conditions at the base of the Elliot Formation to semi-arid,

primarily aeolian depositional conditions in the Clarens Formation (Bordy et al., 2004; Bordy et al., 2006; Smith and Kitching, 1997). In addition to the sedimentary formations, cross-cutting dolerite dykes are located within the proposed development area. These dykes likely date to the Early Jurassic but are certainly younger than the sedimentary facies they intrude. Dolerite dykes do not contain fossils, but they may be located in close proximity to sedimentary facies that are fossiliferous. Moreover, the intrusion of a dyke may cause localized remineralization of neighboring sedimentary facies, rendering them more difficult to identify.

The Elliot Formation is extremely rich in vertebrate fossils, including those of stem mammals (Kitching and Raath, 1984), basal dinosaurs (McPhee et al., 2014; Yates, 2003, 2005, 2007, 2008; Yates et al., 2011; Yates et al., 2010; Yates et al., 2004; Yates and Kitching, 2003), basal crocodylomorphs (Clark and Sues, 2002; Gow, 2000; Walker, 1990), sarcopterygian and actinopterygian fish (Jubb, 1973; Kitching and Raath, 1984; Warren and Damiani, 1999), stereospondyl amphibians (Warren and Damiani, 1999), and basal turtles (Gaffney and Kitching, 1994, 1995). It also has a rich ichnofauna (trace fossil record; reviewed in Olsen and Galton, 1984). Important fossil localities in the Elliot Formation are known from within and adjacent to Golden Gate National Park boundaries, including the Roodraai *Massospondylus* egg site (Map 1), discovered in 1974 by James Kitching of the (former) Bernard Price Institute (Kitching, 1979; Reisz et al., 2005).

The Clarens Formation is less abundant in vertebrate fossils than the Elliot Formation, but its fauna is nearly identical with the exception of some relatively large-bodied sauropodomorphs (Broom, 1904; Kitching and Raath, 1984; Olsen and Galton, 1984; Smith and Kitching, 1997). The Clarens Formation also has a rich ichnofossil record, including vertebrate footprints (Olsen and Galton, 1984; Raath and Yates, 2005) as well as invertebrate burrows and possibly termite nests (Bordy et al., 2009). A minor vertebrate site within the Clarens Formation is known from Golden Gate National Park (Choiniere, personal observation) and is located close to the intersection of the Blesbok Loop with R712. An important Clarens footprint sites is also located within the northernmost section of the park, far off of the tar road. Both of these sites are well outside of the proposed development area.

FIELD RATING

This is a site of 'General' protection A (rating IV A) significance. The possibility of uncovering vertebrate fossils or footprints during the sitework is very high, and the threat of damage of these protected heritage items should be mitigated as part of the construction process. Using proper precautions, the fossils or footprints can be safely excavated for further study and preservation before bedrock is removed.

STATEMENT OF SIGNIFICANCE

Vertebrate fossils from the Elliot and Clarens Formation preserve important information for studying the evolution of major vertebrate groups and for biostratigraphic correlation at a local and global level. These formations (particularly the Elliot) are internationally known for their fossil richness, and many of the fossil species previously discovered from them are known from nowhere else in the world. Thus, these formations and their fossils can form a valuable part of the budding South African palaeotourism industry (which the proposed development is hoping to capitalize on).

It is highly likely that the proposed development of a Dinosaur Interpretation Center will result in the discovery of vertebrate fossils. It is essential that these fossils are examined by a trained palaeontologist *in situ*, so that their significance can be assessed and so that, if necessary, they can be excavated for further study. This will mitigate the potential threat to heritage resources effectively, as well as potentially provide fossil material and exposure for the proposed development.

RECOMMENDATIONS AND CONCLUSIONS

The proposed development area for the a Dinosaur Interpretation Center at Golden Gate Highlands National Park, Free State will overlie deposits of the Elliot and Clarens Formations that are extremely likely to contain important vertebrate fossils. Excavation into the bedrock is likely to expose these fossils.

The potential threat to these heritage resources posed by the proposed development can be mitigated by having a palaeontologist on site to examine in-situ vertebrate fossils uncovered by earthworks, and if necessary rapidly excavate them. The palaeontologist assigned to this task will need a valid collection permit from the South African Heritage Resources Agency. All work would have to conform to international best practice standards for palaeontological fieldwork and the resulting study should adhere to the minimum standards for Phase 2 paleontological impact assessments recently laid out by SAHRA in 2013.

APPENDICES:

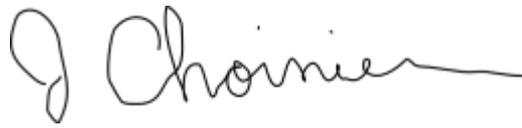
***comprising Map 1 and Map 2.**

Map 1: Satellite imagery of the proposed site (©Google Earth Pro). Pink indicators refer to points of interest mentioned in-text. Red outline represents the approximate overall dimensions of the proposed project. Coordinates relevant to this map are given in Table 1. Scale as indicated.



CERTIFICATION

I declare no competing interests in the proposed project by SANParks, and have no business, financial, or personal affiliations with SANParks, EnviroWorks, or Mashabane Rose. I have been fairly remunerated for the work I have performed to assemble this report.

A handwritten signature in black ink, appearing to read "J. Choinier". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

February 20th, 2015

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